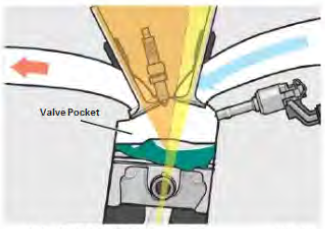
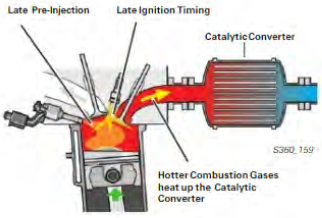


Valve Angle Cylinder 1, 3, 5 S360_252



Valve Angle Cylinder 2, 4, 6 S360_251

important role along with the quantity of fuel injected and the length of injection.



The Homogenous Split Catalytic Converter Heating Process

The purpose of the Homogenous Split Catalytic Converter Heating Process is to bring quickly the catalytic converters to operating temperature after a cold start.

To achieve this, the fuel is injected twice during one combustion cycle. The first injection takes place in the induction stroke. This achieves an even distribution of the fuel-air mixture.

In the second injection, a small amount of fuel is additionally injected shortly before ignition Top Dead Center (TDC). The late injection increases exhaust gas temperature. The hot exhaust gas heats up the catalytic converter so that it reaches operating temperature more quickly.

29

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Engine Management

System Overview

Sensors

Engine Speed (RPM) Sensor G28

Mass Air Flow (MAF) Sensor G70

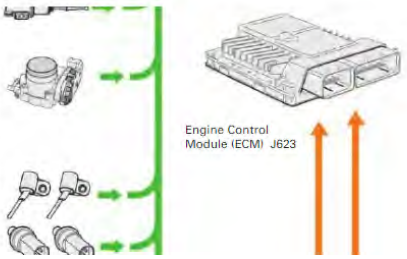
Throttle Position (TP) Sensor G79
Accelerator Pedal Position Sensor 2 G185

Clutch Position Sensor G476

Throttle Valve Control Module J338 with
Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC)) G187
Throttle Drive Angle Sensor 2 (for Electronic Power Control (EPC)) G188

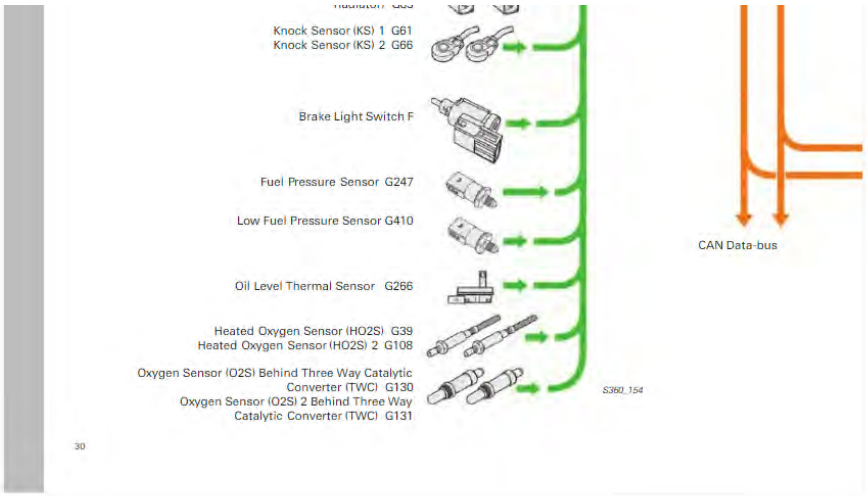
Camshaft Position (CMP) Sensor G40
Camshaft Position (CMP) Sensor 2 G163

Engine Coolant Temperature (ECT) Sensor G62
Engine Coolant Temperature (ECT) Sensor (on Radiator) G83



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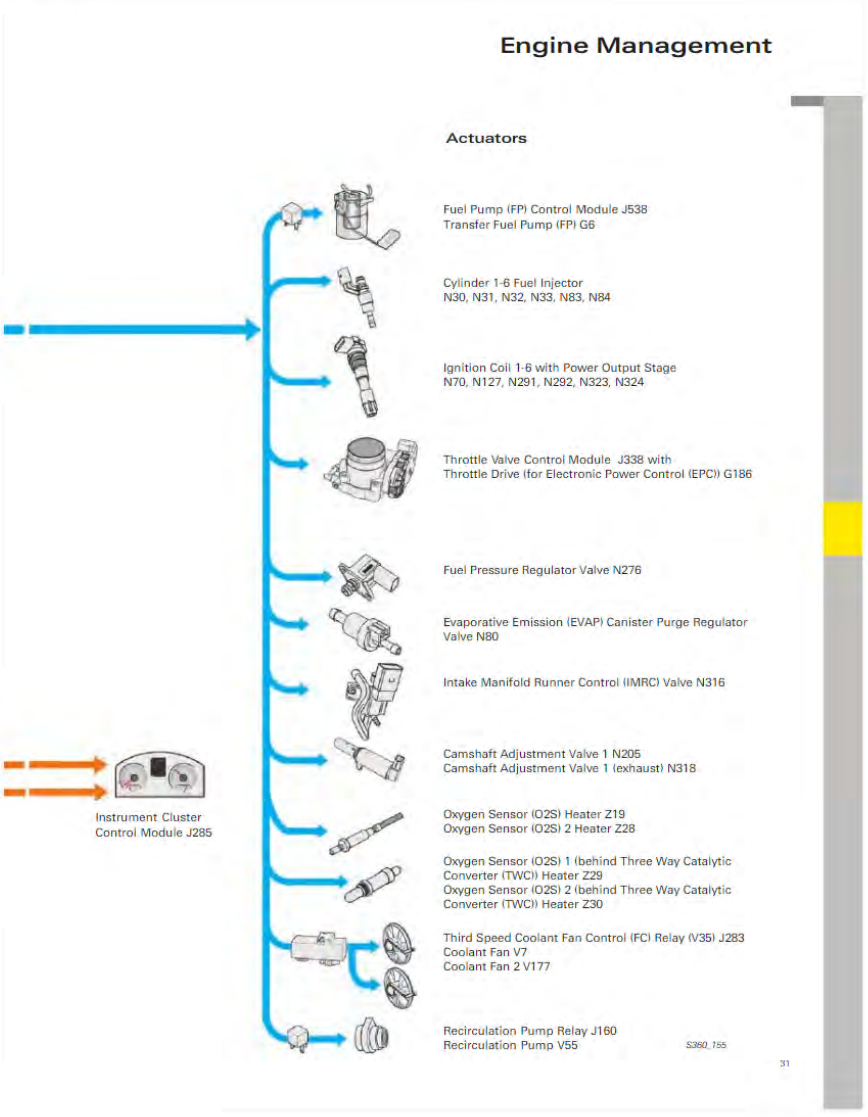
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Engine Management

Sensors

Engine Speed (RPM) Sensor G28

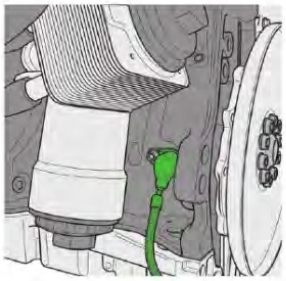
The Engine Speed Sensor is threaded into the side of the cylinder block. It scans the sensor wheel on the crankshaft.

Signal Utilization

The engine speed and the exact position of the crankshaft relative to the camshaft are determined by the engine speed sensor. Using this information, the injection quantity and the start of injection are calculated.

Effects of Signal Failure

In case of signal failure, the engine is switched off and cannot be restarted.



S360_111

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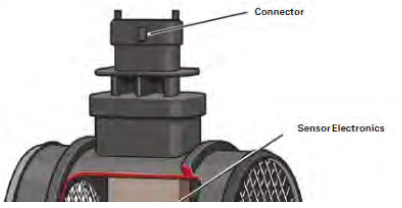
Engine Management

Mass Airflow Sensor G70

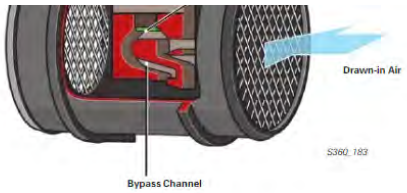
The 6th generation hot film mass airflow sensor (HFM6) is used in the 3.2L and the 3.6L FSI engine.
It is located in the intake manifold and operates based on a thermal measurement principle, as did its predecessor.

Characteristics

- Micromechanical sensor element with reverse current detection
- Signal processing with temperature compensation
- High measurement accuracy
- High sensor stability



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Engine Management

Operation

The sensor element for the Mass Airflow Sensor protrudes into the airstream of the air drawn in by the engine. Some of the air flows through the bypass duct of the mass air flow sensor.

The electronic sensor system is located in the bypass duct. A heating resistor and two temperature sensors are located in the electronic sensor system.

The two temperature sensors detect the direction of airflow:

- The intake air passes first over temperature sensor 1
- The air returning from the closed valves passes first over temperature sensor 2

Using the heating resistor, the ECM can draw conclusions about the oxygen content of the intake air.

Signal Utilization

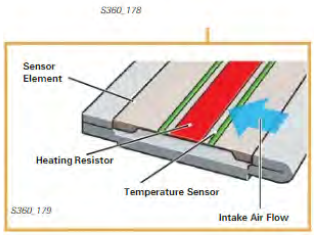
The signal from the mass airflow sensor is used in the ECM to calculate the volumetric efficiency. Based on the volumetric efficiency, and taking into consideration the lambda value and ignition timing, the control module calculates the engine torque.

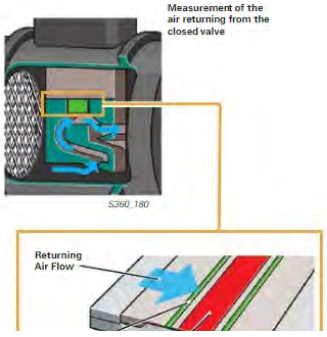
Effects of Signal Failure

If the mass airflow sensor fails, the engine management system calculates a substitute value.

Measurement of the Intake Air

Cut-out Mass Airflow Sensor





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Engine Management

The Throttle Position (TP) Sensor G79 and the Accelerator Pedal Position Sensor 2 G185

The two throttle position sensors are part of the accelerator pedal module and are contact-free sensors. The ECM detects the driver's request from these sensor signals.

Signal Utilization

The ECM uses the signals from the Throttle Position Sensor to calculate the fuel injection volume.

Effects of a Signal Failure

If one or both sensors fails, a DTC is set and memory and the EPC light is switched on. Comfort functions such as cruise control or engine drag torque control are switched off.

Clutch Position Sensor G476

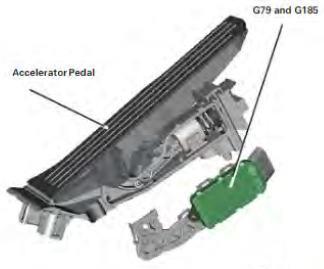
The Clutch Position Sensor is a mechanically actuated switch located on the clutch pedal. It is only required on vehicles with manual transmission.

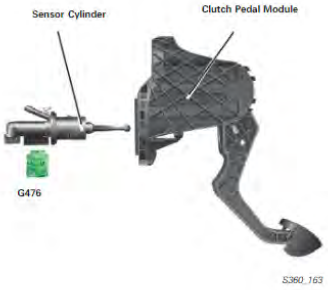
Signal Utilization

The signal is used to control the cruise control and to control the ignition timing and quantity of fuel when shifting.

Effects of a Signal Failure

The cruise control cannot be turned on. It also results in driveability problems, such as engine jerking and increased RPM when shifting.





Volvo Cars USA

Engine Management

The Throttle Drive Angle Sensor 1 G187 and Throttle Drive Angle Sensor 2 G188 in the Throttle Valve Control Unit

These sensors determine the current position of the throttle valve and send this information to the ECM.

Throttle Valve Housing

Throttle Valve Drive



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Signal Utilization

The ECM recognizes the position of the throttle valve from the angle sensors signals. The signals from the two sensors are redundant, meaning that both sensors provide the same signal for reasons of safety.

Effects of a Signal Failure

Example 1

The ECM receives an implausible signal or no signal at all from an angle sensor:

- A DTC is set and the EPC light is switched on
- Systems which affect torque, (e.g. cruise control system or engine drag torque control), are switched off
- The load signal is used to monitor the remaining angle sensor
- The accelerator pedal responds normally

Throttle Valve

G187 and G188

S360_238

Example 2

The ECM receives an implausible signal or no signal from both angle sensors:

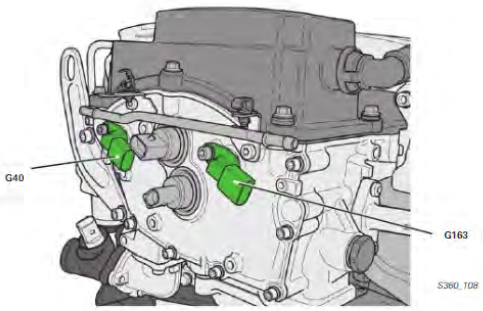
- DTCs are set for both sensors and the EPC light is switched on
- The throttle valve drive is switched off
- The engine runs only at an increased idle speed of 1,500 RPM and no longer reacts to the accelerator pedal

The Camshaft Position Sensors (CMP) G40 and G163

Both Hall sensors are located in the engine timing chain cover. Their task is to communicate the position of the intake and exhaust camshafts to the ECM.

To do this, they scan a quick-start sensor wheel which is located on the individual camshaft.

The ECM recognizes the position of the intake camshaft from the Camshaft Position (CMP) Sensor G40, and recognizes the position of the exhaust camshaft from Camshaft Position (CMP) Sensor 2 G163.



S360_108

Signal Utilization

Using the signal from the Camshaft Position Sensors, the precise position of the camshaft relative to the crankshaft is determined very quickly when the engine is started. Used in combination with the signal from the Engine Speed (RPM) Sensor G28, the signals from the Camshaft Position Sensors allow to detect which cylinder is at TDC.

The fuel can be injected into the corresponding cylinder

Effects of a Signal Failure

In case of signal failure, the signal from the Engine Speed (RPM) Sensor G28 is used instead. Because the camshaft position and the cylinder position cannot be recognized as quickly, it may take longer to start the engine.

and ignited.

37

Engine Management

The Engine Coolant Temperature (ECT) Sensor G62

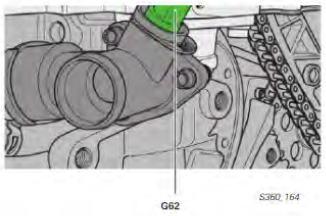
This sensor is located at the coolant distributor above the oil filter on the engine and it informs the ECM of the coolant temperature.

Signal Utilization

The coolant temperature is used by the ECM for different engine functions. For example, the computation for the injection amount, compressor pressure, start of fuel delivery and the amount of exhaust gas recirculation.

Effects of a Signal Failure

If the signal fails, the ECM uses the signal from the Engine Coolant Temperature (ECT) Sensor G83.



S360_164

The Engine Coolant Temperature (ECT) Sensor (on the Radiator) G83

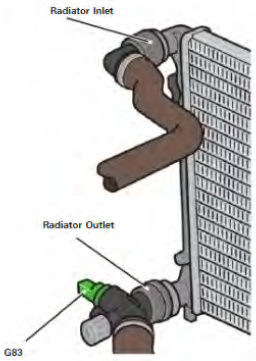
The Engine Coolant Temperature Sensor (on the Radiator) G83 is located in the radiator output line and measures the coolant exit temperature.

Signal Utilization

The radiator fan is activated by comparing both signal from the Engine Coolant Temperature Sensors G62 and G83.

Effects of a Signal Failure

If the signal from the Engine Coolant Temperature Sensor G83 is lost, the first speed engine coolant fan is activated permanently.



S360_182

38

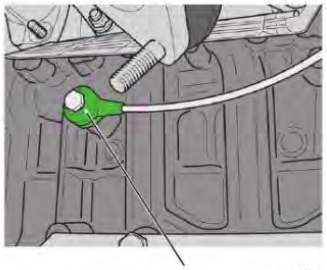
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Engine Management

Knock Sensors (KS) 1 G61 and Knock Sensors (KS) 2 G66

The Knock Sensors are threaded into the crankcase. They detect combustion knocks in individual cylinders. To

prevent combustion knock, a cylinder-selective knock control overrides the electronic control of the ignition timing.



G61

S360_157



G66

S360_158

Signal Utilization

Based on the knock sensor signals, the ECM initiates ignition timing adjustment in the knocking cylinder until knocking stops.

Effects of a Signal Failure

In the event of a knock sensor failure, the ignition timing for the affected cylinder group is retarded.

This means that a safety timing angle is set in the "late" direction. This can lead to an increase in fuel consumption. Knock control for the cylinder group of the remaining knock sensor remains in effect.

If both knock sensors fail, the engine management system goes into emergency knock control in which the ignition angle is retarded across the board so that full engine power is no longer available.

Engine Management

The Brake Light Switch F

The Brake Light Switch is located on the tandem master cylinder. It scans a magnetic ring on the tandem master cylinder piston using a contactless Hall Element.

This switch provides the Engine Control Module with the signal "Brake actuated" via the CAN data bus drive.

Signal Utilization

When the brake is operated, the cruise control system is deactivated. If the signal "accelerator pedal actuated" is detected first and "brake actuated" is detected next, the idle speed is increased.



S360_177

Effects of a Signal Failure

If the sensor signal is lost, the amount of fuel injected is reduced and the engine has less power. The cruise control system is also deactivated.

The Fuel Pressure Sensor G247

The Fuel Pressure Sensor is located on the lower fuel distributor pipe. It measures the fuel pressure in the high-pressure fuel system.

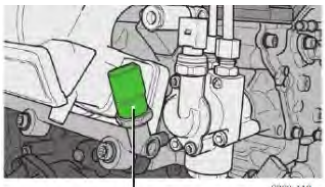


Signal Utilization

The ECM analyzes the signal and regulates the fuel high pressure through the Fuel Pressure Regulator Valve N276 in the high-pressure pump.

Effects of a Signal Failure

If the Fuel Pressure Sensor fails, the fuel pressure regulator valve is activated at a fixed value by the ECM.



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The Low Fuel Pressure Sensor G410

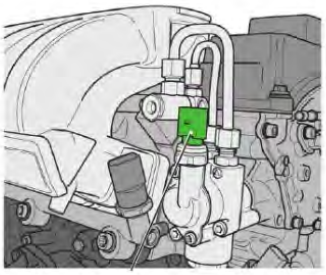
The Low Fuel Pressure Sensor is located on the high-pressure fuel pump. It measures the fuel pressure in the low-pressure fuel system.

Signal Utilization

The signal is used by the ECM to regulate the low-pressure fuel system. Based on the signal from the sensor, a signal is sent by the ECM to the Fuel Pump Control Module J538, which then regulates the fuel pump as needed.

Effects of a Signal Failure

If the Low Fuel Pressure Sensor fails, the fuel pressure is not regulated as needed. Fuel pressure is maintained at a constant 72 psi (5 bar).



G410 S360_109

The Oil Level Thermal Sensor G266

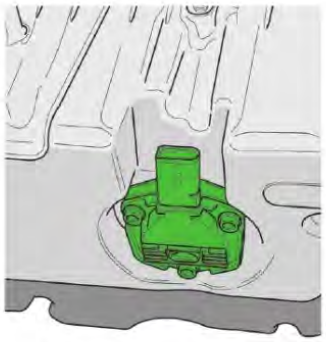
The Oil Level Thermal Sensor is threaded into the oil pan from below. Its signal is used by several control modules.

Signal Utilization

The ECM receives the signal over the CAN data bus and uses the oil temperature signal to control the retarded setting of the exhaust camshaft at high oil temperatures.

Effects of a Signal Failure

The control module uses instead the signal from the Coolant Temperature Sensor.



S360_156

Engine Management

The Heated Oxygen Sensors (HO2S) G39 and the Heated Oxygen Sensors (HO2S) 2 G108

A broadband oxygen sensor is assigned to each pre-catalytic converter as a pre-catalytic oxygen sensor. Using the broadband oxygen sensors, a wide range of oxygen concentration in the exhaust gas can be determined, allowing to derive information about the air-fuel ratio in the combustion chamber. Both oxygen sensors are heated to reach operating temperature more quickly.

Broadband Oxygen Sensor



S360_222

Signal Utilization

The signals from the Heated Oxygen Sensors are one of the variables used in calculating the injection timing.

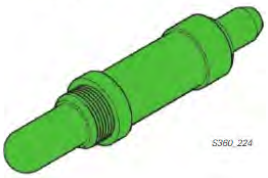
Effects of a Signal Failure

If the pre-catalytic converter oxygen sensor fails, there is no closed loop control. The fuel injection adaptation is not available. An emergency running mode is enabled using an engine characteristics map.

The Oxygen Sensor (O2S) Behind Three Way Catalytic Converter G130 and the Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter G131

The planar oxygen sensors are located downstream of the pre-catalytic converter. They measure the remaining oxygen content in the exhaust gas. Based on the amount of oxygen remaining in the exhaust gas, the ECM can draw conclusions about the catalytic converter operation.

Planar Oxygen Sensor



S360_224

Signal Utilization

The ECM uses the signals from the post-catalytic converter oxygen sensors to check the catalytic converter operation and the closed-loop oxygen control system.

Effects of a Signal Failure

If the post-catalytic converter oxygen sensor fails, the closed loop operation continues. The operation of the catalytic converter can no longer be checked.

The Actuators

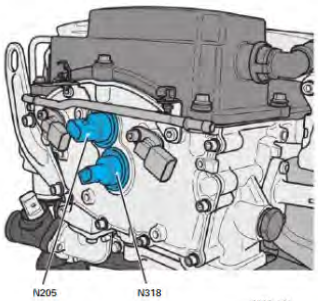
Camshaft Adjustment Valve 1 N205, Camshaft Adjustment Valve 1 (exhaust) N318

The solenoid valves are integrated in the camshaft adjustment housing. They distribute the oil pressure based on the ECM signals for the adjustment direction and adjustment travel at the camshaft adjusters.

Both camshafts are continuously adjustable:

- Intake camshaft at 52° of the crankshaft angle
- Exhaust camshaft at 42° of the crankshaft angle
- Maximum valve overlap angle 47°

The exhaust camshaft is mechanically locked when no oil pressure is available (engine not running).



S360_161

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Effects of a Signal Failure

If an electrical lead to the camshaft adjusters is defective or if a camshaft adjuster fails because it is mechanically seized or as a result of inadequate oil pressure, there is no camshaft adjustment.

Engine Management

The Transfer Fuel Pump (FP) G6 and the Fuel Level Sensor G

The Transfer Fuel Pump and the Fuel Filter are combined in the Fuel Transfer Unit. The Fuel Transfer Unit is located in the fuel tank.

Operation

The Transfer Fuel Pump transfers the fuel in the low-pressure fuel system to the high-pressure fuel pump. It is activated by a Pulse Width Modulation (PWM) signal from the Fuel Pump Control Module.

The Transfer Fuel Pump transfers as much fuel as the engine requires at any point in time.



S360_190

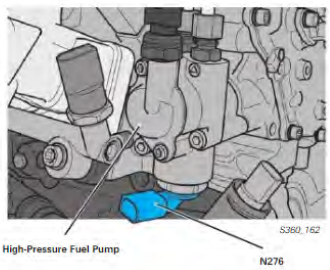
Effects of a Failure

If the Transfer Fuel Pump fails, engine operation is not possible.

The Fuel Pressure Regulator Valve N276

The Fuel Pressure Regulator Valve is located on the underside of the High-Pressure Fuel Pump.

The ECM regulates the fuel high-pressure through the Fuel Pressure Regulator Valve at a level between 507 and 1,450 psi (35 and 100 bar).



S360_162

Effects of a Failure

The ECM goes into emergency running mode.

The Ignition Coils 1-6 with Power Output Stage N70, N127, N291, N292, N323, N324

The ignition coil and power output stage are one component. The ignition timing is controlled individually for each cylinder.

Effects of a Failure

If an ignition coil fails, fuel injection for the affected cylinder is switched off. This is possible for a maximum of two cylinders.

S360_192

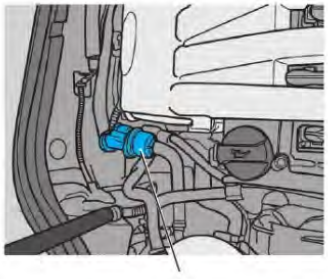
Ignition Coils

The Evaporative Emission (EVAP) Canister Purge Regulator Valve N80

The Evaporative Emission Canister Purge Regulator Valve is located on the front (belt drive side) of the engine and is triggered by the ECM. The fuel vapors collected in the evaporative emission canister are sent for combustion and thus the evaporative emission canister is emptied.

Effects of a Signal Failure

If the current is interrupted, the valve remains closed. The fuel tank is not vented.



S360_406

The Cylinders 1-6 Fuel Injectors N30, N31, N32, N33, N83, N84

The High-Pressure FSI Fuel Injectors are inserted into

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the cylinder head. They are triggered by the ECM in accordance with the firing orders. When triggered, they spray fuel directly into the cylinder.

Due to the design of the engine, injection takes place from one side. For this reason, the fuel injectors for cylinder bank 1, 3 and 5 are longer than the fuel injectors for cylinder bank 2, 4 and 6.

Effects of a Failure

A defective fuel injector is recognized by misfire detection and is no longer triggered.



S360_137

Throttle Drive for Electronic Power Control (EPC) G186

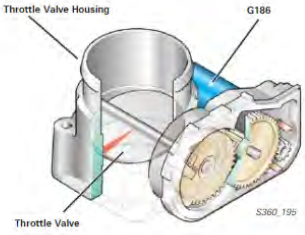
The Throttle Drive for Electronic Power Control is an electrical motor which operates the throttle valve through a gear mechanism.

The range of adjustment is stepless from idle to the wide-open throttle position.

Effects of a Failure

If the throttle drive fails, the throttle valve is automatically pulled to the emergency running position. An entry is made in the DTC memory and the EPC lamp is switched on.

The driver has only emergency features available. The comfort functions are switched off.



S360_195

Engine Management

Intake Manifold Runner Control Valve N316

The Intake Manifold Runner Control Valve is located on the variable intake manifold and is an electropneumatic valve.

When it is activated, it operates the intake manifold flap to change the length of the intake manifold.

Effects of a Failure

If the valve fails, the intake manifold flaps are pulled by a mechanical spring to an emergency running position. This position corresponds to the power setting of the intake manifold.

The Recirculation Pump V55

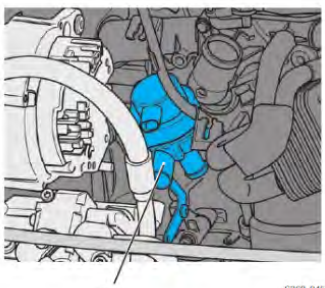
The Recirculation Pump is activated by the ECM. It assists the mechanical coolant pump when the engine is running. After the engine is turned off and with a lack of moving air resulting from the vehicle motion, the Recirculation Pump is switched on depending on the coolant temperature, and prevents a heat buildup in the engine.

Effects of a Failure

If the Recirculation Pump fails, the engine may overheat.

N316

S360_051

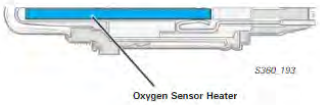


S360_045

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Oxygen Sensor (O2S) Heaters Z19, Z28, Z29 and Z30

The job of the Oxygen Sensor Heater is to bring the ceramic of the oxygen sensor rapidly up to its operating temperature of approx. 1652°F (900°C) when the engine is started and the temperature is low. The oxygen sensor heater is controlled by the ECM.



Effects of a Failure

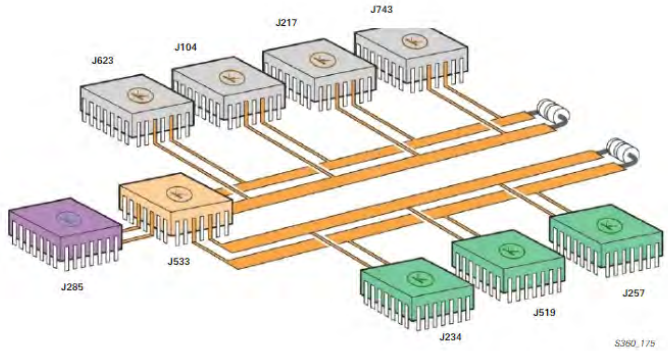
The engine can no longer be regulated with respect to the emissions.

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The Control Modules in the CAN Data Bus

Data Bus

The schematic below shows the Engine Control Module J623 integrated into the CAN data bus structure of the vehicle. Information is exchanged between the control modules over the CAN data bus.



Legend

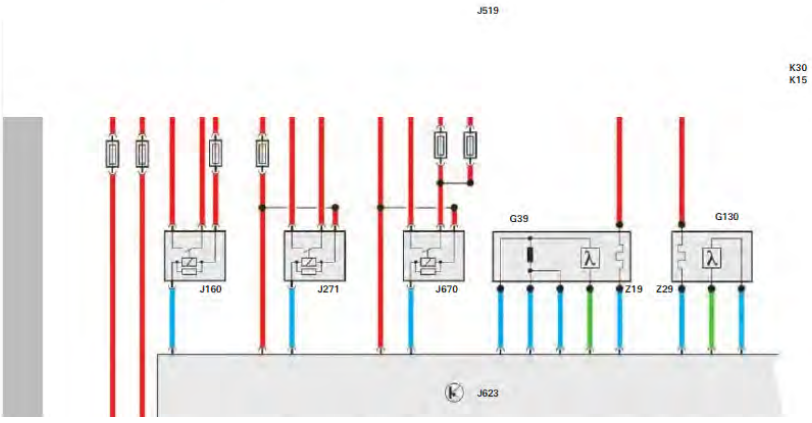
J623	Engine Control Module (ECM)
J104	ABS Control Module
J217	Transmission Control Module (TCM)
J234	Airbag Control Module
J285	Instrument Cluster Control Module
J519	Vehicle Electrical System Control Module
J527	Steering Column Electronic Systems Control Module
J533	Data Bus On Board Diagnostic Interface
J743	Direct Shift Gearbox (DSG) Mechatronic

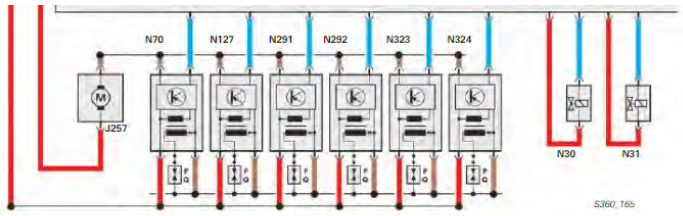
Color coding

- Powertrain CAN-bus
- Comfort system CAN-bus
- Infotainment CAN-bus

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Operating Diagrams



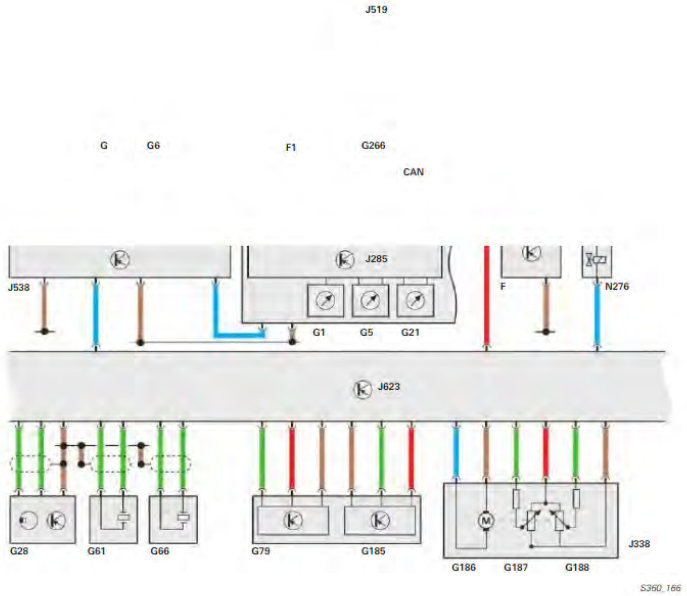


G39 Heated Oxygen Sensor (HO2S)
G130 Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC)
J160 Recirculation Pump Relay
J271 Motronic Engine Control Module (ECM) Power Supply Relay
J519 Vehicle Electrical System Control Module
J623 Engine Control Module (ECM)
J670 Motronic Engine Control Module (ECM) Power Supply Relay 2

N30 Cylinder 1 Fuel Injector
N31 Cylinder 2 Fuel Injector
N70 Ignition Coil 1 with Power Output Stage
N127 Ignition Coil 2 with Power Output Stage
N291 Ignition Coil 3 with Power Output Stage
N292 Ignition Coil 4 with Power Output Stage
N323 Ignition Coil 5 with Power Output Stage
N324 Ignition Coil 6 with Power Output Stage

Z19 Oxygen Sensor (O2S) Heater
Z29 Oxygen Sensor (O2S) 1 (behind Three Way Catalytic Converter (TWC)) Heater

Operating Diagrams



F Brake Light Switch
F1 Oil Pressure Switch

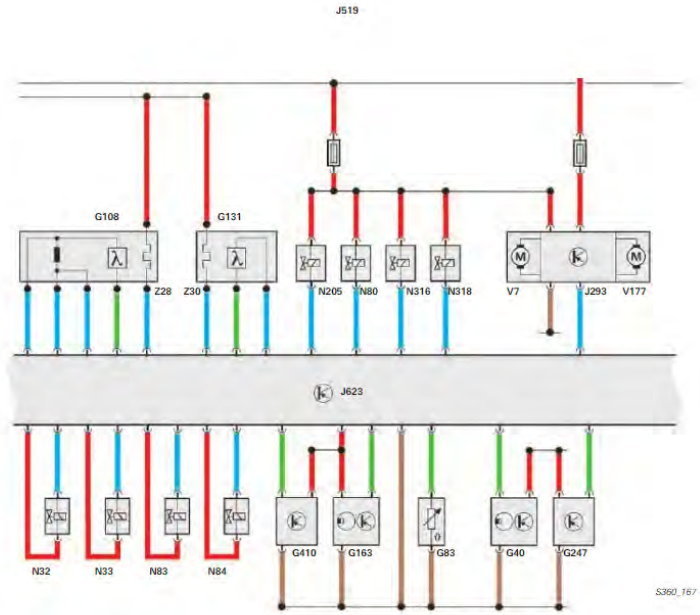
G Fuel Level Sensor
G1 Fuel Gauge
G5 Tachometer
G6 Transfer Fuel Pump (FP)
G21 Speedometer
G28 Engine Speed (RPM) Sensor
G61 Knock Sensor (KS) 1
G66 Knock Sensor (KS) 2
G79 Throttle Position (TP) Sensor
G185 Accelerator Pedal Position Sensor 2
G186 Throttle Drive (for Electronic Power Control (EPC))
G187 Throttle Drive Angle Sensor 1 (for Electronic Power Control (EPC))
G188 Throttle Drive Angle Sensor 2 (for Electronic Power Control (EPC))
G266 Oil Level Thermal Sensor

J285 Instrument Cluster Control Module
J338 Throttle Valve Control Module
J538 Fuel Pump (FP) Control Module
J623 Engine Control Module (ECM)

N276 Fuel Pressure Regulator Valve

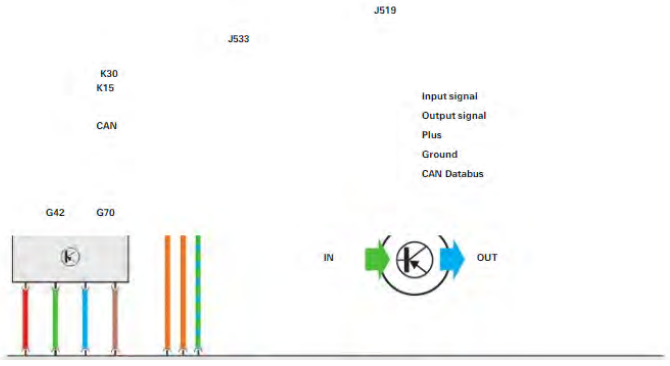
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Operating Diagrams



G40	Camshaft Position (CMP) Sensor
G83	Engine Coolant Temperature (ECT) Sensor (on Radiator)
G108	Heated Oxygen Sensor (HO2S) 2
G131	Oxygen Sensor (O2S) 2 Behind Three Way Catalytic Converter (TWC)
G163	Camshaft Position (CMP) Sensor 2
G247	Fuel Pressure Sensor
G410	Low Fuel Pressure Sensor
J293	Coolant Fan Control (FC) Control Module
J519	Vehicle Electrical System Control Module
J623	Engine Control Module (ECM)
N32	Cylinder 3 Fuel Injector
N33	Cylinder 4 Fuel Injector
N80	Evaporative Emission (EVAP) Canister Purge Regulator Valve
N83	Cylinder 5 Fuel Injector
N84	Cylinder 6 Fuel Injector
N205	Camshaft Adjustment Valve 1
N316	Intake Manifold Runner Control (IMRC) Valve
N318	Camshaft Adjustment Valve 1 (exhaust)
V7	Coolant Fan
V177	Coolant Fan 2

Operating Diagrams





G62	Engine Coolant Temperature (ECT) Sensor	**Z28**	Oxygen Sensor (O2S) 2 Heater
G42	Intake Air Temperature (IAT) Sensor	**Z30**	Oxygen Sensor (O2S) 2 (behind Three Way Catalytic Converter (TWC)) Heater
G70	Mass Air Flow (MAF) Sensor		
J519	Vehicle Electrical System Control Module		
J527	Steering Column Electronic Systems Control Module		
J533	Data Bus On Board Diagnostic Interface		
J623	Engine Control Module (ECM)		

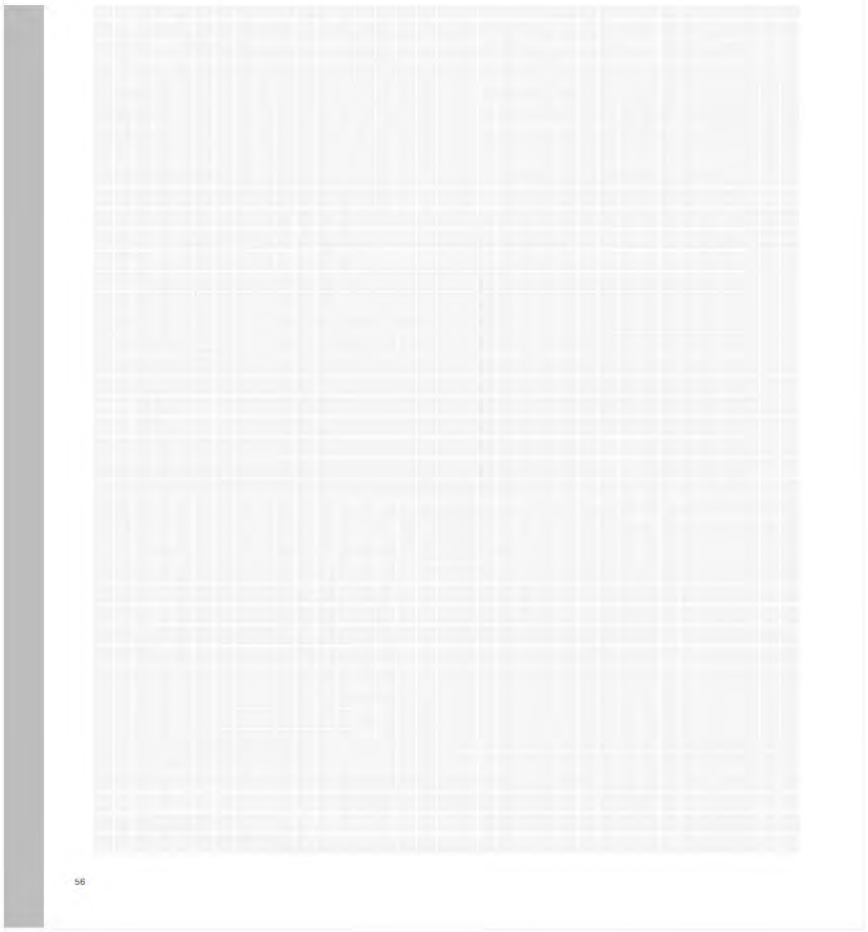
AD Read without ads.

Notes

Special Tools

Description	Tool	Use
Funnel T 10333		The Funnel T 10333 is used for installing the pistons on the 3.6 V6 FSI engine.
Puller T10055 Adapter T 10055/3		The Puller T10055 with Adapter T 10055/3 is used to remove the oil pump.
Tool Set T 10133 Puller T 10133/10		The Tool Set T 10133 with Puller T 10133/10 is needed to remove the fuel injectors.
Adjusting tool T 10332		The Adjusting Tool T 10332 must be used to lock the pinion on the high-pressure fuel pump drive.

Notes



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Knowledge Assessment

An on-line Knowledge Assessment (exam) is available for this Self-Study Program.

The Knowledge Assessment may or may not be required for Certification.

You can find this Knowledge Assessment at:

www.accessaudi.com

For assistance, please call:

Audi Academy

Learning Management Center Headquarters

1-877-AUDI-LMC (283-4562)

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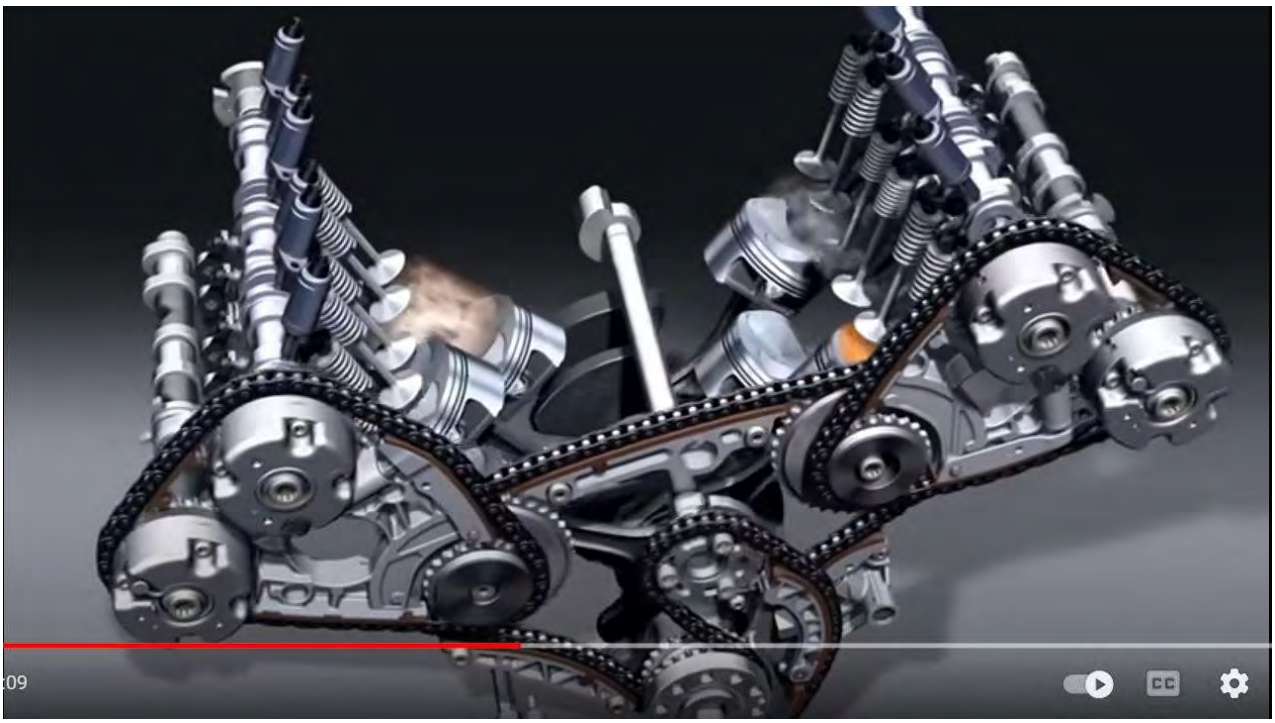
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Exhibit AF

Title- 3.2L-V6-FSI

Snapshots:



Source: https://youtu.be/5hKKO89VbQ0?si=x1nK6-2Q-pCQqrrT&t=83

Back to overview

Driver assistance systems

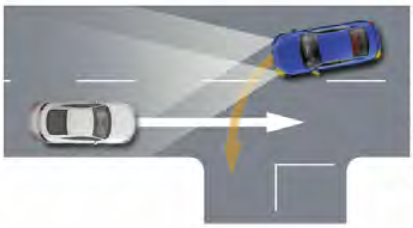
BasicInfo Sub Page — 02/13/2017



Press contacts

Audi assists drivers with a broad range of assistance systems – from turn and parking assistants to the camera-based road sign recognition. They deliver more safety, convenience and efficiency, and they pave the way for piloted driving.

We are currently revising our content. Please understand that we cannot provide you with the most up-to-date information on every topic at the current moment.



Turn assist

Turn assist monitors the road lane with oncoming traffic by means of radar sensors, the front camera and, in certain models, a laser scanner. Monitoring is initiated as soon as the driver sets the turn signal. When driving off from a stop, or during slow driving up to a speed of 10 km/h (6.2 mph), the system can intervene by applying the brakes to prevent the car from colliding with an oncoming vehicle when turning left or right (country-dependent). This brake intervention keeps the vehicle within its own driving lane. The driver is informed of the intervention by an indicator in the instrument cluster.



Adaptive cruise control (with Stop&Go function)

Adaptive cruise control (ACC) offers relief to drivers especially on long trips and in stop-and-go traffic. It maintains a preset distance to the vehicle ahead by automatically accelerating and braking. The driver can choose from five distance levels and adjust acceleration and control system dynamics with Audi drive select



The system uses radar sensors and a front camera. They detect vehicles ahead and measure the distance to them. In interplay with S tronic or tiptronic, the system covers the entire speed range from 0 to 250 km/h (155.3 mph). With a manual transmission, it starts at 30 km/h (18.6 mph). When the system is deactivated, the distance indicator shows the distance to the car ahead and warns drivers when they are tailgating. Its operating speed range is 60 km/h (37.3 mph) and above.

When combined with S tronic or tiptronic, ACC also includes the Stop&Go function. In heavy traffic, it autonomously decelerates the car to a stop. After a brief stop, it automatically resumes driving, following the vehicle ahead. After a longer stop, the driver must tap the accelerator pedal or the control stalk on the steering column. In addition to the radar sensors and front camera, ultrasonic sensors also monitor the vehicle's immediate surroundings.



Adaptive cruise assist

The adaptive cruise assist (ACA) assists the driver with longitudinal and lateral control over the entire speed range – substantially enhancing comfort on long journeys, in particular. It incorporates the functions of adaptive cruise control, traffic jam assist and active lane assist. Depending on the model, the ACA uses the radar sensor in the nose of the vehicle, the laser scanner, the front camera and the ultrasonic sensors to permanently monitor the vehicle's surroundings.

Depending on the sensor set, the system detects lane markings, roadside structures, vehicles in adjacent lanes and vehicles driving ahead. The ACA uses this information to derive a virtual vehicle path and "guides" the vehicle within it. The system also includes helpful steering intervention so that the vehicle remains in the center of the lane. In some models based on the modular longitudinal platform, the system uses also the laser scanner: The ACA detects if the lane is too narrow to allow side-by-side driving and enables offset driving through narrow stretches.

The adaptive cruise assist maintains proper speed and following distance via targeted acceleration and braking. The car automatically adapts its speed to the traffic situation and the route, for example at curves and cross-ways. In stop-and-go traffic as well as traffic jam situations, the ACA can bring the car to a complete stop. Depending on the duration of the stop, the car can start automatically again.



Hold assist

Hold assist enables convenient drive-offs when the car is on the usual inclines and descents of street traffic, and it prevents the vehicle from rolling. The system automatically switches over to the electromechanical parking brake when the car is stopped for a longer period of time while hold assist is activated. This ensures that the car will remain stationary even without activation of the parking brake. In conjunction with S tronic, after a stop at a traffic light, for instance, the car drives off as soon as the driver presses the accelerator pedal. The system is activated by pushing a button.



Trailer maneuver assist

The trailer maneuver assist makes it easier to maneuver in reverse with a trailer. Depending on the operating concept the driver uses the rotary/push-button control or the MMI-display to variably adjust the angle at which the trailer should be backed up. The image from the rear view camera on the monitor shows lines that serve as a guide. Trailer maneuver assist turns the steering wheel and directs the trailer onto the selected course. It allows a driving speed of up to 10 km/h (6.2 mph). If the articulation angle is too large, the system emits a warning, and it brakes in case of an emergency. Depending on the version, either a sensor in the rotating tow bar of the trailer coupling, that senses the angle between towing vehicle and the trailer, or a rearward directed camera serves as the technical basis.



Audi active lane assist

Operating at speeds from 65 km/h (40.4 mph), Audi active lane assist helps the driver keep the vehicle in the driving lane. A camera detects lane lines and the track that the car is following between them. In this process, the camera can distinguish between yellow lines in construction zones and standard white markings. If the car approaches a line without the turn signal being activated, the system helps the driver to steer back into the lane by means of gentle but noticeable interventions in the electromechanical power steering. In the MMI system, the driver sets how early the control intervention should occur. In the case of an early steering intervention point, the system guides the driver towards the middle of the lane by gentle, centering steering interventions. With a late steering intervention point, Audi active lane assist does not intervene until shortly before the detected lane marking might be crossed; then it gives a corrective steering intervention in the proper direction. In addition, the driver may choose to be warned by a vibration of the steering wheel when crossing detected lane markings.



Audi pre sense 360°

The Audi pre sense 360° detects collision hazards all around the car and initiates specific safety measures. It includes the following driver assistant systems:

- Audi pre sense front
- Audi pre sense rear
- Audi pre sense basic
- Audi pre sense side



Audi pre sense basic

Audi pre sense basic initiates preventive safety measures for occupants as soon as it recognizes a critical driving state. It utilizes information from various vehicle systems to determine this. For instance, it intervenes if the Electronic Stabilization Control (ESC) sensors detect skidding or hard braking. Then the system pretensions the seat belts of the driver and front passenger electrically to reduce their forward or lateral movements. The side windows and sliding sunroof are automatically closed. In addition, the hazard warning lights are activated to alert following traffic.



Audi pre sense front / Audi pre sense city

Audi pre sense front and Audi pre sense city utilize the data of radar sensors and/or the front camera, depending on the car model, to compute the probability of a collision. Within the limitations of the system, it warns of collision threats and initiates braking at specific vehicle speeds. Vehicles are detected in the driving speed range of up to 250 km/h (155.3 mph), pedestrians up to around 65 km/h (40.4 mph) or 85 km/h (52.8 mph) depending on the model, as well as cyclists, depending on the system.

If a collision is imminent, the system warns the driver with visual, acoustic and haptic warnings based on a multi-stage warning concept. If necessary, the system provides braking assistance to reduce vehicle speed or initiates a full brake application to avoid the collision under certain circumstances. Actions are also taken to protect occupants. The hazard warning lights are activated, the seat belts are reversibly pretensioned, the seat position is optimized, and the windows and optional panoramic glass sunroof are closed.

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Audi pre sense rear

Audi pre sense rear uses radar sensors in the rear bumper to detect an impending rear-end collision, and it initiates preventive safety measures. These include pretensioning the front seat belts by electric power and closing the windows and sliding sunroof. In addition, the system activates the hazard warning lights to alert following traffic to the critical situation. In this process, the Rear-end collision alert signal (RECAS) is triggered, which flashes the hazard warning lights at a high frequency. Audi pre sense rear is active in background over the car's entire driving speed range with the exception of trailer towing situations.

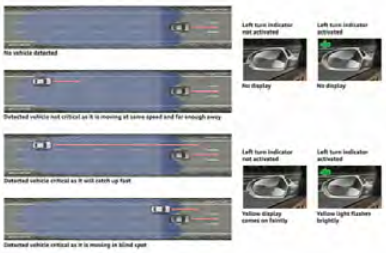
Audi pre sense side



Audi pre sense side reacts in the event of a collision from the side. Amongst ohthers it uses the radar sensors of the crossing assist to calculate the probability of an accident involving traffic approaching from the side. The system can detect the threat of side collisions at speeds of up to approx. 60 km/h (37.3 mph) and apply preventative measures to help protect occupants. These include: activating the hazard lights, tensioning the safety belts, optimizing the seating position, and closing windows as well as the optional panoramic glass roof.

In an impending lateral collision at more than 25 km/h (15.5 mph), the suspension actuators of the optional Audi AI active suspension raise the body on the side exposed to the danger by up to 80 millimeters (3.1 in) within half a second. The other vehicle therefore hits the car in an even more impact-resistant zone. The side sills and floor structure accommodate a large portion of the impact forces. Deformation of the cabin and the loads acting on the occupants, above all to the chest and abdomen areas, are reduced by up to 50 percent compared with a lateral collision with no raising of the suspension.

Audi side assist



The Audi side assist lane-changing assistant helps the driver to change lanes at driving speeds of 15 km/h (9.3 mph) and faster. It uses two rear-mounted radar sensors with a scanning range of roughly 70 meters (229.7 ft). If the system detects a vehicle located in the blind spot or approaching quickly from the rear, a warning LED is lit in the housing of the relevant exterior mirror. If the driver activates the turn signal anyway, the LED flashes several times in rapid succession.

Exit warning



Exit warning improves safety in city traffic. If the car has come to a stop and other vehicles or bicyclists classified as critical are approaching from the rear, the system warns passengers not to open the doors. The system does this using LED lights in the door panels. In a situation assessed to be hazardous, the LEDs flicker and light red. The LEDs of Audi side assist are also lit in the relevant exterior side mirror. The exit warning remains active for approximately three minutes after the ignition is turned off.

This system is based on the radar sensors of Audi side assist, which monitor the zones behind the vehicle and to the sides at the rear. Depending on the model the exit warning is extended by an additional feature: If the system is active, opening of the electronic door locks is delayed roughly one second.

Collision avoidance assist

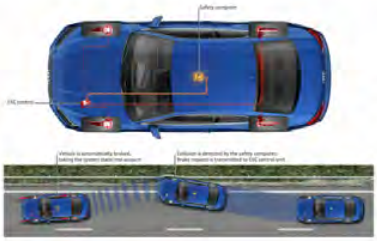
Collision avoidance assist helps the driver steer around an obstacle in a critical situation. The system uses data from the two radar sensors and the front camera for this purpose. In calculating a suitable evasive maneuver corridor, it takes into account the distance, width and offset of the vehicle driving ahead. Collision avoidance assist is available over a speed range from approx. 30 to 150 km/h (18.6 to 93.2 mph), and it assumes that the driver is actively steering throughout the maneuver. The driver is informed of the intervention by an indicator in the instrument cluster.

First, a jolt is produced to warn the driver of the hazard. If the driver then actively avoids the obstacle, the assistant applies a slight steering torque that helps by correcting the driver's steering input or helping to make a lane change. Models like the Audi A8 (2017) use a specific braking of individual wheels – with it the vehicle is made to follow the computed course.



Curb warning

The curb warning identifies curbs that pose a risk to the tires or wheels. Prerequisite: The car is moving forward or backward at up to 10 km/h (6.2 mph). If the system detects a critical situation, it alerts the driver to this in the optical parking system display on the MMI monitor. To scan the surroundings the system uses primarily the 360 degree cameras.



Multicollision brake assist

Multicollision brake assist automatically brakes the vehicle in the event of an accident, reducing the danger of skidding as well as the risk of further collisions. The function uses the relevant sensors to detect a collision; the severity of the crash and the speed reduction are calculated by the safety computer. If defined thresholds are exceeded, the safety computer sends a corresponding message to the Electronic Stabilization Control (ESC) control unit to trigger an automatic brake application, taking the system status into account. If the driver accelerates, the vehicle is not automatically braked. The same is true if the ESC, the brake system or the electrical system are not functioning.



Parking system, rear

Parking system plus informs the driver, visually and audibly, about obstacles in front of and behind the vehicle. The warnings are made when the distance to a detected object in the path of driving is less than 90 cm (35.4 in) – depending on the specific model – after the driver has engaged reverse gear and activated the system by pushing a button on the center console.

Ultrasonic sensors measure the distance, the MMI display depicts it visually. A white segment shows a detected object outside of the driving path. Red segments represent detected objects within the driving path. The virtual driving path display also shows lateral guide lines which are precalculated based on the currently selected steering input. Increasing frequency of the audible warning indicates that the distance to the obstacle is decreasing.



Parking system plus

Parking system plus informs the driver, visually and audibly, about obstacles in front of and behind the vehicle. The warnings are made when the distance to a detected object in the path of driving is less than 90 cm (35.4 in) – depending on the specific model – after the driver has engaged reverse gear and activated the system by pushing a

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button on the center console. Ultrasonic sensors inconspicuously integrated into the bumpers measure the distance. The MMI display depicts it visually. A white segment shows a detected object outside of the driving path. Red segments represent detected objects within the driving path. The virtual driving path display also shows lateral guide lines which are precalculated based on the currently selected steering input and thereby assists in convenient parking and exiting. Increasing frequency of the audible warning indicates that the distance to the obstacle is decreasing. At around 30 cm (11.8 in) distance to the detected object, the driver hears a constant tone – the signal to stop.



High-beam assist

High-beam assist utilizes a camera mounted on the interior mirror. It detects light sources – the headlights of oncoming vehicles, tail lights of other road users and the reflections of municipality limit signs, for instance – and automatically switches between high beam and low beam lighting. This provides for better visibility and a more relaxed driving experience. Drivers of oncoming vehicles are not blinded by glare.



Speed limiter

The configurable speed limiter limits driving speed to a value set by the driver within the speed range of 30 to 250 km/h (18.6 to 155.3 mph) – which is very helpful within city limits or construction zones, for example. When the preset limit is reached, the vehicle gently throttles the speed down. The speed limit is not exceeded even if the driver applies more pressure to the accelerator pedal. However, the driver can temporarily override the limit by kick-down, and the speed limiter can be completely deactivated at any time from the steering column stalk. The speed that has been preset is shown in the instrument cluster.



Cruise control

Cruise control maintains a desired driving speed constantly starting at around 30 km/h (18.6 mph) (model dependent), provided that it can be maintained by engine power and engine braking effects. The system offers relief to drivers in this way – especially on long trips. At the same time, the constant speed mode of driving contributes towards lower fuel consumption and lower CO_2 emissions. The system is operated via a separate steering column stalk, and the preset driving speed is shown in the instrument cluster. The system is deactivated when the driver brakes.



Crossing assist



Crossing assist recognizes critical cross traffic in front of the car and warns the driver of it both visually and audibly. At speeds up to 10 km/h (6.2 mph), it initiates a short braking action when needed. Crossing assist is active at vehicle speeds up to 30 km/h (18.6 mph). It uses data from the zFAS central computer, with the most important information here supplied by the mid-range radars and the laser scanner.

If the driver wants to ease into an intersection or exit with poor visibility, he or she can push the parking button. This sends the images from the 360 degree cameras to the MMI monitor. They drastically expand the field of view, and the driver can choose from among multiple views.



Laser scanner

Together with the long-range radar and the front camera, the laser scanner forms a trio of sensors with various strengths that complement each other. It is these sensors and the central driver assistance controller (zFAS), which generates an image of the surroundings from all the sensor data, that make automated driving possible in the first place.

The laser scanner covers a field approximately 80 meters (262.5 ft) long, with an opening angle of 145 degrees. The roughly fist-sized component is mounted in the front bumper and, regardless of speed, emits moderated pulses of light on multiple vertical levels, which a mirror scatters in the shape of a fan. Having a wave length in the near-infrared range, the extremely short flashes of light are invisible and harmless to the human eye. They are reflected by objects in front of the car and return to the laser scanner in less than one microsecond, where photo diodes detect them.

The result is a detailed, deeply contoured, static image of the surroundings. The laser scanner displays other vehicles as measured cuboids, and it also measures such information as distance and orientation, which it distributes to the partner control units. With its large horizontal aperture, it detects cars entering the lane very early. Detailed information about structures on the side of the road, such as guardrails, round out the spectrum. Like radar, the laser scanner also works in the dark. Automatic cleaning and heating of the covering panel keep it operational even in inclement weather and spray as long as the conditions aren't too extreme.



Maneuvering assist

Maneuvering assist recognizes moving and stationary objects larger than 10 centimeters (3.9 in), such as a pillar in a parking garage or a moving vehicle. It helps to avoid impending collisions using warning steering impulses and by autonomously braking the car to a stop, provided that the car is traveling forward or in reverse at no more than 10 km/h (6.2 mph). The system uses the optical parking system in the MMI to display its steering and parking interventions. The surroundings are scanned using at least the ultrasonic sensors and the 360 degree cameras.



Night vision assist

The night vision assist that Audi offers for multiple full-size models uses a far infrared camera. It reacts to the heat given off by objects. Converted to black and white images, the information can be viewed in the instrument cluster or Audi virtual cockpit. The cooler surroundings appear dark, while animals and people appear strikingly bright.

The system, which has a range of up to 300 meters (984.3 ft), can detect people and larger wild animals at distances between roughly 10 and 90 meters (32.8 and 295.3 ft) and highlights them with yellow markings. If a hazardous situation is detected, a warning sound is emitted. A warning symbol appears in the instrument cluster as well as in the head-up display. Depending on the headlights persons outside of town limits are illuminated with three short flashes of light.



Emergency assist

Emergency assist detects, within system limits, when the driver is inactive. In such a case, the system assumes

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Emergency assist detects, within system limits, when the driver is inactive. In such a case, the system assumes control of the vehicle and automatically brakes it to a standstill in its own lane. Emergency assist monitors the driver's steering activity. If it detects that the driver is inactive, it prompts the driver repeatedly, via visual and audible warnings and by brake jolts, to actively take over control of the vehicle again. With the first strong brake jolt at a driving speed below 80 km/h (49.7 mph), the hazard warning lights are also activated to warn the surrounding traffic. If the driver remains inactive, despite the warnings, Emergency assist brings the vehicle to a standstill within system limits. The parking brake is engaged. The driver can deactivate Emergency assist at any time by moving the steering wheel, pressing the brake or accelerator pedal or by shutting off active lane assist or adaptive cruise control.



Park assist

Park assist can automatically steer the car into parallel or perpendicular parking spaces. It uses ultrasonic sensors located in the front and rear bumpers and on the sides. The driver only has to accelerate, brake and shift gears.

The sensors measure parking spaces along the road while driving past them at moderate speed – a maximum of 20 km/h (12.4 mph) for perpendicular parking spaces and a maximum of 30 km/h (18.6 mph) for parallel spaces. A message appears on the MMI display when the system finds a suitable spot. The only actions required of the driver while parking are accelerating, shifting gears and braking. The system handles the steering. In addition, audible signals help the driver. Park assist will make multiple maneuvers, forwards and backwards, if necessary. It can also exit from parallel parking spaces. Depending on the model, the driver activates the system via either a button on the center console or a button in the lower infotainment display. The maximum speed for all maneuvers is 7 km/h (4.3 mph).



(Predictive) efficiency assist

Efficiency assist helps the driver to drive preemptively and save fuel. The system works closely together with adaptive cruise control (ACC) or adaptive cruise assist (ACA). It accesses predictive route data from navigation and Car-to-X information. In order to detect traffic signs and other vehicles, the efficiency assist uses the front camera as well as data from the front and rear-facing radar sensors.

The driver is shown corresponding information in the instrument cluster or in the Audi virtual cockpit and the head-up display as soon as it would be sensible to take the foot off the right-hand pedal. Symbols for speed limits, bends, roundabouts, towns, or downhill slopes that indicate to the driver to slow down are displayed on the basis of the route data and recognition of traffic signs. Depending on the model the gas pedal also pulses against the sole of the driver's foot – a clear indication to take their foot off the gas.

If the cruise assist is switched on or the ACC is activated, efficiency assist regulates actively. It decelerates and accelerates predictively and adapts the speed to the course of the road and the traffic situation, also taking vehicles driving in front into account. If the driver so wishes, the system controls the freewheeling and coasting operation of the engine in cooperation with other control units. The predictive system always maintains a driving style that reflects the driving program selected – from efficient to sporty – and uses scope for recuperation in the Audi e-tron.

The driver can override the system at any time by accelerating and braking. In addition, drivers can individually activate, deactivate and configure many of their detailed functions in the MMI. Depending on the model, the control, for example, can be adapted to the course of the road in three stages: slow, medium or fast.



Cross traffic assist rear

Cross traffic assist rear warns the driver of approaching vehicles it deems critical when slowly backing up, such as when pulling out of a perpendicular parking spot. It uses the rear radar sensors for this. They cover the zone at the rear, including the driving lanes to the left and right behind the vehicle. The warnings are progressive – initially a visual warning is shown in the MMI display (in the park assist display). The situation is represented in a virtual top view and in the "rear" and "rear side" camera views. Red arrows behind the vehicle point in the direction from which there is a potential hazard. If the driver does not react to the visual display, an audible signal sounds before the system warns the driver with a brake jolt. This helps to avoid accidents while exiting parking spaces.



(Remote) parking pilot and remote garage pilot

The (remote) parking pilot and the remote garage pilot make parking extremely easy and convenient. Both systems enable the car to roll automatically into parallel or perpendicular parking sports or into a garage. They control the steering, the gas, the brakes and the automatic transmission. The driver either sits in the car (parking pilot) or monitors the maneuver from outside via smartphone (remote parking pilot and remote garage pilot).

He or she activates the respective systems using the parking button on the MMI display. If the vehicle is moving at a moderate speed the ultrasonic sensors measure the parking spaces along the road. The garage pilot also uses the laser scanner. A message appears on the MMI display when the system finds a suitable spot. The driver can now stop, select smartphone control in the MMI, get out and start the parking maneuver from his or her phone. This is done by pressing the Audi AI button in the myAudi app and holding it during the entire parking procedure. The driver sees a live image from the 360 degree cameras on the smartphone display. The maximum distance from the car is six meters (19.7 ft). The car pulls into the parking space at a speed of up to 6 km/h (3.7 mph), maneuvering multiple times if necessary. The car can only pull forward into a garage. Once the vehicle reaches its final position, the tiptronic is set to P and both the engine and the ignition are turned off. When it's time to leave again, the driver can start the car using the smartphone and have it pull out of the parking spot or the garage.

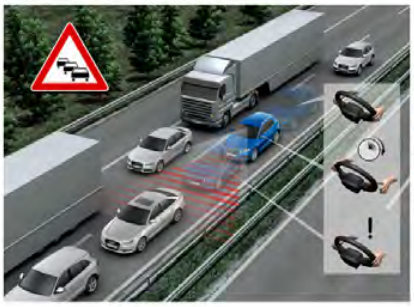
The driver can also start the parking pilot while still sitting behind the wheel by pushing the AI button on the center tunnel console. This button must also be pressed throughout the entire parking procedure.

The (remote) parking pilot and the remote garage pilot function intelligently and conveniently. For instance, the sedan can also pull into a garage if it needs to drive in an arc to do so. Inside the garage, the car can pull very close to walls and obstructions such as bikes – or it will simply not enter the garage if there is not enough space. Its innovative laser scanner is particularly helpful here.



Reversing camera

The reversing camera simplifies maneuvering by showing the zone behind the vehicle on the MMI display. It shows the calculated driving track based on the steering angle as well as auxiliary lines and guide lines. For parallel parking, the latter lines precisely direct steering into the parking space in conjunction with steering reversal points. The blue pictured surface in the camera image indicates where the vehicle will be positioned after the parking procedure. The reversing camera is inconspicuously integrated into the handle trim strip of the luggage compartment lid. It is activated as soon as the driver engages reverse gear or pushes the respective button.



Traffic jam assist

Traffic jam assist is a subsystem of adaptive cruise control (ACC) or adaptive cruise assist (ACA). In vehicles with an automatic transmission, traffic jam assist can assume certain steering tasks over a speed range up to 65 km/h (40.4 mph) on roads that are in good condition, as long as the traffic is moving slowly. The system uses the radar sensors and the front camera. It guides the car by making gentle steering movements within system limits and orients itself to lane markings, roadside structures and other vehicles on the road. When traffic jam assist reaches its system limits – such as when the traffic thins out or there is a sharp curve ahead – the driver must assume driving tasks again. If the driver does not, the system warns the driver in several stages. As a final measure, it autonomously brings the car to a safe stop.



360 degree cameras

The four 360 degree cameras on the vehicle scan the immediate vicinity and display obstacles within. Drivers can choose from different views that simplify parking and maneuvering. A virtual overhead view shown in the MMI display gives the driver an overview of the overall parking situation. The panoramic view to the front and rear covers

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an angle of nearly 180 degrees and provides better visibility when exiting tight parking spaces, courtyard entrances and confusing intersections. Guide lines in the reversing camera view make it easier to park in perpendicular spaces and to hitch trailers. The view from the front camera helps when maneuvering, as it detects obstacles in front of the car. The system is automatically activated when driving in reverse or by pushing a button.

An additional feature for some models is a virtual 3D view. The driver can use the touchscreen to steplessly swivel and zoom the image of the car and the actual vehicle surroundings. There is also a view of the front or rear tires so that the driver can pull the car up right next to the curb.



Traffic sign recognition

Camera-based traffic sign recognition detects traffic signs such as speed limit signs (including digital signs), no passing zones, entry restriction signs and other auxiliary signs, and it shows them to the driver in graphic form. They then appear in the driver information system and/or the Audi virtual cockpit as well as in the head-up display. The camera on the windshield also detects temporary speed restrictions such as in construction zones, as well as time- and weather-conditional restrictions. The system shows the currently applicable speed limit. For example, if a lower speed applies when the road is wet, this value is displayed – if the windshield wipers are on. Speed limits that are only in force at certain times of day are only shown at those times. In addition, the driver can choose a warning threshold as an offset to the legal speed limit. When this threshold is exceeded, a visual warning is given.



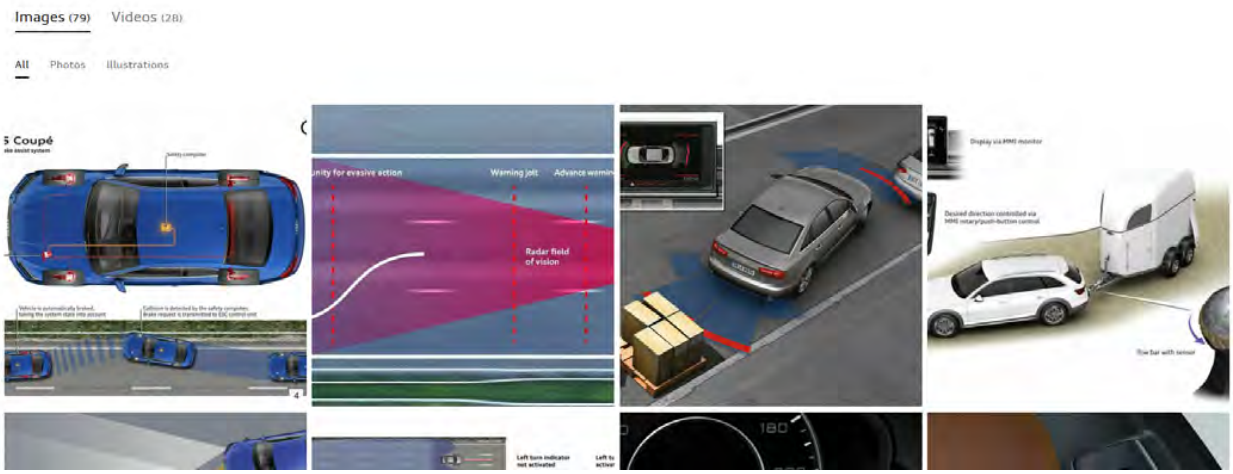
Central driver assistance controller

Conditional automated driving at level 3 is based on two innovations: a sensor set with the laser scanner and a central driver assistance controller known as zFAS, for short. The roughly tablet-sized computer constantly processes sensor signals and uses them to create a complete image of the car's surroundings. To do this, it uses processors from leading global companies – NVIDIA (Tegra K1), ALTERA (Cyclon V), Infineon (Aurix) and Mobileye with the EyeQ3 image processing engine.

The sensor data is read into the "fusion" layer in the zFAS unit and is merged to generate a sophisticated model of the surroundings. It includes moving objects, stationary obstacles and a road model. The latter is generated from the conventional navigation map and from road markings and borders that the sensors detect. The vehicle is guided precisely within its lane in the model, and this positional information flows into the navigation map that the driver sees. This information offers the driver many benefits, such as in complex intersection situations.

The zFAS serves as the central interface for piloted driving functions and for nearly all of the assistance systems. Whether the given system is the crossing assist, the emergency braking function, adaptive driving assistant or traffic jam pilot – its functions are no longer coupled to just a specific sensor. Each system makes use of the vehicle surroundings model and can operate more effectively as a result of this model's high precision. This makes it possible for the vehicle, for example, to recognize the tail end of a traffic jam and brake appropriately.

The principle of a central fusion level based on standardized sensor interfaces gives Audi another advantage – independence from the specificity of sensors. Developers can replace individual sensors whenever better devices are market-ready.





As of: 02/13/2017

Show More Images

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The data on fuel consumption, power consumption, CO_2 emissions and electric range were determined in accordance with the legally prescribed measurement procedure "Worldwide Harmonized Light Vehicles Test Procedure" (WLTP) pursuant to Regulation (EC) 715/2007. Additional equipment and accessories (add-on parts, tire format, etc.) can change relevant vehicle parameters such as weight, rolling resistance and aerodynamics and, in addition to weather and traffic conditions and individual driving behavior, can influence the fuel consumption, power consumption, CO_2 emissions, electric range and driving performance values of a vehicle. Further information on WLTP can be found at www.audi.de/wltp.

Exhibit AH

Title- Animation Audi A8 - Central driver assistance controller (zFAS)

Snapshots:



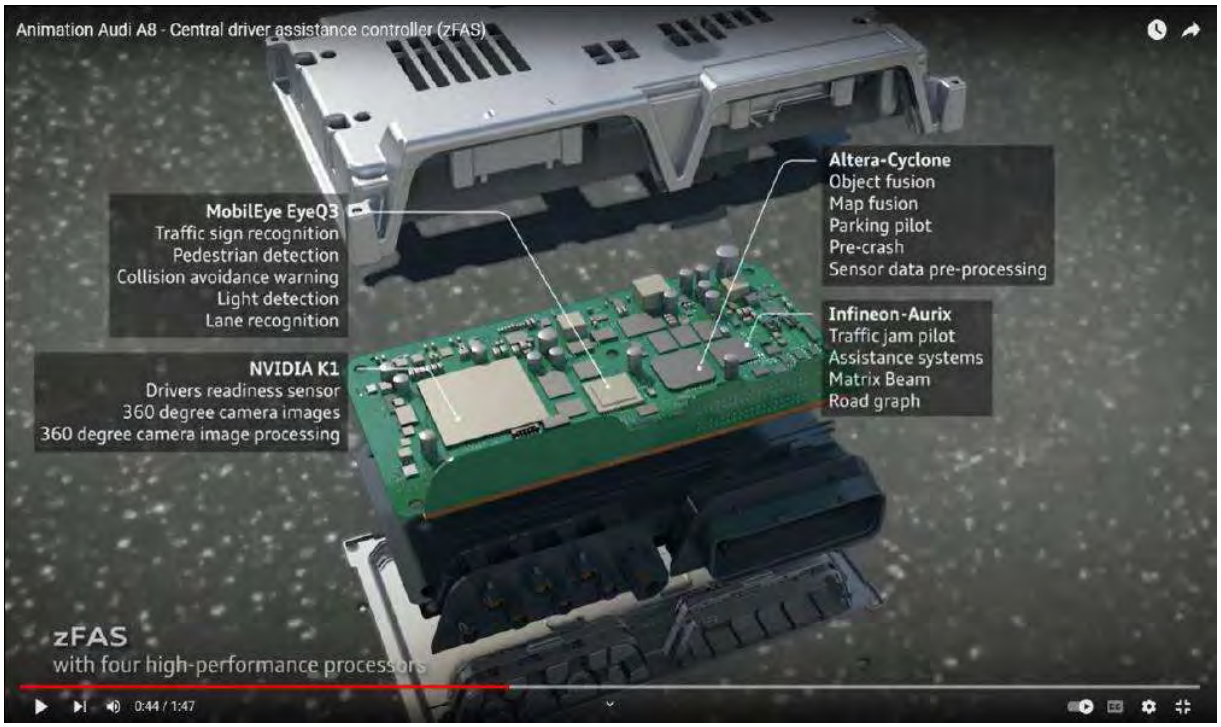
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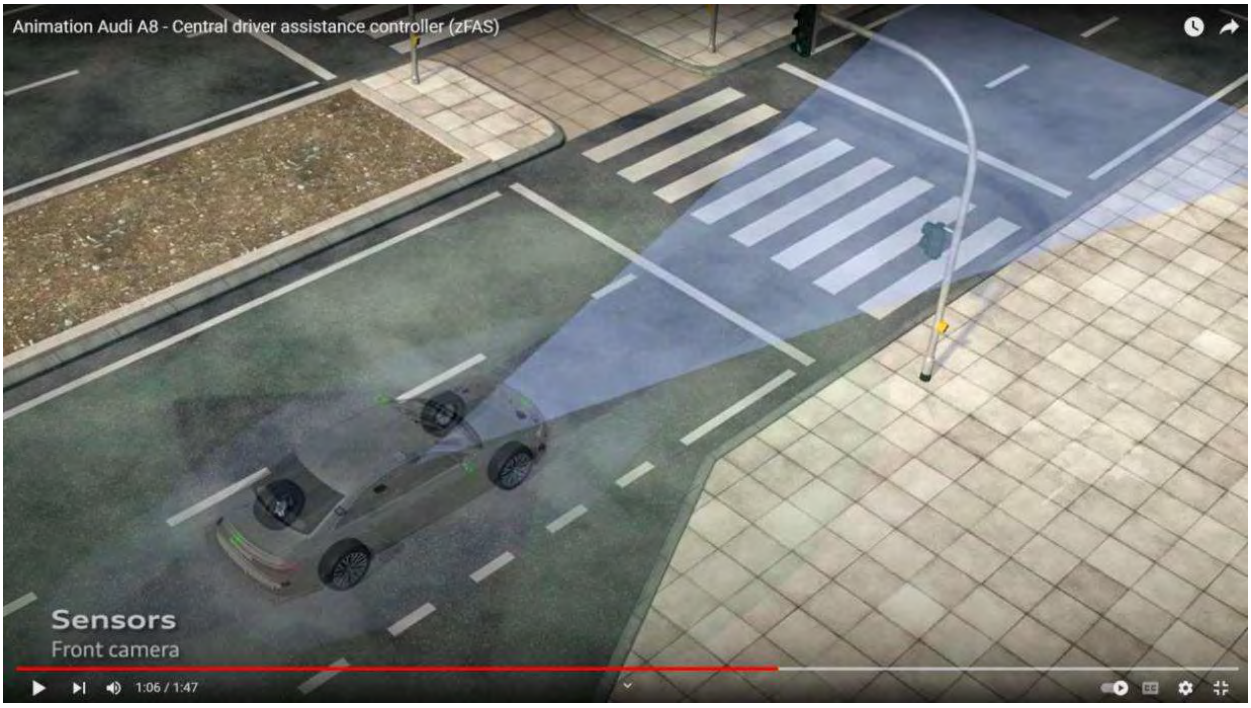
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Exhibit AI

Title- Audi Tech Tutorial: Adaptive Cruise Control

Snapshots:

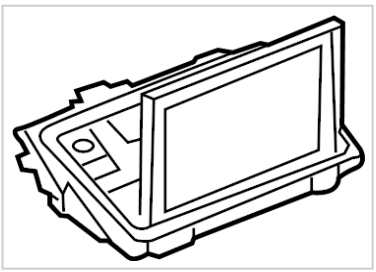


Source: https://youtu.be/7WOHL_J56E0?si=wYlr9n-2YNv4uu-z

Display. System.

Part Number: **8V0857273P6PS**

Supersession(s): **8V0-857-273-P-6PS; 8V0-857-273-P6PS; 8V0857273N 6PS; 8V0857273N6PS; 8V0857273P 6PS**



(https://images.simplepart.com/images/parts/motor/parts/fullsize/1316535_11.png)





A Display / screen used to present different types of information to the driver, such as vehicle instrument readings, entertainment information, GPS and more, which is located in the instrument cluster. GPS Navigation System. unit. Driver Information. GPS Navigation. Mounting.

GPS Navigation SystemDriver Information Display

Fits A3, A3 Sportback e-tron, RS3, S3, S7 Sportback

A3, S3. All. Convertible, all. CONVERTIBLE, w/premium audio. RS3. SEDAN, w/premium audio. Sedan/Wagon, all. W/premium audio.

17 people have looked at this part recently

What This Fits	This product fits 99 vehicle variants. Audi: 4 models, 99 variants between 2015 and 2020.
Product Types	
	Show More

Dealer Price

$ 1,532.31

View Warranty Info (/policy.aspx).

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2019

A3





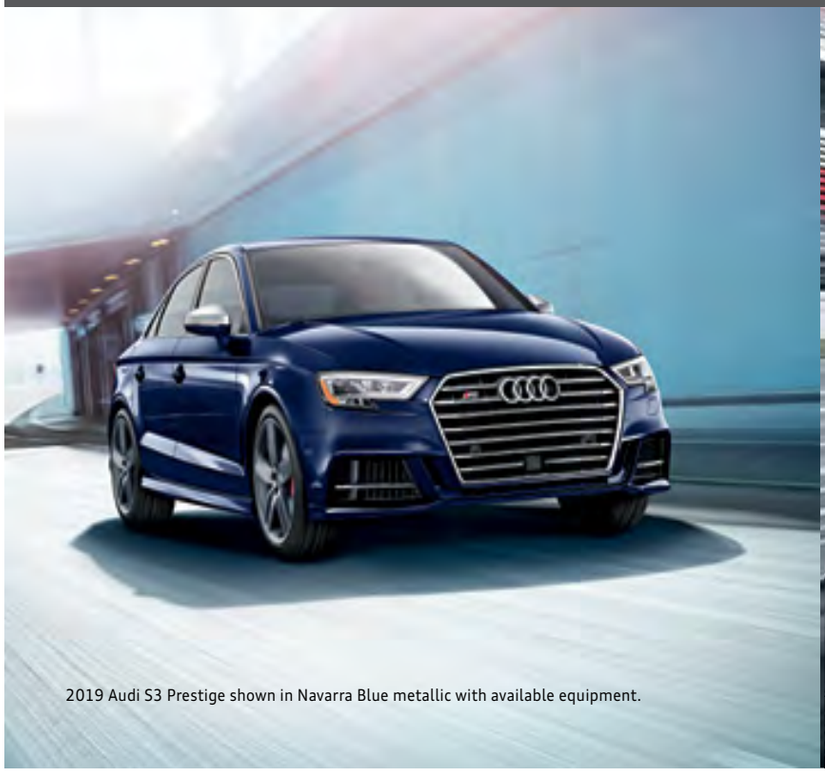
2019 Audi A3 Sedan quattro® Premium Plus shown in Cosmos Blue metallic with available equipment.



2019 Audi A3 Cabriolet quattro® Premium Plus shown in Nano Gray metallic with available equipment.

Some vehicles change your direction entirely.

Choosing the Audi A3 model that's right for you can be difficult when each one makes a compelling argument. Every A3 features turbocharged performance and the design distinction that sets Audi apart. Available as a classic sports Sedan, including high-performance Audi S3 and RS 3 models, plus a sun-loving Cabriolet, there's an Audi A3 ready to move you, whichever way you choose.



2019 Audi S3 Prestige shown in Navarra Blue metallic with available equipment.



2019 Audi RS 3 shown in Tango Red metallic with available equipment.

We know a few things when it comes to style.



The design of the Audi A3 represents a high concentration of institutional knowledge, distilled over the history of Audi. Design elements like the Singleframe® grille—which draws inspiration from the era of Silver Arrow Grand Prix cars—and available distinctive LED headlights imbue your ride with wisdom of races won and decades of enlightening technologies. And when it comes to expressing inspired progress in Audi style, the A3 Cabriolet and A3 Sedan offer a practical choice. The Cabriolet offers a power-folding top that opens up new vistas while operating at vehicle speeds up to 31 mph, and features aero-acoustic sound insulation. And with almost a century of building engines, we offer you options on designing your drive, too. The Audi A3 is available with your choice of 2.0-liter engines, with 184-hp front-wheel drive or 228-hp quattro® all-wheel drive variants to help you make a wise selection, no matter your preference.

2019 Audi A3 Sedan quattro® Premium Plus shown in Cosmos Blue metallic with available equipment alongside 2019 Audi A3 Cabriolet quattro® Premium Plus shown in Nano Gray metallic with available equipment.



2019 Audi A3 Sedan quattro® Premium Plus shown with Black leather seating surfaces and available equipment.



2019 Audi A3 Cabriolet quattro® Premium Plus shown with Black leather seating surfaces and available equipment.

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You'll fall in love in 4.6 seconds.

In the time it takes to go from 0–60 mph,[1] you'll quickly realize what true love is. With its robust engine, the Audi S3 calls for S model specific brakes and quattro® all-wheel drive to help you command its powerful character. Standard S-tuned sport suspension or available Audi magnetic ride helps enhance a feeling of control through the turns, while available S Sport front seats help secure you in the optimal driving position. Once the Audi S3 is yours, hold tight. When you fall in love this fast, things can progress quickly.

2019 Audi S3 Premium Plus shown in Navarra Blue metallic with available equipment.



2019 Audi S3 Premium Plus shown with Rotor Gray Fine Nappa leather seats and available equipment.

1 Manufacturer estimate. Always obey local speed and traffic laws.





2019 Audi RS 3 shown in Tango Red metallic with available equipment.

TURN DESIGN INTO DESIRE.

If you ask the race-winning engineers at Audi Sport® they won't hesitate to explain what it takes to win. More than just progressive engineering to shave seconds off of lap times, it takes desire. This same desire is why the Audi RS 3 exists. We imbued its winning looks with practical design that helps aerodynamics, and we drew on Audi heritage to revive a unique TFSI® five-cylinder engine layout to give you a sports sedan that turns design into desire.

2.5-liter TFSI® turbocharged five-cylinder engine
394 hp, 354 lb-ft

Seven-speed S tronic® dual-clutch automatic transmission and quattro® all-wheel drive

Top track speed[1] of 155 mph

Ventilated disc brakes
14.6" front/12.2" rear

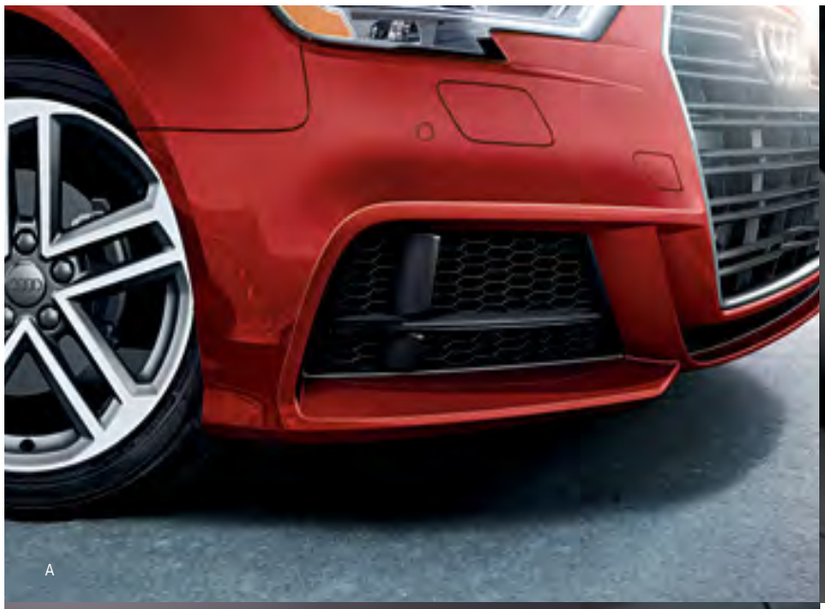
Standard RS-tuned Audi magnetic ride suspension or available RS fixed sport suspension



2019 Audi RS 3 shown with Black Fine Nappa leather seats, RS design package and available equipment.

1 Top track speed is electronically limited in the U.S. Always obey all speed and traffic laws.

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A



B



C



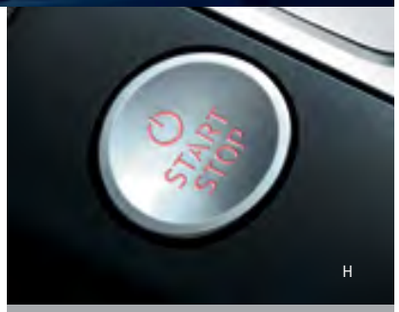
D



E



G



H



F

1 Always pay careful attention to the road, and do not drive while distracted. See owner's manual for further details and important limitations. 2 See owner's manual for further details and important warnings about the keyless ignition feature. Do not leave vehicle unattended with the engine running, particularly in enclosed spaces.

A. **Available S line® front bumper with an integrated front chin spoiler and black honeycomb inserts.**

B. **Standard panoramic sunroof** | Bringing a sense of brightness and clarity into the cabin (Sedan).

C. **Aluminum front door sill inlays** | Available S badging and illumination on front inlays elevate the entryway to your Audi A3 Sedan or Cabriolet.

D. **Exterior LED lighting technology** | Available full LED headlights and standard LED taillights with available dynamic rear turn indicators form a distinctive look and provide long-lasting illumination.

E. **Available Bang & Olufsen® Sound System with LED interior accents on front door speaker grilles.**

F. **Exhaust outlets with chrome tips** | Standard on Audi A3 Sedan and Cabriolet models.

G. **Available MMI® touch with handwriting-recognition technology** | Designed by our engineers to be a natural extension of your hand.[1]

H. **Available Audi advanced key** | Keyless front door entry and one-touch engine start and stop.[2]

See how the Audi A3 has raised the standards of styling and performance.

AudiUSA.com

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Gear up for exciting adventures.

Active lifestyles require thoughtful gear selection. Plan your next getaway and make a bold personal statement by outfitting your Audi vehicle in style with Audi Genuine Accessories. We have the essentials to help you create new opportunities for adventure by equipping your vehicle with extra utility to complete the picture of how you express your individuality.



A. Fork-mount bike rack[1]

Pursuing your favorite pastime just got easier. Made of anodized aluminum, this bike rack features a quick-clamping device that can be secured with the included lock. Shown with the wheel-holder attachment, sold separately.



B



C

B. Ski and snowboard racks[1]

These racks help transport your equipment to the slopes. The standard attachment (shown) holds two sets of skis or two snowboards. And if you're headed to the water, it can hold one wakeboard. A deluxe attachment, sold separately, holds up to six sets of skis or four snowboards.

C. Compact cargo carrier[1]

Extra gear doesn't have to take up valuable cargo space when it's time for a road trip because our aerodynamic carrier offers a generous 10.5-cu-ft capacity. Black or Silver. Size: 76.8" long, 26.4" wide x 15.7" high.



D. All-weather cargo mat[2,3]

Designed to fit for your Audi A3 Sedan, the raised outside edge of the cargo mat helps contain spills and protect the cargo-area carpeting from stains. The textured material helps control load shifting.

1 Proper installation required. See dealer for details. All roof-rack system attachments require the base carrier bars. All accessories sold separately. Recreational equipment and sporting equipment not included. 2 Proper installation required. Professional installation may be recommended. See owner's literature and dealer for details. 3 Always ensure that your vehicle is equipped with appropriate tires and equipment and always adjust your speed and driving style to the road, terrain, traffic and weather conditions. See Owner's Manual for further details and important limitations.

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Audi Genuine Accessories



A


B


C

A. All-weather floor mats[1]

The all-weather floor mats feature a deep-ribbed, channeled design that helps protect your vehicle's floor and carpeting from the elements. Black mats are available in sets of two for front or rear. Front mats feature the A3 logo.

B. Audi A3/S3 winter wheel and tire package[1,2]

Adding style and performance, this 17" winter wheel and tire package features Audi Original winter tires specifically engineered to help improve traction and handling in a variety of winter weather conditions.

C. 18" 5-arm Velum wheels[1]

High-grade aluminum-alloy wheels add a bold design accent to the A3 styling. Matte Black with a machine-finished face.

Audi Genuine Sport and Design Accessories

For a bolder appearance or a finishing touch, we have a solution that helps make every mile more enjoyable—and more yours.

- Stylish wheel designs
- License plate frames
- Audi beam

Audi TravelSpace Transport Accessories

When you're on the go, help make sure what you want to carry fits with a variety of intelligent and innovative solutions.

- Bike and ski racks[3]
- Rooftop cargo carriers[3]
- In-vehicle cargo bags[4]

Audi Guard Comfort and Protection Accessories

Help protect what you love. Use Audi Guard Comfort and Protection Accessories to help keep your Audi looking like new—inside and out.

- Floor mats[1]
- First aid kit
- Cargo mats[1]

Audi Guard Car Care Products

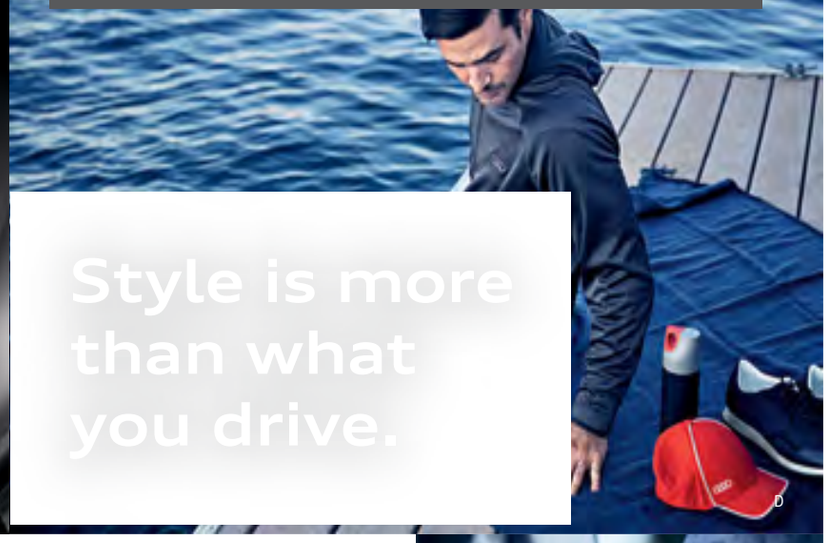
Your Audi A3 deserves the very best, and this is it: the only car care line designed specifically for Audi vehicles.

- Leather care[5]
- Detailing tools[5]
- Winter protection[5]

1 Proper installation required. Professional installation may be recommended. See owner's literature and dealer for details. 2 When driving during cold, snowy or icy weather conditions, ensure that your vehicle is equipped with appropriate all-season or winter weather tires. Even with appropriate tires, you must always drive in a manner appropriate for the weather, visibility and road conditions. Tires are supplied and warranted by their manufacturer. 3 Proper installation required. See dealer for details. All roof-rack system attachments require the base carrier bars. All accessories sold separately. 4 Always ensure cargo is properly secured. See owner's manual for details. 5 Not available in all states. Check with your authorized Audi dealer for product availability.

Visit **audi.us/accessories** for more.

Audi collection


D

Style is more than what you drive.

D. Audi active wear

For you, the fun begins when you break a sweat. The Audi collection of active wear is designed to keep you warm when it's chilly, dry when it rains or help shade your eyes on sunny days. Available in several styles and colors, these active life items are made to put in the extra miles.

E. Stainless steel key ring

You'll know it's your key when you attach this stylish stainless steel key ring to your Audi advanced key. High-quality stainless steel will maintain its luster, and the Audi rings logo is easy to spot.

F. Ladies' scoopneck T-shirt

This polyester/cotton/rayon-blended tee features a semi-fitted silhouette, a seamed collar and double-needle sleeves that make it feel like it was tailored for you. Soft and lightweight, it looks great on its own or part of a combination.


E


F

Visit **audi.us/collection** for more.

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A3 Sedan and Cabriolet Featured Highlights | Packages and Options

Premium

- 17" 5-arm design wheels with 225/45 all-season tires[1]
- Xenon plus headlights with LED daytime running lights
- LED taillights
- Power-adjustable, heated exterior side mirrors
- LED turn indicators integrated into the exterior side mirror housings
- Heated windshield washer nozzles
- Chrome exhaust outlets
- Dual-zone automatic climate control
- Tilt and telescopic manually adjustable steering column
- Micrometallic Silver inlays
- Four beverage holders
- Leather seating surfaces
- Eight-way power driver's seat and four-way power lumbar adjustment for driver (Sedan)
- Six-way partial-power front seats plus four-way power lumbar adjustment for driver and passenger (Cabriolet)
- Split-folding 40/20/40 rear seatbacks (50/50 on Cabriolet)
- Comfort head restraints with "x" adjustment for driver and front passenger (Sedan)
- Heated front seats
- Panoramic sunroof (Sedan)
- Audi smartphone interface with Apple CarPlay® and Google™ Android Auto™ for compatible devices[2]
- 7.0" MMI® center infotainment display
- Audi sound system with ten speakers, 180 watts and single CD player with MP3 playback capability (nine speakers, 140 watts on Cabriolet)
- HD Radio™ Technology
- SiriusXM® with 90-day trial subscription[3]
- SDXC card slot with 32GB operating capacity
- Audi music interface with USB port for charging
- BLUETOOTH® wireless technology preparation with streaming audio for compatible devices
- Rain/light sensor for automatic windshield wipers and headlights
- Cruise control with coast, resume and accelerate features
- Audi pre sense® basic[5]
- Audi pre sense® front[5]
- Rear view camera
- Driver and front-passenger advanced airbags, knee airbags, front thorax side airbags and Sideguard® head curtain airbags[6] (Sedan)
- Driver and front-passenger advanced airbags, knee airbags, front head/thorax side airbags[6] (Cabriolet)
- Active rollover protection system (Cabriolet)
- Lower Anchors and Tethers for Children (LATCH) in rear seats (lower anchors only on Cabriolet)

Premium Plus, includes Premium features in addition to:

- 18" 5-double-spoke design, bi-color finish wheels with 225/40 all-season tires[1]
- Full LED headlights with all-weather light
- LED taillights with dynamic rear turn indicators
- High-gloss Aluminum window surrounds (Sedan)
- S line® exterior appearance—front and rear bumpers, body-colored side sills, S line® fender badges
- Eight-way power front seats and four-way power lumbar for driver and passenger (Sedan)
- Auto-dimming interior rear view mirror with digital compass
- Aluminum Mistral inlays
- Ambient LED interior lighting package
- Illuminated Aluminum front door sill inlays with S badging
- Audi phone box[7] (wireless charging and signal booster)
- Color driver information system
- Audi drive select
- Audi advanced key—keyless start, stop and front doors and trunk entry[8]
- Audi side assist with Rear cross traffic assist[5]
- Parking system plus with front and rear acoustic sensors[5]

Prestige, includes Premium Plus features in addition to:

- Interior storage package (USB charging ports for rear seat, grocery hook and 12V outlet in trunk)
- Audi virtual cockpit (12.3" LCD fully digital instrument cluster with two visual modes: Classic and Infotainment)
- MMI® Navigation plus[4]
- MMI® touch with handwriting-recognition technology[9]
- Six-month trial subscription to Audi connect® PRIME and Audi connect® PLUS online services[10,11]
- Bang & Olufsen® Sound System with 14 speakers and 705 watts (13 speakers and 625 watts on Cabriolet)
- Garage door opener (HomeLink®) (Sedan)
- Audi adaptive cruise control with stop & go[5]
- Audi active lane assist[5]
- High-beam assistant[5]
- Park steering assist[5] (Sedan)

Premium	Premium Plus	Prestige	Available packages
□	■	■	**Convenience package** > Audi advanced key—keyless start, stop and front doors and trunk entry[8] > Ambient LED interior lighting package > Audi side assist[5] > High-gloss Aluminum window surrounds (Sedan)
□	■	■	**18" Wheel package** > 18" 5-double-spoke design, bi-color finish wheels > 225/40 all-season tires[1]
—	□	■	**Technology package** > Audi virtual cockpit (12.3" LCD fully digital instrument cluster with two visual modes: Classic and Infotainment) > MMI® Navigation plus[4] > MMI® touch with handwriting-recognition technology[9] > Six-month trial subscription to Audi connect® PRIME and Audi connect® PLUS online services[10,11] > Bang & Olufsen® Sound System with 14 speakers and 705 watts (13 speakers and 625 watts on Cabriolet)
—	□	□	**19" Wheel package** > 19" 5-arm-wing design, anthracite/polished finish wheels > 235/35 summer performance tires[12]

Premium	Premium Plus	Prestige	Stand-alone options
□	□	□	> Sport suspension (-15 mm ride height)
□	□	□	> Rear-passenger thorax side airbags[6] (Sedan)

■ Standard □ Optional — Not applicable

1–12 See RS 3 Featured Highlights, Packages and Options page for important information regarding: high-performance tires, Audi smartphone interface, SiriusXM®, MMI® Navigation plus, Audi pre sense® basic, Audi pre sense® front, Audi side assist with Rear cross traffic assist, parking system plus with front and rear acoustic sensors, Audi adaptive cruise control with stop & go, Audi active lane assist, high-beam assistant, park steering assist, airbags, Audi phone box, Audi advanced key—keyless ignition, MMI® touch, Audi connect® PRIME, Audi connect® PLUS, and summer performance tires.

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S3 Featured Highlights | Packages and Options

Premium Plus

- > 18" 5-arm-dynamic design wheels with 225/40 summer performance tires[12]
- > Platinum Gray Singleframe® grille
- > Full LED headlights with all-weather light
- > LED taillights with dynamic rear turn indicators
- > Power-adjustable, heated exterior side mirrors
- > Aluminum-optic exterior side mirror housings
- > High-gloss Aluminum window surrounds
- > S model quad exhaust outlets
- > Body-colored, trunk-mounted rear lip spoiler
- > S model-specific front/rear fasciae and side sills
- > Three-spoke multifunction flat-bottom sport steering wheel with S badging and shift paddles
- > Tilt and telescopic manually adjustable steering column
- > Brushed Aluminum inlays, illuminated
- > Leather-wrapped gear selector
- > Leather seating surfaces with S embossing
- > Front sport seats with extendable thigh support
- > Eight-way power front sport seats and four-way power lumbar adjustment for driver and passenger
- > Split-folding 40/20/40 rear seatbacks
- > Comfort head restraints with x-adjustment for driver and front passenger
- > Heated front seats
- > Ambient LED interior lighting package
- > Panoramic sunroof
- > Illuminated Aluminum front door sill inlays with S badging
- > Aluminum-optic pedal caps
- > Color driver information system
- > Audi smartphone interface with Apple CarPlay® and Google™ Android Auto™ for compatible devices[2]
- > 7.0" MMI® center infotainment display
- > Audi sound system with ten speakers, 180 watts and single CD player with MP3 playback capability
- > HD Radio™ Technology
- > SiriusXM® with 90-day trial subscription[3]
- > SDXC card slot with 32GB operating capacity
- > Audi music interface with USB port for charging
- > BLUETOOTH® wireless technology preparation with streaming audio for compatible devices
- > Parking system plus with front and rear acoustic sensors[5]
- > Audi phone box[7] (wireless charging and signal booster)
- > Audi advanced key—keyless start, stop and front doors and trunk entry[8]
- > Rain/light sensor for automatic windshield wipers and headlights
- > Audi drive select
- > Audi pre sense® basic[5]
- > Audi pre sense® front[5]
- > Audi side assist with Rear cross traffic assist[5]
- > Rear view camera
- > Driver and front-passenger advanced airbags, knee airbags, front thorax side airbags and Sideguard® head curtain airbags[6]
- > Lower Anchors and Tethers for Children (LATCH) in rear seats

Prestige, includes Premium Plus features in addition to:

- > Interior storage package (USB charging ports for rear seat, grocery hook and 12V outlet in trunk)
- > Audi virtual cockpit (12.3" LCD fully digital instrument cluster with three visual modes: Sport, Classic and Infotainment)
- > MMI® Navigation plus[4]
- > MMI® touch with handwriting-recognition technology[9]
- > Six-month trial subscription to Audi connect® PRIME and Audi connect® PLUS online services[10,11]
- > Bang & Olufsen® Sound System with 14 speakers and 705 watts
- > Garage door opener (Homelink®)
- > Audi adaptive cruise control with stop & go[5]
- > Audi active lane assist[5]
- > High-beam assistant[5]
- > Park steering assist[5]

Premium Plus	Prestige	Available packages
□	■	**Technology package** > Audi virtual cockpit (12.3" LCD fully digital instrument cluster with three visual modes: Sport, Classic and Infotainment) > MMI® Navigation plus[4] > MMI® touch with handwriting-recognition technology[9] > Six-month trial subscription to Audi connect® PRIME and Audi connect® PLUS online services[10,11] > Bang & Olufsen® Sound System with 14 speakers and 705 watts
□	□	**S Sport seat package** > Front S Sport seats with extendable thigh support > Eight-way, heated, manual front seats and four-way power lumbar for driver and passenger > Fine Nappa leather seats with contrast diamond stitching and S embossing > Leatherette-covered knee pads and door armrests with contrast stitching
□	□	**S sport package** > Audi magnetic ride > Red brake calipers
□	□	**Black optic package** > Audi Sport® 19" 5-arm-rotor design, matte titanium finish wheels > 235/35 summer performance tires[12] > Gloss Black Singleframe® grille > High-gloss Black window surrounds > Black exterior side mirror housings
□	□	**19" Wheel package** > 19" 5-arm-wing design, anthracite/polished finish wheels > 235/35 summer performance tires[12]

■ Standard □ Optional — Not applicable

Premium Plus	Prestige	Stand-alone options
□	□	> Audi Sport® Carbon Fiber inlays
□	□	> 18" 225/40 all-season tires[1] (top speed limiter lowered to 130 mph when equipped[13])
□	□	> Rear-passenger thorax side airbags[6]

1–13 See RS 3 Featured Highlights, Packages and Options page for important information regarding: high-performance tires, Audi smartphone interface, SiriusXM®, MMI® Navigation plus, parking system plus with front and rear, acoustic sensors, Audi pre sense® basic, Audi pre sense® front, Audi side assist with Rear cross traffic assist, Audi adaptive cruise control with stop & go, Audi active lane assist, high-beam assistant, park steering assist, airbags, Audi phone box, Audi advanced key—keyless ignition, MMI® touch, Audi connect® PRIME, Audi connect® PLUS, summer performance tires and top track speed.

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RS 3 Featured Highlights | Packages and Options

RS 3

- 19" 5-arm-blade design, bi-color titanium finish wheels with 235/35 summer performance tires[12]
- Audi magnetic ride, RS tuned
- Matte Aluminum-optic Singleframe® grille surround with quattro® script
- Full LED headlights with all-weather light
- LED taillights with dynamic rear turn indicators
- Matte Aluminum-optic exterior side mirror housings
- Matte Aluminum-optic trim around exterior side windows
- Matte Aluminum-optic front blade and rear diffuser blade
- Body-colored, trunk-mounted rear lip spoiler
- RS model appearance—front/rear fasciae and dual oval exhaust outlets
- Three-spoke multifunction flat-bottom sport steering wheel with RS badging and shift paddles
- Tilt and telescopic manually adjustable steering column
- Aluminum Race inlays, illuminated
- Fine Nappa leather seats with contrast diamond stitching, perforation and RS embossing
- Front S Sport seats with extendable thigh support
- Eight-way manual front seats and four-way power lumbar for driver and passenger
- Heated front seats
- Split-folding 40/20/40 rear seatbacks
- Ambient LED interior lighting package
- Panoramic sunroof
- Illuminated Aluminum front door sill inlays with RS badging
- Aluminum-optic pedal caps
- Interior storage package (USB charging ports for rear seat, grocery hook and 12V outlet in trunk)
- Leatherette-covered knee pads and door armrests with contrast stitching
- Audi smartphone interface with Apple CarPlay® and Google™ Android Auto™ for compatible devices[2]
- 7.0" MMI® center infotainment display
- Audi sound system with ten speakers, 180 watts and single CD player with MP3 playback capability
- HD Radio™ Technology
- SiriusXM® with 90-day trial subscription[3]
- SDXC card slot with 32GB operating capacity
- Audi music interface with USB port for charging
- BLUETOOTH® wireless technology preparation with streaming audio for compatible devices[2]
- Audi phone box[7] (wireless charging and signal booster)
- Parking system plus with front and rear acoustic sensors[5]
- Audi advanced key—keyless start, stop and front doors and trunk entry[8]
- Rain/light sensor for automatic windshield wipers and headlights
- Audi drive select
- Audi pre sense® basic[5]
- Audi side assist with Rear cross traffic assist[5]
- Rear view camera
- Driver and front-passenger advanced airbags, knee airbags, front thorax side airbags and Sideguard® head curtain airbags[6]
- Lower Anchors and Tethers for Children (LATCH) in rear seats

Available packages

Technology package
- Audi virtual cockpit (12.3" LCD fully digital instrument cluster with three visual modes: Sport, Classic and Infotainment)
- MMI® Navigation plus[4]
- MMI® touch with handwriting-recognition technology[9]
- Six-month trial subscription to Audi connect® PRIME and Audi connect® PLUS online services[10,11]
- Bang & Olufsen® Sound System with 14 speakers and 705 watts

Driver assistance package
- Audi adaptive cruise control with stop & go[5]
- Audi active lane assist[5]
- High-beam assistant[5]
- Audi pre sense® front[5]

RS design package
- Red ring around air vents
- RS embroidered front and rear floor mats
- Safety belts with red edge
- Alcantara® knee pads with Crescendo Red stitching and leatherette-covered door armrests

Dynamic package
- Sport exhaust system with Black tips
- Red brake calipers
- Staggered 19" 5-arm-blade design, bi-color titanium finish wheels
- Staggered 255/30 front and 235/35 rear summer performance tires[12]

RS fixed sport suspension package
- Deletes Audi magnetic ride

Black optic package
- Staggered 19" 5-arm-blade design, bi-color black finish wheels
- High-gloss Black Singleframe® grille with quattro® script
- High-gloss Black trim around exterior side windows
- High-gloss Black exterior side mirror housings
- High-gloss Black trunk-mounted rear lip spoiler

Stand-alone options

- Audi Sport® Carbon Fiber inlays
- Rear-passenger thorax side airbags[6]

1 These tires may ride less comfortably, make more noise, and wear more quickly than other choices. To avoid tire, rim or vehicle damage, it is important that inflation pressure is regularly checked and maintained at optimum levels. Tires are supplied and warranted by their manufacturer. 2 Always pay careful attention to the road, and do not drive while distracted. Not all features available on all operating systems. Standard text and data usage rates apply. These features require compatible device, operating system and mobile apps. See mobile device and app providers for terms and privacy. "Android," "Android Auto" and other marks are trademarks of Google Inc. "Apple CarPlay" is a registered trademark of Apple Inc. 3 SiriusXM® and SiriusXM® Traffic subscriptions are sold separately or as a package after trial period and are continuous until you call SiriusXM® to cancel. See Customer Agreement for complete terms and more information at www.siriusxm.com. SiriusXM® Traffic service available in select markets. SiriusXM® U.S. Satellite Service available only to those in the 48 contiguous U.S.A., D.C. and Puerto Rico (with coverage limitations). 4 Audi Navigation plus depends on signals from the worldwide Global Positioning Satellite network. Audi Navigation plus depends on signals from the worldwide Global Positioning Satellite network. The vehicle's electrical system, and existing wireless and satellite technologies, must be available and operating properly for the system to function. The system is designed to provide you with suggested routes in locating addresses, destinations and other points of interest. Changes in street names, construction zones, traffic flow, points of interest and other road system changes are beyond the control of Audi of America, Inc. Complete detailed mapping of lanes, roads, streets, toll roads, highways, etc., is not possible, therefore you may encounter discrepancies between the mapping and your actual location. Please rely on your individual judgment in determining whether or not to follow a suggested Audi Navigation plus route. 5 Driver Assistance features are not substitutes for attentive driving. Please see your Owner's Manual for further details and important limitations. 6 Airbags are supplemental restraints only and will not deploy in all crash circumstances. Always use safety belts and seat children only in the rear, using restraint systems appropriate for their size and age. 7 Requires compatible smart device. This is a CONSUMER device. BEFORE USE, you MUST REGISTER THIS DEVICE with your wireless provider and have your provider's consent. Most wireless providers consent to the use of signal boosters. Some providers may not consent to the use of this device on their network. If you are unsure, contact your provider. You MUST operate this device with approved antennas and cables as specified by the manufacturer. Antennas MUST be installed at least 20 cm (8 inches) from any person. You MUST cease operating this device immediately if requested by the FCC or a licensed wireless service provider. WARNING. E911 location information may not be provided or may be inaccurate for calls serviced by using this device. 8 See Owner's Manual for further details and important warnings about the keyless ignition feature. Do not leave vehicle unattended with the engine running, particularly in enclosed spaces. 9 Always pay careful attention to the road, and do not drive while distracted. See Owner's Manual for further details and important limitations. 10 Always pay careful attention to the road, and do not drive while distracted. Connect PRIME services are optional, may require an additional subscription with separate terms and conditions, and should be used only when it is safe and appropriate. Trial or paid subscription required. Connect PRIME services require vehicle cellular connectivity and availability of vehicle GPS signal; certain services collect location information, see Terms of Service for information about how to disable. Online services are subject to change at any time. See Terms of Service, Privacy Policy and other details at www.audiusa.com/privacy and www.audiusa.com/technology/intelligence/audi-connect/connect-terms. 11 Always pay careful attention to the road, and do not drive while distracted. The Wi-Fi® hotspot feature is intended for passenger use only. 4G LTE coverage is not available in all areas. Wi-Fi® feature is provided through Connect PLUS. Connect PLUS features and technologies are optional, may require an additional subscription with separate terms and conditions, and should be used only when it is safe and appropriate. See materials provided by wireless carrier for terms, privacy, data security details. Returning devices connect automatically and use plan data unless hotspot is removed from device settings. 12 These tires may ride less comfortably, make more noise, and wear more quickly than other choices. To avoid tire, rim or vehicle damage, it is important that inflation pressure is regularly checked and maintained at optimum levels. High-performance tires are designed for optimum performance and handling in warm climates and are not suitable for cold, snowy or icy weather conditions. When driving during cold, snowy or icy weather conditions, ensure that your vehicle is equipped with appropriate all-season or winter weather tires. Tires are supplied and warranted by their manufacturer. 13 Top track speed is electronically limited in the U.S. Always obey all speed and traffic laws.

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Technical Specifications

Engineering | Performance	A3 40 TFSI® (2.0T)	A3 45 TFSI® (2.0T) quattro®	S3 Sedan	RS 3 Sedan
Engine type	2.0-liter four-cylinder	2.0-liter four-cylinder	2.0-liter four-cylinder	2.5-liter five-cylinder
Engine block/Cylinder head	Cast-iron/Aluminum-alloy	Cast-iron/Aluminum-alloy	Cast-iron/Aluminum-alloy	Aluminum-alloy
Displacement (cc)/Bore and stroke (mm)	1,984/82.5 x 92.8	1,984/82.5 x 92.8	1,984/82.5 x 92.8	2,480/82.5 x 92.8
Horsepower (@ rpm)	184 @ 4,300–6,000	228 @ 5,000–6,700	288 @ 5,400–6,200	394 @ 5,850–7,000
Torque (lb-ft @ rpm)	221 @ 1,450–4,300	258 @ 1,700–4,400	280 @ 1,900–5,300	354 @ 1,700–5,850
Compression ratio	11.7:1	9.6:1	9.3:1	10.0:1
Valvetrain	16-valve DOHC with Audi valvelift system	16-valve DOHC with Audi valvelift system	16-valve DOHC with Audi valvelift system	20-valve DOHC with Audi valvelift system
Induction/Fuel injection	Turbocharged/TFSI®	Turbocharged/TFSI®	Turbocharged/TFSI®	Turbocharged/TFSI®
Start-stop engine system	■	■	■	—
Acceleration, Sedan/Cabriolet (0–60 mph)	6.6/6.9 seconds[1]	5.4/5.8 seconds[1]	4.6 seconds[1]	3.9 seconds[1]
Top track speed	130 mph[2]	130 mph[2]	155 mph/ Optional 130 mph[2,3]	155 mph[2]
Transmission | Drivetrain				
Seven-speed S tronic® dual-clutch automatic transmission and front-wheel drive	■	—	—	—
Seven-speed S tronic® dual-clutch automatic transmission and quattro® all-wheel drive	—	■	■	■
Suspension | Braking | Chassis				
MacPherson front suspension and four-link rear suspension	■	■	■	■ (RS-tuned)
Sport suspension	□	□	■ (S-tuned)	—
Audi magnetic ride	—	—	□	■ (RS-tuned)
RS fixed sport suspension (deletes Audi magnetic ride)	—	—	—	□
Ventilated front disc/Solid rear disc brakes (in)	12.3/10.7	13.4/12.2	—	—
Ventilated front and rear disc brakes (in)	—	—	13.4/12.2	14.6/12.2
Red brake calipers	—	—	□	□
Audi progressive steering	—	—	■	■ (RS-tuned)
Steering ratio	15.3:1	15.3:1	15.3:1	14.6:1
Turning circle, curb-to-curb (ft)	36.1	36.1	36.1	36.1
Exterior measurements, Sedan/Cabriolet				
Wheelbase (in)	103.8/102.2	103.8/102.2	103.6	103.6
Length (in)	175.5/174.1	175.5/174.1	175.8	176.3
Height (in)	55.7/55.5	55.7/55.5	54.8	55.0
Overall width with mirrors (in)	77.2	77.2	77.2	77.2
Track, front/rear (in)	61.2/60.1	61.2/60.1	61.1/60.1	61.4/60.2
Curb weight (lb)	3,197/3,439	3,428/3,660	3,494	3,593
Interior measurements, Sedan/Cabriolet				
Head room front (in)	36.5/37.4	36.5/37.4	36.5	36.5
Head room rear (in)	36.1/36.3	36.1/36.3	36.1	36.1
Leg room front (in)	41.2/41.2	41.2/41.2	41.2	41.2
Leg room rear (in)	35.1/31.9	35.1/31.9	35.1	35.1
Shoulder room front (in)	54.8/54.8	54.8/54.8	54.8	54.8
Shoulder room rear (in)	53.0/45.7	53.0/45.7	53.0	53.0
Cargo volume, rear seatbacks up (cu ft)	12.3/9.9 (7.1 with roof down)	10.0/9.9 (7.1 with roof down)	10.0	10.0
Seating capacity	5/4	5/4	5	5
EPA mileage estimates/Capacities				
Fuel economy (city/highway/combined)	26/35/29[4]	22/30/25[4]	22/29/25[4]	NA[5]
Fuel (gal)	13.2[6]	14.5[6]	14.5[6]	14.5[6]
Minimum fuel grade required	Regular	Regular	Premium	Premium

■ Standard □ Optional — Not applicable **NA** Information not available at time of printing

1 Always obey all speed and traffic laws. 2 Top track speed is electronically limited in the U.S. Always obey all speed and traffic laws. 3 When equipped with optional all-season tires. 4 2019 EPA estimates. Your mileage will vary and depends on several factors, including your driving habits and vehicle condition. See www.fueleconomy.gov for details. 5 2019 EPA estimates not available at time of publication. See www.fueleconomy.gov for 2019 EPA estimates. Your mileage will vary and depends on several factors, including your driving habits and vehicle condition. 6 Never drive until the tank is completely empty. The irregular supply of fuel that results from that can cause engine misfires. Uncombusted fuel will then enter the exhaust system. This can cause overheating and damage to the catalytic converter.

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Wheels

17" 5-arm design



Standard on A3 Premium

18" 5-double-spoke design, bi-color finish wheels



Standard on A3 Premium Plus and Prestige, Available 18" Wheel package on A3 Premium

19" 5-arm-wing design, anthracite/polished finish



Available 19" Wheel package on A3 and S3

18" 5-arm-dynamic design



Standard on S3

Audi Sport® 19" 5-arm-rotor design, matte titanium finish



Available Black optic package on S3

19" 5-arm-blade design, bi-color titanium finish



Standard on RS 3, Available in staggered fitment with Dynamic package

19" 5-arm-blade design, bi-color black finish, staggered fitment



Available Black optic package on RS 3

Exterior Colors

Brilliant Black



A3, S3

Ibis White



A3

Nardo Gray



RS 3

Cosmos Blue metallic



A3

Florett Silver metallic



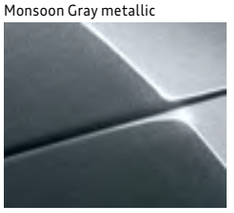
A3

Glacier White metallic



A3, S3, RS 3

Monsoon Gray metallic



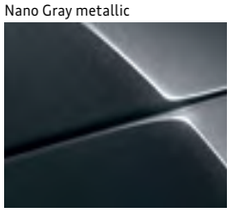
A3

Mythos Black metallic



A3, S3, RS 3

Nano Gray metallic



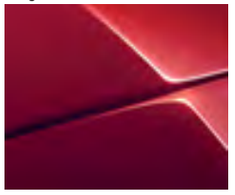
A3, S3

Navarra Blue metallic



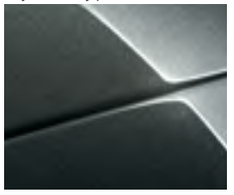
S3

Tango Red metallic



A3, S3, RS 3

Daytona Gray pearl



S3, RS 3

Ara Blue crystal



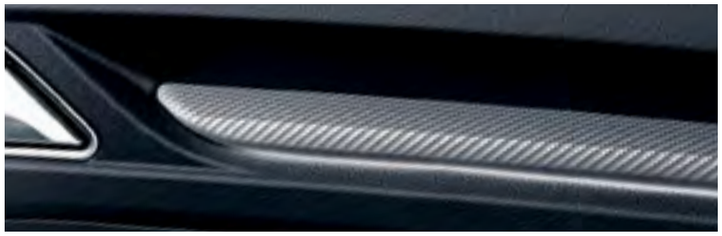
S3, RS 3

Wheel and tire options will vary based on model, trim level and package combination and may increase price. See your dealer for details.

Exterior color options will vary based on model, trim level and package combination and may increase price. See your dealer for details.

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Interior Inlays

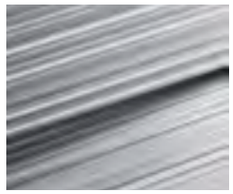


Micrometallic Silver



Standard on A3 Premium

Aluminum Mistral



Standard on A3 Premium Plus and Prestige

Brushed Aluminum, illuminated



Standard on S3

Aluminum Race, illuminated



Standard on RS 3

Audi Sport® Carbon Fiber



Available on S3, RS 3

Interior Colors

Black leather



Standard on A3

Rock Gray leather



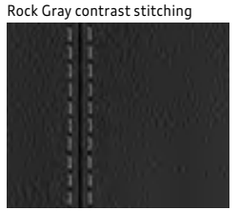
Standard on A3

Chestnut Brown leather



Standard on A3

Black leather with Rock Gray contrast stitching



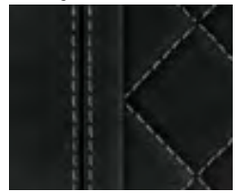
Standard on S3

Magma Red leather with Anthracite contrast stitching



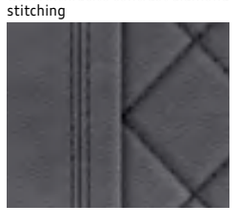
Standard on S3

Black Fine Nappa leather with Rock Gray contrast diamond stitching



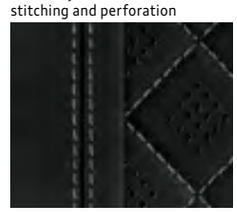
Available on S3

Rotor Gray Fine Nappa leather with Anthracite contrast diamond stitching



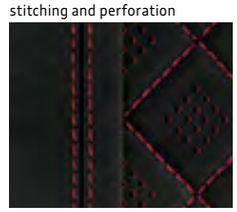
Available on S3

Black Fine Nappa leather with Rock Gray contrast diamond stitching and perforation



Standard on RS 3

Black Fine Nappa leather with Crescendo Red contrast diamond stitching and perforation



Available on RS 3

Interior inlay options will vary based on model, trim level and package combination and may increase price. See your dealer for details.

Interior color options will vary based on model, trim level and package combination and may increase price. See your dealer for details.

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A3
2019

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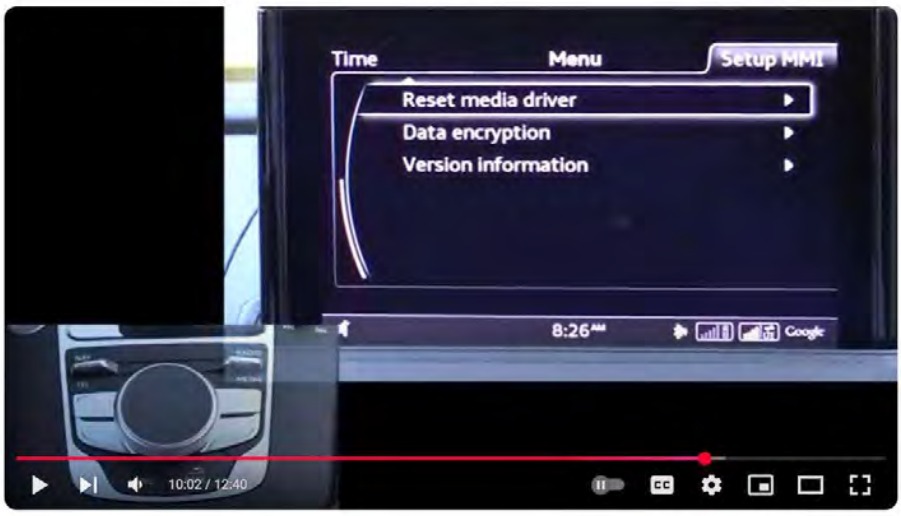
Note: A word about this brochure. Audi of America, Inc., believes the specifications in this brochure to be correct at the time of printing. However, specifications, standard equipment, options, fabrics, and colors are subject to change without notice. Some equipment may be unavailable when your vehicle is built. Please ask your dealer for advice concerning current availability of standard and optional equipment, and your dealer will verify that your vehicle will include the equipment you ordered. Vehicles in this brochure are shown with optional equipment. See your dealer for complete details on the Audi New Vehicle Limited Warranty, twelve-year limited warranty against corrosion perforation, and Audi 24/7 Roadside Assistance. (Roadside assistance coverage provided by Road America in the U.S. Certain conditions apply; see your dealer for details.) Tires supplied by various manufacturers. “Audi,” all model names, “Audi connect,” “Audi pre sense,” “Audi Sport,” “MMI,” “quattro,” “S line,” “S tronic,” “Sideguard,” “Singleframe,” “TFSI,” and the four rings logo are registered trademarks of AUDI AG. “Alcantara” is a registered trademark of Alcantara S.p.A. “Android Auto” and “Google” are trademarks of Google Inc. © 2018 Google Inc. All rights reserved. “Apple CarPlay” is a registered trademark of Apple Inc. “Bang & Olufsen” is a registered trademark of Bang & Olufsen. The BLUETOOTH word mark and logos are owned by the Bluetooth SIG, Inc., and any use of such marks by AUDI AG is under license. “Facebook” is a registered trademark of Facebook, Inc. “HD Radio” and the HD Radio logo are proprietary trademarks of iBiquity Digital Corporation. “HomeLink” is a registered trademark of Gentex Corporation. “SiriusXM” and all related marks and logos are trademarks of Sirius XM Radio Inc. and its subsidiaries. “Wi-Fi” is a registered trademark of the Wi-Fi Alliance. All other trademarks are the property of their respective owners. Some European models shown. Some features may not be available at time of order.

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Exhibit AL

Title- 2015 Audi MMI Infotainment Review in the 2015 Audi A3 Sedan

Snapshots:



Source: https://www.youtube.com/watch?v=xadb1vSXw7Q

Exhibit AM

Title- Audi Tech Tutorial MMI Navigation

Snapshots:



Source: https://www.youtube.com/watch?v=Kfm4xcEtuGQ

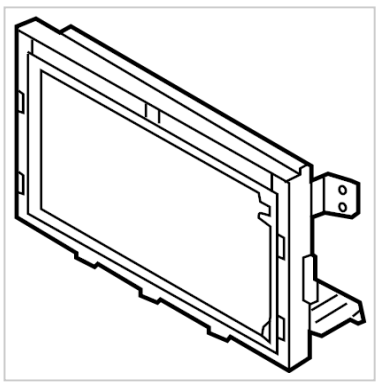


Source: https://www.youtube.com/watch?v=Kfm4xcEtuGQ

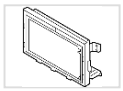
GPS Navigation System

Part Number: **8V0919604C**

Supersession(s): **8V0-919-604-C**



(https://images.simplepart.com/images/parts/motor/parts/fullsize/1081480_8.png)



Display unit. GPS Navigation System.
GPS Navigation System.

GPS Navigation System

Fits A3

Convertible, display only. Display only.

7 people have looked at this part recently

What This Fits	This product fits 30 vehicle variants. Audi: 1 models, 30 variants between 2015 and 2019.
Product Types	
	Show More

Dealer Price

$ 1,467.84

View Warranty Info (/policy.aspx).

Fulfillment Options

◉ **Shipping** ESTIMATE COST

Local Pickup
Audi Tulsa
4208 S. Memorial Dr., Tulsa, OK, 74145-4834

- 1 +

Add To Cart

Audi Tulsa

Dealer Info (//parts.auditulsa.com)

(/aboutus.aspx)

(https://www.audiusa.com/privacy)

(https://www.audiusa.com/)

(https://parts.audiusa.com/policy.aspx)

(https://www.audiusa.com/us/web/en/terms-and-conditions/privacy.html)

(/motor.aspx)

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Menu

Data Protection Notice Audi Connect



A. Scope of the Data Protection Notice

In this Data Protection Notice, we are informing you (as the owner, driver, passenger, etc.) about the processing of your personal data by AUDI AG, Auto-

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Union-Straße 1, 85057 Ingolstadt, Germany ("we") in connection with data processing in and data transmission from an AUDI AG vehicle.

Personal data means any information relating to an identified or identifiable natural person. An identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person.

Processing means any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means, such as collection, recording, organisation, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction.

B. General Information

I. Who is responsible for data processing

The entity responsible for the processing of your personal data (the Controller) is:

AUDI AG, Auto-Union-Straße 1, 85057 Ingolstadt, Germany.

II. Whom can I contact?

If you want to assert your data protection rights, please use the contact options at gdpr.audi.com.

There, you will find more information on how to assert your data protection rights.

You can also contact the following address by post:AUDI AG, DSGVO-Betroffenenrechte (Data Subject Rights pursuant to GDPR), Auto-Union-Straße 1, 85057 Ingolstadt, Germany.

If you have general questions about this Data Protection Notice or the processing of your personal data by Audi, please address them to:

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Audi Kundenbetreuung Deutschland (Customer Service Germany), PO Box 10 04 57, 85045 Ingolstadt, Germany.

E-Mail: kundenbetreuung@audi.de

III. Contact details of the data protection officer

If you have concerns about data protection, you can also contact our company's data protection officer:

AUDI AG, Datenschutzbeauftragter (Data Protection Officer), 85045 Ingolstadt, Germany.

E-Mail: datenschutz@audi.de

IV. What rights do I have?

Depending on your vehicle's equipment, you can deactivate the collection of certain personal data via the privacy settings in your vehicle. With the deactivation, services that use this data cannot be provided and are therefore not usable. Please note that the emergency call service will not be deactivated via this feature and will continue to send the data necessary to provide the services. We inform you about special features of the privacy settings for individual services in section **C.II. "Privacy Settings"**.

Other online services in your vehicle may be protected against deactivation through privacy settings for legal or contractual reasons, such as the Audi Connect key (if available) or the Audi Connect theft tracking system (if installed). Find out about the services protected in your vehicle in the information on "Activate Privacy" in the privacy settings in your HMI (Human Machine Interface).

As the data subject, you are entitled to the following data protection rights, depending on your place of jurisdiction. Please note that such rights might be extended or restricted under applicable local law.

1. Right to be informed

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You have the right to be informed about the collection and use of your personal data by us, in a readily accessible manner, and in plain and clear language. We are implementing your right to be informed, also through this notice, whose content may be updated from time to time.

2. Access

You have the right to obtain confirmation as to whether or not personal data concerning you are being processed, and, where that is the case, to have access to your personal data stored by AUDI AG, be provided with information about to what extent your personal data will be processed or shared and to receive a copy of your stored personal data.

3. Rectification

You have the right to obtain from AUDI AG without undue delay the rectification of inaccurate personal data concerning you and the right to have incomplete personal data completed.

4. Erasure

You have the right to obtain erasure of your personal data stored by AUDI AG without undue delay if the legal requirements are met.

This is particularly the case if

> your personal information is no longer needed for the purposes for which it was collected;

> the legal basis for processing was your consent, and you have withdrawn your consent;

> you have objected to processing your data which was based on the legal basis of legitimate interests due to personal reasons, and we cannot prove that there are overriding legitimate grounds for such processing;

> your personal data were processed unlawfully; or

> your personal data must be erased in order to comply with legal requirements.

If we have transmitted your data to third parties, we will inform them about the erasure to the extent required by law.Please note that your right to erasure is

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subject to certain limitations. For example, we may not and/or must not erase data that we are still required to retain due to statutory retention obligations. In addition, your right of erasure does not extend to data that we need for the establishment, exercise or defence of legal claims.

5. Restriction of Processing

Under certain conditions, you have the right to obtain restriction of processing (i.e., the marking of stored personal data with the aim of limiting its processing in the future). The requirements are:

> The accuracy of your personal data is contested by you and AUDI AG must verify the accuracy of the personal data;

> the processing is unlawful, but you oppose the erasure of the personal data and request the restriction of their use instead;

> AUDI AG no longer needs the personal data for the purposes of the processing, but you require the data to establish, exercise or defend your legal claims;

> you have objected to processing pending the verification of whether the legitimate grounds of AUDI AG override your legitimate grounds.

Where processing has been restricted, such data will be marked accordingly and, with the exception of storage, will be processed only with your consent or for the establishment, exercise or defence of legal claims or for the protection of the rights of another natural or legal person or for reasons of important public interest of the EU or an EU Member State, or the region where you are located at the relevant time, in each case only to the extent permitted under applicable data protection laws.

6. Data Portability

To the extent that we automatically process your personal data that you have provided to us based on your consent or any contract with you (including your employment contract), you have the right to receive such data in a structured, commonly used and machine-readable format and have the right to transmit those data to another controller without hindrance from AUDI AG. You also have the right to have the personal data transmitted directly from AUDI AG to another controller where technically feasible, provided that such transmission does not adversely affect the rights and freedoms of others.

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7. Right to Object

If we process your personal data on grounds of legitimate interests or in the public interest, then you have the right to object to the processing of your personal data on grounds relating to your particular situation. In addition, you have an unrestricted right to object if we process your data for our direct marketing purposes (or other rights if laws of the region where you are located at the relevant time stipulate another legal basis for direct marketing). Please see our separate note in the section "Information about your Right to Object".

In certain situations, and in the context of a balancing of interests, we will also grant you an additional unrestricted right to object that goes beyond the privacy settings (deactivation option). For more details in connection with this, please see the section D. "Special Information about Online Services".

If you wish to exercise your right to object, please use the contact details provided in section B.II.

8. Withdrawal of Consent

If you have given consent to the processing of your personal data, then you can withdraw such consent at any time. Please note that the withdrawal applies prospectively only. Processing that occurred before the withdrawal of consent is unaffected.

If you wish to exercise your right to withdraw your consent to the processing of your personal data, please use the contact details provided in section B.II.

9. Complaint

Furthermore, you have a right to lodge a complaint with a data protection authority if you believe that the processing of your personal data is unlawful. The right to lodge a complaint is without prejudice to any other administrative or judicial remedies. The address of the lead data protection supervisory authority responsible for AUDI AG is:

Bayerisches Landesamt für Datenschutzaufsicht (Bavarian State Office for Data Protection Supervision)

Promenade 18

91522 Ansbach

Deutschland

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The above indicated contacts of the supervisory authority are without prejudice to your right under the conditions and procedures of applicable law to lodge a complaint with a supervisory authority in the state of your habitual residence, place of work or place of the alleged infringement (e.g., for Romania: Autoritatea Națională de Supraveghere a Prelucrării Datelor cu Caracter Personal 28-30 G-ral Gheorghe Magheru Bld., District 1, post code 010336, Bucharest, Romania, anspdcp@dataprotection.ro).

10. Information about your Right to Object

a. Right to object on grounds relating to your particular situation

You have the right to object to the processing of your personal data on grounds relating to your particular situation. The prerequisite for this is that the data processing takes place in the public interest or on the basis of a balancing of interests. This also applies for any profiling.Insofar as we base the processing of your personal data on a balancing of interests, we generally assume that we can demonstrate compelling legitimate grounds but will, of course, examine each individual case.

In the event of an objection, we will no longer process your personal data, unless

> we can demonstrate compelling legitimate grounds for the processing of these data that override your interests, rights and freedoms, or

> your personal data serves the establishment, exercise or defence of legal claims.

b. Objection to the processing of your data for our direct marketing purposes

To the extent that we process your personal data for direct marketing purposes, you have the right to object at any time to the processing of the personal data concerning you for such marketing; this also applies to profiling to the extent that it is related to such direct marketing. If you object to the processing for direct marketing purposes, then we will no longer process your personal data for these purposes.

c. Exercise of the right to object

The objection may be lodged without any form and should be made to the contact details listed in this Data Protection Notice under section B.II.

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V. What data do we process for what purposes and on what legal basis?

We process your personal data in accordance with the provisions of the General Data Protection Regulation (GDPR) and the German Federal Data Protection Act (Bundesdatenschutzgesetz – "BDSG") as well as local regulations. References to articles in the GDPR in this Data Protection Notice are the equivalent articles in any applicable local regulations (if any) where those regulations implement or retain the GDPR.The specific data and purposes of the data processing depend primarily on the particular vehicle and the vehicle equipment and the services used.

Please note that not all services listed may be available for your vehicle or in your country. The features available in your vehicle and their functional scope can be found in the service description.The list and specification of all the maximum available features, regardless of your vehicle model and the specific software version, is only for the purposes of this Data Protection Notice and does not intend or lead to an expansion of the features or functional scope of your specific vehicle.Your vehicle sends certain data to our IT systems or to the IT systems of the service providers we use. On the basis of the data sent from your vehicle, we provide you with a service or content that we deliver directly from our IT systems or via the IT systems of our service providers to your vehicle or app. This always requires at least a technical assignment of a request to a service and to a vehicle. This assignment is effected either via the vehicle identification number of your vehicle or a pseudonym. The personal data are pseudonymised if they can no longer be assigned to a specific data subject without additional information.

With so-called swarm services, data from many vehicles help you to experience new safety and convenience features in your vehicle. As with the online navigation features, the data transfer from your vehicle is pseudonymised, with a different pseudonym (session ID) in each driving cycle. Since these are location-based services, accurate location information must be sent and processed in a timely manner. The vehicle identification number is not transmitted to either the processing systems of AUDI AG or to the service providers involved. The data is only collected if the associated services are activated in your vehicle. The specific data that are transmitted for the respective service can be found in the description of the services marked as swarm services in section D. In addition to this service-specific data, the metadata required to provide the service is transmitted: time stamp, information about the software versions used, map or map tile versions used, key position, ignition on/off, engine on/off.

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Further details on the specifically processed data categories and the corresponding sources can be found in the following sections for each service under "Specific Information about Online Services".

The processing of the data listed for each service takes place in order to provide and perform the services you use (necessary for the performance of a contract with you or for the implementation of pre-contractual measures that are based on your requests (Article 6 (1) (1) (b) GDPR)) as well as to identify disruptions and maintain system security, including detection and tracking of inadmissible access attempts and access to our IT systems based on our legal obligations in the area of data security (Article 6 (1) (1) (c) GDPR) and our legitimate interest in the elimination of disruptions, the maintenance of system security and the detection of tracking of inadmissible access attempts and access our IT systems (necessary for the purposes of the legitimate interests pursued by AUDI AG or by a third party, except where such interests are overridden by your interests or fundamental rights and freedoms which require the protection of personal data, in particular where the data subject is a child (Article 6 (1) (1) (f) GDPR)).

In individual cases, processing takes place for the exercise or defence of legal claims on the basis of our corresponding legitimate interest (Article 6 (1) (1) (f) GDPR).

If, in individual cases, we process personal data of passengers or other occupants, this is done to provide the service you and/or the passenger or occupant are using for the performance of the contract or for the purposes of pursuing our legitimate interest in the performance of the contract towards the respective contracting party (Article 6 (1) (1) (b) GDPR or Article 6 (1) (1) (f) GDPR).

For so-called swarm services, the service provider aggregates the data that it processes for the provision of the service with data from other vehicles, and saves the aggregation result without reference to the vehicles. Our service provider processes these data to optimise and further develop services to protect legitimate interests in order to offer customers a high-quality service (necessary for the purposes of the legitimate interests pursued by AUDI AG or by a third party, except where such interests are overridden by your interests or fundamental rights and freedoms which require the protection of personal data, in particular where the data subject is a child (Article 6 (1) (1) (f) GDPR)). This requires processing and storing the exact location information with the respective events, where no reference to your vehicle or your person is made.

Insofar as we process your personal data otherwise, the processing is based on the following legal grounds for the following purposes:

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Purpose	Legal Basis
Legitimate Interest in the Balancing of Interests	
Supporting law enforcement authorities in the event of vehicle theft by tracking vehicles and vehicle parts using the vehicle identification number (VIN)	Legitimate interest (Article 6 (1) (1) (f) GDPR)
Compliance with legal and official requirements	
Fraud and money laundering prevention	Compliance with our legal obligations (Article 6 (1) (1) (c) GDPR), balancing of interests (Article 6 (1) (1) (f) GDPR)
Compliance with legal and official requirements	
Prevention, control and investigation of terrorist financing and asset endangering criminal offences, comparisons with European and international anti-terror lists,	Compliance with our legal obligations (Article 6 (1) (1) (c) GDPR), balancing of interests (Article 6 (1) (1) (f) GDPR)
Compliance with legal and official requirements	
Compliance with control and reporting obligations under tax law, archiving of data	Compliance with our legal obligations (Article 6 (1) (1) (c) GDPR), balancing of interests (Article 6 (1) (1) (f) GDPR)

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Compliance with legal and official requirements

Disclosure as part of official/judicial measures for the purposes of gathering evidence, law enforcement and enforcing civil claims

Compliance with our legal obligations (Article 6(1) (1) (c) GDPR), balancing of interests (Article 6 (1) (1) (f) GDPR)

Compliance with legal and official requirements

Settlement and tax assessment of company services

Performance of contract (Article 6 (1) (1) (b) GDPR), balancing of interests (Article 6 (1) (1) (f) GDPR, compliance with our legal obligations (Article 6 (1) (1) (c) GDPR)

Compliance with legal and official requirements

Internal and special audits, internal investigations

Balancing of interests (Article 6 (1) (1) (f) GDPR)

Verifying compliance with contractual and legal obligations by AUDI AG, its employees and its sales partners, suppliers, etc., using the vehicle identification number if necessary

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Statistical evaluations for corporate management, Cost recording and controlling

Balancing of interests (Article 6 (1) (1) (f) GDPR)

We have a legitimate interest in carrying out evaluations to control our business processes and cost control based on the analysis of sales and order data by model, sales channel, order status, analysis of requested variants and equipment, reporting on business parameters, using the vehicle identification number if necessary.

Establishment of legal claims and defence in legal disputes

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Balancing of interests (Article 6 (1) (1) (f) GDPR)

We have a legitimate interest in establishing, exercising or defending our legal claims

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Compliance checks

Balancing of interests (Article 6 (1) (1) (f) GDPR); compliance with our legal obligations Article 6 (1) (1) (c) GDPR)

Checking compliance with legal provisions, internal company guidelines, rules and standards of AUDI AG, group companies, employees, business partners and other third parties

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Insofar as we process further data for other purposes or based on another legal ground, we will state this separately with the respective legal grounds in the notes in section D. “Specific Information about Online Services”.

Please note: We do not process your personal data for automated individual decision-making (including profiling).

VI. Who receives my data?

Within AUDI AG, those entities receive your data that they need to comply with our contractual and statutory obligations and for the purposes of the legitimate interests pursued by us.

1. Processors

Our service providers (processors) that we employ and engage may also receive data for these purposes. If we use processors to provide our services, we ensure that personal data is protected in accordance with the relevant statutory provisions by means of suitable legal precautions and appropriate technical and organisational

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measures.We employ processors of the following categories for the provision of specific services, who support us in the execution of our business processes. Specifically, this includes undertakings in the following categories:

- Hosting Provider
- Service Provider

2. Third Parties

As a matter of principle, we will only disclose your personal data to third parties if this is necessary for the performance of the contract, if we or the third party have a legitimate interest in such disclosure, or if you have given your consent.

In addition, data may be transferred to third parties (including investigative or security authorities) if we are obliged to do so by law or by enforceable official or court order.

Regarding the processors employed in each case and the other recipients, please see the special information on the individual services in section D. “Specific Information about Online Services”.

3. Are data transmitted to a third country?

A transfer of data to third countries (i.e., countries that are neither members of the European Union nor of the European Economic Area) may occur to the extent necessary to perform services for you, if required by law, or where you have given us your consent (in the absence of any other appropriate safeguarding mechanism under the GDPR). Please note: Under applicable local law, a third country transfer might be defined differently, e.g., as a transfer outside of the country where you are located at the relevant time. In addition, we also share your personal data with processors in third countries in individual cases and insofar as this is necessary for the provision of the specific features. Please note that not all third countries have a level of data protection recognised as adequate by the European Commission. For data transfers to third countries where there is no adequate level of data protection, we ensure that, prior to disclosure, the recipient has either an adequate level of data protection (e.g., an adequacy decision of the EU Commission or the agreement of so-called EU standard contractual clauses of the European Union with the recipient or any other safeguard required under local law), or we have obtained express consent from our users.

You can find more information on the European Commission's adequacy decision on the website of the European Commission (

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https://ec.europa.eu/info/law/law-topic/data-protection/international-dimension-data-protection/adequacy-decisions_en
).

You can obtain a copy from us of the specific applicable or agreed provisions to ensure an adequate level of data protection. Please refer to the information in the section B.II. “Whom can I contact?”

Details on data transfers to third countries are contained in section D. “Specific Information about Online Services”.

VII. How long will my data be stored?

We store your data only for as long as is necessary for fulfilling the purposes for processing personal data as described in this notice (e.g., providing our services to you or as long as we have a legitimate interest to do so, in particular to eliminate disruptions or to optimise our services). We only store the data that we require for the respective purpose and pseudonymise or anonymise the data that is processed beyond the provision of our services as far as possible.

In addition, we are subject to various retention and documentation obligations pursuant to, inter alia, the German Commercial Code (Handelsgesetzbuch – “HGB”) and the German Tax Code (Abgabenordnung – “AO”). The retention and documentation periods specified therein last up to ten years. Finally, the storage period is also governed by statute of limitations periods, which can be up to thirty years, for example, pursuant to Sections 195 et seqq. Of the German Civil Code (Bürgerliches Gesetzbuch – “BGB”), where the general limitation period is three years.

Under certain circumstances, your data may also need to be retained for a longer period of time, such as when a legal hold or litigation hold (i.e., a prohibition of data deletion for the duration of the proceedings) is ordered in connection with an administrative or judicial proceeding.We may also be subject to retention and documentation obligations in line with the local legislation of your country.

To the extent further details are possible, you will find further information on retention obligations in section D. "Specific Information about Online Services."

VIII. Is there an obligation for me to provide data?

As part of our business relationship, you only need to provide the personal data that is required to enter into and conduct a business relationship, or that we are required

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to collect by law. Without this data, we will generally have to refuse to enter into the contract or to execute the order, or will be unable to perform an existing contract and possibly have to terminate it. This means that the use of a service requires that you provide the specified data. Unless you provide the data, we cannot provide the service to you. You can find further information about the privacy settings in section C. II.

C. Special Information – Vehicle Data

I. What data does my vehicle process?

1. Electronic Control Units

a. General

Electronic control units are installed in your vehicle. Control units process data that they receive, for example from vehicle sensors, generate themselves or exchange with one another (vehicle data). Some control units are necessary for the safe functioning of your vehicle, others support you when driving (driver assistance systems), others enable convenience or infotainment features.Below you will find general information on data processing in the vehicle. Specific information can be found in the respective owner's manual, which is available online and, depending on the equipment, also digitally in the vehicle, in direct connection with the notes on the relevant functional features and below under section D. "Specific Information about Online Services".

b. Personal Reference

Each vehicle is marked with a unique vehicle identification number. In some countries this vehicle identification number can be traced back to the current and former owner of the vehicle via information from the relevant national motor transport authority of the domicile (e.g., in Germany the German Federal Motor Transport Authority (Kraftfahrtbundesamt). In other countries, this might be possible via information from other local ministries or authorities). There are also other ways of attributing data collected from the vehicle to the owner or driver, for example via the license plate number.

The data generated or processed by control units can therefore be personal or become personal under certain conditions. Depending on which vehicle data is

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involved, it may be possible to draw conclusions about your driving behaviour, your location or your route or usage behaviour.

c. Legal Requirements for the Disclosure of Information

Insofar as there are legal regulations, manufacturers are generally obliged to release the data stored by the manufacturer to the required extent at the request of government agencies in individual cases (e.g., when investigating a criminal offence).Government agencies are also authorised under applicable law to read data from vehicles themselves in individual cases. In the event of an accident, for example, information can be read from the airbag control unit that can help to investigate it.

2. Operating Data of the Vehicle

Control units process data to operate the vehicle. This includes for example:

> Vehicle status information (e.g., speed, deceleration, lateral acceleration, wheel revolution speed, whether the seat belts are fastened),

> Environmental conditions (e.g., temperature, rain sensor, distance sensor).

This data is generally volatile – it is not stored after the vehicle is switched off and is only processed in the vehicle itself. Control units often contain data memory (sometimes also including the vehicle keys). These are used to temporarily or permanently document information about vehicle status, component stress, maintenance requirements and technical events and errors.

Depending on technical equipment, the following information is stored:

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> Operating conditions of system components (e.g., fill levels, tyre pressure, battery status)

> Deviations from system states in important system components (e.g., lights, brakes) that are documented in the internal vehicle systems event memory,

> System responses in specific driving situations (e.g., deployment of airbags, use of stability control systems)

> Information about vehicle-damaging events,

> For electric vehicles, the charge level of the high-voltage battery, estimated range.

> In special cases (e.g., when the vehicle has detected a malfunction), it may be necessary to store data that would otherwise be volatile.

If you use services (e.g., repair services, maintenance work), the stored operating data and the vehicle identification number (VIN) might, to the extent necessary, be read out and accessed. The data may be read out from the vehicle by an employee of the service network (e.g., workshops and manufacturer) or third parties (e.g., roadside assistance services). The same applies to warranty cases and quality assurance measures.The readout is generally carried out via the statutorily prescribed connection for OBD ("on-board diagnostics") in the vehicle. The readout operating data records the technical conditions of the vehicle or individual components and helps with error diagnostics, compliance with maintenance obligations and with quality improvement. This data, especially information about component stress, technical events, operating errors and other errors, is sent with the respective vehicle identification number (VIN) to the manufacturer, if necessary. In addition, the manufacturer is subject to product liability. For liability issues, such as vehicle recalls, the manufacturer also uses operating data from the vehicle. This data may also be used to review warranty and guarantee claims by customers.Error memories in the vehicle can be reset by a service provider as part of repair/service work or at your request.

3. Convenience and Infotainment Features

You can save convenience settings and customisations in the vehicle and change or reset them at any time. These include, depending on the equipment, e.g.,

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> Settings of seat and steering wheel positions,

> Suspension and climate control settings,

> Driver assistance and driver information systems,

> Settings in instrument cluster and infotainment system

> Customisations such as interior lighting.

As part of the selected equipment, you can enter data into the vehicle's infotainment functions yourself. These include, depending on the equipment, e.g.,

> Multimedia data such as music, movies or photos for playback in an integrated multimedia system,

> Address book data for use in connection with an integrated hands-free device or an integrated navigation system,

> Entered navigation destinations,

> Data on the use of Internet services.

This data for convenience and infotainment functions can be stored locally in the vehicle or it can be on a device that you have connected to the vehicle (e.g., smartphone, USB flash drive or MP3 player). If you have entered data yourself, you can delete it at any time.This data is only transmitted from the vehicle at your request, in particular when using online services in accordance with the settings you have selected. For further information on online services, please refer to section D.

4. Smartphone Integration e.g., Android Auto or Apple CarPlay

If your vehicle is equipped accordingly, you can connect your smartphone or another mobile device to the vehicle so that you can control it using the controls integrated in the vehicle. The smartphone's image and sound can be output via the multimedia system. At the same time, certain information is transmitted to your smartphone. Depending on the type of integration, this includes, for example, position data, day/night mode and other general vehicle information. Please refer to the owner's manual for the vehicle/infotainment system and to "Special Information".The integration enables the use of selected smartphone apps, such as navigation or music playback. There is no further interaction between smartphone and vehicle, in particular active access to vehicle data. The type of further data processing is determined by the provider of the app used in each case. Whether and which

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settings you can make depends on the respective app and the operating system of your smartphone.

5. Online Services

If your vehicle has a wireless network connection, this enables the exchange of data between your vehicle and other systems (data servers of AUDI AG or data servers of service providers). In certain countries, the wireless network connection is enabled possibly by an on-board transmitter and receiver unit (built-in by us) or by a mobile device (e.g., smartphone) brought in by you. Online features (information and control services for your vehicle) can be used via this wireless network connection. This includes online services and applications/apps that are made available to you by us or by other providers ("Audi Connect services" or "services").For information about each service, please see section D. "Specific Information about Online Services."Please note that not all services listed may be available for your vehicle or in your country.

a. Manufacturer's Services

In the case of online services from AUDI AG, the respective features are described at the relevant place (e.g., vehicle infotainment system (MMI), manufacturer's website). The associated data protection information can be found below in section D. "Specific Information about Online Services". Personal data may be used to provide online services. The exchange of data for this takes place via a protected connection, e.g., with the IT systems provided for this purpose by AUDI AG. Any collection, processing and use of personal data that goes beyond the provision of core services takes place exclusively on the basis of legal permission, e.g., a statutory emergency call system, a contractual agreement or on the basis of consent.

You can activate or deactivate the services and functions (some of which are subject to a fee) and – depending on the vehicle – also the entire wireless network connection of the vehicle. This does not apply to functions and services required by law, such as an emergency call system.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

b. Data transmission in connection with charging

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When a vehicle is connected to a charging station that includes a communication interface, function-related data (e.g. vehicle identification data) will be transmitted to the charging station as part of the charging process.

c. Third-Party Services

If you make use of the opportunity to use online services of other providers (third parties), these services are subject to the responsibility and the data protection terms and terms of use of the respective provider. We generally have no influence on the content exchanged here.Therefore, please obtain information on the nature, extent and purpose of the collection and use of personal data in the context of third-party services from the respective service provider.

II. Privacy Settings

The "Privacy Mode" feature allows you to partially or completely restrict data communication via the vehicle's internal SIM card. To do this, you can deactivate/activate the data processing displayed in the vehicle for each group. Safety-relevant services are excluded from deactivation through Privacy Mode. You can find an overview of which services and data processing are assigned to the respective group under "Privacy Settings" in your vehicle's MMI.

Depending on the vehicle equipment and country, the primary user has the option of deactivating/activating individual services for all users of the vehicle in the myAudi portal, or the individual user can deactivate/activate individual services in the vehicle itself.

As part of this feature, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the selected privacy setting and the current deactivation/activation status per service or service group.

We process the above data to implement the settings and to enable you and authorised users (main and secondary users) to view the privacy settings in the myAudi web portal or in the Audi smartphone app.

Please note that changes to privacy settings only affect data transfer via the in-vehicle SIM card. Other wireless data interfaces such as Bluetooth, Bluetooth Low Energy (BLE), Wireless LAN (WLAN), CV2X Communication, Near Field Communication (NFC), Electronic Toll Collect (ETC), Integrated Toll Module (ITM) must be connected separately. Wired data transmission via USB, charging communication (high-voltage system) or on-board diagnostics (OBD) is similarly unaffected by the settings in "Privacy Mode".

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III. Anonymisation of Vehicle Data

We may further use your personal data from the vehicle in an anonymised form. Anonymous means that it is no longer possible to draw conclusions or identify an individual person. For example, we remove identifying features such as the vehicle identification number, aggregate the data or only process statistical data. Anonymising the data serves to protect your privacy. If a legal basis for the anonymisation is required, this is done for the purposes of the legitimate interest pursued by us in the data protection-compliant further use of vehicle data, inter alia for the development and optimisation of our products and services and to increase road and product safety (Article 6 (1) (1) (f) GDPR).

D. Specific Information about Online Services

Please note that some of the online services are offered not only via the MMI, but also on the optionally available Audi Rear Seat Entertainment (Rear Seat Entertainment for MMI 3G+, Audi Tablet for MIB2 and MIB2+) and can be used there as well. The following information on data processing applies accordingly

The specific data and purposes of the data processing depend primarily on the particular vehicle and the vehicle equipment and the services used. Please note that not all services listed may be available for your vehicle or in your country. The features available in your vehicle and their functional scope can be found in the service description.

The list and specification of all the maximum available features, regardless of your vehicle model and the specific software version, is only for the purposes of this Data Protection Notice and does not intend or lead to an expansion of the features or functional scope of your specific vehicle.

I. Registration and Login of Your Vehicle

To provide the online services in your vehicle and to secure your vehicle's communication, your vehicle registers with our IT systems for each driving cycle. For this purpose, your vehicle sends the following data or categories of data from your vehicle in the course of the registration: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner). If you use personalised services, your login data for your myAudi account,

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which you enter in the vehicle, will be transmitted to our IT systems. This means that certain data that you store in your myAudi account is also available in the vehicle (further information can be found in the information for the respective services).

For the use of certain online services, signed proof of authorisation (so-called "credentials") is transferred to your vehicle (e.g., OAuth token), with which our service providers can verify the authorisation to use a service. We only transmit the proof of authorisation to the service provider, without having to transmit your vehicle identification number or any other specific reference to you or your vehicle (pseudonymous authorisation). Information on the use of pseudonymous authorisation can be found under the individual services.

We process the above data to check, register and authenticate your vehicle on our IT systems in order to provide the Audi Connect services and display your license status in the vehicle (Article 6 (1) (1) (b) GDPR). In order to check your authorisation to use services, your vehicle registers with the IT systems of Audi AG in each driving cycle.

In addition to your vehicle identification number, we also log the time and type of service used in order to identify and analyse disruptions for the purposes of the legitimate interests pursued by us. The log data is stored for 4 months for this purpose.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

For unforeseen events, we additionally collect data for monitoring and analysis purposes to ensure the quality of the services offered. In this case, information such as type, origin and time of the event, the affected vehicle systems, and the general conditions are extracted and processed in the backend.

II. Special Information – Audi connect Navigation & Infotainment

1. Special Information – Navigation with Google Satellite Map™

From model year 2019 and use with MMI Rear Seat Entertainment or myAudi app:

To be able to display a high-resolution navigation map with satellite images in the MMI or the myAudi app, information about the map section that is to be displayed is transmitted to our service provider for the delivery of the satellite images. The data is sent in accordance with the principle of data minimisation. Under this principle,

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all queries from your vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. During each driving cycle, the data is sent with a different pseudonym (session ID) to the service provider. The service provider does not receive your name or your vehicle identification number (VIN). In addition to the service-specific data detailed above, the metadata required to provide the service is transmitted: time stamp, information about the software versions used, map or map tile versions used. The satellite images are delivered by the following service provider: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands. If the service provider does not have current satellite images on file for the map section to be displayed, it contacts the following service provider to request the satellite images: Google Dublin, Google Ireland Ltd., Gordon House, Barrow Street, Dublin 4, Ireland. This provider does not receive any personal data from you for this purpose, in particular it does not receive the session ID or vehicle-related data. Information about the stored data and the duration of storage can be found in the service provider's privacy policy: https://policies.google.com/privacy?hl=en&gl=us

Before model year 2019 and use with MMI Rear Seat Entertainment:

In order to be able to display a high-resolution navigation map with satellite images in the MMI, information about your current vehicle position, the exact course of your current navigation route (including destination and waypoints) and the roaming status of your mobile phone connection as well as the software version used and the system language set is periodically sent to our service provider. The service provider for providing the satellite images is: Google Dublin, Google Ireland Ltd., Gordon House, Barrow Street, Dublin 4, Ireland. Information about the stored data and the duration of storage can be found in the service provider's privacy policy: https://policies.google.com/privacy?hl=en&gl=us

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

2. Special Information – Personal Route Assistant

The personal route assistant supports you intuitively in reaching your navigation destinations. After successful registration, the parking locations of your vehicle, relationships between parking locations, specific routes driven, charging stations used as well as the day of the week and times are processed in the background.

Based on the learned data, probable navigation destinations are suggested to you when you get into the vehicle. If you do not select any of the destinations offered,

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you will be shown alternative routes in the event of traffic disruptions on routes that have already been learned.

The prerequisite for using the service is the registration and opening of a myAudi account. For the personalised service, the assignment to your pseudonym across driving cycles is necessary. For this purpose, a unique pseudonym (user ID) is assigned to your myAudi user name. The data is synchronised using your pseudonymous user ID. The service provider HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands only receives the pseudonym.

After you delete data in one of your MMI systems, it is also deleted at our service provider after the next successful synchronisation of all end devices. You have the option of deleting the data learned from you from the vehicle completely or relating to the last 24 hours at any time. The service provider is: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

3. Special Information – Online Map Update

With this service, the navigation database can be updated online directly in the vehicle. To do this, the vehicle analyses which regions within a country (e.g., Bavaria) are relevant for the vehicle and transmits this information to our service provider. The data is sent in accordance with the principle of data minimisation. Under this principle, all queries from your vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. The data are transmitted to the service provider with a different pseudonym for each driving cycle (pseudonymous vehicle ID). If you are logged in as a user in the vehicle, a pseudonymous user ID will also be transmitted. The service provider does not receive your name or your vehicle identification number (VIN). In addition to the service-specific data detailed above, the metadata required to provide the service is transmitted: time stamp, available memory for the update package, installation result, information about the software versions used, map or map tile versions used, data consumption. The service is provided by the following service providers: e.solutions GmbH, Despag-Strasse 4a, 85055 Ingolstadt. HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

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4. Special Information – myAudi Navigation

myAudi Navigation provides you with personalised navigation services. The prerequisite for using the services is the registration and opening of a separate and individual myAudi account. With your myAudi account, you can configure the services in the myAudi portal and transfer certain data and content for the features of your Audi Connect services (via your mobile phone connection) to your vehicles, as well as allow the transfer of certain vehicle and user data between the compatible vehicle, mobile device and the service provider. For the personalised services of myAudi Navigation, the assignment to your pseudonym across driving cycles is necessary. For this purpose, your myAudi user name and your vehicles are each assigned a unique pseudonym (user ID and vehicle ID); the service provider only receives the pseudonyms. The data is synchronised using your pseudonymous user ID and your pseudonymous vehicle IDs. The service provider does not receive your name or your vehicle identification number (VIN). After you delete data in one of your MMI systems or your myAudi app, it is also deleted at our service provider after the next successful synchronisation of all of your end devices. The service provider is: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands.

If your vehicle supports the e-tron route planner, additional information about energy consumption, climate vehicle data and vehicle climate control settings as well as the charging data is sent so that we can provide route suggestions in the myAudi app, taking into account the available charging stations and the electric range of your vehicle. This data is stored in your myAudi account until it is overwritten by sending a new data record from the vehicle or until you delete your myAudi account.

Destinations created while the privacy settings are activated (last destinations, favourites) are assigned to your profile and synchronised again with your myAudi account after the privacy settings have been switched off. If you want to prevent subsequent synchronisation of certain destinations, you must manually delete these destinations before deactivating the privacy settings.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

5. Special Information – e-tron Route Planner (Remote Service)

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With the e-tron route planner service, you can calculate charging routes using your mobile device. In order to calculate a suitable route with the specific consumption of your vehicle, we process the following data or categories of data from your vehicle as part of the service:

> Pseudonymised vehicle identification number (which can uniquely identify your motor vehicle)

> Consumption values for different speed ranges

> Data on secondary consumers, including air conditioning

> Characteristic curves for electrical consumption

> Climate settings

> Range calculation mode

> Current range

> Maximum range

> Time of data transmission

> Battery charge level

> Planned target charge level at the charging stop

The corresponding data is sent to our IT systems after the vehicle is switched on or switched off and is then available for retrieval via the myAudi app. The e-tron route planning is available to every authorised myAudi user who has been activated by the primary user for this vehicle.

We process the above data for the provision of the service in order to provide you and the authorised myAudi users with the information in the app for retrieval. Only the last record sent by the vehicle is stored so that it can be displayed to you, and this is overwritten when a new record is sent.

The service is provided by the following service provider: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands. We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR). For this purpose, the above data can be transferred to the service provider: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich, Germany.

6. Special Information – Map Display in myAudi app and MMI Rear Seat Entertainment

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In order to be able to display a current navigation map in the MMI Rear Seat Entertainment and the myAudi app, information on the map section to be displayed is transmitted to our service provider. The data is sent in accordance with the principle of data minimisation. Under this principle, all queries from your vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. During each driving cycle, the data is sent with a different pseudonym (session ID) to the service provider. The service provider does not receive your name or your vehicle identification number (VIN). In addition to the service-specific data detailed above, the metadata required to provide the service is transmitted: time stamp, information about the software versions used, map or map tile versions used. The service is provided by the following service provider: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

7. Special Information – Destination Feed via myAudi or Google Maps™:

With this service, you can use your myAudi account and the mobile connection you use to transfer data stored in your myAudi account (e.g., navigation destinations stored in the myAudi account, settings, etc.) to your vehicle via Google Maps™ for the features of the service.

For this service, we process your myAudi user ID for the assignment of your myAudi account. We provide the data in your myAudi account and store the data until you delete it in your myAudi account.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

8. Special Information – Online Points of Interest (charging stations, fuel prices, parking information, weather, restaurant search, hotel search), point of interest search with Google

Various service providers are connected to make it easy to search for numerous POIs (Points of Interest) in different categories via your MMI system, MMI Rear Seat Entertainment or your myAudi app. The data is sent in accordance with the principle

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of data minimisation. Under this principle, all queries from your vehicle are anonymised as far as possible.

As part of the services, when you make a search query, your vehicle sends the following data or categories of data to the IT systems of AUDI AG in order to be able to process your search query: the time you accessed the service and the type of query you sent via the MMI, pseudonymous information to check the authorisation of your vehicle or the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the search term, the selected system language, the vehicle position (location data place and time), model, drivetrain type, model year and/or the position that you have defined yourself (search position) – whether you have specified the vehicle position or the search positions is not transmitted.

If you use the option of voice control for the PoI search, your vehicle will also send your voice data after activating this function. The IT systems of AUDI AG, in turn, forward the queries to the respective content provider to provide the requested information. The vehicle identification number or another identifying feature for assigning the request to a vehicle or a person is not transmitted. However, since these are location-based services, it is necessary for each service to transmit your current position (vehicle or myAudi app) or the search position or route you have selected. The type of POI (e.g., hotel, restaurant, car parks) or searched name are transmitted as parameters for the search. In addition, the system language and type of units of measurement, e.g., kilometres or miles, are transmitted in order to provide the search result in the correct language and unit of measurement. We or the content provider process the above data to provide the service in order to be able display the desired information to you (e.g., charging stations, petrol stations, parking spaces, restaurants, train and bus timetables, arrival and departure times, etc.) in proximity to your current position or destination and for the other purposes mentioned below.

Below you will find a list of the individual services with details of the service provider:

Online POI search: This service allows you to search for numerous POIs of different categories, e.g., restaurants, hotels, transport facilities, leisure activities, etc. The following content providers are involved: HERE Global B.V. Kennedyplein 222 -226, 5611 ZT Eindhoven, The Netherlands; Yelp Inc., 140 New Montgomery, San Francisco, CA 94105, USA;

Unless you have activated the privacy mode, you will find an “offer icon” next to certain POIs in the search results indicating that special offers and promotions are available for that POI. In order to determine promotions and offers that may be relevant for you, we process fuel type, vehicle model and location of the POI as

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selection criteria. You can retrieve the available offers and promotions by selecting the POI and clicking on “Details”.

The service is facilitated by 4.screen GmbH, Sailerstrasse 17, 80809 Munich, with whom we have entered into a Joint Controllership Agreement (Art. 26 GDPR) determining our respective responsibilities for compliance with the obligations under the GDPR; but we do not transmit any personal data to 4.screen.

Service provider is: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich.

Fuel prices: This service allows you to search for current fuel prices. In addition to the general parameters, the type of fuel relevant to your vehicle is also transmitted. The content provider is: OPISNAVX, Chemin de la Mairie 24, CH-1258 Perly. Service provider is: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich, Germany.

Charging stations: This service allows you to search for suitable charging stations. The content provider is: Cariad POI Management, CARIAD SE, Berliner Ring 2, Brieffach 1080/2, 38440 Wolfsburg.

Parking information: This service allows you to search for parking spaces and car parks. The content provider is: Parkopedia Limited, 1st Floor, Apex Yard, 29-35 Long Lane, London, SE1 4PL, UK. Service provider is: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich, Germany.

Weather: This service allows the retrieval of weather information. The content provider is: Vaisala GmbH, Notkestraße 11, 22607 Hamburg. Service provider is: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich.

Train information: This service allows you to search for train stations/bus stops and their arrival and departure times. The content provider is: HaCon Ingenieurgesellschaft mbH, Lister Str. 15, 30163 Hanover.

Flight information: This service allows you to search for airports and arrival or departure times. The content provider is: FlightStats, Inc., 522 SW 5th Avenue, Suite 200, Portland, OR 97204, USA. For the transmission of your data to the content provider in the USA, please note the information presented in section B.VI.3.

Country information: This service allows the display of country-specific regulations for many European countries. The content provider is: wcities, 512 2nd Street Second Floor, San Francisco, CA 94107, USA.

Navigation destinations powered by Google: This service allows you to search for numerous navigation destinations in different categories, e.g., restaurants, hotels, transport facilities, leisure activities, etc. If you use your myAudi app for the search, the queries from the Google destination search are sent directly to the systems of the service providers. In contrast to the POI services described above, your vehicle or

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the myAudi app sends the requests for the Google destination search directly to the service provider's systems. In addition to pseudonymous information for authorisation to use the service, the current vehicle position or the search position you have selected, the search text and the set system language are transmitted. The service provider is: Google Dublin, Google Ireland Ltd., Gordon House, Barrow Street, Dublin 4, Ireland. Information about the stored data and the duration of storage can be found in the service provider's privacy policy: https://policies.google.com/privacy?hl=en&gl=us

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

9. Special Information – On-Street Parking

The on-street parking service allows you to search for and display parking spaces along streets. To do this, your vehicle sends parking events that include GPS positions of the vehicle before and during a parking event together with time stamps and information from vehicle sensors on vehicle speed, direction of travel and metadata on the quality of the sensor data. These data are transmitted from your vehicle to the IT systems of AUDI AG. They are not stored there, but forwarded directly to the service provider. The data are processed there. The service provider for the on-street parking service is: Parkopedia Limited, 1st Floor, Apex Yard, 29-35 Long Lane, London, SE1 4PL, UK. Further information can be found in the service provider’s privacy policy: https://www.parkopedia.com/privacy. When searching for on-street parking, the search location (which may match your current vehicle location) is sent to the service provider. Communication with the service provider is pseudonymous (session ID).

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

10. Special Information – Online Navigation

The online navigation service provides you with a route calculated online, taking into account the current traffic situation. This requires the transmission of the current position of your vehicle, the desired destination, as well as settings for route criteria and traffic information settings. The data is sent in accordance with the principle of data minimisation. Under this principle, all queries from your

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vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. During each driving cycle, the data is sent with a different pseudonym (session ID) to the service provider. The service provider does not receive your name or your vehicle identification number (VIN). The data transmitted to the service provider are used exclusively for service provision, service optimisation and service development. In addition to the service-specific data detailed above, the metadata required to provide the service is transmitted: time stamp, information about the software versions used, map or map tile versions used. The service is provided by the following service provider: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

11. Special Information – Highly Detailed 3D City Display

3D City Display provides you with three-dimensional buildings in the map view. For this purpose, current map tiles (ID and version) to be loaded are requested. To do this, we process the following data from your vehicle: tile area in which the vehicle is located. The data is sent in accordance with the principle of data minimisation. Under this principle, all queries from your vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. During each driving cycle, the data is sent with a different pseudonym (session ID) to the service provider. The service provider does not receive your name or your vehicle identification number (VIN). The data transmitted to the service provider are used exclusively for service provision, service optimisation and service development. In addition to the service-specific data detailed above, the metadata required to provide the service is transmitted: time stamp, information about the software versions used, map or map tile versions used. The service is provided by the following service provider: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

12. Special Information – Online Traffic Information

Online traffic information informs you about current traffic events and shows the traffic flow in the map and along the route of your MMI system or myAudi app. To

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this end, your vehicle sends the following data to the IT systems of AUDI AG: current position of your vehicle (use in the vehicle) or the current map section to be displayed (use in the myAudi App), the desired destination, and settings in your vehicle for traffic information. The data is sent in accordance with the principle of data minimisation. Under this principle, all queries from your vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. During each driving cycle, the data is sent with a different pseudonym (session ID) to the service provider. The service provider does not receive your name or your vehicle identification number (VIN). In addition to the service-specific data detailed above, the metadata required to provide the service is transmitted: time stamp, information about the software versions used, map or map tile versions used. The above data is transmitted to the service provider for delivery: HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands. The service provider for providing the traffic information is TomTom Germany GmbH & Co. KG, Am Neuen Horizont 1, 31177 Harsum, Germany or HERE Global B.V., Kennedyplein 222-226, 5611 ZT Eindhoven, The Netherlands. Throughout a driving cycle, this service provider continuously receives the position data as well as information from vehicle sensors on vehicle speed, direction of travel and metadata about the quality of the sensor data. This data is continuously forwarded to the service provider – if necessary via the IT systems of AUDI AG. The data is sent in accordance with the principle of data minimisation. Under this principle, all queries from your vehicle are pseudonymised. The review of the usage authorisation is conducted pseudonymously. During each driving cycle, the data is sent with a different pseudonym (session ID) to the service provider. The service provider does not receive your name or your vehicle identification number (VIN). We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR). For this purpose, the above data can be transferred to the service provider: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich, Germany.

13. Special Information – Online Traffic Sign Information

The online traffic sign service updates the speed limits stored on your MMI system. To do this, your vehicle sends the recognised traffic signs, the GPS positions of the vehicle before, during and after detection together with time stamps and information from vehicle sensors on vehicle speed, direction of travel and metadata on the quality of the sensor data. This data is continuously forwarded to the service providers – if necessary via the IT systems of AUDI AG. The data are processed there. For quality assurance and checking the correctness of the recognition, it is necessary for the transmitted data to be stored for up to one week. After that, the transferred data is automatically deleted. Only the products of the processing, i.e.,

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traffic signs with position and last detection time, remain saved until they are overwritten by new detections. A reference to your pseudonym (session ID) then no longer exists. The service providers for the online traffic sign service are: e.solutions GmbH, Despag-Strasse 4a, 85055 Ingolstadt; HERE Global B.V. Kennedyplein 222 -226, 5611 ZT Eindhoven, The Netherlands. For the delivery of the information to your vehicle, the data is transmitted to the service provider HERE Global B.V. Kennedyplein 222 -226, 5611 ZT Eindhoven, The Netherlands using the session ID or without reference to you or your vehicle (without session ID). To query online traffic signs, your vehicle also sends the selection of relevant map tiles (tiles along the route and around the current vehicle position) to the IT systems of this service provider at regular intervals.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

14. Special Information – Online Traffic Light Information

The traffic light information service shows you information about the traffic light ahead in the form of a speed recommendation for crossing the next traffic light when it is green or, if this is not possible, a waiting time at the next traffic light. To do this, your vehicle sends the current vehicle position (location data/GPS position) to query relevant intersections in the vicinity as well as crossing data after passing an intersection with a connected traffic light to IT systems of AUDI AG. In addition to location and time information, this crossing data also contains information about the intersection and other service-specific attributes without personal reference.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, we process the above personal data for the purposes of quality assurance and checking the correctness of the switching forecasts of a traffic light as well as to create anonymised and aggregated evaluations and store the above data for up to 12 months for the purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

The service provider for the online traffic light information service is: CARIAD SE, Berliner Ring 2, 38440, Wolfsburg, Germany. The following service providers have been engaged for the development and quality assurance of the information sent to your vehicle: CARIAD SE, Berliner Ring 2, 38440, Wolfsburg, Germany.

15. Special Information – Hazard Information

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The local hazard information service shows you hazardous spots, such as slippery roads, breakdowns, accidents, impaired visibility.

For this purpose, your vehicle occasionally sends the condition of the road and, depending on the event, the type of hazardous spot as well as the associated time and GPS positions, driving speed and direction of travel of the vehicle and other information on the vehicle condition (e.g., light status) and environmental conditions (e.g., outside temperature).

These data are transmitted from your vehicle to the IT systems of AUDI AG. They are not stored there, but forwarded directly to the service provider.The service provider for the local hazard information service is: e.solutions GmbH, Despag-Strasse 4a, 85055 Ingolstadt and NIRA Dynamics AB, Wallenbergs gata 4, 58330 Linköping, Sweden. The service provider HERE Global B.V. Kennedyplein 222 -226, 5611 ZT Eindhoven has been engaged to deliver the information to your vehicle.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

16. Special Information – Online News

In order to use the service, please log in by specifying your myAudi login in the vehicle (user name (email address) and password)).If you persistently save your myAudi login data in the vehicle, you may be automatically logged in when using the service in the future depending on the vehicle, i.e., without a new login. The prerequisite for this is that there is an online connection (e.g., through your mobile phone, plug-in SIM or fixed SIM). Please note that the personalised service is also accessible to third parties, if you have not logged out of the system or if you let them use your mobile phone (and your myAudi PIN, if you have created one) or if they can also use the plug-in SIM card registered to you.

This online service is a personalised service, i.e., the prerequisite for the use of the service is the registration and opening of a separate and individual myAudi account. In your myAudi account, you can configure the service and transfer certain data and content for the features of your Audi Connect services (via your mobile phone connection or Internet connection) to your vehicle, as well as permit a transfer of specific vehicle data from the vehicle to us or to the service provider, as described below.

As part of the service, we process the following data or categories of data from your vehicle:

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The time of access to the service and the nature of your request submitted via the MMI, the vehicle identification number (with which your vehicle can be uniquely identified and assigned to a specific owner) and your myAudi user ID.We process the above data for the provision of the service in order to transmit the data stored under your myAudi account for the features of online news to your vehicle (e.g., RSS feeds that you have saved on myAudi) (Article 6 (1) (1) (b) GDPR). The time of access to the service and the vehicle identification number are also stored for a short time for the purpose of error analysis.Within the scope of Audi Connect, AUDI AG only enables the use of the communication or information service in the vehicle that you have already obtained separately for online news ("service provider"). Accordingly, we will forward your specified identification data (username and password) to the service provider for the request so that it can allow you to access the service and make the service available within the Connect services portfolio. The necessary identification and connection data are processed and used for the provision of services and the proper functioning of the services in accordance with the applicable legal requirements. Your identification data will be stored at AUDI AG for the use of the personalised information service, so that you do not have to log in separately for each individual use process. For further data processing in the context of the use of the service, the terms of use already agreed between you and the service provider or their associated data protection notices apply. Up-to-date information of the service provider (in particular with regard to the imprint, the terms of use that may apply to the services and any data processing by the service provider) may be provided on the following website of the service provider:News: www.afp.com, www.tagesschau.de, www.partner.dw.com and any other RSS feed providers added by the user.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR). For this purpose, the above data can be transferred to the service provider: Valtech Mobility GmbH, Marsstraße 46, 80335 Munich, Germany.

17. Special Information – Online Radio

The online radio service shows you an up-to-date list of the radio stations available at your location in the vehicle as well as information from the radio station on the current playlist.

As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), current country, current system language, market, software version as well as current position of the vehicle (location data).

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The above data is transmitted via our service provider e.solutions GmbH, Despag-Strasse 4a, 85055 Ingolstadt, Germany, without your vehicle identification number to our content provider or, in the case of a proximity search, directly to our content provider Audials AG, Erbprinzenstraße 27, 76133 Karlsruhe, Germany, for the provision of the station list and playlist (Article 6 (1) (1) (b) GDPR) as well as for the purposes of service optimisation and further development for the purposes of the legitimate interests pursued by it in the optimisation and further development of its services (Article 6 (1) (1) (f) GDPR).

18. Special Information – Hybrid Radio

The hybrid radio service adds current station logos and the option of tracking stations online to the lists of receivable radio stations generated in the vehicle.

As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), currently receivable broadcast radio stations, current country, current system language, software version. On this basis, we deliver the information to your vehicle in order to make the online station tracking function as well as current station logos available.

The above data is sent to our service provider e.solutions GmbH

Despag-Strasse 4a. 85055 Ingolstadt without your vehicle identification number and processed by it for the provision of the service (Article 6 (1) (1) (b) GDPR) and also for the purposes of service optimisation and further development to protect its legitimate interests in the optimisation and further development of its services (Article 6 (1) (1) (f) GDPR).

19. Special Information – Amazon Music /Apple Music

Within the scope of Audi Connect, AUDI AG only enables the use of the audio streaming service in the vehicle that you have already obtained separately (currently: Amazon Music, Apple Music). This requires that you first register with the provider of the audio streaming service. A non-personalised token provided by the service provider is transmitted for use in the vehicle. This token will be stored for the use of the service in the vehicle, so that you do not have to log in separately for each individual use process.

The respective conditions and notices of the service provider (e.g., Terms of Use, Data Protection Notices) shall apply to any further data processing within the scope of the use of the service.

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We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

20. Special Information – Online Speech Recognition, Online Speech Output

As part of the services, we process the following data or categories of data from your vehicle: time of access to the service and speech data or text spoken by the user for speech recognition, language settings, the recognised search term and the current vehicle position (location data) when entering a destination, pseudonymised ID for the technical assignment of the request. To use the services, you must explicitly activate them with the associated voice command or via the vehicle menu. The voice data or texts are converted by our service provider into an audio or text/data format and the results are sent back to the vehicle.

The above data is processed to provide the service, to convert spoken audio signals into text or data and return them to the vehicle or to convert text into audio and read them to the user in the vehicle, for voice data on the basis of the consent you have given in the vehicle (Article 6 (1) (1) (a) GDPR).

To the extent necessary for the provision of the service, the above personal data is sent via our service provider e.Solutions GmbH, Despag-Strasse 4a, 85055 Ingolstadt to the speech recognition service provider Cerence B.V., CBS Weg 11, 6412 EX Heerlen, The Netherlands or for destination entries (addresses, points of interest, ...) to HERE Global B.V., Kennedyplein 222, 5611 ZT Eindhoven, The Netherlands or to Google Dublin, Google Ireland Ltd., Gordon House, Barrow Street, Dublin 4, Ireland or to Microsoft Ireland Operations Limited, One Microsoft Place, South County Business Park, Leopardstown, Dublin 18, Ireland. In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

21. Special Information – Online Speech Recognition with Amazon Alexa

As part of the service, we process the following data or categories of data from your vehicle: the time of access to the service and language data spoken by the user, language settings, the token provided by the provider of the voice assistant to which you have connected.The above data is processed to provide the service after express activation (Article 6 (1) (1) (b) GDPR).To the extent necessary for the provision of the service, the above personal data will be transmitted to the provider you have connected via our service provider e.Solutions GmbH, Despag-Strasse 4a,

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85055 Ingolstadt. We currently offer you the option of connecting Amazon Alexa.Within the scope of Audi Connect, AUDI AG only enables the use of the communication or information service (currently: Amazon Alexa) in the vehicle that you have already obtained separately from a voice assistant. This requires that you first register with the provider of the voice assistant. For use in the vehicle, you send us a token provided by the voice assistant. This token will be stored in the vehicle for the use of the personalised information service so that you do not have to log in separately for each individual use process.For further data processing in the context of the use of the service, the terms of use already agreed between you and the provider of the voice assistant or their associated data protection notices apply.

Up-to-date information on Amazon Alexa (in particular with regard to the imprint, the terms of use that may apply to the services and any data processing by Amazon Alexa) may be provided on the following website of the provider: https://www.amazon.de.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

22. Special Information – Audi Smartphone Interface

In addition to the section **"Smartphone Integration, e.g., Android Auto or Apple CarPlay"**, your vehicle sends data to your mobile device connected via the smartphone interface. This includes the following data: steering angle, lights on/off, speed, GPS signal, ESP sensors. Which data is actually sent depends on the function you use.

In addition, your mobile device transmits data to your vehicle that you have actively enabled on the device when the connection between the vehicle and device is activated. This includes the following data: name and Bluetooth and Wi-Fi address of the connected mobile device, call lists, music titles, playlists, content of the screen of your mobile device.

The name of your end device is stored locally in the vehicle in order to be able to identify different devices, and you can delete it in the vehicle at any time. The other data is transmitted during an active connection, but not saved.

No data is sent to the IT systems of AUDI AG in this case.AUDI AG only enables the use of the communication or information service in the vehicle that you use via the mobile device. Accordingly, the vehicle sends the required data to the connected end device. For further data processing, in particular the forwarding of data to a service provider in the context of the use of the service, the terms of use agreed

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between you and the service provider or their associated privacy notices apply and you should refer to this for further information.

23. Special Information – Wi-Fi Hotspot

You can set up a Wi-Fi hotspot for your vehicle using your mobile device in your vehicle.

As part of the service, we process the following data or categories of data from your vehicle: MAC address and name of the end device used. This data is stored in the vehicle so that you can reconnect your end device more quickly. The Wi-Fi hotspot may use the data packets service. Information on this service can be found in myAudi.

We process the above data to provide the service to enable you to use the Wi-Fi hotspot (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

24. Special Information – User Profiles

The user profile Audi Connect service is a personalised service, i.e., the prerequisite for the use of the services made available by Audi Connect upon the registration and opening of a separate and individual myAudi account. Once a user has been identified in the vehicle using their myAudi account, personalisation enables the automatic adoption of the last personal settings within the framework of convenience and infotainment functions in the vehicle.

As part of the service, we process the following data or categories of data from your myAudi account: pseudonym, profile picture (photo), and infotainment preferences.

As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner).

With regard to the convenience settings, we process depending on the respective equipment, e.g.,

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> Settings of seat and steering wheel positions

> Suspension and climate control settings

> Driver assistance and driver information systems

> Settings in instrument cluster and infotainment system

> Customisations such as interior lighting

With regard to the data you have entered yourself in infotainment functions, we process depending on the respective equipment, e.g.,

> Multimedia data such as music, movies or photos for playback in an integrated multimedia system,

> Address book data for use in connection with an integrated hands-free device or an integrated navigation system,

> Entered navigation destinations,

> Data on the use of Internet services.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). Your personal settings in the area of convenience and infotainment functions are stored in the IT systems of AUDI AG for your personal myAudi account. If you log in to any vehicle with your myAudi login data, your personal settings will be automatically applied depending on the vehicle equipment. Your usage behaviour is not analysed.

If your myAudi account is deleted, the above data is also deleted from the IT systems of AUDI AG.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

III. Special Information – Audi connect Remote Control

1. Special Information – Vehicle Status

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The vehicle status report service allows you to view various vehicle data via myAudi or your mobile end device. As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner) as well as the current status of the doors (locking status) and status of windows, hatches and, if applicable, convertible/sunroof, spoiler status, fuel and oil level (OK/NOK), mileage, total range or individual range, parking light status, current warning messages, parking brake status, battery charge level for e-tron vehicles as well as AdBlue values for diesel vehicles.

The corresponding data are sent directly to our IT systems via the app upon turning on or turning off the vehicle, locking and unlocking, when opening or closing doors as well as upon reaching the critical state of charge of the 12V battery or on your request by access in myAudi or on your mobile end device, and is subsequently available for retrieval via the app and via myAudi. In addition, your vehicle sends the position of your vehicle when the vehicle is turned off. The vehicle status is visible to every authorised myAudi user who has been activated by the primary user for this vehicle.

We process the above data for the provision of the service in order to provide you and the authorised myAudi users with the information in myAudi for retrieval (Article 6 (1) (1) (b) GDPR).

In addition, receiving of push notifications can be activated. These provide any vehicle status information or recommendations that are available for this vehicle (e.g. temperature-based charging information regarding the drive performance of e-tron vehicles). Only the last record sent by the vehicle is stored so that it can be displayed to you, and this is overwritten when a new record is sent.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

2. Special Information – Driving Data (e-tron) / Remote Trip Statistics

As part of the service, we process the following data or categories of data from your vehicle: route length, consumption (fuel consumption, electrical consumption, secondary consumption, e.g., oil), total mileage at the beginning and end of the trip, average speed, trip time. Depending on your model or the equipment of your vehicle, not all of the data listed may be transmitted from your vehicle.

After completing a trip, the data is transferred for display in myAudi or on a smartphone. The transmitted data can be retrieved at any time via myAudi or using a smartphone.

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We process the above data to provide the service in order to show you the information on your recent trips in myAudi or on a smartphone (Article 6 (1) (1) (b) GDPR). The above data are available until deletion by you. You can delete the data in myAudi or using a smartphone.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

3. Special Information – Charging Information

As part of the service, we process the following data or categories of data from your vehicle: vehicle identification number (with which your vehicle can be identified clearly and allocated to a specific keeper), user ID, characteristics and status of the vehicle and of the charging process (battery state of charge, battery size, battery temperature, status of the charging plug), time stamp of the journey and status of readiness to drive (ignition on/off), outside temperature and position data. Depending on the vehicle model, we may not process all of the data listed above.

We process the above data to provide the service, i.e. to give you personalised recommendations and suggestions for optimised settings for the charging process configuration through the app, based on your battery usage and your charging patterns. This service is available to the user who most recently logged into the vehicle.

You receive the charging information as a push notification in the myAudi app, if you have activated this feature.

We store your data for 30 days or until you unlink the vehicle from your myAudi account.In addition, the aforementioned personal data may on rare occasions be processed for development and optimisation purposes, in order to protect our legitimate interests (Article 6(1)(1)(f) GDPR).

4. Special Information – Plug & Charge

The Plug & Charge service allows you to link your digital Plug & Charge card to your vehicle. The Audi connect Plug & Charge service is a personalised service, i.e. to use the service, you have to register and open a separate, individual myAudi account, link it to the key user of your vehicle and have a Plug & Charge compatible charging agreement with one of our cooperation partners. An overview of the current cooperation partners can be found in the myAudi portal and in the myAudi app.

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As part of this service, we process the following data or categories of data from your vehicle: the vehicle identification number (which clearly identifies your vehicle and links it to a specific owner), the availability and function status (activated/deactivated/error), the hardware and software version of your vehicle as well as information from the charging agreement (supplier information, your agreement number, validity period).

To display the right data while you are using the service, we use your personal Audi ID for identification.

The data from your vehicle are transferred to the IT systems of CARIAD SE, Berliner Ring 2, 38440 Wolfsburg, Germany with a time stamp at each vehicle start and in the event of changes to the function status.

When the information from your charging agreement is changed, the information is received by the card issuer on the IT systems of CARIAD SE, Berliner Ring 2, 38440 Wolfsburg, Germany and forwarded to your vehicle.

We process the above data for the purpose of providing the service, in order to allow you to link your digital charging card to your vehicle and to then automatically enable charging stations with the digital charging card.

We store the settings for your function status and agreement status until you change them yourself or remove the link between your vehicle and your myAudi account. The information from your vehicle is deleted each time a new data record is sent, so that we only ever store the current data record. The last 10 actions in each case are saved for the purpose of fulfilling our contractual obligations and to protect our legitimate interests in safeguarding system security (Article 6 (1)(f) GDPR).

5. Special Information – Remote Control Auxiliary Heater

The remote auxiliary heater Audi Connect service is a personalised service, i.e., the prerequisite for the use of the service is the registration and opening of a separate and individual myAudi account. In your myAudi account, you can configure the service, a schedule for your auxiliary heater, and transmit certain data and content for the features of your Audi Connect services (via your mobile phone connection) to your vehicle and allow certain vehicle data to be transferred to us from the vehicle (as described below).

As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the planned departure timer you have entered, the heating effect (defrost or interior heating), availability of

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auxiliary heating functionality (status tank empty, battery empty, system error), current status of the climate control system (heating, ventilation, not active) and the remaining runtime with air-conditioning running. This data is sent by your vehicle to the AUDI AG IT systems with the time stamp when you modify a timer, the climate control status (start, end of a climate control process), the remaining runtime and/or the availability of the auxiliary heating functionality.

We process the above data to provide the service to enable you to remotely control your auxiliary heater via the app (Article 6 (1) (1) (b) GDPR).

We save the settings of your timers until you change them yourself or unlink the assignment of the vehicle to your myAudi account. The climate control information from your vehicle is deleted each time a new record is sent, so that we only store the current record. The last 10 actions are stored there to fulfil our contractual obligations (Article 6 (1) (1) (b) GDPR) and for the purposes of the legitimate interests pursued by us in ensuring system security (Article 6 (1) (1) (f) GDPR).

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

6. Special Information – Remote Control Climate Control (e-tron)

As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), current climate control status in the vehicle, availability of the auxiliary climate control functionality (status tank empty, battery empty, system error). We also process the climate control timers scheduled by you in myAudi, selection of the heating source as well as special configurations of the auxiliary climate control (e.g., heating of the glass surfaces) and seat climate control. If the air-conditioning is running, the remaining runtime is also processed. This data is sent by your vehicle to the AUDI AG IT systems with the time stamp when you modify a timer, the climate control status (start, end of a climate control process), the remaining runtime and/or the availability of the auxiliary climate control functionality.

We process the above data to provide the service in order to communicate with your vehicle and to enable you to configure and control the climate control process via smartphone or via myAudi and to display the climate control status (Article 6 (1) (1) (b) GDPR).

The climate control timers and settings you have configured are saved until you change them. The climate control information from your vehicle is overwritten when sending a new record, so that we only store the current status.

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In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR)

7. Special Information – Remote Control Locking and Unlocking

This service allows you to lock and unlock your vehicle via your mobile end device. As part of the service, we process the following data or categories of data from your vehicle: vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), executed action (lock/unlock), condition of the vehicle doors and hatches and time stamp and ID of the mobile end device used.

The corresponding data is sent directly to AUDI AG upon execution of the service and will then be available for retrieval using your smartphone via the myAudi app and via myAudi. The service can be deactivated by the primary user in the myAudi portal.

We process the above data to provide the service to enable you to remotely lock and unlock your vehicle via the app (Article 6 (1) (1) (b) GDPR). We log the use of the service and store the actions for the purposes of system security and theft prevention and tracking for the performance of the contract (Article 6 (1) (1) (b) GDPR) and for the purposes pursued by our legitimate interests in securing the service for up to 5 years (Article 6 (1) (1) (f) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

8. Special Information – Remote Horn and Flasher

This service enables you to trigger the vehicle's horn and signals via your mobile end device. As part of the service, we process the following data or categories of data from your vehicle: vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), executed action and time stamp and ID of the mobile end device used, current position of your vehicle (location data) and position of your mobile end device.We process the above data to provide the service to enable you to remotely control your vehicle's horn and flashing within a certain radius of your vehicle via the app (Article 6 (1) (1) (b) GDPR). For the perimeter detection, the position of the vehicle and the end device are required.

The position data of your mobile end device will be deleted after the action has been performed. We store the above personal data of the last 10 actions (action

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and time) for the performance of the contract (Article 6 (1) (1) (b) GDPR) and for the purposes of the legitimate interests pursued by us in the security of our systems (Article 6 (1) (1) (f) GDPR) until you unlink the assignment of the vehicle to your myAudi account. The oldest above data are deleted each time a new record is sent.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

9. Special Information – Push Notification Anti-Theft Alarm System

If your vehicle's anti-theft alarm system is triggered, you can be informed via a push message within the myAudi app. As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), detected event (triggering event) and time stamp. In addition, we transmit the current status of the anti-theft alarm system (so-called activation status) to the IT systems of AUDI AG whenever the status changes, in order to be able to validate alarm events.

The last alarm event is displayed to you in your myAudi app and an alarm history is saved to your myAudi account.

We process the above data for the provision of the service to provide you with alerts about a triggering of the theft warning system of your vehicle as a primary or authorised user via push message within the myAudi app (Article 6 (1) (1) (b) GDPR). You can view and delete the last alarm event via your myAudi account. We save the data in connection with your myAudi account until you delete it or unlink the assignment of the vehicle to your myAudi account. In any case, an alarm event is deleted after 30 days have elapsed since the event was detected.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

IV. Special Information – Audi connect Emergency Call & Service

1. Special Information – Statutory Emergency Call

In the event of a manual or automatic triggering of the legally required emergency call system (eCall), your vehicle sends a legally specified minimum data record and

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sets up a voice call to an emergency call centre. The data record contains the following data: vehicle identification number (with which your vehicle can be uniquely identified and assigned to a specific owner), vehicle type (car or light commercial vehicle), type of vehicle drive (petrol/diesel/CNG/LPG/electric/hydrogen), the current position of the vehicle (location data place and time) as well as the last 3 locations of the vehicle and direction of travel, number of vehicle occupants, time stamp, trigger type (manual, automatic).

This data is generated when triggered and stored locally for the duration of the emergency call and up to 1 hour after the emergency call.

When the emergency call is triggered, your vehicle sends the above data directly to the relevant public safety answering points, which are designated by the relevant authorities of the country in which you are located to be the first to receive and process eCalls to the single European emergency number 112.

The above personal data is processed on the basis of a legal obligation to provide the emergency call functionality (Article 6 (1) (1) (c) GDPR).

The service is automatically activated by default and cannot be deactivated. This ensures that your vehicle cannot be traced during normal operation on the basis of this service, i.e., no electronic tracking can take place.

For further information on data processing within the framework of the statutory emergency call, please refer to your vehicle manual.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

2. Special Information – Audi connect Emergency Call

The private emergency call service is an emergency call that can be triggered either automatically by activating in-vehicle sensors or manually (by pressing a button) by the vehicle occupants.As part of the service, we process the following data or categories of data from your vehicle: vehicle identification number (with which your vehicle can be uniquely identified and assigned to a specific owner), control (information on whether the emergency call was made manually or automatically, the current position of the vehicle (location data place and time), the vehicle type, vehicle energy storage type (e.g., petrol, diesel, natural gas, etc.), time of the emergency event, number of passengers in the vehicle, language setting, crash intensity (at the measuring points, front, left, right and rear or, if applicable, in the event of a rollover), passenger seat occupancy and door status. The vehicle

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positions before and after the emergency event are also stored in the vehicle. The last vehicle position before the vehicle was last switched off is continuously stored in the vehicle, even without an emergency call event, so that even if no current location can be calculated and transmitted to the call centre in the event of an accident, at least the last recorded location is known.When the emergency call is triggered, the vehicle sends the above data to our call centre, Bosch Service Solutions GmbH, Lahnstrasse 34-40, 60326 Frankfurt am Main. This establishes an audio connection between the vehicle occupants and the nearest rescue control centre (police, control centre, traffic inspection) and forwards the data required for the rescue accordingly.The above data is not transmitted to us for processing the respective emergency call, but directly to the call centre. In some vehicle models, the individual emergency calls are logged in a ring memory (limited to data documenting that an emergency call has taken place – not the content of the emergency call) and continuously overwritten. The call centre records the emergency call (voice call) and saves the recording of the caller (to enable possible queries/callbacks to the vehicle) for 24 hours. The other data of the emergency call are stored for a period of 10 years. The above personal data is processed to provide the service (Article 6 (1) (1) (b) GDPR).

The service is automatically activated by default and cannot be deactivated. This ensures that your vehicle cannot be traced during normal operation on the basis of this service, i.e., no electronic tracking can take place.

For information on data processing within the framework of the statutory emergency call, please refer to the information on this service.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

3. Special Information – Audi incident assistance and online roadside assistance

The Audi connect services “Audi incident assistance” and “Online roadside assistance” offer you an easy way of being put through to your importer’s call centre (in the case of market Germany, this is Audi) in case of an accident or breakdown. Your importer is the importer of the country in which the myAudi key user is registered.

In case there is no key user you will be put through to the importer of the vehicle´s destination country. Both services have to be triggered proactively in the car. Alternatively, the service can also be used without Audi connect via the telephone hotline. Alternatively, the driver can call the telephone hotline and use the service without Audi connect.

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The call centre employee may access your myAudi profile data so that rapid and targeted steps can be taken to log the case and provide you with assistance. Your profile data will be forwarded to the importer. In the case of market Germany, no data will be forwarded. Your name and date of birth will be used for identification purposes (as well as the telephone number of the SIM card integrated into the vehicle where applicable or the vehicle identification number). The data will be forwarded for further processing to the dealer that you have selected in myAudi as your preferred dealer (or a different dealer if you indicate a different preference to the call centre employee). For faster processing of the claim, you additionally have the option of forwarding your data to your insurance (if it is digitally linked).

You can use the service once you confirm (e.g. from the vehicle, the Audi apps or by actively accepting a call from the call centre).

We process the following data or categories of data in connection with this service and forward it to the importer for service delivery (in the case of market Germany, no data will be forwarded): customer data (title, salutation, name, date of birth, address, country, telephone number, email address, number plate), vehicle data (VIN, brand, mileage, remaining range, model name, model year, colour, transmission, drive type, year of manufacture, vehicle type, equipment features), insurance data (e.g. name of insurance company of the person reporting the accident, insurance policy number of the person reporting the accident, type of damage), claim data (area of impact, severity of impact, date of the accident, time of the accident, cause, warning lights, DTC, GPS data, accuracy of GPS data, direction of travel, type of damage, date on which the claim was logged, precalculation of damage, next inspection, last inspection).

We process the aforementioned data for providing the service so that we can provide rapid assistance in the event of an accident. In order to provide the service, the importer (or Audi, for the German market) will forward your data to your service partner and your insurance at your request. Outside of Germany, please read the importer’s privacy policy terms & conditions for further information related to data processing by the importer.

Your importer (in the case of market Germany Audi) will pass on data to contracting parties in order to meet contractual obligations or to third-parties for whom you have given explicit consent (insurance). You then will be granted access to Audi connect services.

In connection with Audi incident assistance and online roadside assistance, we use processors as operation, hosting and support service providers.

Audi incident assistance and online roadside assistance data processing might require data access from the US during technical support. Your data will be stored

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for as long as is necessary to provide the Audi connect service to you or for as long as there is a legitimate interest in continuing to store it.

4. Special Information – Automatic Service Reminder

To use the "automatic service reminder" service, activation via your personal myAudi account is required. In this process, you can select your Audi partner designated for the service and store your personal contact data (name, telephone number, email address, communication preferences via telephone or email) for the provision of the desired service of the automatic service reminder.

If you use the automatic service reminder service, the technical data required for an upcoming service interval for your vehicle:

> Vehicle status data (mileage, fuel tank level, oil filling level, etc.)

> Service-relevant data (maintenance interval data, event log entries, warning lights)

> Vehicle identification number

is transmitted to Audi’s IT systems.

This data is merged with your contact details and transmitted to the Audi partner you have selected for the automatic service reminder and stored there. The Audi partner uses this data for the purpose of preparing for the appointment, contacting you and carrying out the individual service. Your Audi partner selected for the automatic service reminder will then contact you by telephone or email for this scope of service, as indicated in your contact preferences, to arrange an appointment.

The Audi partner specified for the automatic service reminder will not use your personal data for any other purpose beyond the purpose described. Audi uses your data to provide the service, then it uses anonymised data to optimise the service. Your data is not forwarded to third parties.

If the Audi partner cannot process or enable the service request for technical or organisational reasons, the aforementioned data will be forwarded to the sales company (importer) responsible for your country so that you can be offered an appointment with a suitable Audi partner. In Germany, the data is forwarded to AUDI AG. Data transfer to the importer is carried out to protect our legitimate

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interests in accordance with Article 6(1)(f) GDPR; this is also to meet your request for a service appointment and to help provide a satisfactory outcome for you.

In connection with the automatic service reminder, we use processors as operating, hosting and support service providers. It may happen that for technical support purposes a support service provider accesses your information from the USA. We have therefore concluded relevant EU standard contractual clauses (a set of contractual clauses approved by the European Commission that gives personal data the same protection as it has in the EU when data is processed in non-EU countries).

To activate the Audi connect service, for technical reasons you have to enter the data requested during the service configuration. All requested data must be provided for activation, otherwise we will be technically unable to implement it. You can view, change or delete your data at any time in the service configuration. However, deleting your data will deactivate the service.

5. Special Information – Predictive maintenance reminder

The Audi connect service for predictive maintenance reminders monitors wear parts in the vehicle. Monitoring only runs if the service for predictive maintenance reminders has been activated by the key user.

The selected service partner and the contact information (name, phone number, email address, preferred communication method) from your myAudi profile are used to deliver the service. This information is requested on activation of the service as necessary and can be changed in your myAudi profile at any time.

For predictive maintenance reminders, the following vehicle data is sent to our IT systems and stored for up to 4 years:

> Vehicle identification number (which is used to uniquely identify your vehicle and link it to a specific keeper),

> time stamp of data recording,

> vehicle status data and diagnostic data (e.g. mileage, outside temperature, tyre pressure, information about the condition of the 12V battery and the tyre pressure monitoring battery, currently active warning lights/messages on brake fluid level),

service-related information (e.g. remaining mileage and time until the next oil change, date and mileage at last inspection, maintenance interval data, vehicle

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master data, event memory entries, warning messages, history of warning lights/messages, error code of the event (including time stamp and mileage of when the error was entered))

The specific data for data processing are primarily based on the applicable vehicle and vehicle equipment.

We process the aforementioned data in order to provide the service (Article 6(1)(1)(b) GDPR). In addition, the above personal data may in specific cases be processed for development and optimisation purposes to safeguard our legitimate interests (Article 6(1)(1)(f) GDPR).

6. Special Information – Theft Tracking System

The Audi connect theft tracking system is a personalised service, i.e., the prerequisite for the use of the service is the registration and opening of a separate and individual myAudi account. In your myAudi account, the primary user can configure the service and activate or deactivate it.

To activate the service, we process the following data, which you provide when activating the service in your myAudi account: registration: name and contact details (address, up to 3 mobile numbers) and information about the vehicle (colour, body shape, number plate), vehicle Identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner). This data is transmitted to our service provider Vodafone Automotive Telematics SA, Via S. Franscini 10, 6850 Mendrisio, Switzerland or to a local service provider commissioned by the service provider to create the registration and activation.

If the vehicle detects manipulation, the vehicle sends the following data or categories of data to us and the service provider: manipulation event, current vehicle position (location data place and time), vehicle status data (mileage, battery voltage, speed, tank fill level, time from the vehicle, ignition status, engine status).

The vehicle then periodically sends the current vehicle position.

These data are transmitted to our service provider. The service provider then contacts the contact information stored by the primary user in order to forward the alarm.

With the consent of the primary user and upon confirmation of a theft or notification of a theft by the primary user, the service provider transmits the last known vehicle position to the national security or investigation authorities.

If the primary user reports a theft, the above data can also be actively queried from the vehicle via the service provider.

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We process the above data to provide the service to detect tampering events and to enable the localisation of your vehicle in case of theft (Article 6 (1) (1) (b) GDPR). This service can only be activated or deactivated by the primary user. It will not turn off when privacy settings are activated. In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

7. Special Information – Online-Car-Care

The Audi Connect Online-Car-Care service is a personalised service, i.e., the prerequisite for the use of the service is the registration and opening of a separate and individual myAudi account. The Online-Car-Care service is activated as part of the primary user registration. As the primary user, you can activate or deactivate the service in your myAudi account.

The specific data and purposes of the data processing are primarily based on the respective vehicle and vehicle equipment. Please note that not all listed functions of Online-Car-Care may be available in your vehicle or country.

The service includes the following features:

> Anomaly assistant (swarm feature): A 4-stage function that uses online vehicle data from the fleet to monitor the vehicle's state of health. Functionality:

1.

1.1. Event monitoring: The condition of the vehicle is monitored online in order to detect unusual accumulations of anomalies within certain parts of the vehicle fleet.

1.2. Analysis: In the next step, the causes of the anomalies in the affected vehicles are analysed.

1.3. Customer information: If the analysis reveals acute defects in a vehicle that require a visit to the workshop, the customer is informed in the vehicle and in myAudi and can conveniently contact the service partner via the Audi online service “Service request/booking”.

1.4. Prediction: Some anomalies can already be detected predictively, i.e., based on vehicle data it becomes apparent that the corresponding anomaly will occur in the future. The customer is informed of this in the vehicle and in myAudi and can conveniently contact the service partner via the Audi online service “Service request/booking”.

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> Notification assistant: mirroring of the vehicle's current warning light status in myAudi.

> Display: additional display of relevant driver information and indicator lights from the instrument cluster via the myAudi app and portal.

> Reminder feature: If a critical warning light is present in the vehicle for a longer period of time or over a longer distance, the customer is reminded of this by email.

> Field measure assistant: A feature that controls field measures individually for each vehicle and displays them on all customer front ends:

> Needs-based control of field measures: By collecting vehicle online data, it is possible for certain field measures to check in advance whether the customer's vehicle is affected by a field measure. The customer is thus only informed about the field measure that the vehicle requires. This avoids unnecessary visits to the workshop for the customer.

> Customer information: If a vehicle is affected by a field measure, the customer is informed in the vehicle and in myAudi and can conveniently contact the service partner via the Audi online service “Service request/booking”.

To provide the service, we process the following data or categories of data from your vehicle and make the information available in myAudi and in the vehicle:

The vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the time stamp of the data collection and the mileage, as well as certain other operating data in the vehicle.

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> This includes operating data that provide indications of an upcoming repair: vehicle status information, environmental conditions, operating statuses of system components, deviations from system statuses that lead to an event memory entry in the internal vehicle systems, reactions of the systems in special driving situations, charge level of the high-voltage battery (in electric vehicles), estimated range. This data is sent in accordance with the principle of data minimisation, i.e., AUDI AG evaluates all collected data to calculate forecasts (predictions) of repairs. Your vehicle sends this data at regular intervals (in some cases each time the vehicle is used) or when certain conditions are met (e.g., event memory entry, changes in the environmental or operating conditions, etc.).

> This also includes the operating states of system components that provide information about the display of indicator lamps and driver information in the vehicle's instrument cluster. Your vehicle sends this data to AUDI AG after the start and end of a journey during which an indicator lamp or driver information is active or its status changes.

> Operating states of system components that provide information about the software variant of the installed control units. This data is required to translate the raw data sent by your vehicle of detected deviations from system states into a readable format.

> Operating states of system components required for product monitoring of important components, e.g. battery voltages of the high-voltage battery.

> Operating states of system components required to analyse specific deviations from system states, e.g. engine speed.

> Internal logs for error analysis and error correction.

Your vehicle may send the above data when there is a change in an operating status that leads to an event memory entry in the vehicle, or they can be sent out cyclically, e.g., every 500 – 1,000 km or when the vehicle is started or during a charging process.

In the IT systems of AUDI AG, this data is linked using the VIN with technical data from production and previous workshop visits in order to be able to draw conclusions about vehicle equipment such as transmission, engine identification, etc. as well as the production period, software and hardware versions. If the VIN is not absolutely necessary for further analysis, it is replaced by a pseudonym, so that we process the data without reference to a specific driver or user, but with reference to a specific vehicle (via the pseudonym). A personal reference is only restored in justified exceptional cases, e.g., in order to enable recall campaigns or if safety-related anomalies are detected.

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If the “Automatic Service Reminder” service is used, the information regarding which malfunction indicator light(s) or predictive model(s) are active will be transmitted to the dealer in addition to the information listed in the “Special information – Automatic Service Reminder” section.

The “Online-Car-Care” service can only be activated or deactivated by the key user.

You have the option at any time to temporarily switch off the transmission of certain data from your vehicle as part of the privacy settings, although this may limit the usability of the Connect services.

We do not use these data to create profiles.

In addition to the data from your vehicle, we process your name and email address from myAudi exclusively to inform you if your vehicle needs repairs (so-called "predictive information" and field measures) and to inform you of important indicator lights and driver information.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

8. Special information – Remote vehicle diagnostics

The Audi connect remote vehicle diagnostics service enables us to collect data on the current state of the vehicle and, in the event of a complaint, to carry out remote vehicle diagnostics on request. The result of the diagnostics is saved in the myAudi app and at the customer support contact points, and contains a recommendation of what to do next based on the specific diagnostics result.

The Audi connect remote vehicle diagnostics service is a personalised service, meaning that you need to register and open a separate and individual myAudi account to make use of it. The remote vehicle diagnostics service is activated as part of key user registration.

To provide this service, we process the following data and data categories regarding your vehicle and make this information available in myAudi and at the customer support contact points:

The vehicle identification number (a unique number with which the vehicle can be identified and assigned to a specific owner), the time stamp for the data collection and the odometer reading, as well as certain other operational data on the vehicle.

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This includes operating data that provides indications for current errors: vehicle status information, environmental conditions, operating statuses of system components and deviating system statuses that lead to an event memory entry being made in the vehicle's internal systems.

The data transmission follows the principle of data minimisation, i.e. AUDI AG evaluates all the data collected to determine the current state of the vehicle.

Your vehicle sends the aforementioned data when a change of operating condition leads to an entry being made in the vehicle's event memory, when certain conditions are met (e.g. change of environmental or operating conditions) and at regularly recurring intervals, e.g. when the vehicle starts or when it is charging.

This service can only be activated or deactivated by the key user.

You can temporarily switch off the sending of certain data from your vehicle at any time by adjusting your privacy settings, although this restricts the usefulness of the connect services.

We do not use this data to create profiles.

We process the aforementioned data in order to provide the service (Article 6, para. 1, sub-para. 1, point b) GDPR). In addition, the aforementioned personal data may on rare occasions be processed for development and optimisation purposes, in order to protect our legitimate interests (Article 6, para. 1, sub-para. 1, point f) GDPR).

V. Special Information – Other connect Services

1. Special Information – Online Logbook

The online logbook service enables the semi-automatic keeping of electronic logbooks. In addition, the primary user can view various vehicle data via myAudi or their mobile end device. The prerequisite for using the service is the creation of a myAudi account, registration as the primary user and nomination as the primary user in the vehicle. As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the user ID associated with the myAudi account and:

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> At the start of the journey: date, time, mileage, GPS position, street name, house number, city, postal code, country

> At the end of the journey: date, time, mileage, GPS position, street name, house number, city, postal code, country, name of the primary user

The feature takes over these data from the navigation system and uses them to generate a logbook entry. We also process the category of the logbook entry indicated on the vehicle display (business trip, commute, private trip, uncategorised) and, if applicable, the business purpose and business partner. If a mobile end device is connected to the vehicle, the primary user can automatically transfer the business purpose and business partner from the smartphone's system calendar to the logbook via the myAudi app and transmit it to our IT systems. To do this, the myAudi app accesses the calendar of the primary user. The subject of the appointment is taken from the calendar for the business purpose data field and the organiser of the appointment is taken from the calendar for the business partner data field. The corresponding data is then available for the primary user to retrieve via myAudi. All logbook entries are available to the primary user in myAudi for recategorisation 7 days after the start of the journey. Logbook entries that are not fully categorised are automatically categorised as private trips after 7 days. We store this data until the primary user deletes it via myAudi. Logbook entries are no longer sent from the vehicle to our IT systems if the primary user has deleted their myAudi account or a primary user is no longer nominated in the vehicle. The primary user can create a PDF export of the logbook in myAudi. To do this, we process the data entered by the primary user in myAudi. These include name, place of residence and the registration number of the vehicle.

The above data will not be transmitted to us if you activate privacy mode before the end of the journey.

We process the above data to provide the service and to provide the primary user with the information in the vehicle and in myAudi for retrieval (Article 6 (1) (1) (b) GDPR). The service is provided by the service provider Volkswagen AG, Berliner Ring 2, 38440 Wolfsburg.In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

2. Special Information – Log System Online (Owner's Manual)

The online log system service enables the on-board literature to be displayed digitally in your MMI. As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which

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your motor vehicle can be uniquely identified and assigned to a specific owner). Your vehicle identification number is transmitted to the IT systems of AUDI AG when the feature is started and used to provide the on-board literature for your vehicle model.We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

3. Special Information – Audi Connect Key

The Audi Connect key service is a personalised and safety-relevant service. It enables the user to unlock, lock and start the vehicle using a mobile end device. Prerequisite for the use of the service is the previous registration in the myAudi portal and the verification as the primary user. Furthermore, the use of the Audi Connect key requires the download of the myAudi app.

For the proper assignment of the Audi Connect key to a user's mobile end device, this end device transmits the following data to the IT systems of AUDI AG for the purpose of authentication and authorisation: Card Production Life Cycle Data (CPLC), type of secure element, device type, app version and OS version and Google Cloud Messaging/Fire-based Cloud Messaging Token. This data is stored in the IT systems of AUDI AG together with the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner) and the assigned Audi Connect key for the purpose of authentication and verification of authorisation until the assignment of the end device is unlinked. This is required for the device to be recognised as an authorised key. AUDI AG uses processors as hosting and support service providers to provide the service.

With the assignment of an Audi Connect key to a user, the respective vehicle is also linked to the user and the user can see the vehicle and the vehicle equipment in the myAudi Portal or myAudi app. The primary user can see which users (email address) with which key name (which the primary user himself or herself has assigned) are assigned to the vehicle.

When using the Audi Connect key, i.e., when unlocking, starting and locking the vehicle using the mobile end device, data is transmitted from the mobile end device to the vehicle by means of Near Field Communication (NFC). This data is not transmitted to AUDI AG.

When using the Audi Connect key, the following data is transmitted to the IT systems of AUDI AG and logged and stored for the purposes of monitoring and ensuring service security for the performance of the contract: ID of the Audi Connect key (if applicable), ID of the conventional radio key (if applicable), ID of the Audi Connect key card (if applicable), vehicle identification number (with which your

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motor vehicle can be uniquely identified and assigned to a specific owner), key type, status of the key card, status of the feature, type of change (e.g. changing the vehicle key when starting the vehicle, key card activated/deactivated, feature activated/deactivated), time of change and mileage.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

4. Special Information – Data Packets

This offer enables each user to purchase data packages for the use of the Wi-Fi hotspot from a partner mobile service provider of AUDI AG and to use them in the linked vehicle. Prerequisite is the registration of a SIM owner with the mobile service provider. AUDI AG will not transfer any personal data to the mobile service provider unless you have consented to such use or transfer. We have no control over the amount of data that the wireless service provider collects in connection with the purchase of the data package and your use of the offering. The collection, processing, transmission and use of personal data as well as the intended purpose are determined exclusively by the mobile service provider. For more information, the privacy policies of the mobile service provider and your rights and settings options for the protection of your privacy, please refer to the privacy policies of the mobile service provider http://www.cubictelecom.com/.

5. Special Information – Functions on Demand

The "Functions on Demand" feature enables the user to permanently or temporarily unlock additional vehicle features.

As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the vehicle status, activation information and, if applicable, the term of the purchased license. We process this data solely for the purpose of enabling the feature.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

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6. Special Information – Audi as a Matchmaker

We process the following data when themes are activated through the vehicle: vehicle identification number (VIN), country of the vehicle, theme. Themes can still be viewed by other users even after the vehicle has been reset to factory settings. Please contact Audi Customer Support at kundenbetreuung@audi.de to have the themes deleted permanently.

We process the above data to provide the service (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

7. Special Information – Audi Application Store

The Audi Application Store comprises:

- Audi Functions Store for Group products of the VW brands
  - The Audi Functions Store is the basic store for every Audi customer. The first tab allows you to find out about and purchase Functions on Demand, Audi connect services and other functions offered by Audi. Visibility and price depend on the vehicle model, equipment version, market and region.
- Store for 3rd party apps
  - This gives customers access to a range of 3rd party apps, which can be installed directly in the MMI without a smartphone. The app portfolio is adapted specifically for each market and brand.

While using the Audi Application Store, we process the following data or categories of data from your vehicle:

IT usage data include Audi User ID, information about purchased licence packages and services, status of apps currently in the vehicle (completed installations, deinstallations, downloads and updates per user or vehicle), saved user settings (e.g. selected shopping region and activation of automatic updates), installations queued by the customer or administrators, user access with corresponding timestamps, and IP address as part of the web application.

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Vehicle identification number (VIN) (which uniquely identifies your vehicle and assigns it to a specific owner).Zu den KFZ-Nutzungsdaten gehören die konfigurierten Spracheinstellungen.Vehicle usage data includes the configured language settings.

In addition, vehicle master data including vehicle country of registration, brand, model, year of manufacture, installed infotainment control unit, infotainment system software version, Android API level and CPU architecture.

This data is saved in the cloud by Harman Becker Automotive Systems GmbH, Becker-Göhring-Strasse 1, 76307 Karlsbad, Germany, on an Amazon Web Services instance in Ireland.

IT usage data is stored until the myAudi account is deleted. The IP address and user access data (in the form of log files) are stored for 30 days, excluding audit log files. Audit log files are stored for 12 months.

The vehicle usage data and the VIN are only processed and are not stored; they are only used to assign the language setting. All other data is stored until the myAudi account is deleted.

We process the personal data that you provide as part of the registration process and the above data when using the Audi Application Store on the following legal basis: Performance of a contract or steps prior to entering into a contract, insofar as necessary (Article 6(1)(b) GDPR). The data is processed for the purpose of providing an offer and a service.

The above personal data may also be processed occasionally for the purposes of development, optimisation and IT security (e.g. prevention and tracking of attacks) in order to safeguard our legitimate interests (Article 6(1)(f) GDPR). With regard to data processing as part of the ordering and payment process, please refer to the privacy policy of the Audi Function Store.

8. Special Information – In-Car Office

The In-Car Office service allows the user to access and display their inbox and calendar on the central display in the vehicle, as well as automatically dial in to conferences.

As part of this service, we process the following data or categories of data from the vehicle: Login data for the myAudi user account, the access tokens for Microsoft and Google, as well as emails and calendar data accessed by the customer.

The user must log in to their myAudi User account and enter the login details for Microsoft or Google to be able to access the relevant API (interface). This allows the

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user to access emails and the calendar or create new content. New content is processed in the vehicle and sent back to the Microsoft or Google API.

Audi only acts as an interface and directs the emails or calendar entries from the vehicle to the In-Car Office backend, which then synchronises with the Microsoft or Google interface. There is no further processing by AUDI AG.

AUDI AG stores the myAudi user ID and the access tokens for customers' email accounts. These tokens are stored until the customer deletes them or the customer deactivates or deletes the myAudi account.

The accessed calendar and email content is stored for 30 days in the vehicle and is automatically deleted after that period. The user can also manually delete the cache at any time via the settings of the In-Car Office app.

The above personal data is processed to provide the requested services (Article 6(1)(1)(b) GDPR).

In addition, the above personal data may in specific cases be processed for development and optimisation purposes to safeguard our legitimate interests (Article 6(1)(1)(f) GDPR).

VI. Special Information – Product Safety, Optimisation and Development

1. Vehicle and Product Safety

For reasons of (commercially necessary and legally required) product monitoring, we process the following data or categories of data from your vehicle to improve vehicle and product safety:

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> (1) The vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), the time stamp of the data collection and/or the mileage

> (2) Deviations from system states that lead to an event memory entry in the internal vehicle systems

> (3) Operating states of system components that provide information about the display of indicator lights and driver information in the vehicle's instrument cluster

> (4) Operating states of system components that provide information about the software variant of the installed control units. This data is required to translate the raw data of detected deviations in system states sent by your vehicle into a readable format.

> (5) Operating states of system components that are required for product monitoring of important components, e.g., battery voltages of the high-voltage battery.

> (6) Operating states of system components that are necessary for the analysis of certain deviations from system states, e.g., the engine speed.

> (7) GPS data that are collected event-based only if this is required to ensure the purposes listed above; these will be deleted or anonymized immediately when the data are no longer required for the purpose.

Your vehicle sends the data cyclically upon starting/shutting off of the vehicle and/or during charging, e.g. in the event of a change to an operating state that results in an event memory entry in the vehicle.

The analysis of certain deviations of system states may require recording and forwarding data up to 60 seconds before and after the deviation of interest. If the deviation to be examined occurs, data (1) and (6) are transmitted to AUDI AG. There is no permanent transmission of data from the vehicle.

Only the data required for product monitoring are collected.

The specific data and purposes of data processing are primarily based on the respective vehicle, the vehicle equipment and your country.

In the IT systems of AUDI AG, this data is linked using the VIN with technical data from production and previous workshop visits in order to be able to draw conclusions about vehicle equipment such as transmission, engine identification, etc. as well as the production period, software and hardware versions. If the VIN is not absolutely necessary for further analysis, it is replaced by a pseudonym, so that

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we process the data without reference to a specific driver or user, but with reference to a specific vehicle (via the pseudonym). A personal reference is only restored in justified exceptional cases, e.g., in order to enable recall campaigns or if errors relevant to safety or product liability are identified.

We process the above data for the purpose of product monitoring to maintain and further develop product safety and product conformity (necessary for the purposes of the legitimate interests pursued by AUDI AG or by a third party, except where such interests are overridden by your interests or fundamental rights and freedoms which require the protection of personal data, in particular where the data subject is a child (Article 6 (1) (1) (f) GDPR)).

If you have activated the Online-Car-Care service, the data collected via this service will also be processed for the aforementioned purposes.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

We do not use these data to create profiles. You have the option at any time to temporarily switch off the transmission of certain data from your vehicle as part of the privacy settings, although this may limit the usability of the Connect services. If you want to stop the sending of data from your vehicle for the aforementioned product monitoring purposes more than just temporarily, please contact our customer service (see section A.II. "Whom can I contact?").

2. Optimisation and Development of Vehicle Features and Vehicle-Related Online Services

For the purpose of optimising our range of vehicle features and adapting them to customer expectations, in particular the evolution and new development of innovative features, your vehicle sends various technical function data from the assistance systems, convenience systems, operating elements or control units together with environmental data (e.g., outside temperature, brightness) as part of temporary campaigns and, if applicable, the associated position data and information on the length of the route, vehicle speed, vehicle status data (e.g., tank fill level or charge level, mileage), time of data collection and usage data to systems of AUDI AG. If there are error messages in your vehicle, these are sent to the systems of Audi AG for the purpose of error diagnosis.

Depending on the type of campaign, the data is transmitted using a randomly generated and time-limited session ID or another pseudonym, so that this data can no longer be assigned to you as the driver or user without additional information.

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For an analysis, we only collect the data that is required for the respective evaluation. Categories of data other than those specified above are not processed.

To the extent possible, we anonymise the data in our IT systems before evaluation. If this is not possible, we largely analyse the data from your vehicle in such a way that no conclusions can be drawn about you or your vehicle. AUDI AG has established measures to ensure that a personal reference can only be established in justified exceptional cases, e.g. if errors relevant to safety or product liability are identified. We do not use this data to create profiles or evaluations based on individual vehicles. In addition, no data attributes are used that allow profiling or conclusions about your behaviour or behaviour patterns.

We process the above data as part of time-limited campaigns for the purpose of optimising the range of vehicle features and adapting them to the expectations of our customers (necessary for the purposes of the legitimate interests pursued by AUDI AG or by a third party, except where such interests are overridden by your interests or fundamental rights and freedoms which require the protection of personal data, in particular where the data subject is a child (Article 6 (1) (1) (f) GDPR)).

You have the option at any time to deactivate the transmission of data for the purpose of optimising and developing vehicle features from your vehicle as part of the privacy settings, although this may limit the usability of the Connect services. If you would like to prevent the sending of data from your vehicle in general, please contact our customer service (see section A.II. "Whom can I contact?").

3. Special Information – Connection Test/Check License Status

You can check the status of the licenses for the online services and the connection status of your vehicle in your vehicle. If, for example, a service cannot be used, you can check here whether the licenses have expired or whether your vehicle is offline. As part of the service, we process the following data or categories of data from your vehicle: the vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner) and the current connection status (online/offline) or license status of the vehicle.

The corresponding data is sent directly to our IT systems when turning off the vehicle and will then be available for retrieval using your smartphone via the app and via myAudi. The vehicle status is visible to every authorised myAudi user who has been activated by the primary user for this vehicle.

We process the above data to provide the service in order to show you information about the connection status of your vehicle with the app and our IT systems (Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual

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cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

4. Special Information – Online System Update

Via online system update, we provide you with updates for your vehicle system for download and installation. As part of the service, we process the following data or categories of data from your vehicle: vehicle identification number (with which your motor vehicle can be uniquely identified and assigned to a specific owner), software and hardware version and serial numbers of the hardware in order to check whether an update for your vehicle system is available and to provide the correct update version.

We store this data together with the information on the provided update for vehicle safety purposes to provide our contractual services (contract performance, Article 6 (1) (1) (b) GDPR). In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

VII. Special Information – Advertising

1. Promotional communication and market research based on consent (Article 6(1)(a) GDPR)

Further product information and market research: If you would like to receive information about our products and services, you can request this advertising. For this purpose, we process the following data within the framework of the consent given by you (Article 6(1)(1)(a) GDPR) for the purpose of sending you the marketing information: Surname, first name, email address and/or telephone number. If you consent to being contacted by email, we use what is known as the double opt-in procedure, i.e. we send you an email to the specified email address with a request to confirm your consent. You can find out how to revoke your consent in the section "What rights do I have?".

If you have separately given your corresponding consent to further use of your personal data, we will process your personal data in accordance with the scope described in the consent and, with your separate consent, also with a high degree of personalisation on the basis of an individual customer profile and/or market research, and may pass this on to certain other sales partners. For details, please refer to the respective declaration of consent.

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If you have given your separate consent to personalised advertising and, if applicable, on the basis of an individual customer profile, we process the following supplementary information:

Supplementary personal information/preferences, e.g. company name, your relationship with this company, if you use a company vehicle or are our contact person for this company potential time period in which you may need a new vehicle and your interest in Audi vehicles and services as well as your requests for information and test drives, etc. preferred or current Audi partner(s) vehicle identification number and other attributes linked to it (vehicle master data such as model, year of manufacture, equipment) interests and hobbies status of your data protection declaration of consent and selected or preferred communication channel Identification data, e.g. customer number, Audi ID, contract number Customer history, e.g.

vehicle identification number and other attributes linked to it (vehicle master data such as model, year of manufacture, equipment) interests and hobbies status of your data protection declaration of consent and selected or preferred communication channel Identification data, e.g. customer number, Audi ID, contract number Customer history, e.g.

vehicle purchase data incl. model, configurations, date of purchase, date of registration, registration number, date of order, date of delivery, owner, list price

campaign history and response (customer and prospect management programmes and direct marketing activities)

Vehicle usage data, e.g. contract data, geo and sensor data related to the customer's USE. This includes information about connect services (pseudonymous), infotainment data, mileage, licences (e.g. booking FoD).

App / website / social media data

if you have registered or logged in, your Audi ID, your account data Audi uses the sales and customer care information collected in this way to:

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> determine which information and offers are most likely to be of interest to you and to

> contact you in connection with this information and offers, and for

> promotional communications about products and services in accordance with your data protection declaration of consent. This includes, in particular, information about vehicles, original parts and accessories, lifestyle products, driver equipment, accessories and myAudi services as well as information about data recipients selected in the consent, e.g. VW Financial Services (leasing), Volkswagen Group Charging GmbH (charging service & tariff)

In the data protection declaration of consent, you also specify the communication channels (e.g. post, telephone, email, push notification) through which we may contact you.

You can also decide here on your consent to the creation of an individual customer profile in order to receive personalised offers.

The profile may include, if available, the following information provided by you or through your use of products or services: Contact information (such as name, address, email); supplementary personal information/preferences (such as preferred dealer, hobbies); identification data (such as customer number, contract number); customer history (such as receipt of offers, vehicle purchase data, dealer information); vehicle data (such as usage data of the myAudi app: mileage, range); contract data (e.g. type and term of financial service contracts such as leasing or financing); app/ website/social media data

Data processing for advertising purposes is generally carried out in Germany. Under no circumstances will personal data be transferred to a country outside the EU.

E. Local Data Storage

I. Personal POI

Using an SD card, the user can load their own points of interest into their vehicle. This data is displayed on the map and can be used for navigation. This data is stored locally in the vehicle. A transfer to us only takes place when used as part of another service.

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II. Driver Availability Detection

This vehicle is equipped with a technical function for driver availability detection. Driver availability detection is active at all times while the vehicle is being driven and cannot be deactivated by the vehicle occupants.

This function is used, for example, for microsleep detection to ensure that the driver is ready to take over the wheel again if necessary even if traffic jam pilot is activated. This is because even in automated driving mode, the driver must always be able to take over the task of driving based on the traffic situation.If the driver is not ready to take over the wheel despite repeated requests, the vehicle is stopped, the hazard warning lights activated and an emergency call (eCall) is made.

Driver availability is detected using a camera with infrared lighting, which is permanently installed in the vehicle in the upper area of the instrument panel. The cone of vision of this camera captures the driver's head. It cannot be aimed at other areas of the vehicle (e.g., front passenger seat).

The camera images are not recorded or saved, but are immediately transmitted to the relevant control unit in the vehicle for processing. The control unit analyses the current camera image using image evaluation software. This image evaluation software determines technical measurements of human facial features (e.g., the general position of the nose, ears or eyes) and uses these measurements to determine information about the driver's readiness to drive (e.g., based on the position of the head or the direction of the eyes). The image evaluation software may be able to detect whether the driver is unconscious or asleep, for example, and use this information to assess whether the driver is able to take the wheel again. The technical parameters generated by the image evaluation software are collected anonymously and are not assigned to a person by name and do not allow the driver's face to be reconstructed (i.e., only abstract technical parameters are recorded).

In order to be able to reactivate the driver availability detection as quickly as possible after a break in driving, the above technical parameters are stored in a small number of memory locations in the responsible control unit. As soon as the storage capacity in the responsible control unit is reached, the older technical measured variables are overwritten by the most recent ones. In any event, the technical parameters will be deleted as soon as the ignition is turned off, the seatbelt is unfastened or the driver’s door is opened.

III. Environment Monitoring

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The functionality of the traffic jam and parking pilots require the vehicle's route to be recognised and evaluated. For this purpose, cameras permanently installed in the area of the vehicle's exterior detect objects in the vehicle's driving range (e.g., lane boundaries, crash barriers). The live images from the cameras are transmitted to the responsible control unit.The camera images are not recorded or saved, but are immediately transmitted to the relevant control unit in the vehicle for processing. The control unit analyses the current camera image using image evaluation software. This image evaluation software determines anonymous technical parameters, such as distances to stationary objects (e.g., crash barriers) or moving objects (e.g., vehicles driving ahead). The control unit evaluates these technical parameters and enables the traffic jam or parking pilot to control the vehicle.

The anonymous technical parameters are stored in the control unit for a few seconds in a volatile memory. In principle, they do not allow any conclusions to be drawn about the identity of persons or vehicles (e.g., faces, license plates).

F. Data Release to Third Parties (Extended Vehicle)

Via extended vehicle, the primary user can give third parties access to the vehicle's telematics data. Telematics data are data (e.g., mileage) generated by the vehicle as part of the Audi Connect services and stored in an Audi backend. The prerequisite for access is that the corresponding Audi Connect services are active and the primary user of the vehicle concerned has given explicit approval for the respective third party in the myAudi portal.

The third parties can be, e.g., insurance companies, workshops, gas stations or charging station operators who need this data in order to be able to offer individual services (e.g., telematics tariffs) to the primary user. The following data can currently be passed on to third parties for the use cases listed below:

a. Regular transmission of mileage and time stamps to insurance companies for the offering of a tailor-made tariff. ("Pay as you drive")

b. Regular transmission of the status and position of individual vehicle components (e.g., door, bonnet, power windows, parking brake, light status, etc.) or tyre pressure to selected service companies so that they can inform the primary user of irregularities in the vehicle. ("General Vehicle Status" and "Detailed Vehicle Status")

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c. In the event of an accident, transmission of accident severity and impact location (e.g., front, side, rear, etc.) on the vehicle to service companies so that they can support the primary user. ("First Notification of Loss")

The respective use cases and associated data that the third party specifically wants to obtain from the vehicle are displayed to the primary user in the release text of the respective request in the myAudi portal. The primary user can grant or revoke the release simply by clicking. Vehicle users who are not the primary user can request information about Extended Vehicle (in particular whether data release to third parties is active or which data is passed on) from the primary user.Every user of the vehicle has the option of deactivating data collection in the vehicle via the privacy settings in the vehicle.The above data is passed on to the respective third party by Audi on the legal basis of performance of a contract or implementation of pre-contractual measures, insofar as these are necessary (Article 6 (1) (1) (b) GDPR) for the primary user. With regard to secondary and guest users, the transfer of the above personal data is necessary for the purposes of the legitimate interests pursued by AUDI AG or by a third party, except where such interests are overridden by interests or fundamental rights and freedoms which require the protection of personal data, in particular where the data subject is a child (Article 6 (1) (1) (f) GDPR). The purpose is to give third parties the opportunity to offer the primary user individual and personalised services based on the data.

Within the scope of Extended Vehicle, we use the following processors: Volkswagen AG, Berliner Ring 2, 38440 Wolfsburg for the operation and hosting of Extended Vehicle.

If the primary user changes, the release is automatically revoked and data is no longer passed on to the third party. To ensure this, Audi compares the technical user ID of the primary user for the purpose of validating the primary user status. This ID is an individual identification number that is assigned to a customer during Audi ID registration. When the primary user contract is concluded, the user ID is assigned to a vehicle together with the "primary user" status. The third party is independently responsible for processing the data. Please inquire about the Terms of Use and Data Protection Notices of the third party directly from the third party, e.g., on their website.

In addition, the above personal data may be used in individual cases for development and optimisation purposes of the legitimate interests pursued by us (Article 6 (1) (1) (f) GDPR).

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G. Updates of this Data Protection Notice

This Data Protection Notice will be updated and modified periodically. You can view these updates and modifications at any time at: https://www.audi.de/de/brand/de/tools/navigation/layer/rechtliches/audi-connect-datenschutz.html

Annex 1 – Additional data subject rights and further country-specific information

Australia

Under Australian law, you have the right to

> access;

> rectification;

> lodge a complaint with both AUDI and the Office of the Australian Information Commissioner (“OAIC”) or any other dispute recognition scheme recognised by the OAIC which can be found on the OAIC website www.oaic.gov.au.

> If you are concerned with the way we have handled your personal data, you may lodge a privacy complaint with the Office of the Australian Information Commissioner (“OAIC”). However, it is a requirement of the OAIC that prior to lodging a complaint, you have raised your complaint with us. If you are not satisfied with our response or we fail to provide a response within 30 days of receipt, you can lodge a complaint with the OAIC. The contact details for the OAIC are set out below:

Phone: 1300 363 992

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Fax: (02) 9284 9666

Website: https://www.oaic.gov.au/

Post: GPO Box 5288, Sydney NSW 2001

Canada

Please note

> Personal data may be processed or stored outside of Canada for purposes consistent with this Data Protection Notice. You acknowledge and agree that, as a result, the personal data that is processed or stored or accessed in other jurisdictions may be subject to the laws of those jurisdictions and may be disclosed in response to valid demands or requests from government authorities, courts, or law enforcement in such other countries.

> Under Canadian law, you have the right to

> opt out of information handling practices that are not reasonably necessary to provide the services you've requested. You can exercise this right by contacting using the contact details set out in Sec. B. II.

> be informed of the use by us of technology allowing us to profile, locate or identify you and of the means available to you to activate the functions that allow us to identify, locate or profile you.

> While Audi AG takes the security of personal data seriously and uses industry standard security risks associated with transferring and processing personal data contemplated herein. However, no security or processes are fool proof. If personal data is accessed by third parties, it may lead to phishing attempts to get more information from you and/or identify theft.

> For some of the services described in this Data Protection Notice, we use technology allowing us to locate your position. Please refer to the descriptions of the individual services in section D. "Specific Information about Online Services" for information on whether and to what extent we process location data for the provision of the respective service. To benefit from such technology and to use such services, you might have to first activate the required settings. Please find detailed information on how to activate/deactivate individual services in Sec. C.II. "Privacy Settings" and in your vehicle's MMI.

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Hong Kong

In addition to your rights set out in Sec. B. IV. 8, under the laws of Hong Kong, you may withdraw your consent to the use of your personal data.

In addition to your rights set out in Sec. B. IV. 10 (b), under the laws of Hong Kong, you will be informed at the time of the first communication with you in direct marketing without charge to you.

Japan

Please note regarding data transfers to third countries (Sec. B. VI 13 of this Data Protection Notice):

For transfer of data out of Japan please note that to the extent, recipients are located in EU member states and/or the UK, the Japanese government has recognized the adequacy of the EU's and the UK's personal data protection standards.

To the extent, recipients are located in the U.S., please note the following additional information:

i. Information on the personal data protection system in the U.S. or other non-EU/UK countries, are published by the Personal Information Protection Commission JAPAN (https://www.ppc.go.jp/enforcement/infoprovision/laws/offshore_report_america/)

ii. Information on measures by the recipients to protect personal data: We execute proper contracts to adequately safeguard the protection of personal data at least the same level as required under the EU GDPR.

Please note that you have, under Japanese law, the right to

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- request information on purpose of use;
- request information on security control measures;
- request access;
- request correction, addition or deletion;
- request discontinuance of use or erasure; and
- request explanations on data processing.

Malaysia

Under the laws of Malaysia, you have the right to

- request access to your personal data;
- request correction of your personal data;
- prevent processing likely to cause damage or distress; and
- prevent processing for purposes of direct marketing.

Upon exercising your rights stated above in written form addressed to the contact details listed in section B. II., if you are dissatisfied with our response or we fail to provide a response within 21 days of receipt, you have the right to submit an application to the Personal Data Commissioner to require us to comply with your request. The application to the Per-sonal Data Commissioner can be made to the following address:

Commissioner of Personal Data Protection, 6 th Floor, KKMM Complex Lot 4G9, Persiaran Perdana, Presint 4 Federal Government Administrative Centre 62100 Putrajaya.

In the event of any inconsistencies between the English version and the Bahasa Malaysia version of this Data Protection Notice, the English version shall prevail.

Mexico

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You have the right to:

> access;

> rectify;

> cancel;

> oppose;

> file data protection measures with the Federal Institute for Access to Information and Data Protection;

> request a reconsideration of a decision made via automated decision making in case you are of the opinion that the data processed in this context is (partly) incomplete or incorrect.

New Zealand

Under the laws of New Zealand, you have the right to

> know what personal data is held;

> request for personal data held and access the personal data;

> rectification;

> a response to your request within 20 working days, if you make a request for access to or rectification of your personal information. In limited circumstances, AUDI may extend this 20 working day time limit, but we must tell you the period of the extension and the reasons for the extension.

> lodge a complaint with both AUDI and the Privacy Commissioner. However, it is a requirement that before you can complain to the Privacy Commissioner you must first raise your complaint with AUDI. If you are not satisfied with AUDI's response or you do not receive a response, you can lodge a complaint to the Privacy Commissioner. In general, you should wait at least 30 working days for a response before contacting the Privacy Commissioner to lodge a complaint. Further details on how to make a complaint to the Privacy Commissioner are available on the Privacy Commissioner website at www.privacy.org.nz.

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Singapore

You have statutory rights as provided under Singapore's Personal Data Protection Act 2012, including the rights to

> request access to your personal data;

> request correction of your personal data; and

> withdraw consent to the collection, use or disclosure of your personal data (where applicable), subject to any grounds for the collection, use or disclosure of your personal data without your consent that are required, permitted or authorised or any exceptions that may apply to the obligations above under the Personal Data Protection Act 2012 or any other written laws of Singapore.

South Africa

Personal information means information relating to an identifiable, living, natural person and where it is applicable, an identifiable, existing juristic person.Under South African law, you have the right to

> not have your personal data processed for the purposes of direct marketing by unsolicited electronic communication;

> initiate civil proceedings;

> be informed if your personal information has been compromised;

> be informed, free of charge and before the information is included in a directory, should you be a subscriber to a printed or electronic directory;

> lodge a complaint to the Information Regulator of South Africa by completing the complaint and sending it to POPIAComplaints@inforegulator.org.za. The complaint form is available at https://inforegulator.org.za/wp-content/uploads/2020/07/InfoRegSA-PAIA-Form05-Reg10-1.pdf

.

For further information about your South African data privacy rights, please visit the website of the Information Regulator at https://inforegulator.org.za/.

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Topics

AUDI AG

Services

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Legal notice Legal Whistleblower System Privacy Policy Cookie Policy

Cookie Consent Options

English

Notice: All consumption and emission values are based on the characteristics of the German market.

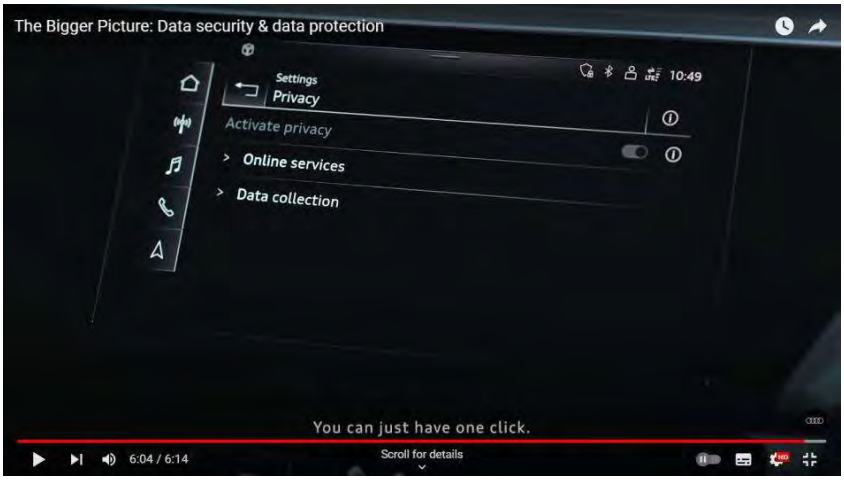
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Exhibit AP

Title- The Bigger Picture Data security & data protection

Snapshots:



Source: https://www.youtube.com/watch?v=Aock3u4bWa8

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Exhibit AQ

Title- Where is SD Card Slot in AUDI A3 8V (2012 – 2020) How to Find SD Card Slot

Snapshots:



Source: https://www.youtube.com/watch?v=FG3JGYiuArE

Technical Service Bulletin

91 How to update the MMI MIB navigation map - potential customer concerns

91 19 23 2037809/5 December 20, 2019. Supersedes Technical Service Bulletin Group 91 number 19-74 dated August 5, 2019 for reasons listed below.

Model(s)	Year	VIN Range	Vehicle-Specific Equipment
A3	2015 - 2021	All	With MIB1 or MIB2
A4, Q7, and R8	2017 - 2021	All	With MIB2
A5, Q5, and SQ5	2018 - 2021	All	With MIB2
TT, TTS, TTRS, and Roadster	2016 - 2021	All	With MIB2
A6, A7, A8, Q3, Q8, and Audi e-tron quattro	2019 - 2021	All	With MIB2+

Condition

REVISION HISTORY		
Revision	**Date**	**Purpose**
5	-	Revised *Condition* (Updated website link) Revised *Technical Background* (Updated content)
4	08/05/2019	Revised header (Added model years) Revised *Technical Background* (Added new releases)
3	12/20/2017	Revised header data (Added models, model years, and attachment to describe update cycle and activation) Revised *Technical Background* (Added note of 3yr/5 free updates and added Map Release Schedules/Names)

The customer states of one of the following concerns:

- The navigation map does not show the latest roads or points of interest.
- The map download provided by the myAudi website (www.audiusa.com/myAudi) cannot be performed.
- The customer does not know how to obtain the data or cannot perform the update after downloading the data.
- The MMI is slow to respond or freezes during the map update.

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- For vehicles with MIB2, the MMI over-the-air (OTA) map update does not allow for a full map update and shows greyed-out regions.
- The customer is concerned that the OTA map update will consume too much data from the Audi connect data subscription.

Technical Background

The new MIB navigation system is the first system that allows the customer to update the vehicle's navigation system on their own. The map data is available on the myAudi website (www.audiusa.com/myAudi) for download or available in the MMI via an OTA update. For the 2015-2016 Audi A3 with MIB1, there is no OTA option in the MMI, thus the map data can only be updated using the SD card method.

For MIB1 & MIB2 vehicles, map updates are free for the first three years after the ***production date of the vehicle***. The vehicle is automatically activated from the factory to allow the customer to update the MMI navigation with the next five releases within the next three years. This means the customer can attempt to update the MMI with the same release as many times as they want. Release schedules for map updates are approximately CW22 and CW45 of each year.

The customer can update the MMI as many times as they like during the current release period. For instance, if the customer decides to perform the partial update via the Over-the-Air method in the MMI, then the customer can decide later to perform the complete update using the same map data for the current release for free. This only counts as a single update since the update data is from the same release. The five updates are related to the release schedules and not the attempts the user makes to update the MMI.

Once the period of three years after the vehicle's production date has passed, map updates will no longer work in the MMI. The last available update for the customer's car will always remain available for download via the myAudi portal.

Customers will be able to purchase activations via Audi accessories to allow the MMI to be updated to the latest map update. This activation will allow the current release and the forthcoming next release to be available to the customer (see attachment "MIB Map Update Strategy.pdf"). Please talk to your parts department to find out which activations are available for purchase by the customer. The dealer can purchase the map data on an SD card or download it from the myAudi portal. The customer must **NEVER** be charged for the map data on the SD card. The dealer should consider this as a shop tool and purchase it for the service department to use. The customer only purchases the activation documentation to enable the map install.

The current release schedule for map updates:

Release Schedule	Navigation Map Release Name
CW22/15	NAR 2015/2016
CW45/15	NAR 2016
CW22/16	NAR 2016/2017
CW45/16	NAR 2017

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CW22/17	NAR 2017/2018
CW45/17	NAR 2018
CW22/18	NAR 2018/2019
CW45/18	NAR 2019
CW22/19	NAR 2019/2020
CW45/19	NAR 2020
CW22/20	NAR 2020/2021

For MIB2+ & MIB3 infotainment systems:

- Over-the-air navigation map updates are also available in the MMI system. Audi has designed the OTA system to track the data used separately from the data used in the customer's existing Audi connect subscription.
- The update can be accessed in two different areas of the MMI:
  - *Menu >> Audi connect >> Online map update >> Start map update now >> Online update*.
  - *Menu >> Settings >> Left Option >> System maintenance >> System update >> Online update*.
- The customer will not be billed for the data used when performing the OTA map update, but the customer must have an active Audi connect subscription to use the OTA map update feature in the MMI.
- The OTA update for MIB2+ and MIB3 systems are designed to automatically choose the regions to be updated based on the customer's normal areas of driving. To perform a complete NAR (North American Region) update, the customer or dealer will always need to download the complete data file using a computer. For certain updates, the complete NAR map update may also be available through the service SD card. This SD card can be ordered with the part number listed in ETKA for the North American Region (NAR). No SVM activation is required because the MMI is already pre-activated for a 5 year period for MIB2+ and a 10 year period for MIB3 which is based on the vehicle's production date. After this period (even if no updates were performed), an SVM activation will be required to update the Navigation database (currently not available for purchase). The customer will need to purchase the activation documentation once it is made available by Audi of America.

For MIB2 infotainment systems:

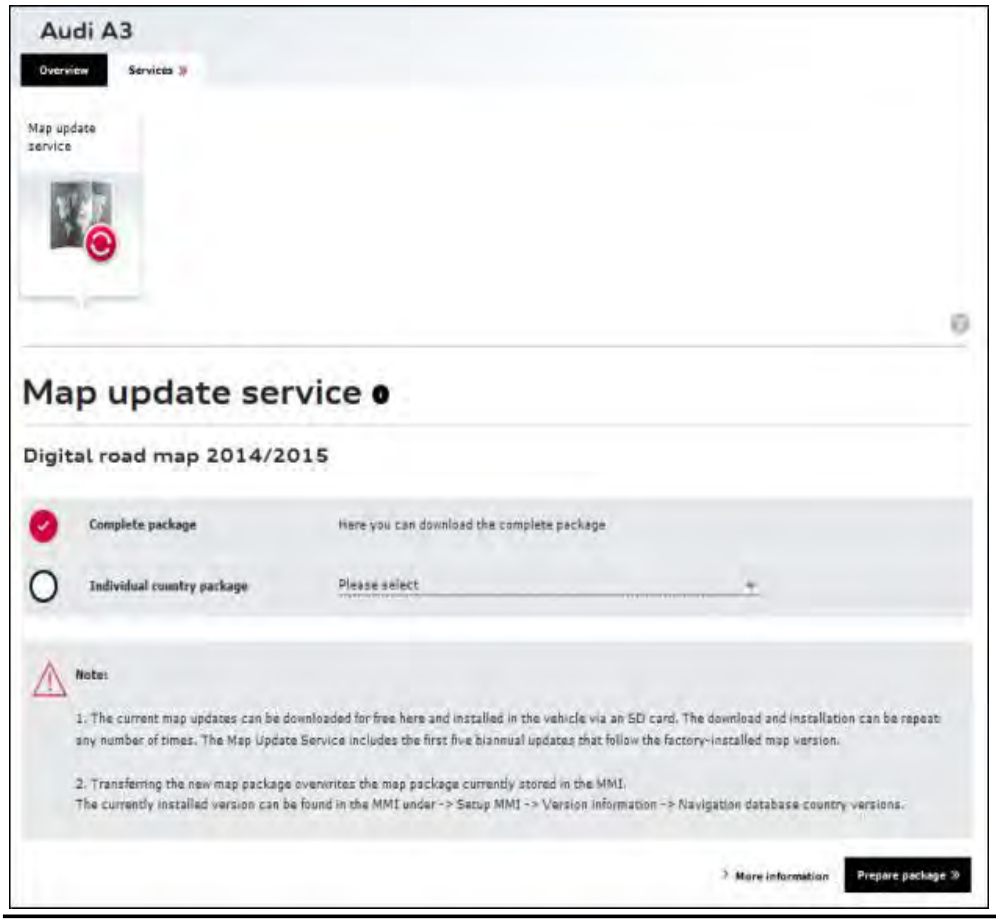
- Over-the-air navigation map updates are also available in the MMI system. Audi has designed the OTA system to track the data used separately from the data used in the customer's existing Audi connect subscription.
- For the model year 2016 A6 and A7 Product Improvement vehicles with MIB2 Navigation, the update can be accessed in the MMI by going to *Menu >> Setup MMI >> System Update >> Online Update.*
- For all other vehicles with MIB2 Navigation, the update can be accessed in two different areas of the MMI:
  - *Menu >> Audi connect >> Online map update >> Start map update now >> Online update*.
  - *Menu >> Settings >> Left Option >> System maintenance >> System update >> Online update*.

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- The customer will not be billed for the data used when performing the OTA map update, but the customer must have an active Audi connect subscription to use the OTA map update feature in the MMI.
- The OTA update for MIB2 is designed only to allow a limited number of regions to be updated in the vehicle. To perform a complete NAR (North American Region) update, the customer or dealer will always need to download the complete data using a computer. For certain updates, the complete NAR map update may also be available through the service SD card. This SD card can be ordered with the part number listed in ETKA for the North American Region (NAR). No SVM activation is required because the MMI is already pre-activated for a 2½ year period, or five consecutive updates, from the production date of the vehicle. After this period (even if no updates were performed), an SVM activation will be required to update the Navigation database. The customer will need to purchase the activation documentation.

For all MIB infotainment systems, map updates via myAudi are available for download:

- The customer must register with the myAudi website (my.audiusa.com).
- The customer will need to add the vehicle VIN that supports MIB navigation to their myAudi profile on the website in order to access the “Map update service” (Figure 1).



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Figure 1. *Map update service on the myAudi website (my.audiusa.com).*

- The vehicle must have MIB navigation for the option in the myAudi website to be activated. Vehicles with MMI3G+, for instance, will not show this option in the myAudi portal.
- To download the full map update, the customer must have an SD card that indicates it has *at least* 16GB of usable space when viewed within the PC file system. The full update is typically 14GB - 16GB in size. An SD card larger than 16GB will most likely be required.
- The customer can also choose a partial map update (only a limited number of US states). When doing so, the customer can use an SD card with less available space, as a typical partial update is 3GB - 4GB in size.

  Tip: A blank 16GB SD card may actually contain slightly less than 16GB of usable space, so it is possible that a larger SD card will be needed for a full map update.
- The SD card must be formatted to FAT/FAT32/exFAT. Mac-formatted SD cards will not work in the MMI MIB main unit. SD card types are:
  - 4GB and less: SD (FAT/FAT32).
  - 4GB/8GB/16GB: SDHC (FAT/FAT32).
  - 16GB/32GB/64GB and higher: SDXC (exFAT only; will work with MIB but not with MMI3G+).

During the map update process, the performance of the MMI system may be slow, with lagging or freezing during screen transitions or after a selection is made. These performance limitations should only occur during the map update, and no repairs should be made to correct them. A file transfer icon appears when the map update is running the background (Figure 2).

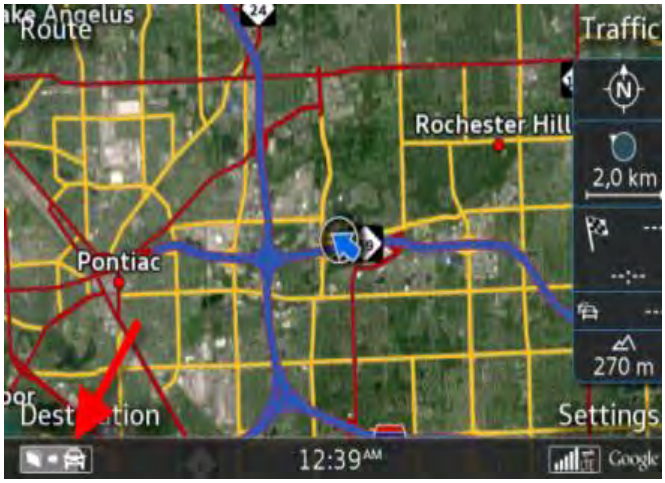


Figure 2. *The background map update is indicated by the file transfer icon.*

Production Solution

Not applicable.

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Technical Service Bulletin

Service

1. The map download is performed with a Java-based download manager (Figure 3). Ask the customer if the latest version of Java is installed on his or her computer. If the latest version of Java is not installed, it is possible that the map update cannot be performed.

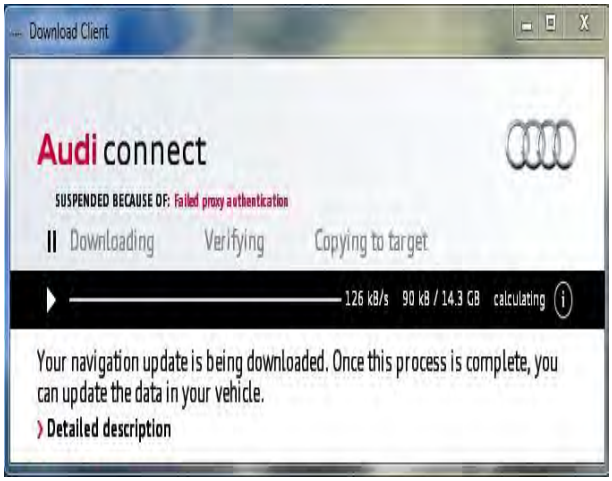


Figure 3. *Download manager.*

2. If the error message pictured at right (Figure 4) appears, it is because the Java download client cannot initiate a connection to the download site, which is indicative of a local issue with the customer's PC or ISP.

   If this error message appears, ask the customer to do the following:

   - Turn off all anti-virus software, which could be blocking the java application. Or, add the program to the exception list for the anti-virus software.
   - Turn off any firewalls in the PC or in the router hardware.
   - Try connecting the PC directly to the cable or DSL modem with the Ethernet cable, to bypass the router.
   - Have the customer contact his or her ISP or local IT support.

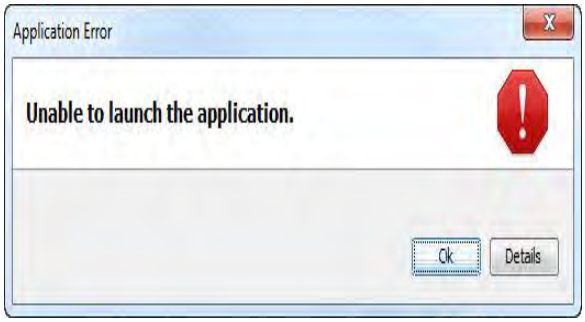


Figure 4. *Error message.*

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3. After the map download client is successfully downloaded to the customer's computer, the map download client will start the map download process. The download client will ask where the data should be stored. Advise the customer to save the data to the root directory of the SD card. If the data is saved inside a folder on the SD card, the update may not be seen by the main unit in the vehicle.

   If the computer loses its internet connection, the customer will be required to reenter his or her myAudi password to restart the download (Figure 5). The map download client automatically saves all progress if the computer loses its internet connection.

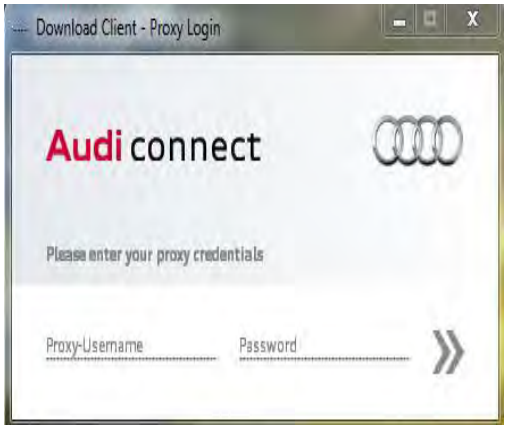


Figure 5. *Login prompt for my.audiusa.com.*

4. After the map data has successfully downloaded to the SD card, the SD card should be inserted into the MMI main unit. Once the SD card is inserted into the MMI main unit, the customer must initiate the download (Figure 6) function in the MMI.

   For A3/A6/A7:

   MENU >> Setup MMI >> System Update.

   For TT3/R8NF/Q7NF/B9 A4:

   MENU >> Settings >> Left Option >> System maintenance > >System update.

   The update does not start automatically when the SD card is inserted.

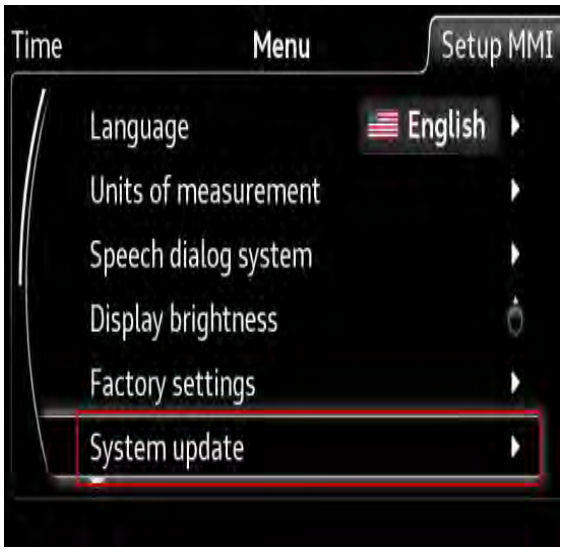


Figure 6. *MMI option for customer map update.*

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5. If the data was downloaded to the SD card correctly, the SD card will be highlighted in white (Figure 7). If there is no SD card highlighted, ask the customer to troubleshoot the issue (check the formatting and verify that all the data is in the root directory of the media).

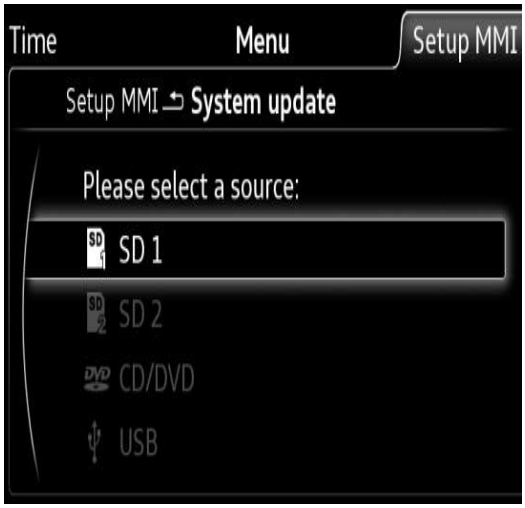


Figure 7. *SD card that contains the map update data.*

6. The new version of the map data will be indicated on the MMI screen. Selecting “Start update” begins the update (Figure 8).

   The MMI will automatically perform the update in the background, which is indicated by the file transfer icon in the lower left-hand side of the MMI screen (Figure 9).

   Tell the customer that the vehicle can be shut off during the update process, but the SD card (or other update media) should never be removed from the MMI main unit. If the vehicle is turned off during the update process, the MMI will continue to perform the update in the background for approximately 30 minutes. The update will automatically begin again on the next ignition cycle. The complete process can take about 60-90 minutes with an SD card. If the customer chooses to use a DVD or a USB drive via AMI, then the update may take considerably longer.

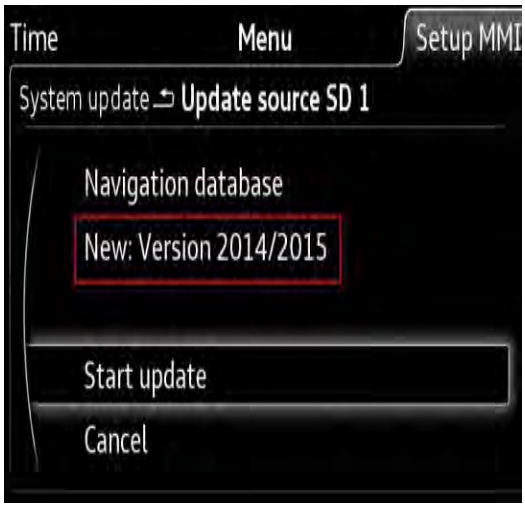


Figure 8. *Selecting “Start update”.*

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Figure 9. *The background update is indicated by the file transfer icon.*

7. After the update is complete, the icon on the lower left-hand side of the MMI screen will disappear. Additionally, a confirmation can be seen in the MMI system update screen (Figure 10).



Figure 10. *Successful update screen.*

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8. The update can be verified under the MMI Version Information screen (Figure 11).

   For A3/A6/A7:

   MENU >> Setup MMI >> Version Information.

   For TT3/R8NF/Q7NF/B9 A4:

   MENU >> Settings >> Left Option >> System maintenance >> Version Information.

   The MMI system will allow the same map data to be overwritten at any time, which means that if the customer puts the same SD card with the same map data into the main unit after a successfully completed map update, the MMI will still indicate that a map update is available. This does not directly indicate the map update was incomplete; the customer must review the "Version Information" data and verify that the latest calendar year listing is shown under each region (Figure 11).

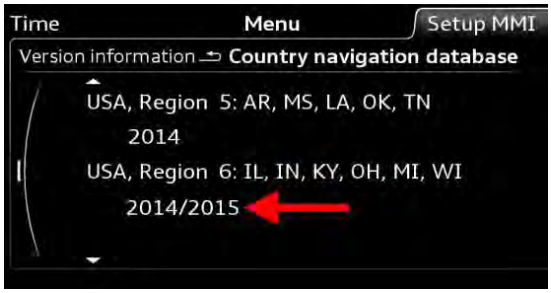


Figure 11. *The updated map regions will be indicated by the calendar year listing under the region. In this figure, only "USA, Region 6" was updated.*

Warranty

This TSB is informational only and not applicable to any Audi Warranty.

Additional Information

All parts and service references provided in this TSB (2037809) are subject to change and/or removal. Always check with your Parts Department and/or ETKA for the latest information and parts bulletins. Please check the Repair Manual for fasteners, bolts, nuts, and screws that require replacement during the repair.

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Audi at 2015 CES

- **Audi hears the word**
- **From racetrack to road – piloted driving**
- **New cockpit architecture in the Audi Q7**

January 06, 2015 | Las Vegas, NV -- A four?core processor processing eight billion operations per second. A virtual tachometer with a needle that is rendered anew 60 times per second to ensure absolutely fluid motion. 3D sound to match a concert hall and appearing to come from every direction, an Audi tablet as a multimedia control panel and simple wireless communication between your mobile devices and your car all demonstrate how diverse the future of the automobile is at Audi. All this and convenience, too: piloted parking and innovative Audi wireless charging (AWC) technology pave the way for electric mobility. A laser headlight shining ahead hundreds of feet and a car lapping the famous Hockenheim speedway at 240 km/h *(149.1 mph)* without a driver – Audi is a leading and driving force in all technology areas relating to electronics and electrics. At CES in Las Vegas, the world's most important electronics exhibition, Audi makes a splash with a host of new technologies

Even today, many customers view their car as more than just a vehicle – it is a "mobile device". Audi drives forward networking of its models both inside and outside the car. At CES, Audi presents a wide range of innovations in the technology fields of controls and displays, infotainment, connectivity and lighting technology, in driver assistance systems and in piloted driving.

Audi's new hardware and software solutions are flexible and intelligent, and they provide added operating comfort. Take the new Audi TT* and the new Audi Q7*: here, all the driver needs to do is to issue the voice command "take me to the nearest Italian restaurant" and the navigation system immediately will display the corresponding route. This big SUV's new all?in?touch MMI will let the driver scroll and zoom as on a smartphone. Every entry will trigger a haptic feedback.

Audi connect, a rich portfolio of networked applications, also offers new solutions. In the new Audi Q7, the driver can use a smartphone to link up with the software environment of Apple Car Play and Android Auto. The system also provides the driver with access to Napster's and Aupeo!'s music worlds and to online updates of navigational maps. A virtual cockpit shows all of the car's displays in the Audi TT (standard) and the Audi Q7 (optional). This fascinating digital instrument combination boasts elaborate 3D graphics and animations as well as great scope for customization.

Driver assistance systems is another area where Audi opens a new chapter in the new Audi Q7. Solutions such as the Predictive Efficiency Assistant and adaptive cruise control including congestion assistant point the way towards upcoming piloted driving technology. The brand recently showed how much emotional appeal this can have when the driverless Audi RS 7 piloted driving concept raced

Las Vegas. The car's zFAS driver assistance controller will upload data collected during the journey to the Cloud where it will be processed, then transmitted back to the car, enabling the car to permanently expand its data repository and making it an intelligent and adaptive vehicle.

Four spectacular cars round off Audi's presence in Las Vegas. They are the standard TT Roadster, RS 7 Sportback* and R8 LMX as well as the Audi prologue piloted driving showcar, which was purpose-built for CES.

Summary

Audi at 2015 CES

"Next chapter" is the motto for Audi's presence at the Consumer Electronics Show (CES), which will be held in Las Vegas, Nevada, from January 6ththrough 9th, 2015. At this most important electronics fair in the world, Audi, the brand with the four rings, will present its available technology and its projects for tomorrow.

Audi's CES presence is centered on the car's communication with its surroundings. Focus topics include piloted driving, new Audi connect solutions, new infotainment modules, control and display concepts and new developments in lighting technology. Among the highlights of Audi's CES presence are the hybrid-powered Audi prologue piloted driving showcar and the interior model of the new Audi Q7, itself debuting at the Detroit auto show

"Digitalization and networking in all areas are the megatrends of the present," says Prof. Dr. Ulrich Hackenberg, board member for technical development at AUDI AG. "The car is becoming a mobile device on four wheels. Connectivity is the key to the future and a crucial area of our development work. We have continually pioneered the use of electronic technologies for years now."

Extremely convenient: driver assistance system and piloted driving

Driver assistance systems make driving more pleasant, safer and more efficient. They are available in almost all of Audi's model lines. Debuting in the Audi Q7, to be launched in 2015, are groundbreaking solutions such as the Predictive Efficiency Assistant, the Trailer Assistant and adaptive cruise control including a congestion assistant.

For the company's next big step, Audi will introduce its new technologies for piloted driving before the end of this decade. These can take over driving in certain situations if the driver wishes them to do so. Audi has been performing pioneering work in this area for years and shown how thrilling piloted driving can be. In October 2014, the Audi RS 7 piloted driving concept lapped the Grand Prix circuit at Hockenheim at speeds up to 240 km/h *(149.1 mph)* with no driver on board, making it the sportiest piloted driving car in the world.

Contributing to Audi's edge in piloted driving is the central driver assistance controller (zFAS), which processes information gathered by the sensors to create a detailed impression of the car's surroundings. Audi connect's superfast online connection will route this data to a Cloud?based IT backend. There, the data will be processed using machine learning algorithms and artificial intelligence before it is transmitted back to the car. The car thus continually expands its intelligence as it drives, ceaselessly improving its performance in complex situations. At the same time, other users of this technology can also benefit from this accumulation of information.

Farsighted: Audi's lighting innovations

Audi has been a leader in automobile lighting technology for years. Groundbreaking innovations available in several current model lines include matrix LED headlights for intelligent and flexible illumination of the road surface as well as dynamic turning signals.

Another world first is the laser highbeam available in Audi's high-end R8 LMX edition model. Its range is more than 500 feet. At CES, Audi will introduce Audi Matrix laser technology as the next step, a laser light providing high-resolution and finely tuned illumination of the roadway ahead. Another innovation is construction area lighting. This projects two markedly bright light strips onto the road, thus visualizing the car's width.

Attractive and intuitive: controls and displays in the TT and the Q7

Clear and intuitive operation has always been a strength of Audi. At CES, the brand will show the most recent advances in control and display technology as available in the new Audi TT and the upcoming Audi Q7.

One highlight is the Audi virtual cockpit. This fully?digital combined instrument provides the driver with minutely rendered, brilliant 3D graphics of all information and offers different display modes to choose from on its 12.3?inch TFT monitor. Audi virtual cockpit is powered by the T 30 graphics processor made by Audi's cooperation partner NVDIA.

Audi will also present innovations in control technology The TT and the new Q7 will feature MMI terminals with an all-new interface logic. This will emulate the concept of modern smartphones, where flat hierarchies replace sprawling menu trees.

Four elements: the traditional push-turn knob, the multifunction steering wheel, natural voice operation accommodating everyday speech, and a touchpad accepting signs and multi-finger gestures, are available to control the system's numerous functions, which include telephone, radio, media and navigation. In the Audi TT, the MMI all?in?touch's interface is on the knob, while in the Audi Q7, it is a separate surface. The system provides haptic feedback after every entry.

All-round networking: Audi connect

A central hardware element, the Audi connect module, connects the car with the internet via LTE, the fastest available transmission standard. The car's passengers can connect their mobile devices to a WLAN hotspot, which also provides the driver with customized online in-car services from the Audi connect portfolio. One of the innovations in this area is Online Media Streaming, which offers access to Napster and Aupeo! music services, and online updating of the navigational map.

Additional services will be available in the new Audi Q7, among them the Audi smartphone interface. Depending on whether a customer connects an iOS or an Android device, the interface will call up the Apple Car Play or Android Auto platform onto the car's MMI monitor. At the core of the offering is an enormous selection of music titles. In addition, both platforms provide navigation and messaging functions and appointment reminders.

Future car?to?X technologies are another key element of Audi connect. These will enable Audi models to interact with traffic lights in a city to navigate traffic faster and more efficiently. Another solution will permit cashless payment in a parking garage or at a kerbside meter, a third one will identify speed limits and spot dangers and also relay the corresponding information to other cars.

Another innovation presented by Audi at CES is the Audi mobile key. Here, a smartphone or a smartwatch provides access to the vehicle, making them highly flexible complements to existing keys. The mobile key uses Near Field Communication (NFC), which is available even when the mobile device's battery is empty.

Powered by NVIDIA: infotainment

At CES, Audi will be showing attractive innovations in infotainment. One of these can be seen in the Audi phone box in the new Q7, which permits easy pairing of a smartphone. It can now inductively charge compatible phones under the Qi standard.

Another first is 3D sound. In the new Audi Q7, the premium sound systems from Bose and Bang & Olufsen integrate additional speakers which open up height as a spatial dimension. A sophisticated algorithm extracts information for the third dimension from conventional stereo or 5.1 recordings and processes it for reproduction via the speaker array.

Audi to set new standards in infotainment with its Modular Infotainment Matrix and its technology network. The brand's revolutionary approach involving a modularized electronic architecture brings Audi's development cycles closer to those in the fast-paced consumer electronics business.

2012 saw the debut of the Modular Infotainment Matrix (MIB) with an NVIDIA T 20 chip as its heart in the Audi A3*. A mere one-and-a-half years later, the MIB's second stage has been deployed in the Audi TT and in the new Audi A6* and A7 Sportback*. Again, an NVIDIA processor plays a key role. The T 30 is a quad-core chip running a 3D graphic program from specialist software manufacturer. Rightward to render brilliant graphics on two displays simultaneously. Thanks to the matrix' modular structure, Audi can keep it continuously up-to-date and quickly integrate attractive innovations from consumer electronics.

high-class and robust. Of course, it can also be used on a WLAN outside the car.

Audi as driving force: electronic architecture

To expand its lead in hardware, Audi set up the Progressive Semi Conductor Program (PSCP) in late 2010. Under the program, Audi directly involves not just its system suppliers but also semiconductor makers. It is a key factor for future innovations.

As in hardware, so Audi develops solutions of its own in software – a task falling mainly to e.solutions GmbH, a subsidiary.

In vehicle electrics, Audi has developed a new, scalable architecture, the 48 volt onboard partial network. It will soon complement conventional 12 volt networks and permit deployment of new high-performance electric components. These will include an electric compressor as a supplementary turbocharger or an extra-strong generator capable of recuperating a higher amount of kinetic energy and, when used as a motor, transforming the car's powertrain into an efficient mild hybrid.

Future power: electromobility – charging without a cable

Under the name e?tron, Audi resolutely advances the electrification of the powertrain. One of many aspects in this is contactless charging of all- or part-electric e?tron models. Audi is putting great effort into induction-based supply of energy, known as Audi wireless charging (AWC).

The brand has developed a power matrix offering numerous options so as to provide each customer with a solution filling his or her precise needs. Approaches range from a 48?volt onboard network to plug-in hybrid powertrains. These marry the advantages of a combustion engine with those of electric traction, providing the customer with long range, power and efficiency all at the same time.

The launch of the A3 Sportback e?tron* in 2014 was Audi's successful entrance into plug?in hybrid technology. This will now be swiftly rolled out across the model range, with the medium and top segment next in line. A new e?tron model is set for introduction every year. At the same time, Audi is working on purely-electric vehicles with high-capacity batteries and powerful motors requiring no compromises in terms of range and usability.

A look into the future: Audi models at CES

Four spectacular cars round off Audi's presence in Las Vegas. They are the TT Roadster, RS 7 Sportback and R8 LMX production models as well as the Audi prologue piloted driving showcar which was purpose-built for CES.

The showcar expresses progressive technology in its entire character. Its brightly lit interior fuses the car's architecture with the display and control concept to create a novel unit. The entire front of the instrument is executed as a three-part touch display. Add to this an innovative, ultrathin and flexible OLED (organic light-emitting diode) display.

– End –

Fuel consumption of the models named above:

Audi TT:

Combined fuel consumption in l/100 km: 7.5 – 4.2** *(31.4 – 56.0 US mpg)*;

Combined CO_2 emissions in g/km: 174 – 110** *(280.0 – 177.0 g/mi)*

Audi TT Roadster:

Combined fuel consumption in l/100 km: 7.5 – 4.2** *(31.4 – 56.0 US mpg)*;

Combined CO_2 emissions in g/km: 174 – 114** *(280.0 – 183.5 g/mi)*

Audi Q7:

Combined fuel consumption in l/100 km: 10.7 – 7.2** *(22.0 – 32.7 US mpg)*;

Combined CO_2 emissions in g/km: 249 – 189** *(400.7 – 304.2 g/mi)*

Audi A7 Sportback:

Combined fuel consumption in l/100 km: 9.5 – 4.7** *(24.8 – 50.1 US mpg)*;

Combined CO_2 emissions in g/km: 221 – 122** *(355.7 – 196.3 g/mi)*

Audi RS 7 Sportback:

Combined fuel consumption in l/100 km: 9.5** *(24.8 US mpg)*;

Combined CO_2 emissions in g/km: 221** *(355.7 g/mi)*

Audi R8 LMX

Audi A3:

Combined fuel consumption in l/100 km: 8.3 – 3.2**; (*28.3 - 73.5 US mpg*)

Combined CO_2 emissions in g/km: 194 – 35** *(312.2 – 56.3 g/mi)*

Audi A6:

Combined fuel consumption in l/100 km: 9.6 – 4.2** *(24.5 – 56.0 US mpg)*;

Combined CO_2 emissions in g/km: 224 – 109 *(360.5– 175.4 g/mi)***

Audi A3 Sportback e-tron:

Combined fuel consumption in l/100 km: 1.7 – 1.5** *(138.4 – 156.8 US mpg)*;

Combined electricity consumption in Wh/km: 124 – 114**

Combined CO_2 emissions in g/km: 39 – 35 *(62.8 – 56.3 g/mi)***

**The fuel consumption and the CO_2 emissions of a vehicle vary due to the choice of wheels and tires. They not only depend on the efficient utilization of the fuel by the vehicle, but are also influenced by driving behavior and other non-technical factors.

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Exhibit AT

Title- How to update for free Audi MMI Maps GPS Navigation (For almost all Audi Models) - step by step

Snapshots:



Source: https://www.youtube.com/watch?v=vJIlznH4F3U

Exhibit AU

Title- MyAudi Logging into Your Vehicle

Snapshots:



Source: https://www.youtube.com/watch?v=8v_MPhp5CRE

Shop 2019 Audi A8 Tire Pressure Monitoring System (TPMS) Sensor - OEM Audi Part # 5Q0907275F (5Q0-907-275-F, 5Q0907275B)

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L Sedan (/p/Audi_2019_A8-L-Sedan/Tire-Pressure-Monitoring-System-TPMS-Sensor/96955915/5Q0907275F.html)

Tire Pressure Monitoring System (TPMS) Sensor

Part Number: **5Q0907275F**

Supersession(s): **5Q0-907-275-F; 5Q0907275B**



(https://images.simplepart.com/images/parts/vw/fullsize/5Q0907275F.jpg)



Tire Pressure Monitoring System (TPMS) Sensor.
433 MHz. Direct Tire Pressure Monitoring System. From 03/30/2020. From 06/01/2020. From 10/19/2020. Sensor used to Monitor the Tire Pressure. To 03/30/2020. To 06/01/2020. To 10/19/2020. Included with: Repair kit.

Tire Pressure Monitoring System Sensor

19" WHEEL. 20" WHEEL. 2015. 2015-17. 21" WHEEL. 22" WHEEL. A3. A3 Quattro. Arteon. E-tron GT. RS e-tron GT. RS3. RS5; 433 mhz; From 06/01/20. RS5; 433 mhz; To 06/01/20. S3. Tiguan; From 3/30/20. Tiguan; To 3/29/20. Touareg; 433MHZ. TPMS SENSOR. TT RS Quattro. W/O INDIRECT SYSTEM, from 10/19/2020. W/O INDIRECT SYSTEM, to 10/19/2020.

Tire Pressure Monitoring Sensor - Repair or Replace

If your TPMS sensor has failed or its battery has died, the tire pressure monitoring system warning light will come

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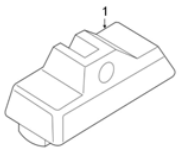
on. To have your 2019 Audi A8 expertly repaired, count on the experts at your Audi service department to perform necessary repairs.
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#1

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Brilliant black, 250 L Roof Box

4K0071200Y9B **$ 925.00**



Windshield washer fluid, 32oz concentrate. A solvent-surfactant.

ZAW096311BDSP **$ 20.00**



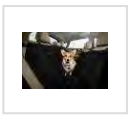
Gecko Air Freshener - black

000087009AT **$ 25.00**



Audi e-Mountain Bike - Small

4J3050209C **$ 5,450.00**



Pet Hammock

ZAW061680 **$ 255.00**



Customer Assistance Kit (https://w

ZAW093059 **$ 85.00**

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Audi cargo box. The Audi Cargo Box is a.



Audi singleframe fragrance dispenser Black

80A087009D $ 30.00

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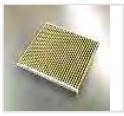
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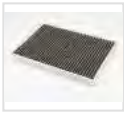
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Wheel Hub (Front, Rear)

8W0407613 $ 613.59

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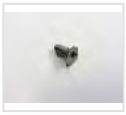
Cabin Air Filter

4M0819439B $ 53.48

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Screw. Rotor. Brake. Bolt. Drum. Brake Drum Screw. Disc.

N10648301 **$ 3.18**

(/p/Audi_2019_A8/Screw-Rotor-Brake-Bolt-Drum-Brake-Drum-Screw-Disc/48723203/N10648301.html?clickSource=relatedProduct)



Valve. Incl.Cap and Nut. Tire.

420601361A **$ 109.42**

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Audi offers first production animated Digital Matrix LED headlights in 2021 Audi e-tron Sportback and e-tron SUV

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- **Audi demonstrates leadership role with next-generation lighting technology**
- **Comprised of 1.3 million micromirrors per headlight, Digital Matrix LED headlights operate like movie projectors on the road**
- **At introduction, headlights offer five unique welcome and exit lighting signatures with motion graphics**

HERNDON, Va., Oct. 14, 2020 – As lighting technology advances, Audi continues leading the way, now offering Digital Matrix LED (DML) headlights as optional equipment in 2021 e-tron and e-tron Sportback models. This is the first time DML headlights have been mass-produced for a production vehicle.

Comprised of 1.3 million micromirrors per headlight, DML headlights essentially operate like movie projectors, emitting tiny unique particles or adaptable light. At market introduction, this lighting technology offers a selection of five different welcome/leaving animations when the vehicle is parked, each with unique motion graphics and text selected through a vehicle's MMI touchscreen display. With DML headlights – and other innovations like a capacitive-touch steering wheel and Integrated Toll Module® technology – the Audi e-tron lineup continues to lead the brand in offering the latest technologies to customers.

Audi's innovate lighting technology provides customers with a confidence-inspiring drive that can illuminate their road ahead. Beyond the welcome/leaving animations currently available for U.S. vehicles, the full feature set of DML headlights includes:

- A 50-meter "light carpet" that is designed to keep light within the driver's lane and extends the carpet left or right when changing lanes and helps to avoid a "blinding" effect for oncoming traffic
- Low-beam curved lighting that bends below oncoming traffic and can help illuminate people or objects on the side of the road, which are otherwise difficult to detect
- Electrostatically controlled micromirrors that can adjust light beam pixels up to 5,000 times per second
- On-ground light arrows that place the vehicle's tires within its lane

Although the total functionality of Digital Matrix LED headlights is not yet fully available in the U.S., the brand continues to work with government officials and authorities in an effort to do so for U.S. consumers.

To see the full functionality of the European-specification DML headlights in various conditions, check it out here.

The 2021 Audi e-tron and e-tron Sportback are available at dealerships nationwide starting this month.

– End –

Documents

Audi offers first production animated Digital Matrix LED headlights in 2021 Audi e-tron Sportback and e-tron SUV

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Media contact

Mark Dahncke
Email: mark.dahncke@audi.com

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Audi of America, Inc. and its U.S. dealers offer a full line of German-engineered luxury vehicles. AUDI AG is among the most successful luxury automotive brands, delivering about 1.845 million vehicles globally in 2019. In the U.S., Audi of America sold just over 224,000 vehicles in 2019 and launched the brand's first fully electric vehicle, the Audi e-tron – one of four fully electric models coming to the U.S. market in the next two years. Globally, the brand aims to be CO2 neutral by 2050. Visit audiusa.com or media.audiusa.com for more information regarding Audi vehicles and business topics.

When using the MMI touch display, always pay careful attention to the road, and do not drive while distracted. See Owner's Manual for further details, and important limitations.

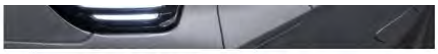
Integrated Toll Module requires registration and paid subscription with BestPass, Inc. Subscription fee does not cover individual tolls. Coverage area limited. See bestpass.com for details.

Images

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2020 Audi e-tron Sportback



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Audi e-tron Sportback 55 quattro



Audi e-tron Sportback 55 quattro



Audi e-tron Sportback 55 quattro



Digital matrix LED module

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Embedded Systems

Audi A8 with Level 3 self-drive and LiDAR technology

By | Thursday, May 21, 2020

SHARES

By Junko Yoshida and Maurizio Di Paolo Emilio

When Audi launched its redesigned A8 sedan at the end of 2017, the company touted it as the auto industry's first Level 3 car. The entire automotive industry is still contending with technological issues and unfamiliar cost structures that confronted Audi back then. The teardown conducted by System Plus provides valuable insights into a few questions:

- What does it take to pull off a Level 3 car?
- What's included in the A8 sensor suite?
- How much processing power does a Level 3 car require?
- Is it a GPU, SoC, CPU, or FPGA driving Audi's central driver-assistance controller called zFAS?
- How much does zFAS cost?

It can be instructive how Audi achieved Level 3 functionality using chips that had been on the market and were already tried and tested in other applications, especially in comparison with Tesla, which two years later (2019) launched its "Full Self Driving Computer" board that relies heavily on two home-grown self-driving chips.

System Plus teardowns include analyses that go beyond simply reverse-engineering and identifying hardware elements. The firm also performs "reverse costing" — estimating how much it must have cost a company to source specific components and build its products. System Plus's reverse-costing of the A8 shows that 60% of the cost of zFAS — estimated to be $290 — is driven by the cost of semiconductors. This is hardly startling, being that 80% to 85% of the content in modern cars is electronics. That wasn't the startling thing about the costs, however.

Margin

The real shocker to car OEMs, said Romain Fraux, CEO at System Plus Consulting, is that no automotive companies were mentally prepared to pay a 50% margin per component — as charged by Nvidia, Intel, and others for their flagship chip solutions. This opened the door to a whole new world for automotive OEMs, prompting them to rethink the calculus of highly automated vehicles.

The System Plus teardown/cost estimate does not include the cost of software development for automated vehicles. However, the use of an FPGA (Altera Cyclone) inside zFAS shows Audi's attempt to preserve the own software assets that it had already developed.

Over the last 18 months, some leading OEMs have begun hinting their desire to design their own autonomous vehicle chips, à la Tesla. This approach enables them to control their own destiny in terms of hardware and software development. However, given the high cost of chip designs, it's far from clear if car OEMs are better off going it alone.

Another important aspect of the A8 is that Audi brought to market the first commercial vehicle, among all the car OEMs, to show a path to autonomy.





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At the time of the A8 launch, the technology inside the vehicle was pitched as an "automated driving breakthrough," featuring a system called Traffic Jam Pilot. When activated, Traffic Jam Pilot supposedly relieves human drivers from the ordeal of negotiating stop-and-go traffic.

But these best-laid plans collided with a "handoff problem" (to alert and engage a distracted human when the computer falters) that has dogged the very concept of the Level 3 vehicles since the beginning.

Today, A8s are on the streets, but none have its Level 3 autonomy features activated and operating in the real world.

That's not a knock on Audi, however. The A8 made it clear to the AV industry what it's up against. Industry leaders must sort out every regulatory, technical, safety, behavioral, legal, and business-related complication before they can tout the utopian future of robocars. This partly explains growing momentum behind safety standards setting among car OEMs, Tier Ones, chip suppliers, and technology and service companies (i.e., Waymo, Uber).

A8 under the hood

The challenge for automotive manufacturers will no longer be offering the most speed or the best acceleration from 0 to 100 km/h but to ensure increasingly advanced autonomous driving and assistance systems. This is the goal of the Audi A8 with Level 3 self-drive, the first to used LiDAR technology.

The A8's sensor suite also includes cameras, radar, and ultrasonic sensors. The Audi A8 will autonomously manage driving on the most congested roads without a driver's intervention. Audi specifies that the driver can keep his or her hands off the steering wheel at all times and, depending on local laws and regulations, can engage in other activities such as watching TV onboard. The vehicle can perform most driving tasks, but human override is still required (*Figure 1*).



Figure 1: The key elements of the Audi A8

Fraux ran down the list the innovative technology inside the Audi A8: "Audi is the first car with Level 3 autonomy. The Traffic Jam Pilot system installed on the Audi A8 takes charge of driving in slow-moving traffic at up 60 km/h on freeways and highways, using sensor fusion and the world's first laser scanner." (Note: This Level 3 feature, however, has never been activated to date.)

Level 3 autonomy and computing platform

Digital technology can take on the same tasks that the driver should do while providing greater safety and comfort. The long-term goal is to have fully networked roads — an automotive smart grid. Traffic jams and environmental pollution will be reduced, with a remarkable improvement in safety.

Autonomous driving is an increasingly central topic in the automotive world; news about the progress and novelties in the sector are on the agenda. Level 3 used for the Audi A8 is defined as highly automated driving. The system is able to relieve the driver of the need for continuous control over the longitudinal and lateral movement of the vehicle.

Fraux said, "The Audi A8 consists of a variety of sensors and a zFAS controller put together by Aptiv with four processor chips." zFAS (*Figure 2*) is the first centralized computing platform. A computer acts as a central hub to process live feeds of ultrasonic sensors (front, rear, and side), 360° cameras (front, rear, and side mirrors), mid-range radar (at every angle) as well as a long-range radar, and a laser scanner on the front of the vehicle in real time.



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(Source: www.revese-costing.com, System Plus Consulting)



Figure 2: Aptiv zFAS Controller

A plethora of processors inside zFAS

The processors that make up the platform are Nvidia Tegra K1, used for traffic-signal recognition, pedestrian detection, collision warning, light detection, and lane recognition. Tegra K1, with eight layers of PCBs, integrates 192 Cuda cores, the same amount that Nvidia integrates into a single SMX module inside the Kepler GPUs currently on the market (*Figure 3*) with DirectX 11 and OpenGL 4.4 support.

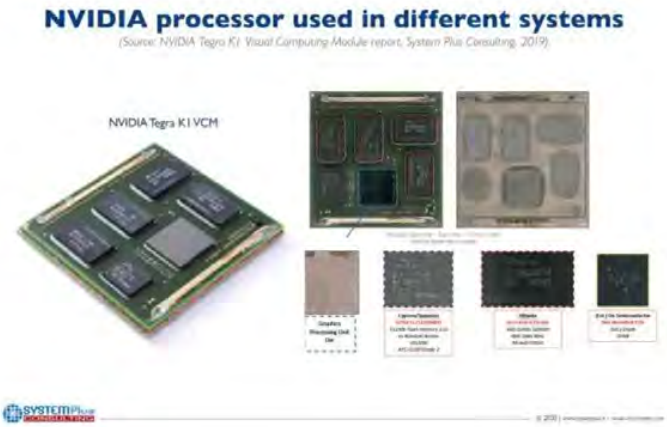


Figure 3: Nvidia Tegra K1

Having a very powerful processor in a car is of great importance when you think of the number of sensors that are integrated into it. Intel/Mobileye's EyeQ3 is responsible for image processing. To meet power consumption and performance targets, EyeQ SoCs are designed by using a finer geometry. Of Eye3, Mobileye is using a 40-nm CMOS, while the company will be using 7-nm FinFET in the fifth-generation SoC EyeQ5. Each EyeQ chip features heterogeneous, fully programmable accelerators, with each accelerator type optimized for its own family of algorithms.

Curiously, Nvidia Tegra K1 and Mobileye EyeQ 3 aren't enough to handle all the advanced driver-assistance system (ADAS) tasks expected for Level 3 vehicles. Inside zFAS are Altera Cyclone for data pre-processing and Infineon Aurix Tricore to watch for safety operations. Altera Cyclone family of FPGA devices is based on a 1.5-V, 0.13-µm, all-layer copper SRAM process, with densities up to 20,060 logic elements (LEs) and up to 288 kbits of RAM.

Infineon Aurix architecture is implemented for performance optimization in the powertrain and safety applications of the automotive industry. TriCore is the first unified, single-core, 32-bit microcontroller-DSP architecture optimized for real-time embedded systems.

Sensors in the Audi A8

In the automotive world, ADAS has become a must for all new cars to score higher Euro NCAP ratings. In *Figure 1*, we could find the detailed list of devices in the Audi A8 found by System Plus. "Manufacturers are developing increasingly efficient radar sensors in the market," said Fraux. "We can distinguish some companies, such as Aptiv, Veoneer, ZF, Valeo, Bosch, Mando, Denso, and Ainstein."

In particular, in the Audi A8, we can see Autoliv's third-generation automotive night-vision camera, Aptiv's lane-assist front camera, Valeo's SCALA laser scanner, Bosch's LRR4 77-GHz long-range radar sensor, and Aptiv's R3TR 76-GHz mid-range radar sensor.

The Autoliv night-vision camera consists of two modules: the camera and a remote processing unit (*Figure 4*). The infrared night-vision camera consists of FLIR's 17-µm-pixel high-definition

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(*Figure 4*). The infrared night-vision camera consists of FLIR's 17-µm-pixel high-definition vanadium oxide microbolometer ISC0901. The device offers an engineering approach with a complex optical system and sophisticated numerical processing system based on an array of FPGAs and a custom algorithm.



Figure 4: Autoliv's third-generation automotive night-vision camera

Aptiv's lane-assist front camera is mounted on the rearview mirror and offers a range of 80 m with a frame of 36 images/s. The camera uses a 1.2-megapixel CMOS image sensor provided by ON Semiconductor and an 8-bit Microchip PIC microcontroller. The zFAS control unit manages the image-mapping and -recognition software with the Mobileye EyeQ3 processing chip (*Figure 5*).

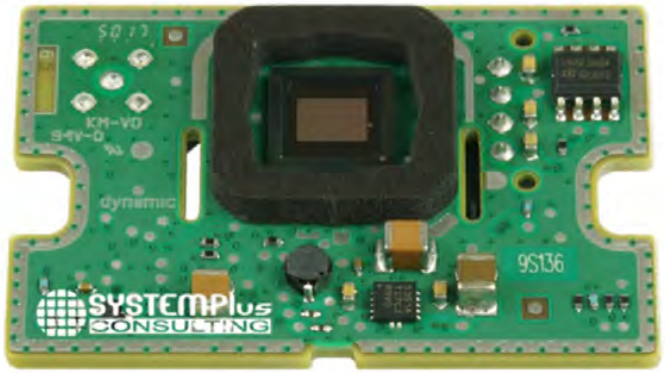


Figure 5: PCB of Aptiv's lane-assist front camera

LRR4 is a multi-mode radar with six fixed radar antennas from Bosch. The four centrally arranged antennas offer a high-speed recording of the environment, creating a focused beam with an aperture angle of ±6° with minimal traffic interference in adjacent lanes. In the near field, the two outer antennas of the LRR4 expand the field of view to ±20°, offering a range of 5 m with the ability to quickly detect vehicles entering or leaving the vehicle lane (*Figure 6*).



Figure 6: Long-range radar sensor (Image: System Plus)

Aptiv's short-range radar sensor consists of two transmitters and four receiver channels and operates in the 76- to 77-GHz frequency band, which is standard for automotive radar applications. The PCB uses a monolithic microwave integrated circuit (MMIC) and cavity waveguides. The radio frequency (RF) PCB substrate uses a glass-reinforced hydrocarbon-based ceramic laminate and is completely PTFE-free (*Figures 7* and *8*).



Figure 7: Aptiv R3TR 76-GHz short-range radar overview



Figure 8: Aptiv R3TR 76-GHz short-range radar electronics board

LiDAR technology

The key element in the Audi A8 is the LiDAR. This is the first time when the carmaker used the laser scanner. It is a LiDAR based on a mechanical system with rotating mirror technology and 905-nm wavelength in edge-emitting technology. The device offers a range of 150 m with a FOV of 145° horizontal and 3.2° vertical. The motor control unit consists of a stator and rotor with a control driver and MPS40S Hall-effect sensor for motion detection. A Hall-effect sensor varies its output voltage in response to a magnetic field. It is a long-lasting solution because there are no mechanical parts to wear down over time. The integrated package reduces the size of the system and the relative complexity of implementation (*Figures 9*, *10*, and *11*).

LiDAR systems are based on time of flight (ToF), which measures precise timing events (*Figure 12*). The latest developments have seen several multi-beam LiDAR systems, which generate an accurate, 3D image of the environment around the vehicle. This information is used to choose the most appropriate driving maneuvers.





Figure 9: Laser scanner (Image: System Plus)



Figure 10: The internal part of the laser scanner implemented in the Audi A8

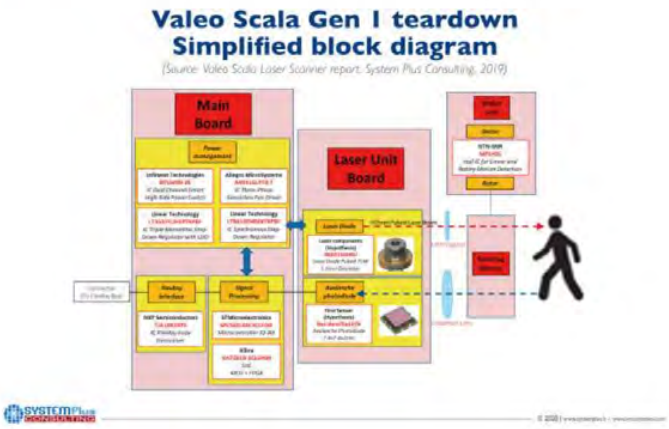


Figure 11: Block diagram of the laser scanner

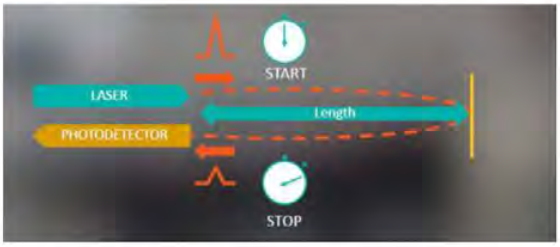


Figure 12: Time-of-flight functional diagram (Image: Maxim Integrated)

Edge-emitting lasers are the original and still widely used form of semiconductor lasers. Their resonance length allows achieving high gain. Within the structure, the laser beam is guided in a typically dual hetero-structure waveguide. Depending on the physical properties of the waveguide, it is possible to achieve an output with high beam quality but limited output power or high output power but low beam quality (*Figure 13*).



Figure 13: Edge-emitting laser diode

The laser used in the LiDAR solution has a three-pin TO-type package with a die area of 0.27 mm^2, as shown in *Figure 13*. The laser has a power of 75 W and a diameter of 5.6 mm. "Probably made by Sheaumann Laser on 100-mm wafer," said Fraux. The conditioning unit uses an avalanche

photodiode (APD) to acquire the laser beam after passing through two lenses, one transmitting and one receiving. "APD is probably made by First Sensor on 150-mm wafer with eight-pin FR4 LLC package and die area of 5.2 mm² [see *Figure 14*]," Fraux said.

APD is a high-speed photodiode that uses photonic multiplication to obtain a low noise signal. The APD achieves a higher signal-to-noise ratio than the PIN photodiode and can be used in a wide range of applications such as high-precision rangefinders and low-light-level detection. From an electronic point of view, the APD requires higher inverse voltage and more detailed consideration of its temperature-dependent gain characteristics.



Figure 14: Avalanche photodiode

In addition to the two units for laser and motion control, the control hardware also consists of the main board, comprised of a Xilinx XA7Z010 SoC dual-core Arm Cortex-A9, a 32-bit STMicroelectronics SPC56EL60L3 microcontroller, and a power management system consisting of a synchronous step-down regulator from ADI, dual-channel smart high-side power switch from Infineon, triple monolithic step-down IC with LDO from ADI, and a three-phase sensorless fan driver IC from Allegro. The FlexRay protocol enables data communication. A FlexRay system consists of several electronic control units, each with a controller that manages access to one or two communication channels.

An estimate of the cost per >100K units/year of such LiDAR technology could reach $150, with a good percentage of it being related to the main unit board and the laser (*Figure 15*).



Figure 15: The disassembled laser scanner hardware

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New functions: Digital Matrix LED Headlights

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On request, the Q8 e-tron comes optionally with Digital Matrix LED headlights – a global innovation in mass production that Audi unveiled in the fall of 2019 with the e-tron Sportback. Dispersed into 1.3 million pixels per headlight, the light can be controlled with high precision, which enables a number of new functions. On narrow lanes, the orientation light marks the car's position in the lane, for example. They also include three new functions: advanced traffic information, a lane light with direction indicator lights for highway use, and an orientation light on country roads.

Digital Matrix LED headlights are based on digital micromirror device (DMD) technology, which is also used in video projectors for example. At its core is a small chip with around 1.3 million micromirrors with edges only a few hundredths of a millimeter long. Using electrostatic fields, each and every one of them can be angled up to 5,000 times a second. Depending on the setting, the LED light is either directed onto the road via the lenses or absorbed for the purpose of masking. This allows the light to be controlled intelligently, creating a continuously regenerating video image rather than a static beam.

Lane light and orientation light on highways

The lane light, in partnership with the orientation light is extremely helpful for night driving on the highway, illuminating the car's own lane, helping the driver focus on driving events. The integrated position marking from the orientation light – darkened arrows – predictively indicates the position of the Audi Q8 e-tron between the lane markers, encouraging safe driving in the center of the lane.

With its focus on the car's own lane markers, the lane light with the orientation light on the highway helps the driver accurately assess their position in the lane, for example in narrow lanes around construction sites.

While changing lanes, the lane light dynamically and brightly illuminates both lane markers, while the orientation light indicates the car's exact position in the lane to give the driver the most support possible. This is where the innovative direction indicator lights come in; with the turn signals activated; the Digital Matrix LED headlights create a dynamic blinking area on the appropriate side of the lane light. This way, the lane light reiterates and intensifies the signal from the direction indicator lights on the road in front of the vehicle providing additional clear information about the upcoming lane change to the traffic along the side. Another way that Audi is making driving safer for everyone on the road, particu-

larly in heavy traffic.

Orientation light on country roads

Now that the headlight has been digitalized, the orientation light is also available independently of the lane light on country roads, making changing lanes easier and helping the driver to more accurately assess their position, especially on narrow country roads.

Warnings on the road

A further innovation: while visual and acoustic warnings about possible accidents or breakdowns are already provided by HERE maps, the Digital Matrix LED headlights including DMD module offer another level of security. Apart from a display in the digital instrument panel, the headlights now project a warning indicator on the road in front of the car for about three seconds. From the driver's seat, a triangle with an exclamation point can be seen projected onto the road allowing the driver to keep their eyes ahead and react as quickly as possible in the event of an accident or breakdown in upcoming traffic.

All terms marked in the text are explained in detail in the technology lexicon at www.audi-mediacenter.com/en/technology-lexicon. The equipment, data and prices specified in this document refer to the model range offered in Germany. Subject to change without notice; errors and omissions excepted.

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* The indicated consumption and emissions values were determined according to the legally specified measuring methods. The WLTP test cycle completely replaced the NEDC on January 1, 2022, which means that no NEDC figures are available for vehicles with new type approvals from after this date.

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Due to the more realistic test conditions, the consumption and CO_2 emission values measured are in many cases higher than the values measured according to the NEDC. This may result in corresponding

Due to the more realistic test conditions, the consumption and CO_2 emission values measured are in many cases higher than the values measured according to the NEDC. This may result in corresponding changes in vehicle taxation since September 1, 2018. Additional information about the differences between WLTP and NEDC is available at www.audi.de/wltp

Further information on official fuel consumption figures and the official specific CO_2 emissions of new passenger cars can be found in the "Guide on the fuel economy, CO_2 emissions and power consumption of all new passenger car models", which is available free of charge at all sales dealerships and from DAT Deutsche Automobil Treuhand GmbH, Hellmuth-Hirth-Str. 1, 73760 Ostfildern, Germany (www.dat.de).

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Audi's new DMLED headlights to be applied as first-time mass-produced models

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Audi is a German automobile manufacturer that designs, engineers, produces, markets, and distributes luxury vehicles worldwide. This company is already one of the world's leading brands for automotive lighting technology which has come up with new solutions such as Matrix laser headlights that continue to drive progress.

According to the reports, Audi's newly launched digital matrix LED headlights will be applied to mass-produced models for the first time. The sources say that the digital matrix LED headlights are one of the options for the 2021 e-Tron and e-Tron Sportback.

All-new Audi Matrix LED technology

The new Audi Matrix LED headlights are based on DMD technology, which stands for Digital Micro-mirror device. The heart of the device is a small chip with around one million micro mirrors, each of which has an edge length of only a few hundredths of a millimeter. Electrostatic fields allow

the mirrors to be tilted at a rate of up to 5,000 times per second.

Each of the headlights consists of 1.3 million micro-reflectors. These headlights are the same as a movie projector, each micro-mirror can emit tiny and unique adaptive light particles to project images when the car is stopped or moving.

Besides that, the mirrors' position determines what happens to the light generated by the three LEDs. A lens system directs the majority of the light onto the street; when a particular area should be dimmed, the necessary light is directed to an absorber that swallows it up.

According to Audi, when the vehicle is parked, the lighting technology provides 5 different welcomes to board or get off animations, each with unique dynamic graphics and text, which can be selected through the vehicle's MMI touch screen. This kind of animation will surely enhance the magnificent appearance of the vehicle.

Additionally, the new digital lighting system offers features that make driving easier and more secure. The lane and orientation lighting for highways help the headlights to emit a carpet of light up to 50 meters long. Thus, it brightly illuminates the driver's current lane and adjusts dynamically during lane changes.

Furthermore, Audi uses the low beam to create curve lighting, city lighting, and highway lighting functions. As a result of this, the main headlights can exclude other vehicles from the beam of light even more precisely, to avoid blinding them.

Audi has been always ahead of the other automobile manufacturers in terms of lighting technology. Their all-new digital matrix LED headlights will also go for mass production very soon according to an October 15 report.

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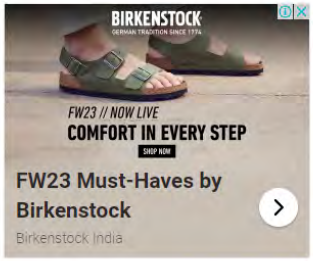
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If you happen to walk by an Audi dealership and see a 2021 e-tron or e-tron Sportback parked inside, know that the German EV crossover is available with Digital Matrix LED (DML) headlight technology as an optional extra.

We should note that U.S. buyers are yet to have total functionality for the DML headlights, with Audi still negotiating with government officials and other authorities in an effort to fully unleash the technology onto the masses.

Still, this marks the first time that DML headlights have been mass produced for a production vehicle.

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DML headlights feature 1.3 million micromirrors per unit, essentially working like movie projectors, emitting tiny particles or adaptable light. Initially, buyers will benefit from five different welcome/leaving animations when the vehicle is parked, each with its unique motion graphics and text that you can select via the car's MMI touchscreen display.



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Aside from the available animations, the full feature set of DML headlights includes a 50 meter "light carpet" designed to keep light within the driver's lane, while also avoiding to blind oncoming traffic. There's also a low-beam curved lighting function that bends below oncoming traffic and can illuminate people or objects on the side of the road, as well as electrostatically controlled micromirrors that can adjust light beam pixels up to 5,000 times per second.

Last but not least, there are the on-ground light arrows that place the car's tires within its lane.

The 2021 Audi e-tron range is priced from $65,900.



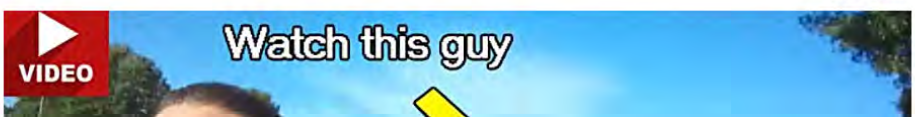
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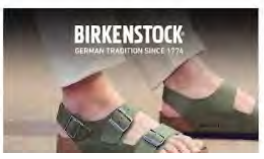
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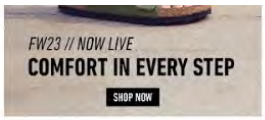
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Enter Ranting
3 years ago

A pointless, needlessly complicated gimmick that might work for the duration of the lease, but *definitely* don't buy one of these out of warranty.

0 0 Reply • Share ›

ace_9
3 years ago edited

What is this? Some sort of retro contraption? I expect Audi to offer at least a proper 24-bit color and 4K resolution headlights soon. This is offensively primitive for sophisticated Audi customers.

(1.3 million micromirrors equals roughly to resolution 1280 * 1024 or 1440 * 900 pixels)

0 0 Reply • Share ›

RobinPP
3 years ago

I can only imagine that if you have an accident, each of those headlights will be more expensive than a brand-new Chevy Spark...

0 0 Reply • Share ›

MICHGO
3 years ago

JUST WHAT OTHER DRIVERS NEED TO SEE, ON GROUND ARROWS.
HEADLIGHTS NEED TO DO THEIR BEST TO LET DRIVER'S SEE WHERE THEY'RE GOING NOT CREATE A LIGHT SHOW. I'M SURE THERE'S AN OPTION TO TURN OFF THE SILLY FEATURES.

0 0 Reply • Share ›

Nordschleife

Birkenstock India

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3 years ago

And this is why they stopped RR from having a lit up Spirit of Ecstasy.

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Exhibit F

Title- Learn why Audi chose high resolution headlights from TI DLP Auto

Snapshots:



Source: https://www.youtube.com/watch?v=oRY8wN5ue2Y

Technology Learning Center

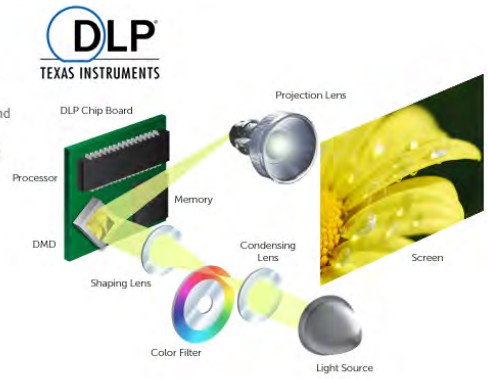
DLP® Chip Technology

DLP chipset-based projectors produce vivid images with digital clarity and precision. The DLP chip uses millions of tiny mirrors to reflect all the colors of visible light to project a digital image onto a screen. DLP technology delivers high contrast ratios and minimizes the gaps between pixels for bright, sharp pictures. Since the light is reflected off of the mirrors, DLP projectors retain color accuracy and deliver stunning images onto the screen. Most DLP projectors are designed to be filter-free, which means lower maintenance and operating costs over time.

All Vivitek projectors feature a DLP chipset.

Learn more about DLP technology

- DLP Chip Board
- Projection Lens
- Processor
- Memory
- DMD
- Shaping Lens
- Color Filter
- Light Source
- Condensing Lens
- Screen





Six is Better than Three
In addition to red, green, and blue, BrilliantColor utilizes magenta, cyan, and yellow to create more accurate colors than LCD-based projectors

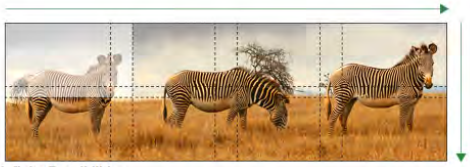
BrilliantColor™ Technology

BrilliantColor from Texas Instruments is a multi-color processing technology that produces vibrant images. BrilliantColor technology uses up to six colors, instead of just the three primary colors, red, green and blue, to improve color accuracy and brightens secondary colors. This results in a new level of color performance that increases the brightness of the colors by up to 50% over DLP projectors without BrilliantColor for accurate, true-to-life images.
All Vivitek projectors feature BrilliantColor technology.

Edge Blending Technology

Edge blending is when two or more projectors are used to create a larger canvas with higher resolution on which the image will immerse audiences. The application can be used for anything from digital signage to simulations to extreme entertainment. Edge blending utilizes projectors with good optics, color reproduction and brightness uniformity, as well as good black levels for high-resolution displays.





Infinite Possibilities
Theoretically, there could be an infinite number of projectors lined up both vertically and horizontally taking full advantage of edge blending. Here's an example with four across and two down, for a total of eight projectors.

Depending on the applications, the projectors can be placed side-by-side or top-to-bottom, then by overlapping the borders and using specific test patterns to align the images. This is all done with the projectors' software and optical tuning features. The result will be an impressive and extreme picture. Vivitek offers a variety of projectors that have the edge blending functionality to meet the daring imaginations of designers and installers. Edge blending technology can be applied to any Vivitek projector.



Projector Stacking



The projector stacking technique has been used by custom installers to share a single screen to increase brightness or create an abundance of visual excitement. To set-up stacking, look for a projector with lens shift capability. Then, with a test pattern, align the projected images pixel for pixel. The projectors should have high optical standards, since it is necessary to align the overlapping images accurately. This technique can be performed with many Vivitek projectors.

The following Vivitek projectors can be used for projector stacking:

- D5000 Series projectors
- D6000 Series projectors (excluding fixed short throw optional lens)
- D8000 Series projectors (excluding fixed short throw optional lens)
- H5080 Series projectors
- H9080 Series projectors (excluding fixed short throw optional lens)

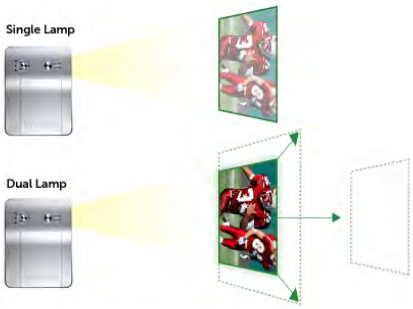


Dual Lamp Technology

For the most part, video projectors operate with a single lamp/bulb. A projection system with more than one lamp allows users to have a projector that is always ready to go. A dual-lamp projector ensures that for presentations and other notable uses that the projector will continue to be operable.

A Vivitek dual-lamp projector can be managed and monitored through a central control room or network, whether harnessing the power of two lamps at the same time for extra brightness or operating one lamp at a time through a single projection path. Having a dual-lamp projector also offers the ability to project content at a longer distance or create larger image sizes beyond what a single lamp can produce.

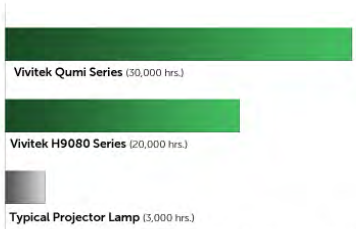
Vivitek projectors with Dual Lamp technology are the D6000series and D8800 series projectors.



LED Light Technology

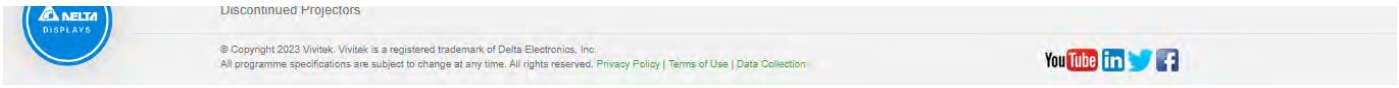
LED (Light-Emitting Diode) is a semiconductor-based light source. It is small diode capable of producing a great amount of light. An LED light source is more dynamic than traditional lamps resulting in stunning life-like images with a wider range of color. Vivitek projectors with DynamicBlack and LED technologies have a higher contrast ratio and better black levels due to the ability to adjust brightness levels in bright scenes to almost zero in dark scenes.





The Vivitek H9080 and the Qumi series of projectors utilize LED technology.

Combined with today's projection technology, LED-based projectors yield a life-span of almost 10 times longer than standard bulb/lamp-based projectors, without having to replace a lamp. LED consumes less power and is free of hazardous materials including mercury and lead, making it an environmentally-friendly solution. Consuming less power also equates to less heat being produced, thus reducing noise level from the projector's fan.


Discontinued Projectors
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YouTube

Audi A8

2020 Press Kit



For media inquiries, contact
amanda.koons@audi.com

Overview

The fourth generation of the Audi A8 redefines the Audi design language and delivers a modern, serene interior, usable technology, innovative connectivity and cutting edge driver assistance features[1] all designed to help keep drivers and passengers informed and able to arrive more relaxed. A new high-performance, long-wheelbase S8, first-ever plug-in hybrid A8 and a turbocharged V8 engine variant expand Audi luxury sedan offerings in 2020.

Design

- The A8 embodies the **premium Audi design language from Head of Design Mark Lichte's Prologue concept**, with state-of-the-art exterior lighting, a powerful stance and precise, proportional design.
- The interior is designed to feature exceptional precision and material selection, as well as advancements to enhance relaxation and comfort, including:
    - **Theatre-like exterior lighting display** when the vehicle is unlocked, followed by the personalized interior welcome of the A8 in the virtual cockpit; available Air Quality package with **cabin air ionization and refreshing scents**; premium leather seating and extended leather surfaces throughout the cabin; optional rear right reclining passenger relaxation seat with heated massaging footrest; and optional adjustable rear Matrix LED reading lights.
- The performance-oriented S8 receives bold exterior design elements including S-model bumpers and side sills, quad exhaust, and a platinum double-slat Singleframe® grill to **emphasize the car's sporty and progressive character**.
- The A8 TFSI® e is differentiated through **its unique light signature** in the front bumper and standard 19-inch wheels.

Technology and Connectivity:

- Revolutionary infotainment and MMI system deliver **an elevated level of useable Audi technology** features to customers.
- Model line features **MMI touch response®**[2] with haptic touch functionality and a multitude of individual buttons consolidated into the stacked dual screen MMI touch response® interface – which is user friendly and operates with simplicity similar to that of a smart-phone.
- Other cutting-edge standard and available features include:
    - **A8 voice interaction with natural language processing** for MMI commands and vehicle functions.
    - **HERE-powered map and navigation system** that is able to recognize drive routes over time so the system can make smart route suggestions.
    - Optional **smartphone-sized OLED remote control** allowing rear-seat passengers to conveniently customize their seating and infotainment preferences as well as the ambient and matrix interior lighting settings.
    - Standard **second generation Audi virtual cockpit** featuring a large, 12.3-inch display that delivers vibrant color at a rapid 60 frames per second with K1 chip from NVIDIA® quad core processing power at 1920 x 720 pixels per inch.
- The plug-in hybrid receives an MMI display with electric-specific driving screens including charging information, and additional consumption statistics to help drivers **maximize the efficiencies of the hybrid system**. The Audi virtual cockpit is also updated to display battery data and estimated range statistics.

Latest Updates

- Lane departure warning[1] and Audi virtual cockpit plus are standard equipment on the A8.
- Multicolor ambient interior lighting is now included in the available Executive package.
- An available Black Optic package adds black exterior trim and 20-inch 5-V-spoke-star-design black wheels. The Audi design selection in Merino Gray includes Gray-Brown Beech Natural Wood inlays.
- A Sport Style exterior package emphasizes sporty features of the A8 with 20-inch Audi Sport 5-V-spoke-star-design wheels with all-season tires and sport exterior styling on the front and rear bumpers and side sills. The Sport plus package, available exclusively on the 4.0-liter derivative, adds the Black Optic package as well as dynamic all-wheel steering and predictive active suspension to enhance the superior ride comfort of the A8, or provide the firm handling of a sports car.
- Also available for 2020, are HD Matrix-design LED headlights with Audi laser light technology and dynamic all-wheel steering.

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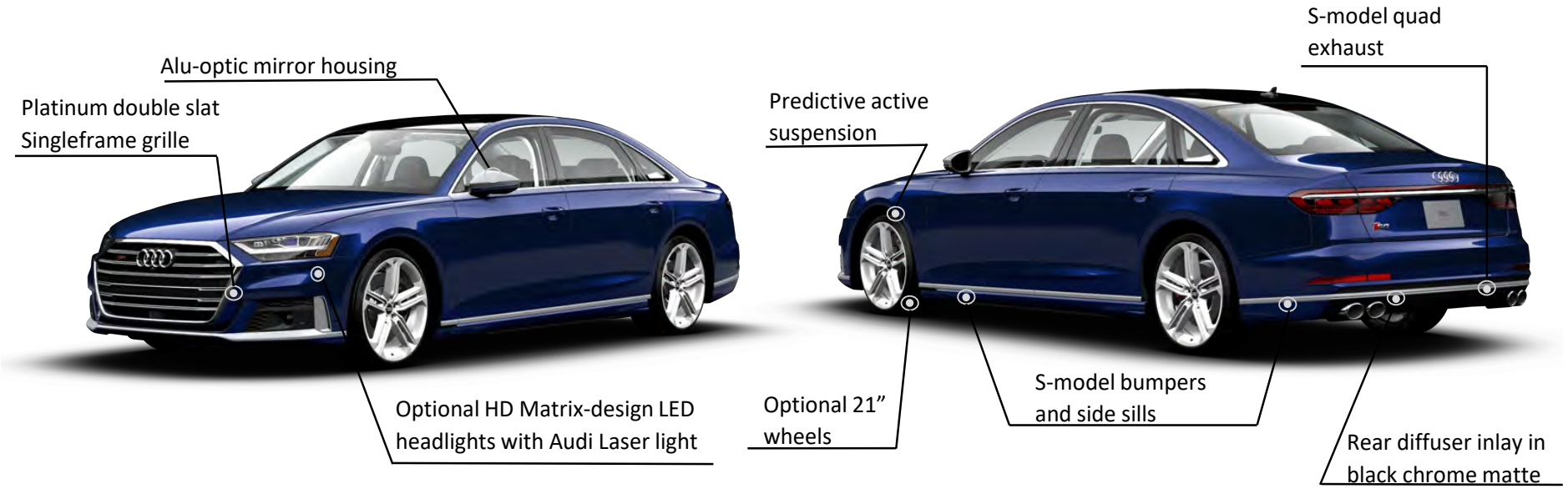
Audi A8

2020 Press Kit – Exterior Design

A8 vs. S8







Audi A8

2020 Press Kit – Key Specifications

2020	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e	S8
Starting MSRP[3]	$85,200	$96,800	$94,000	$129,500
Engine	3.0 TFSI®, 6 cylinder	4.0 TFSI®, 8 cylinder	3.0 TFSI®, 6 cylinder and electric motor	4.0 TFSI®, 8 cylinder
Transmission / Drivetrain	Eight-speed Tiptronic® automatic transmission with shift-by-wire technology and quattro® all-wheel drive with center differential	Eight-speed Tiptronic® automatic transmission with shift-by-wire technology and quattro® all-wheel drive with center differential	Eight-speed Tiptronic® automatic transmission with shift-by-wire technology and quattro® all-wheel drive with center differential	Eight-speed Tiptronic® automatic transmission with shift-by-wire technology and quattro® all-wheel drive with center differential
Horsepower	335	453	443	563
Torque (lb-ft)	369	487	516	590
Acceleration (0-60 mph)[4]	5.6 seconds	4.5 seconds	~4.9 seconds	3.8 seconds
Top Track Speed (mph)[5]	130 mph	130 mph	130 mph	155 mph
Curb Weight (lb)	4,773	4,905	5,335	5,302
EPA estimated MPG (city/highway/combined)[6]	17/26/21	15/23/18	TBA	13/22/16

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Audi A8

2020 Press Kit – Features and Options

Engine/Transmission/Suspension/Chassis	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
3.0-liter TFSI® turbocharged V6 engine (335 hp/369 lb-ft)	•	-	-	-
4.0-liter TFSI® turbocharged V8 engine (453hp/487 lb-ft)	-	•	-	-
3.0-liter TFSI® turbocharged V6 engine with electric motor (443hp/516 lb-ft)	-	-	•	-
4.0-liter TFSI® turbocharged V8 engine (563hp/590 lb-ft)	-	-	-	•
48-volt Mild Hybrid Electric Vehicle (MHEV) technology with recuperation	•	•	-	•
Start-stop engine system	•	•	•	•
Eight-speed Tiptronic® automatic transmission with shift-by-wire technology	•	•	•	•
quattro® all-wheel drive with self-locking center differential	•	•	•	•
quattro® sport differential	-	-	-	•
Audi adaptive air suspension (five-link front and rear)	•	•	•	-
Predictive active suspension	-	Available	-	•
Dynamic all-wheel steering (up to five degrees in the opposite direction at slow speeds, and up to two percent in the parallel direction at medium to high speeds)	Available	Available	-	•

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Audi A8

2020 Press Kit – Features and Options

Engine/Transmission/Suspension/Chassis	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Lightweight construction technology —ASF® multi-material body construction	•	•	•	•
21.7-gallon/82-liter fuel tank capacity	•	•	-	•
Tool kit and car jack located in trunk compartment	•	•	•	•
Space-saving spare tire	•	•	-	•
Tire mobility kit	-	-	•	-

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Audi A8

2020 Press Kit – Features and Options

Exterior	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Singleframe® grille	•	•	•	•
LED headlights with LED daytime running lights (LED dipped and high beams, daytime running lights, indicator and all-weather light)	•	•	•	-
HD Matrix-design LED headlights (LED dipped and high beams, daytime running lights, position light, static cornering light, indicator and all-weather light)	Available	Available	Available	•
Audi Laser Light	Available	Available	Available	Available
LED taillights with dynamic turn signals	•	•	•	•
OLED taillights with animation	Available	Available	Available	Available
Headlight washing system	Available	Available	Available	•
Heat-insulating front windshield	•	•	•	•
Power-adjustable, auto-dimming, power-folding, heated exterior side mirrors with memory	•	•	•	•
Power soft-closing doors	•	•	•	•
Power trunk, open/close	•	•	•	•

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Audi A8

2020 Press Kit – Features and Options

Interior	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Four-spoke multifunction steering wheel with shift paddles	•	•	•	•
Heated steering wheel	Available	Available	Available	•
Power tilt and telescopic steering column with memory	•	•	•	•
Four-zone automatic climate control	•	•	•	•
Air quality system (ionizer and aromatization) (Two high-quality fragrances, Summer and Winter)	Available	Available	Available	•
Dual-pane acoustic glass	Available	Available	Available	•
Power rear side and rear window sunshades	•	•	•	•
Panoramic sunroof with black-out sunshade	•	•	•	•
Ambient LED interior lighting package	•	•	•	-
Contour/Ambient LED interior lighting package - multicolor	Available	Available	Available	•

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Audi A8

2020 Press Kit – Features and Options

Interior	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Valetta leather interior	•	•	•	-
Valcona leather interior	Available	Available	Available	•
Comfort front seats	•	•	•	-
Comfort front sport seats with diamond stitching	-	-	-	•
Heated 18-way power front seats including lumber adjustment and seat memory	•	•	•	-
Heated and ventilated 22-way power comfort front seats including lumber adjustment, seat memory and massage functions	Available	Available	Available	•
Front heated surfaces (Heated front center armrest and door armrests)	Available	Available	Available	Available
Fine Nappa leather package (center console, door armrests and airbag cap)	•	•	•	•
Extended leather package (center console, door armrests, instrument panel top, door sills and airbag cap)	Available	Available	Available	Available
Full leather package (instrument panel bottom including glove compartment, door linings and pockets, front seat backrest covers and front and rear headrest shells)	-	Available	Available	Available

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Audi A8

2020 Press Kit – Features and Options

Interior/Comfort/Seating	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Electrically adjustable front safety belt height	•	•	•	•
Auto-dimming rear view mirror with digital compass	•	•	•	•
Heated rear seats	Available	Available	Available	Available
Power outboard rear seats with lumbar adjustment (five-seat configuration)	Available	Available	Available	Available
Ventilated outboard rear seats with massage function	Available	Available	Available	Available
Front passenger seat power adjustment from the rear seat	Available	Available	Available	Available
Power outboard rear seats with fixed leather-wrapped full-length center console (four-seat configuration)	-	Available	Available	Available
Rear passenger relaxation seat with footrest and foot massage function	-	Available	Available	Available
Folding productivity tables in center console	-	Available	Available	Available
Rear heated surfaces (Heated rear center arm rests and armrests in doors)	Available	Available	Available	Available
Two additional rear LED reading lights	Available	Available	Available	Available

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Audi A8

2020 Press Kit – Features and Options

Interior/Comfort/Seating	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Rear seat pass-through	•	•	•	•
Rear seat 12V power outlets	•	•	•	•
Light cloth headliner	•	•	•	-
Black cloth headliner	Available	Available	Available	-
Alcantara® headliner (Light or Black)	Available	Available	Available	•
Black glass touch control buttons with haptic feedback	•	•	•	-
Aluminum-optic control buttons	Available	Available	Available	•
Aluminum door sill inlays	•	•	•	•
Driver and front passenger extendable sun visors with illuminated vanity mirrors	•	•	•	•
Trunk tie downs and 12V power outlet	•	•	•	•

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Audi A8

2020 Press Kit – Features and Options

Infotainment/Technology	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Audi virtual cockpit plus (12.3" LCD fully digital instrument cluster with 1,920 x 720 pixel resolution	•	•	•	-
MMI® Navigation plus with natural voice control system[7]	•	•	•	•
MMI® touch response[2] with Haptic feedback	•	•	•	•
Limited time subscription to Audi connect® CARE assistance and security services[8]	•	•	•	•
Six-month trial subscription to Audi connect® PRIME and Audi connect® PLUS online services[9]	•	•	•	•
Audi smartphone interface including wireless Apple CarPlay® and wired Google™ Android™ Auto[10]	•	•	•	•
Bang & Olufsen® 3D Premium Sound System, 17 speakers, 16-channel amplifier and 730 watts	•	•	•	•
Bang & Olufsen® 3D Advanced Sound System, 23 speakers, 23-channel amplifier and 1,920 watts	-	Available	Available	Available

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Audi A8

2020 Press Kit – Features and Options

Infotainment/Technology	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
HD Radio™ Technology	•	•	•	•
SiriusXM® Satellite Radio with 90-day trial subscription[11]	•	•	•	•
Audi music interface with front USB port for data and charging	•	•	•	•
BLUETOOTH® streaming audio for compatible devices	•	•	•	•
BLUETOOTH® wireless technology preparation for compatible devices	•	•	•	•
Audi phone box (signal booster and wireless charger) [12]	Available	Available	Available	•
Audi tablet rear seat entertainment system (dual tablets)	Available	Available	Available	Available
Rear seat smart remote	Available	Available	Available	Available
Rear seat DVD changer	Available	Available	Available	Available
Garage door opener (HomeLink®)	•	•	•	•

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Audi A8

2020 Press Kit – Features and Options

Driver Assistance Features[2]	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Audi advanced key—keyless start,[14] stop and entry with hands-free trunk release	•	•	•	•
Rain/light sensor for automatic windshield wipers and headlights	•	•	•	•
High-beam assist	•	•	•	•
Adaptive windshield wiping system	Available	Available	Available	Available
Cruise control with coast, resume and accelerate features	•	•	•	•
Audi pre sense® basic	•	•	•	•
Audi pre sense® front	•	•	•	•
Audi side assist and Audi pre sense® rear with Rear cross traffic assist and Vehicle exit warning	Available	Available	Available	Available
Audi active lane assist with Emergency assist	Available	Available	Available	Available
Adaptive Cruise Assist, Turn assist and Predictive Efficiency assist	Available	Available	Available	Available

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Audi A8

2020 Press Kit – Features and Options

Driver Assistance Features[2]	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Traffic sign recognition	Available	Available	Available	Available
Head-up display with navigation and assistance systems information	Available	Available	Available	•
Night vision assistant with pedestrian and large animal detection	-	Available	Available	Available
Intersection assist	Available	Available	Available	Available
Parking system plus with front and rear sensors	•	•	•	•
Top view camera system with Virtual 360 view	Available	Available	Available	•

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Audi A8

2020 Press Kit – Features and Options

Safety	A8 L 55 TFSI	A8 L 60 TFSI	A8 60 TFSI e (PHEV)	S8
Driver adaptive and front-passenger dual-stage, thorax side front and rear, front center, knee and Sideguard® head-curtain airbags[13]	•	•	•	•
Safety belt reminder for driver and front passenger	•	•	•	•
Safety package front, with front center airbag and illuminated safety belt buckles	•	•	•	•
Lower Anchors and Tethers for Children (LATCH) in rear seats	•	•	•	•
Power central locking system with safety unlock feature if airbags deploy	•	•	•	•
Electronic Stability Control (ESC) with secondary collision brake assist and traction control (ASR)	•	•	•	•
Anti-lock Brake System (ABS) with Electronic Brake-pressure Distribution (EBD) and brake assist	•	•	•	•
Tire-pressure monitoring system	•	•	•	•
Rear view camera	•	•	•	•
Anti-theft alarm system with motion sensor	•	•	•	•

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Audi A8

2020 Press Kit – Technical Specifications

Engineering/Performance	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e (PHEV)	S8
Engine type	Six-cylinder	Eight-cylinder	Six-cylinder + electric motor	Eight-cylinder
Engine block/Cylinder head	Aluminum-alloy	Aluminum-alloy	TBA	Aluminum-alloy
Displacement (cc)/Bore and stroke (mm)	2,995/84.5 x 89.0	3,996/85.3 x 85.3	TBA	3,996/86.0 x 86.0
Horsepower	335	453	443	563
Torque	369	487	516	590
Compression ratio	11.2:1	11.0:1	TBA	10.1:1
Valvetrain	24-valve DOHC with Audi valvelift system and variable valve timing	32-valve DOHC with Audi valvelift system and variable valve timing	TBA	32-valve DOHC with Audi valvelift system and variable valve timing
Induction/Fuel injection	Turbocharged/TFSI®	Turbocharged/TFSI®	TBA	Turbocharged/TFSI®
Start-stop engine system	•	•	TBA	•
Acceleration (0-60 mph) [4]	5.6	4.5	~4.9	3.8
Top track speed[5]	130 mph	130 mph	130 mph	155 mph

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Audi A8

2020 Press Kit – Technical Specifications

Electrical	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e (PHEV)	S8
48-volt Mild Hybrid Electric Vehicle (MHEV) technology with recuperation	•	•	-	•
14.1 kWh battery	-	-	•	-
Transmission/Drivetrain	**A8 55 TFSI**	**A8 60 TFSI**	**A8 60 TFSI e (PHEV)**	**S8**
Eight-speed Tiptronic® automatic transmission with shift-by-wire technology	•	•	•	•
quattro® all-wheel drive with center differential	•	•	•	•
Dynamic all-wheel steering	Available	Available	-	•
Body/Suspension/Chassis	**A8 55 TFSI**	**A8 60 TFSI**	**A8 60 TFSI e (PHEV)**	**S8**
Lightweight construction technology—ASF® multi-material body construction (steel, aluminum and carbon composition)	•	•	•	•
Audi adaptive air suspension (five-link front and rear)	•	•	•	-
Predictive active suspension	-	Available	-	•
Electromechanical progressive steering system	•	•	•	-
Steering ratio	15.8:1	15.8:1	TBA	13.3:1-15.8:1
Turning circle, curb-to-curb (ft)	42.2	42.2	TBA	42.3

Audi A8

2020 Press Kit – Technical Specifications

Body/Suspension/Chassis	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e (PHEV)	S8
Brake disc size (front/rear)	14.8/13.8	15.8/13.8	TBA	15.8/13.8
Red brake calipers, steel	-	-	-	Available
Ceramic brakes, gray calipers	-	-	-	Available

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Audi A8

2020 Press Kit – Technical Specifications

Exterior measurements	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e	S8
Wheelbase (in)	123.2	123.1	TBA	123.2
Length (in)	208.7	208.7	TBA	209.0
Height (in)	58.6	58.5	TBA	58.6
Overall width with mirrors (in)	83.9	83.9	TBA	83.9
Width without mirrors (in)	76.6	76.6	TBA	76.6
Track, front/rear (in)	64.7/64.3	64.7/64.3	TBA	64.1/63.7
Curb weight (lb)	4,773	4,905	5,335	5,302
Drag coefficient (Cd)	0.27	0.28	TBA	0.29

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Audi A8

2020 Press Kit –Technical Specifications

Interior measurements	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e	S8
Head room, front (in)	38.3	38.3	TBA	38.3
Head room, rear (in)	38.5	38.5	TBA	38.5
Leg room, front (in)	41.5	41.5	TBA	41.5
Leg room, rear (in)	44.3	44.3	TBA	44.3
Shoulder room, front (in)	59.1	59.1	TBA	59.1
Shoulder room, rear (in)	57.6	57.6	TBA	57.6
Cargo volume (cu ft)	12.5	12.5	TBA	12.5
Seating capacity	5	5 (4 with Executive rear seat package)	TBA	5 (4 with Executive rear seat package

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Audi A8

2020 Press Kit – Technical Specifications

Capacities	A8 55 TFSI	A8 60 TFSI	A8 60 TFSI e	S8
Automatic transmission and quattro® all-wheel drive EPA estimated mileage (city/highway/combined)[6]	17/26/21	15/23/18	TBA	13/22/16
Engine oil (qt)	8.0	10.0	TBA	10.0
Cooling system (gal)	2.9	3.9	TBA	3.6
Fuel (gal)	21.7	21.7	TBA	21.7
Recommended fuel	Premium	Premium	TBA	Premium

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About Audi of America

Audi of America, Inc. and its U.S. dealers offer a full line of German-engineered luxury vehicles. AUDI AG is among the most successful luxury automotive brands, delivering about 1.812 million vehicles globally in 2018. In the U.S., Audi of America sold nearly 224,000 vehicles in 2018. 2019 marks 50 years for the brand in the U.S. Visit audiusa.com or media.audiusa.com for more information regarding Audi vehicles and business topics.

"Audi," "TFSI," "quattro," "e-tron," "S tronic," "Audi connect*," "MMI," "Singleframe," "FSI," the four rings logo and all model names are registered trademarks of AUDI AG. All other trademarks are the property of their respective owners.*

This information and any vehicle specifications are preliminary and subject to change.

[1]Driver Assistance features are not substitutes for attentive driving. See Owner's Manual for further details, and important limitations

[2]Always pay careful attention to the road, and do not drive while distracted. See Owner's Manual for further details, and important limitations

[3]Prices listed are the Manufacturer's Suggested Retail Prices and do not include destination and delivery ($975), taxes, title, options, and dealer charges. Dealer sets actual price.

[4]Always obey all local speed and traffic laws.

[5]Top track speed electronically limited in U.S. Always obey all speed and traffic laws.

[6]Where stated, fuel economy values (mpg) are EPA estimates. See www.fueleconomy.gov for updated information. Actual mileage will vary and depends on several factors including driving habits and vehicle condition.

[7]MMI Navigation plus depends on signals from the worldwide Global Positioning Satellite network. The vehicle's electrical system, and existing wireless and satellite technologies, must be available and operating properly for the system to function. The system is designed to provide you with suggested routes in locating addresses, destination and other points of interest. Changes in street names, construction zones, traffic flow, points of interest and other road system changes are beyond the control of Audi of America, Inc. Complete detailed mapping of lanes, roads, streets, toll roads, highways, etc., is not possible, therefore you may encounter discrepancies between the mapping and your actual location. Please rely on your individual judgment in determining whether or not to follow a suggested MMI navigation plus route.

[8]Always pay careful attention to the road, and do not drive while distracted. Connect CARE services are provided with the support of authorized affiliated and third party service providers. Available on select models. Connect CARE services are activated prior to purchase or lease and do not require registration or paid subscription. Connect CARE services require vehicle cellular connectivity and availability of vehicle GPS signal; certain services collect location information, see Terms of Service for information about how to disable. Audi Connect services, including Connect CARE are subject to technologies remaining commercially available, such services are not guaranteed, and may not be available after December 2021. See Terms of Service, Privacy Policy, and other details at www.audiusa.com/privacy and https://www.audiusa.com/technology/intelligence/audi- connect/connect-terms. Connect CARE services should only be used when it is safe and appropriate.

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About Audi of America

[9]Connect PRIME services are optional, may require an additional subscription with separate terms and conditions, and should be used only when it is safe and appropriate. Trial or paid subscription required. Connect PRIME services require vehicle cellular connectivity and availability of vehicle GPS signal; certain services collect location information, see Terms of Service for information about how to disable. Online services are subject to change at any time. Google Earth features will not be available after December 2020 for Model Year 2018 & older vehicles. Google Earth is a trademark of Google Inc. See Terms of Service, Privacy Policy, and other details at: https://www.audiusa.com/privacy and https://www.audiusa.com/technology/intelligence/audi-connect/connect-terms

[10]Not all Apple CarPlay or Android Auto features available on all operating systems. Message and data usage rates apply. These features require compatible device, operating system, and mobile apps. See mobile device and app providers for terms and privacy. “Android, Android Auto, Google Play, and other marks are trademarks of Google Inc. “Apple CarPlay” is a trademark of Apple Inc.

[11]SiriusXM® Satellite Radio subscriptions sold separately or as a package after trial expires. Subscriptions are governed by SiriusXM® Customer Agreement (see www.siriusxm.com) and are continuous until you call SiriusXM® to cancel. Sirius U.S. Satellite Service available only to those 18 and older in the 48 contiguous U.S.A., D.C and Puerto Rico (with coverage limitations).

[12]Requires compatible smart device. This is a CONSUMER device. BEFORE USE, you MUST REGISTER THIS DEVICE with your wireless provider and have your provider’s consent. Most wireless providers consent to the use of signal boosters. Some providers may not consent to the use of this device on their network. If you are unsure, contact your provider. You MUST operate this device with approved antennas and cables as specified by the manufacture. Antennas MUST be installed at least 20 cm (8 inches) from any person. You MUST cease operating this device immediately if requested by the FCC or a licensed wireless service provider. WARNING. E911 location information may not be provided or may be inaccurate for calls serviced by using this device.

[13]Airbags are supplemental restraints only and will not deploy under all crash circumstances. Always use safety belts and seat children only in the rear, using restraint systems appropriate for their size and age.

[14]See Owner’s Manual for further details and important warnings about the keyless ignition feature. Do not leave vehicle unattended with the engine running, particularly in enclosed spaces, and consult local laws for any limitations on use.

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Menu



Audi connect®

A range of services designed to help you keep in touch with your Audi.

Available on select MY2024 vehicles

View offers

Get acquainted with your Audi.

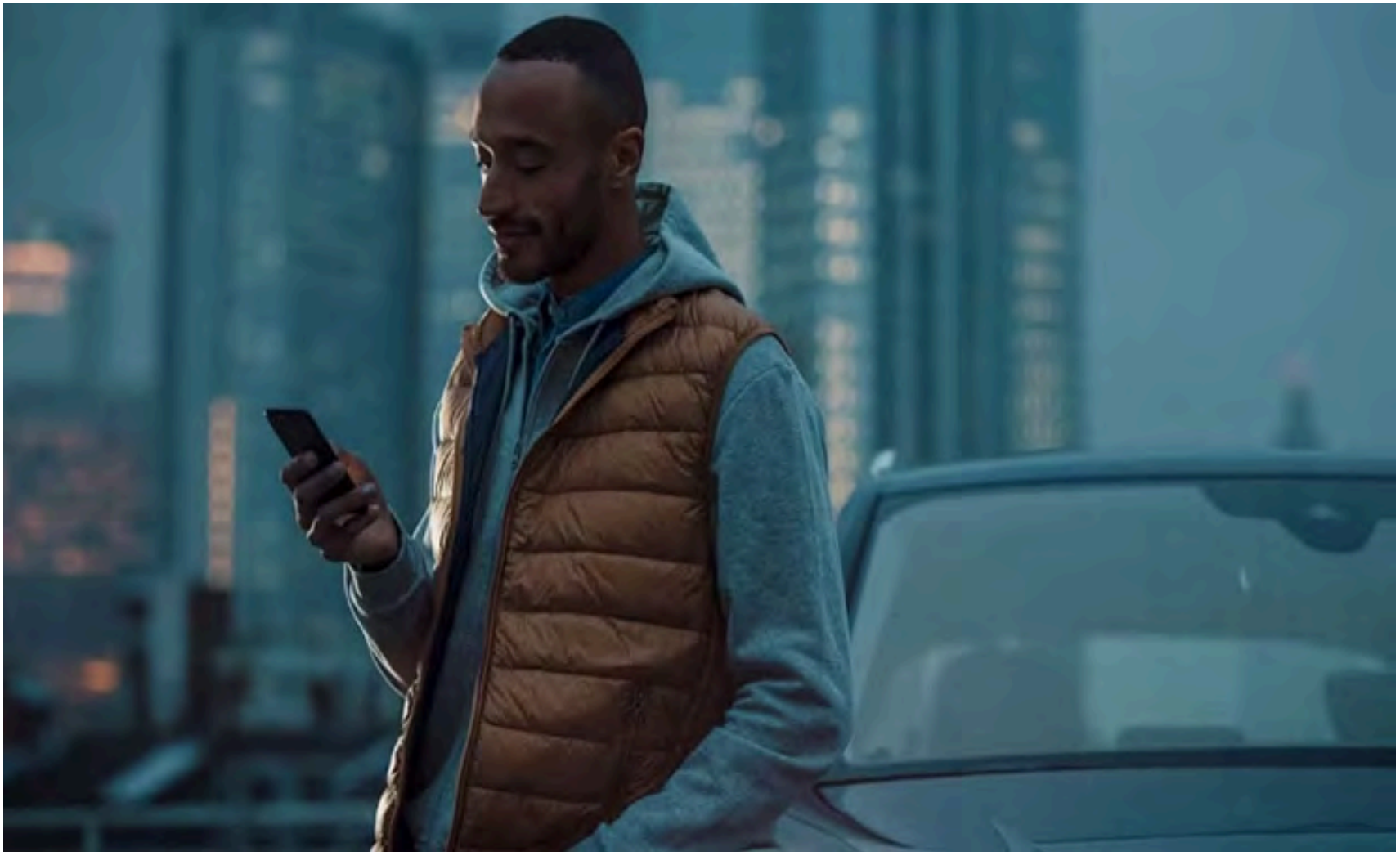
Audi connect transforms your relationship with your Audi. With a range of connected services that can enhance your navigation, infotainment and peace of mind, you'll feel closer to your Audi than ever before. Available on select MY2024 vehicles, the latest in-car Audi App Store offers greater levels of customization with expanding app options, allowing customers to access their favorite apps directly via the MMI touch screen. The integrated and ever-expanding store has apps across Music, Video, Gaming, Navigation, Parking & Charging, Productivity, Weather, and News. Because driving experience should be individual and unique, at Audi we have a range of in-car products and features that you can opt in based on your lifestyle needs. You tell us how often you want them (monthly, annual or lifetime) and we serve you based on your needs. As simple as that.

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Download the iOS app >

Download the Android app >

Available plans



Audi connect CARE [1]

Get 10 years of the Audi connect Care plan included with the purchase of every new Audi. Audi connect CARE provides a suite of peace of mind and remote services,

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including:

- Emergency Call [4]
- Remote Lock / Unlock [5]
- Remote Start (if equipped)
- Stolen Vehicle Locator[6]
- Vehicle Status Report [7]

To find out the whole suite of features available, please access your myAudi Marketplace.

View key feature information >



Audi connect NAV [2]

Audi connect NAV includes all of the helpful features of connect CARE, plus additional navigation and Traffic Light Information, that enhance your driving experience

including:

- Real Time Traffic
- Satellite Imagery/Maps
- POI Search [8]
- Traffic information
- Natural Voice Recognition ('Hey Audi...')
- Connected real time EV Charging Location stations

Complimentary 6-month trial subscription included with new MY24 vehicle purchase. After the trial, a paid subscription of $15 monthly or $150 yearly is required to access the Audi connect PLUS features.

View key feature information >

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Audi connect PLUS with Full-Speed Wi-Fi [3]

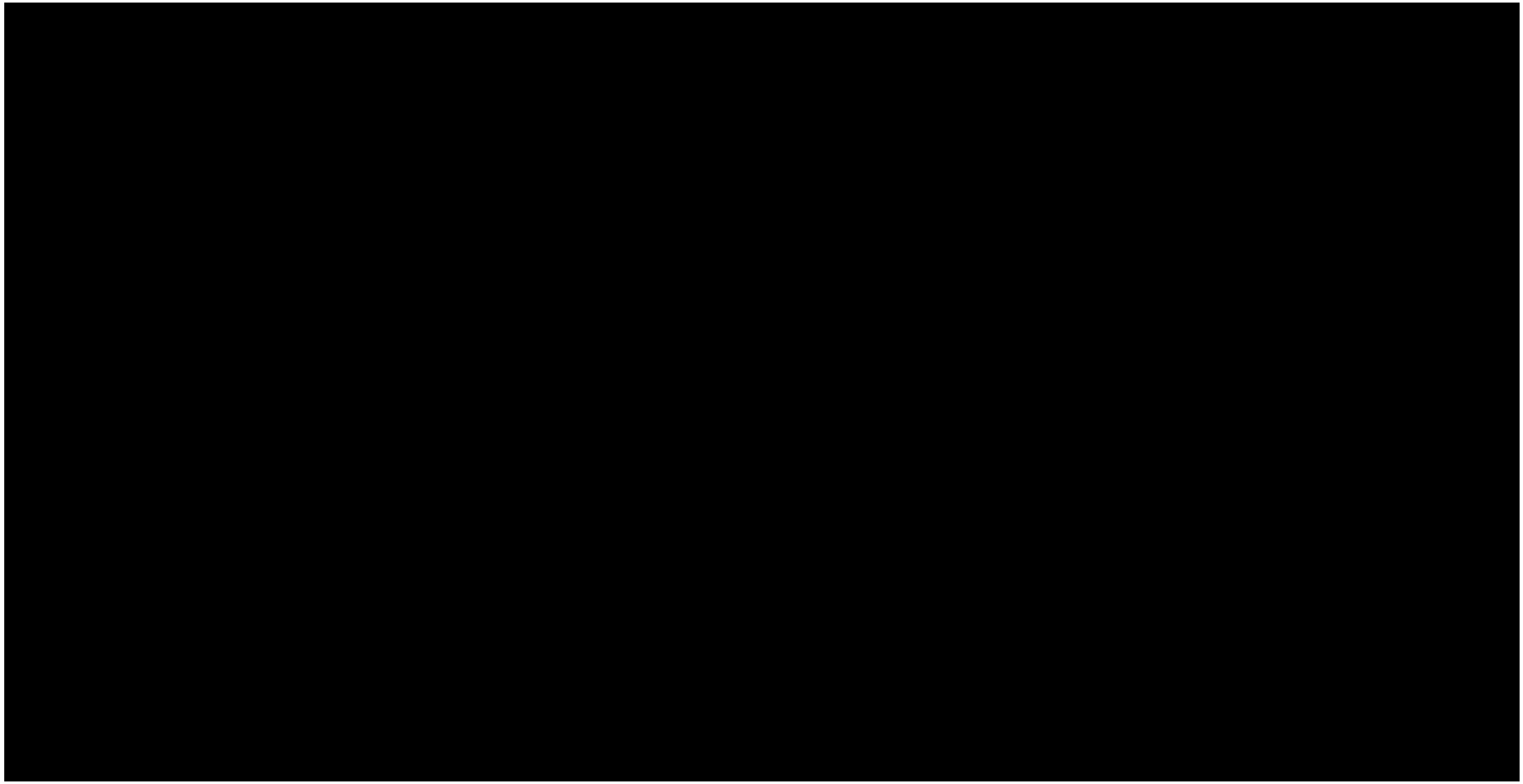
Audi connect PLUS turns your Audi into a Wi-Fi hotspot, providing full-speed internet connection for up to 8 devices at a time.

- Full-speed Wi-Fi (speed reduced after 15GB)
- App Store (Spotify, YouTube, Zoom and so much more)[10]
- Amazon Alexa[11]

Complimentary 6-month trial subscription included with new MY24 vehicle purchase. After the trial, a paid subscription of $25 monthly or $250 yearly is required to access the Audi connect PLUS with Full-Speed Wi-Fi features.

View key feature information ›





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Audi connect CARE

Audi connect NAV

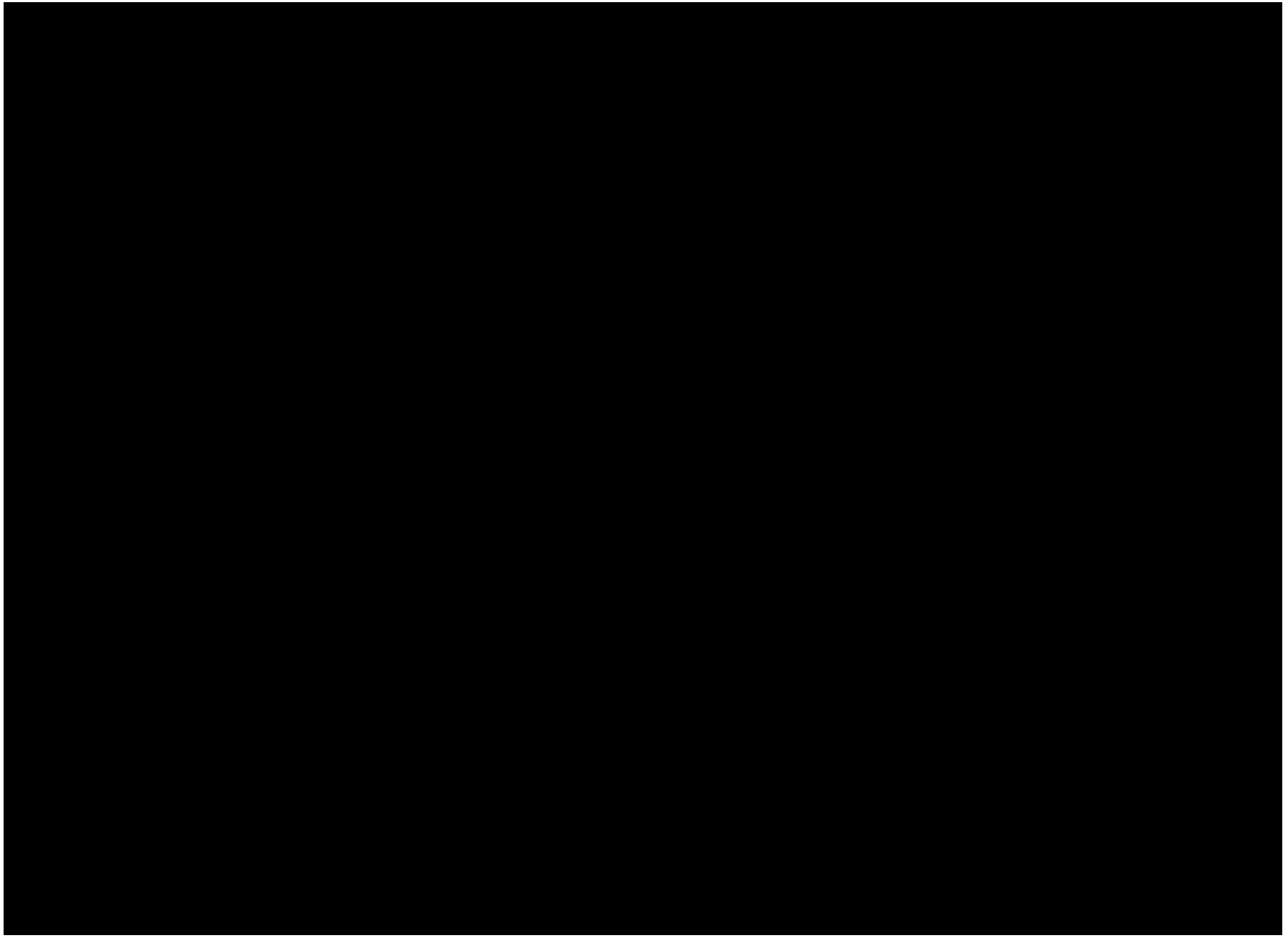
Audi connect PLUS

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Audi Themes

Themes allow you to customize and personalize your car's infotainment screen (MMI) and ambient lighting (where fitted). By purchasing and activating these themes, the background image in the MMI and the appropriate ambient lighting are adjusted in the interior. Themes can be purchased in the myAudi app and activated in the vehicle or from the myAudi app.

Discover Audi Themes

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Background of the MMI: © Stuart Franklin - Magnum Photos

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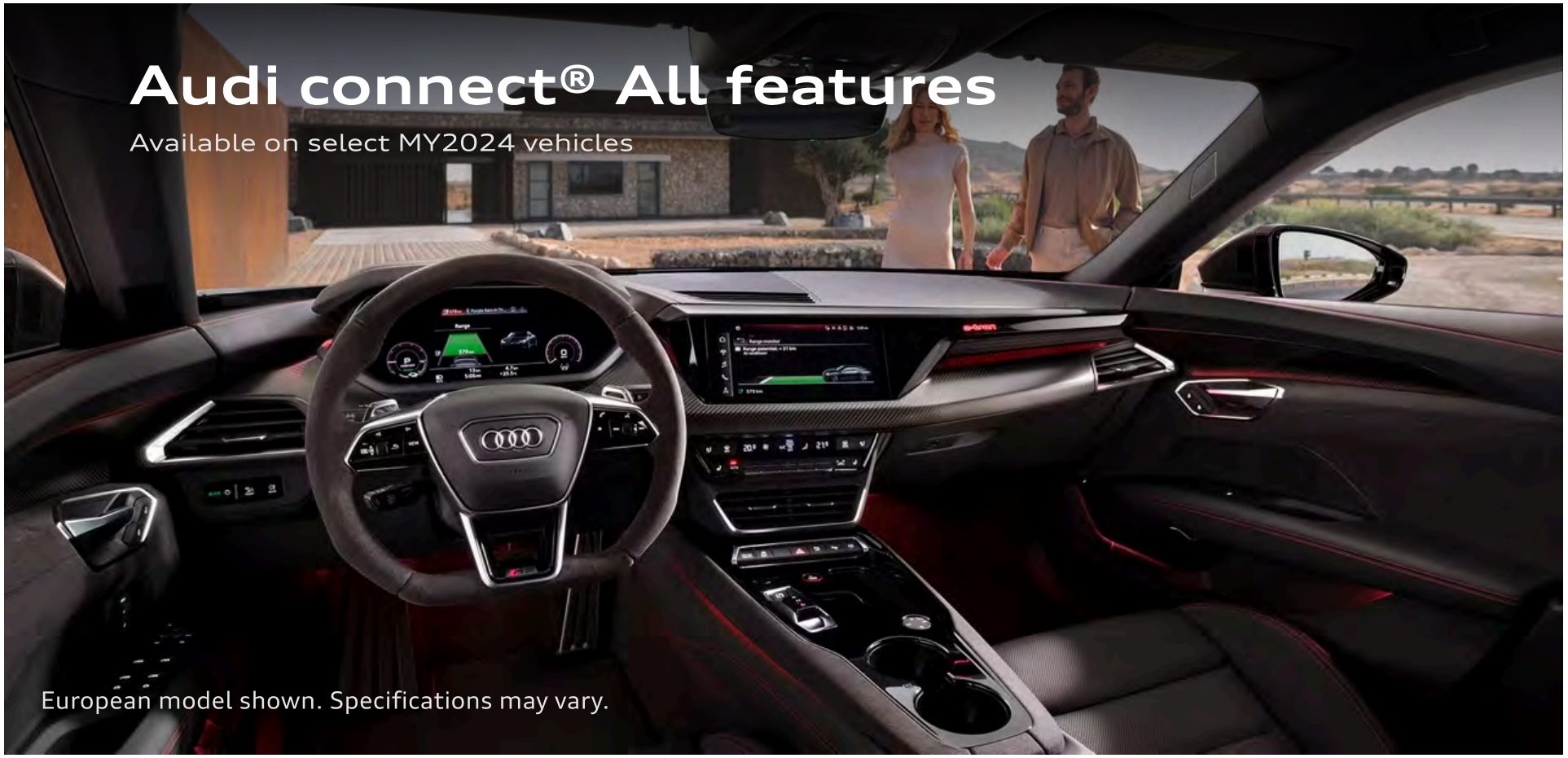
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Code of Conduct

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Audi connect® All features
Available on select MY2024 vehicles
European model shown. Specifications may vary.

Select a plan

Audi connect CARE >

Audi connect NAV >

Audi connect PLUS >

These plans apply to select MY2024 vehicles. Please visit the myAudi Portal or the myAudi App for more information on features and plan options for your vehicle

myAudi Portal >

View key feature info >

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Audi connect CARE.

If equipped, start your Audi remotely without stepping outside—because every Audi driver deserves a comfortable driving experience with peace of mind. Make an emergency call, get a vehicle status report, or check the charging stats of your e-tron®—all with Audi connect CARE, included for 10 years with the purchase of every new Audi.

View key feature info

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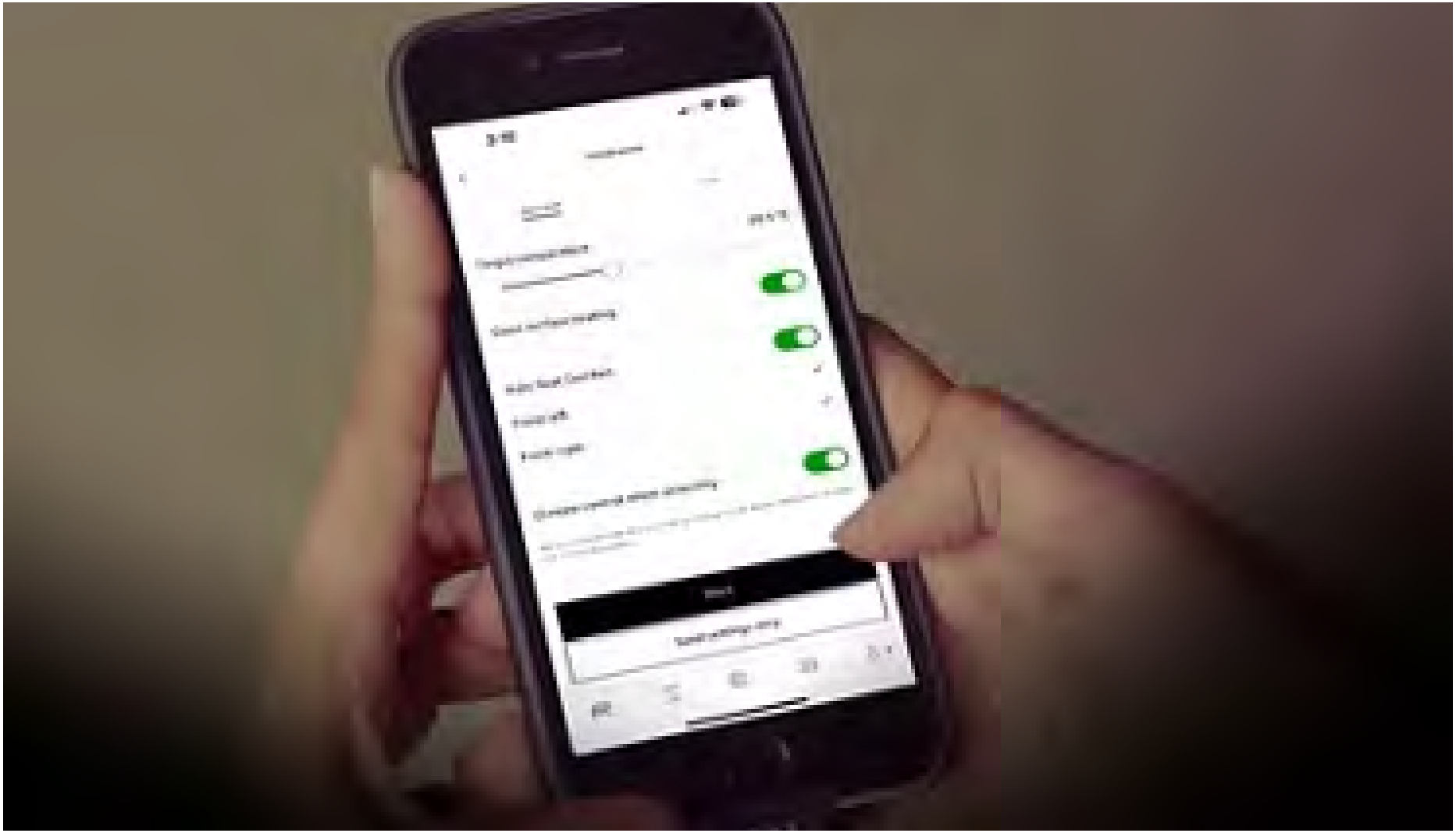


Emergency Call

Quickly notify authorities in the event of an emergency.

View key feature information >

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Remote Start via myAudi App

If equipped, start your Audi remotely without stepping outside.



Online Roadside Assistance

Get help with flat tires, fuel delivery, and more.

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View key feature information >

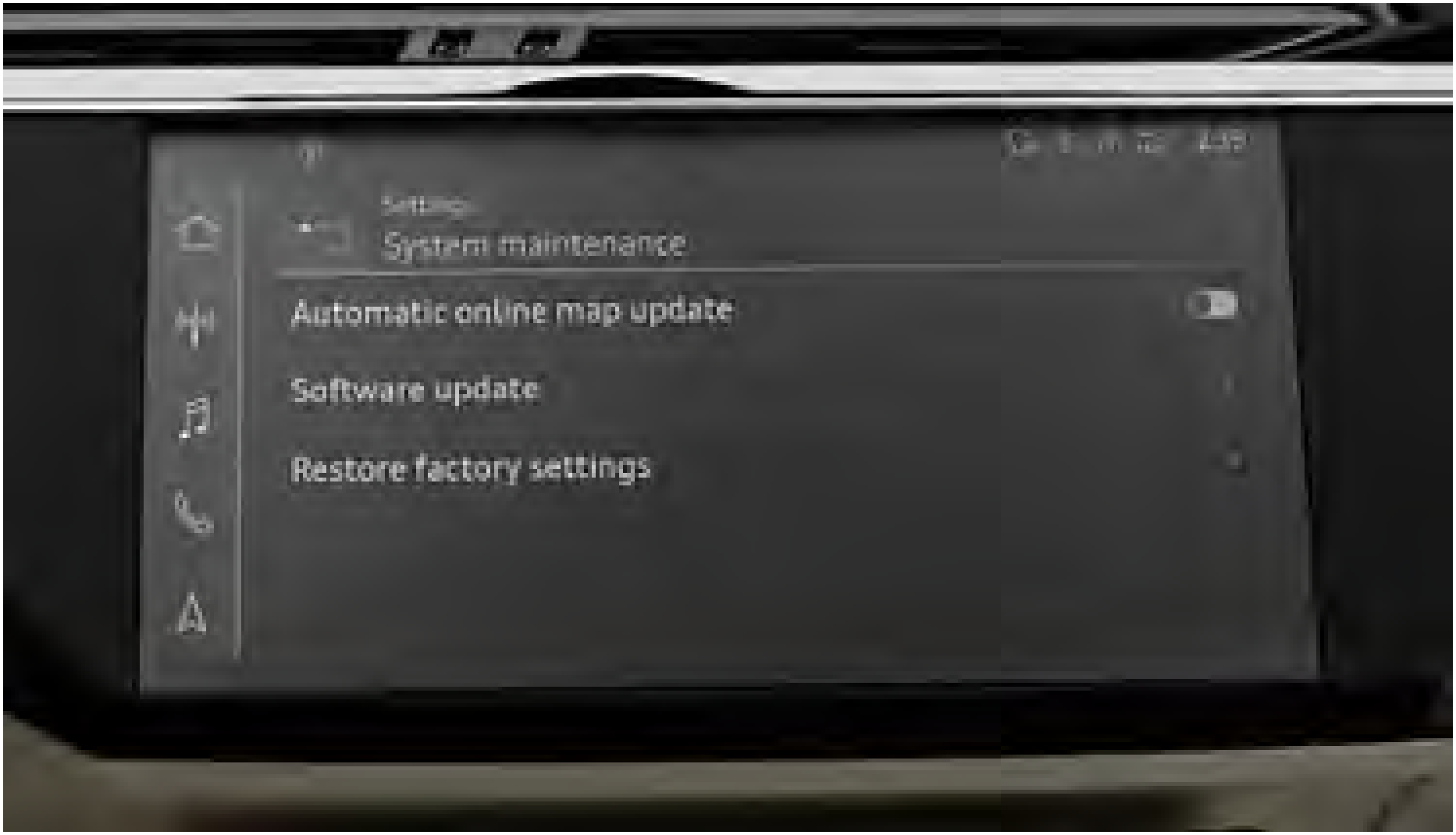


Audi Service Request

Schedule services from your smartphone.

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View key feature information >



Map Update

Keeps maps up to date for accurate navigation.

View key feature information >



In-Vehicle Trip Planner

Generate routes with access to EV charging stations and ETAs that include charging time estimates.

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View key feature information >



Remote Lock / Unlock

Lock and unlock your Audi remotely.

View key feature information >



Vehicle Status Report

Receive maintenance reminders and alerts about vehicle concerns.

View key feature information >



Car Finder

Locate your Audi remotely.

View key feature information >

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Static Charging Location Finder

Find nearby charging stations for your EV.

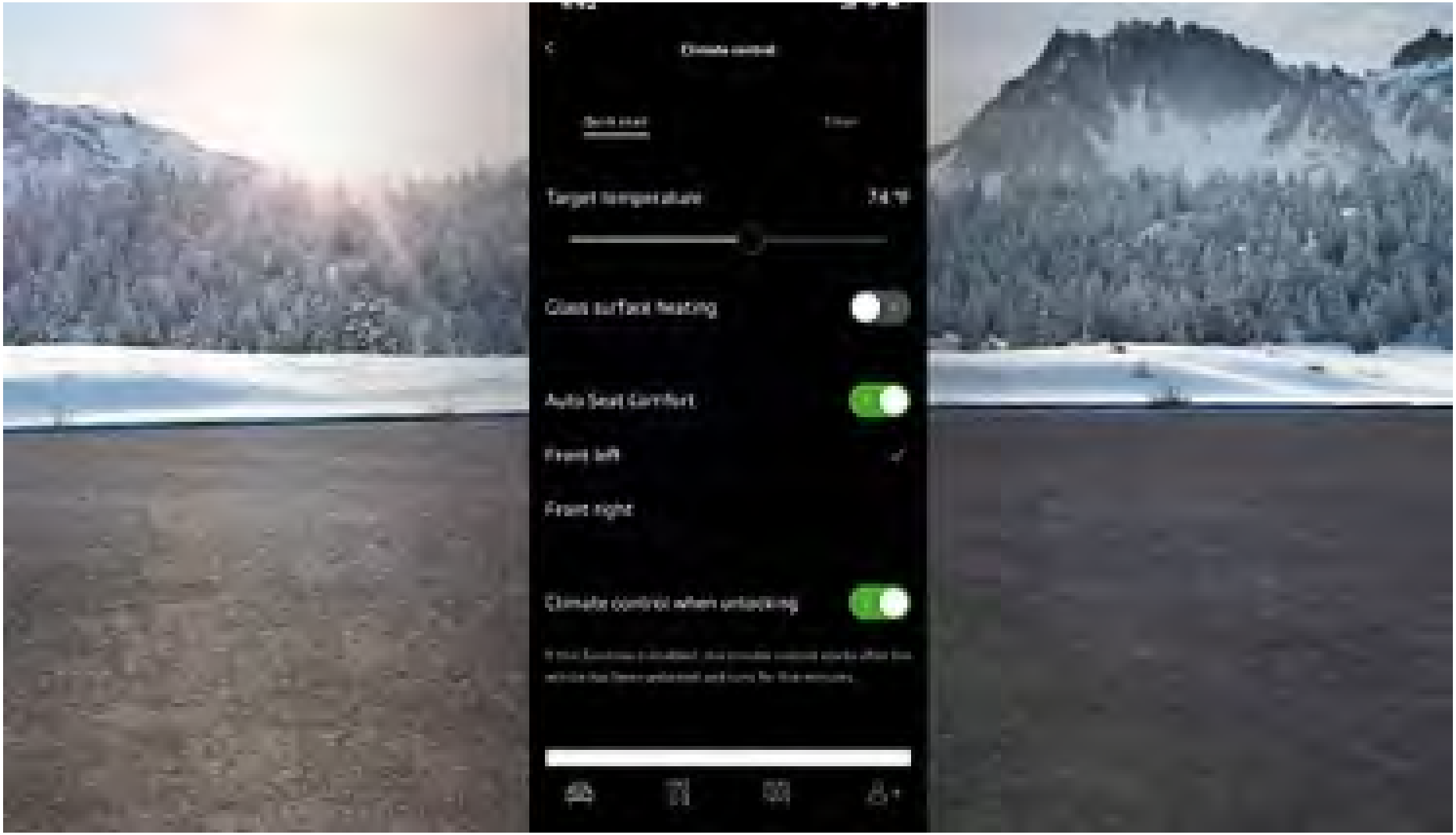
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Remote Charging

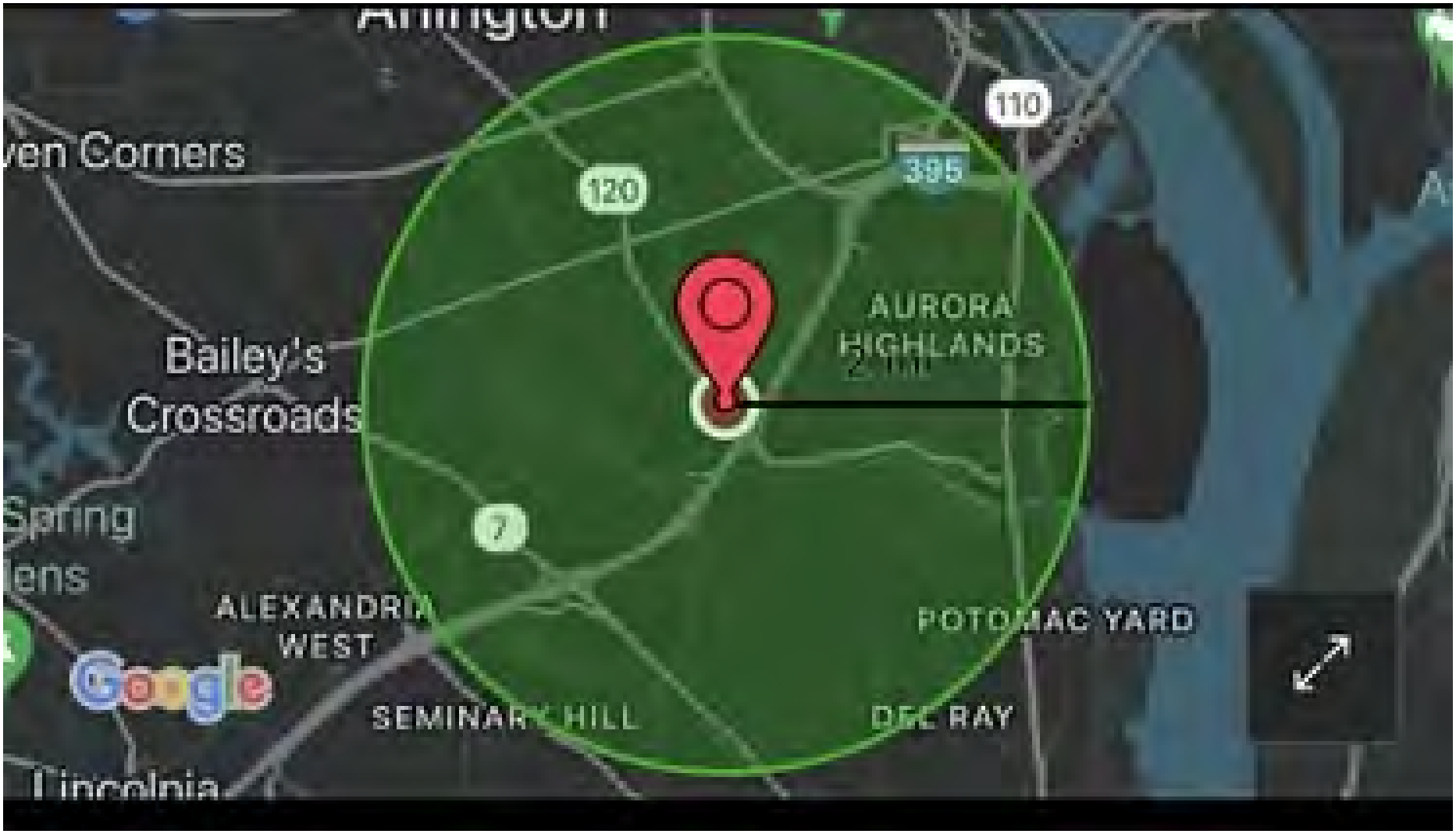
Monitor charging status for your EV on your smartphone.



Remote Climatization

Adjust the cabin temperature of your EV from anywhere.

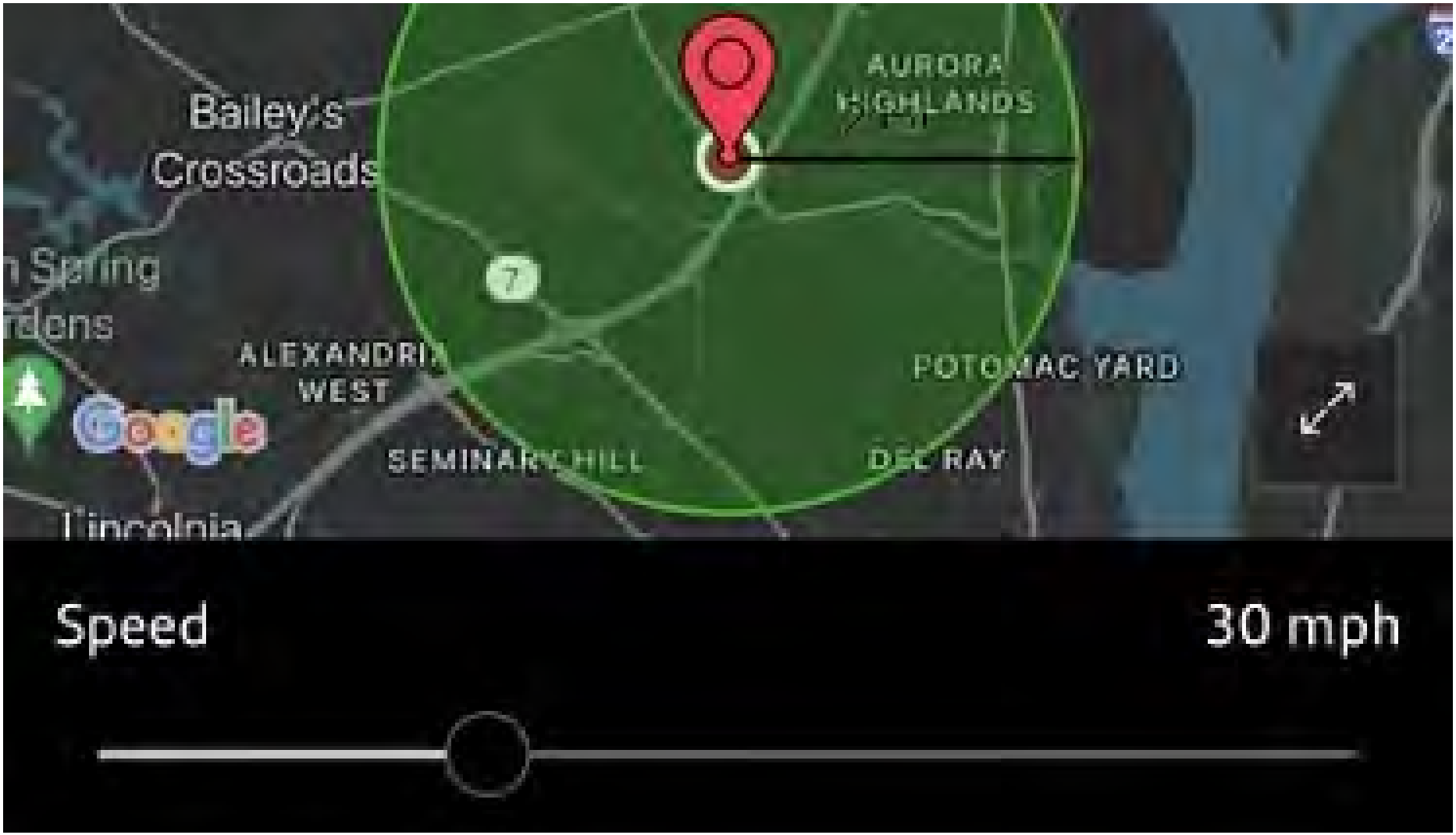
View key feature information >



Geofencing

Get notified when your Audi leaves your set boundaries.

View key feature information >



Valet Alert

Set geofences when valeting your Audi.

View key feature information >



Speed/Curfew Alert

Set speed and time alerts for your Audi.

View key feature information >



Driving Data

Get helpful insights into your driving behavior.



Stolen Vehicle Locator

Contact authorities for help locating your vehicle.

View key feature information >

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Audi connect NAV

Audi connect NAV is a paid subscription service that includes a suite of additional navigation and infotainment services for a seamless and entertaining driving experience.**

View key feature info

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Satellite Map Imagery

Drop a pin, zoom out, or change the map viewing angle to better understand your surroundings.



Traffic Light Information

Know what speed to drive to hit the most green lights.

View key feature information >



myAudi Destinations

Import destinations to your vehicle from your phone.

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Traffic Information

Get real-time traffic information and re-routing guidance.



Parking Information

Find parking spots and see pricing before you arrive at your destination.

View key feature information >



Predictive Route Guidance

Get route suggestions for commonly taken trips.



Advanced 3D City View

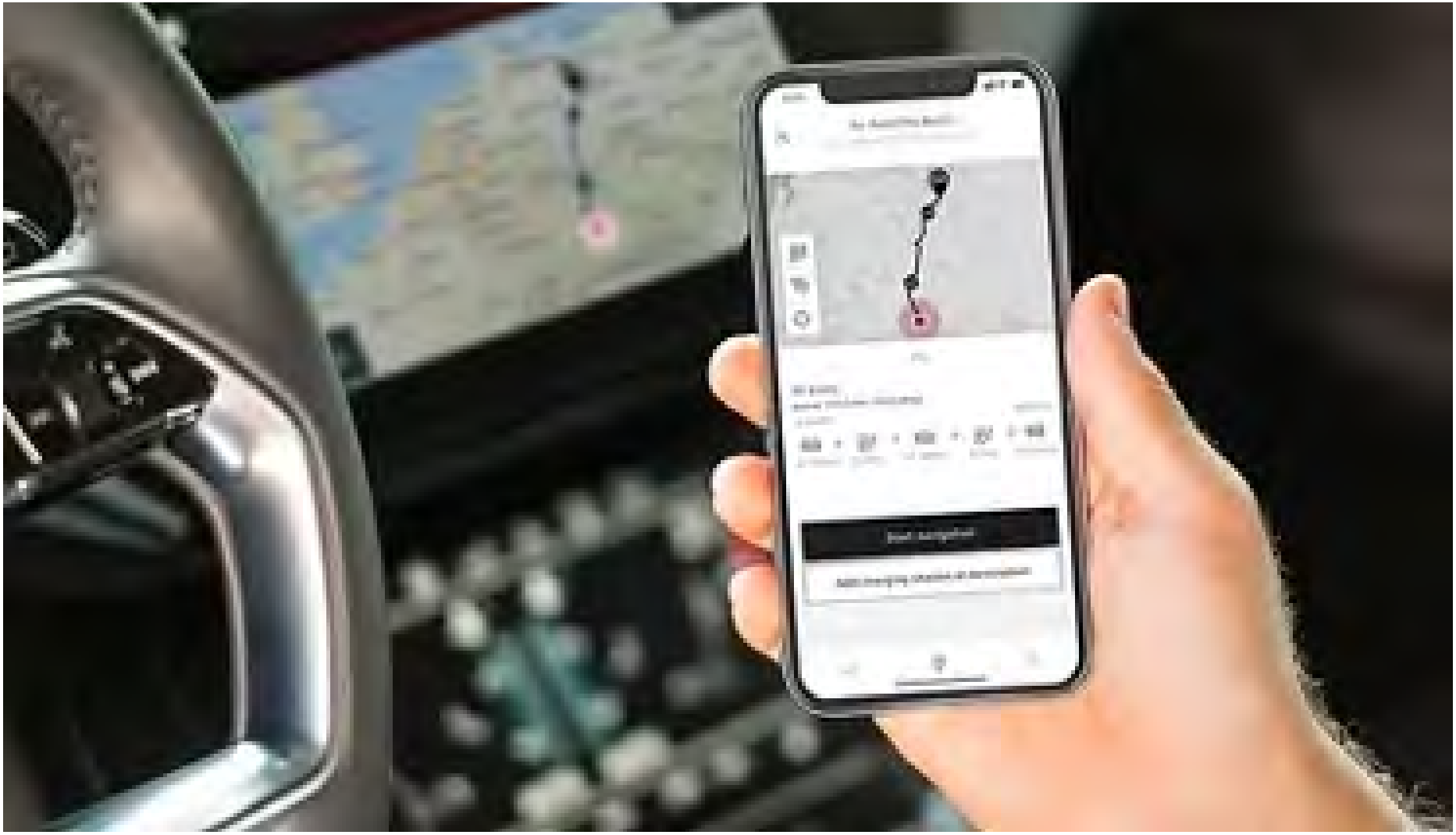
See 3D renders of your surroundings to help identify your destination.



Fuel Prices

Find the best fuel prices near you.

View key feature information >



myAudi trip planner

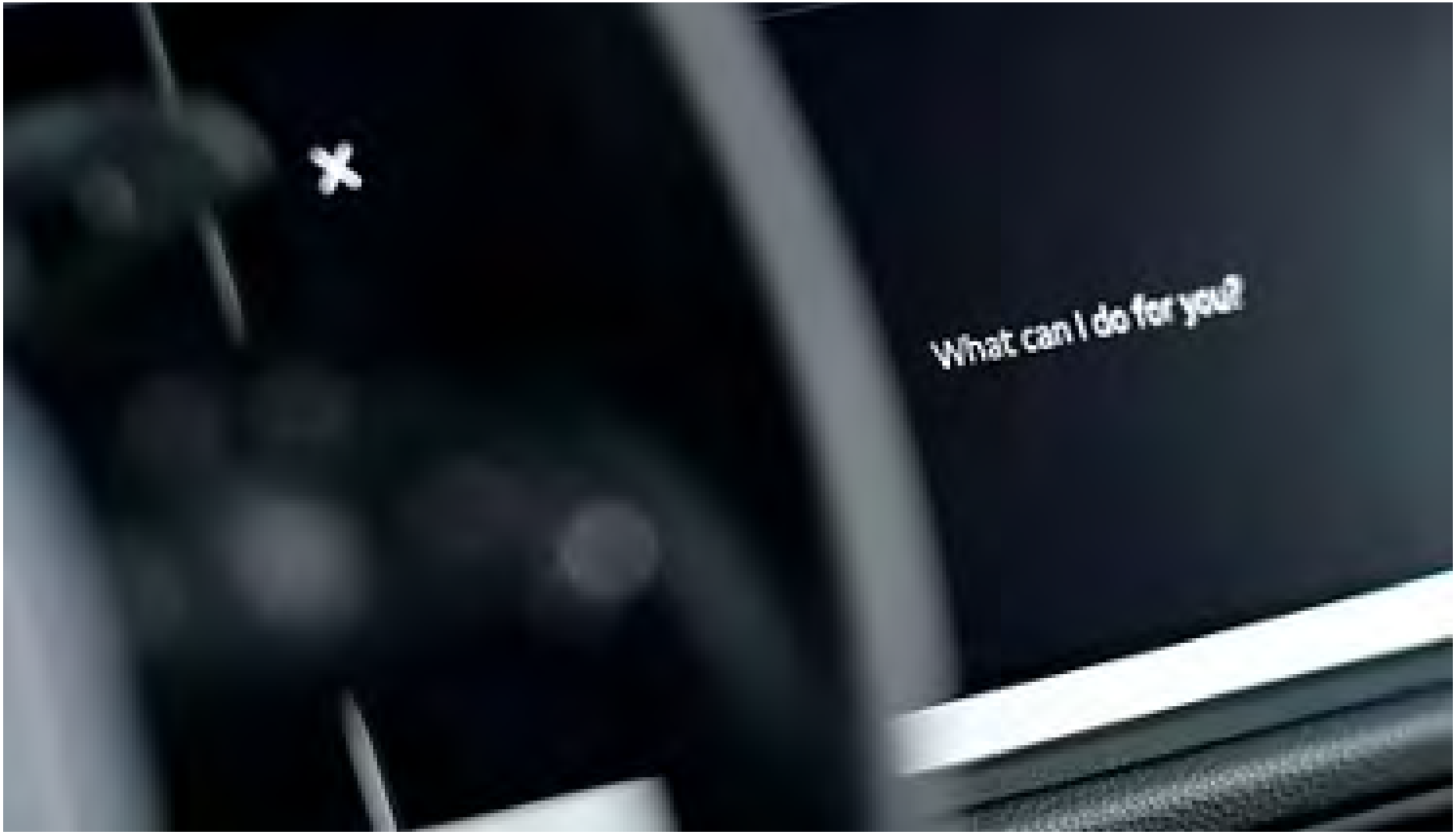
Plan a trip on your myAudi app and sync it to your vehicle.



Connected Charging Station Location

See real-time nearby Electrify America charging station availability.

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Natural Voice Recognition

Give voice commands in your natural speaking voice.



Connected POIs

Conduct a search using your voice to find nearby points of interest.

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Audi connect PLUS.

Audi connect PLUS is a paid subscription that turns your Audi into a Wi-Fi hotspot. Providing full speed internet connection for up to 7 devices, Audi connect PLUS makes your Audi feel like home.

View key feature info

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Full-speed Wi-Fi

Enjoy full-speed 4G LTE connection for up to 8 devices at once.

View key feature information >

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Amazon Alexa

Enjoy the convenience of a virtual assistant in your Audi.



Amazon Music

Access your Amazon Music library while you drive.



Apple Music

Access your Apple Music library while you drive.

View key feature information >

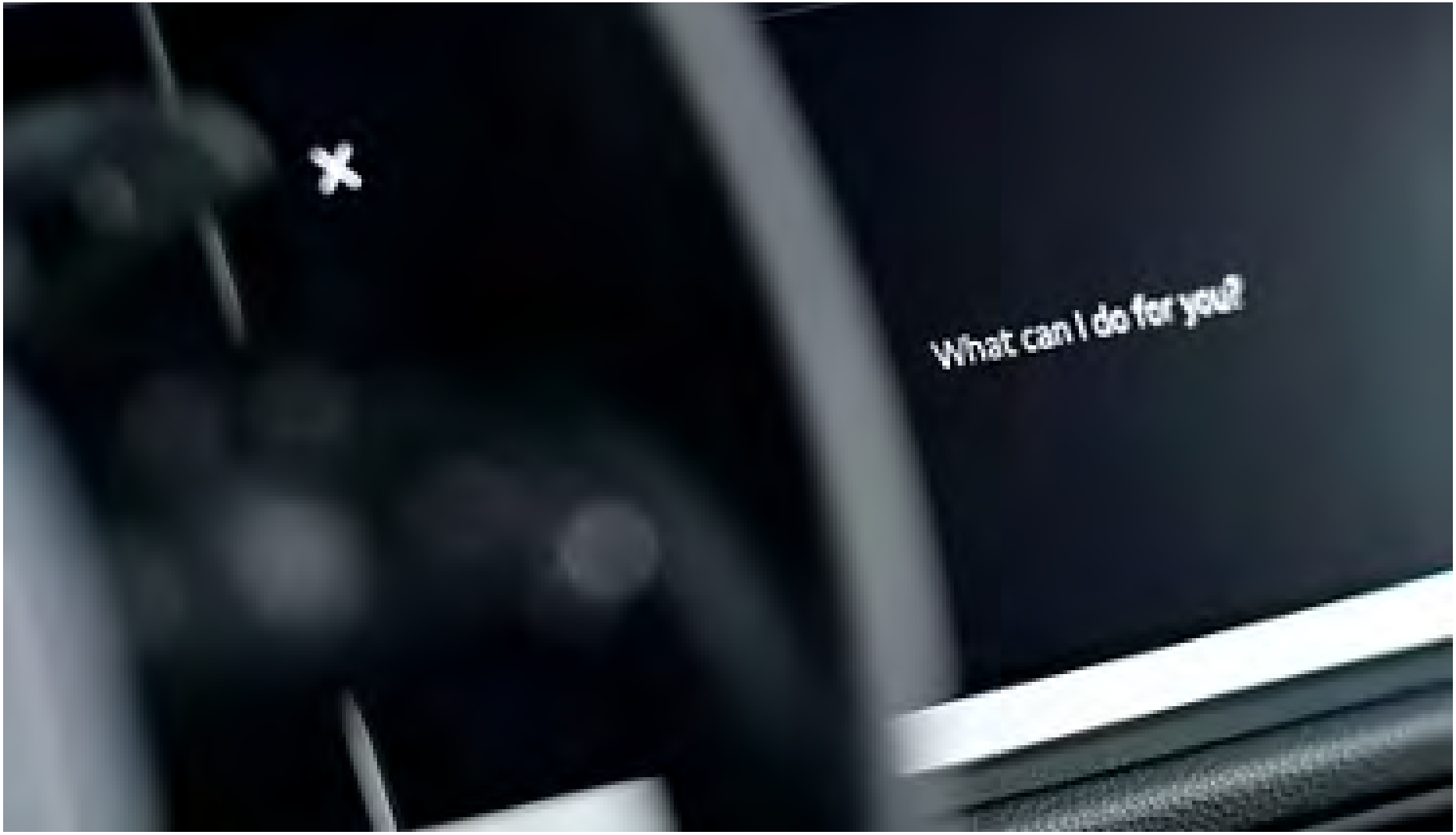
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Online radio

Access unlimited online streaming radio stations from across the globe.

View key feature information >



Online news

Have your customizable news feed read out to you while you drive.

View key feature information >



Weather

See real-time weather updates.

View key feature information >

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App Store

Access your favorite apps directly via the MMI touch screen. The integrated and ever-expanding store has apps across Music, Video, Gaming, Navigation, Parking & Charging, Productivity, Weather, and News.

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Customer support

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If you have additional questions about your Audi connect services, please call our dedicated service line.

Call us >

LAG-VW00002273

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Audi Financial Services

Audi collection store

Accessories

Audi connect

Roadside Assistance

In-Use Verification Program

About Audi

Careers

Newsroom

Emissions Modification Lookup

Accessibility

Recalls

INDUSTRY GUIDANCE FOR EMERGENCY RESPONDERS

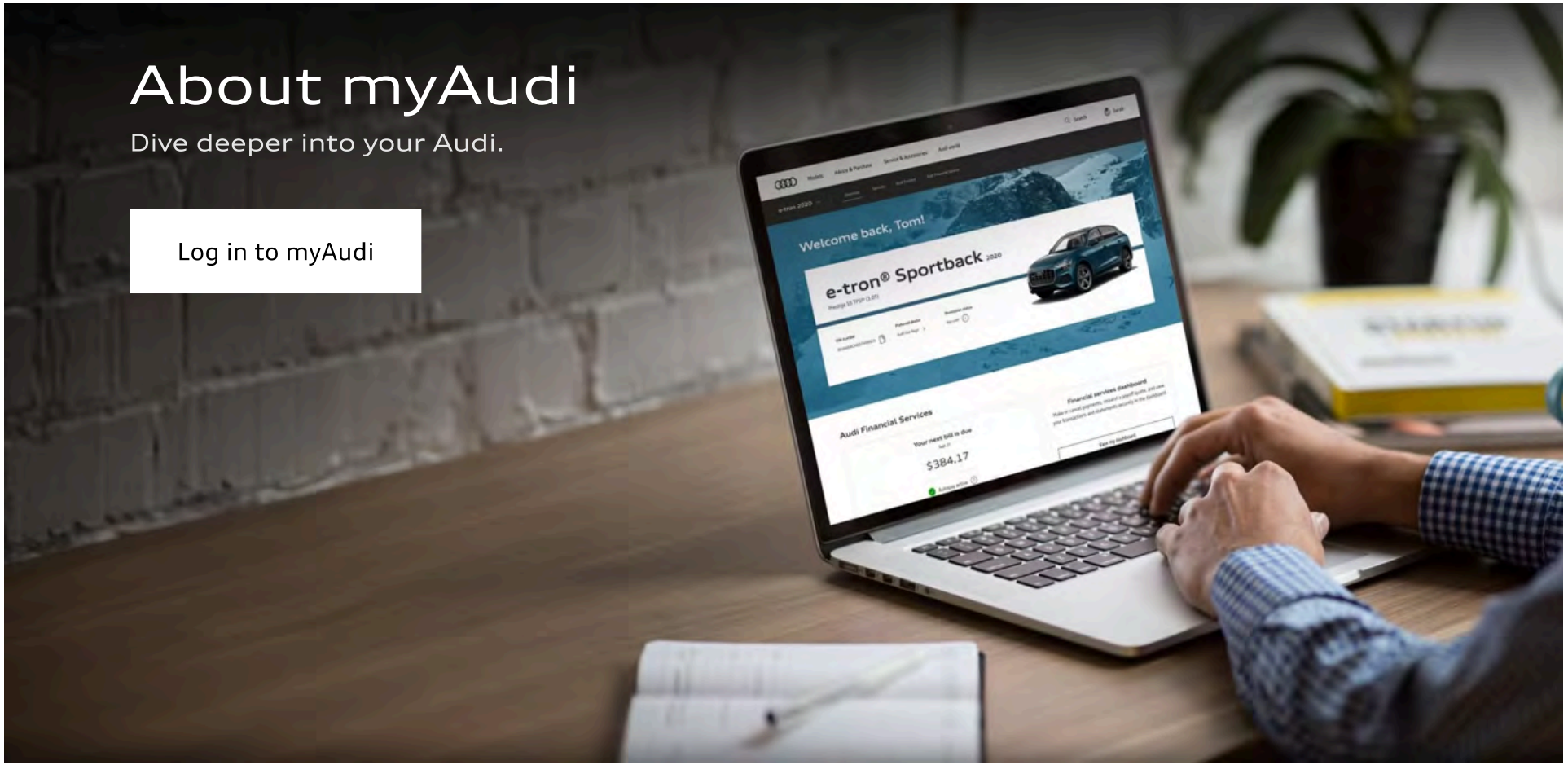
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Menu



About myAudi

Overview | All myAudi features

Stay in sync with your Audi—wherever you are.

Whether you're awaiting your new Audi, enjoying your current ride, or looking to extend your Audi journey, the myAudi app[1] and portal allow you to conveniently access a world of Audi resources. The app is your virtual key to remote services and charging information, while the portal offers a comprehensive overview of your service and maintenance history and Audi Financial Services information.

Control & access

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Remote vehicle access

Remotely lock or unlock doors and windows. Plus, receive alerts on the myAudi app when a secondary driver exceeds your set distance and speed limits.[2]

European models shown. Specifications may vary.

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Audi Financial Services

Sync your Audi Financial Services account with myAudi to make payments, check payment history, and track upcoming payments on the myAudi portal.

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Vehicle status report

Get notified on the myAudi app when there’s a concern with your vehicle and receive reminders when it’s time to book your next service appointment. [3]

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Remote climatization[4]

Set your ideal cabin temperature before you even enter your Audi—for a comfortable drive no matter the weather.

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Key User setup

Set yourself as the Key User on the myAudi app, then designate other drivers as secondary users so they can also access gain to vehicle information on the app.

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Stolen Vehicle Locator

Stolen Vehicle Locator is a dedicated feature aimed at assisting Audi owners in locating and tracking their vehicle if it’s ever stolen.

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Service & care

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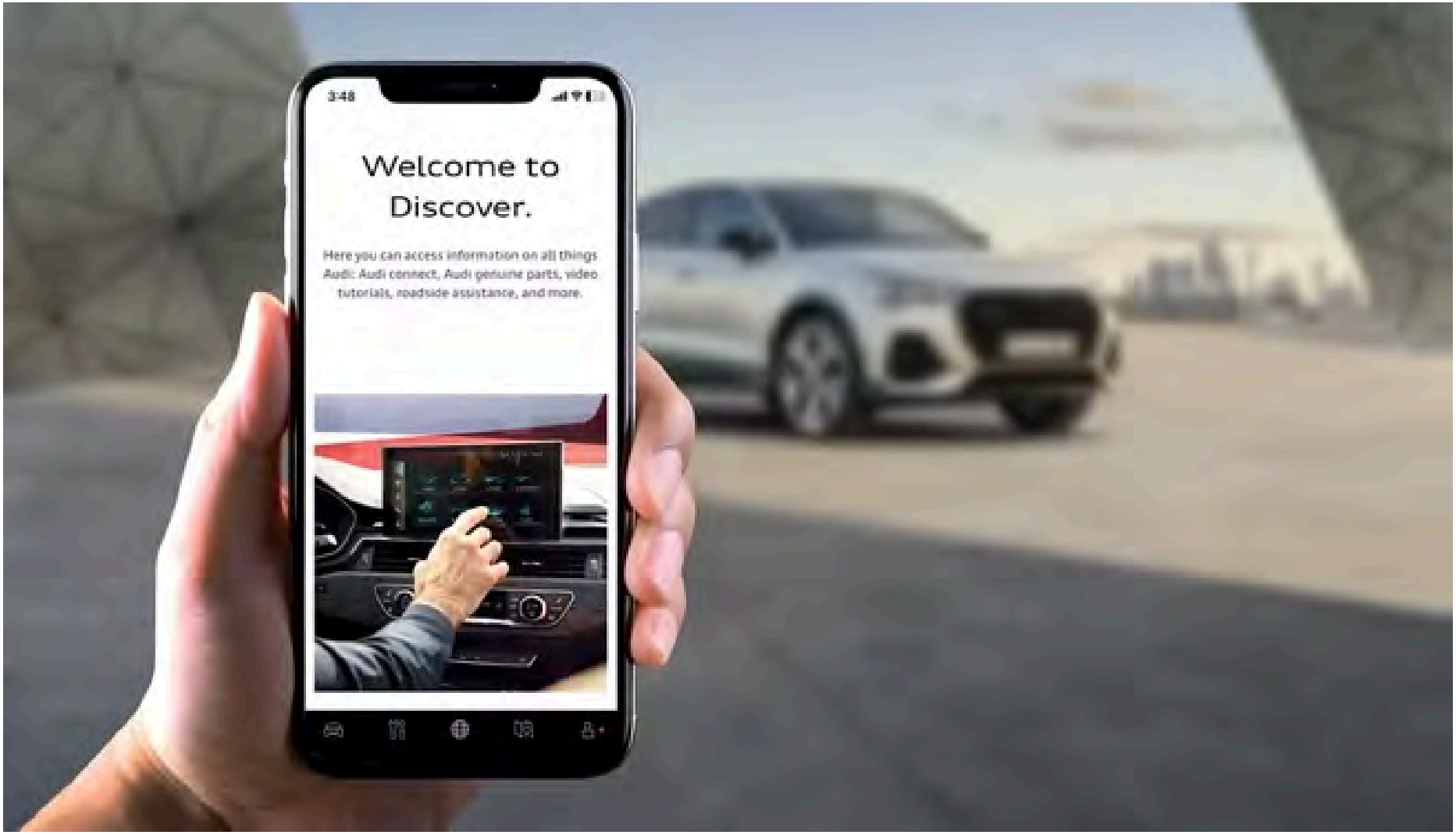


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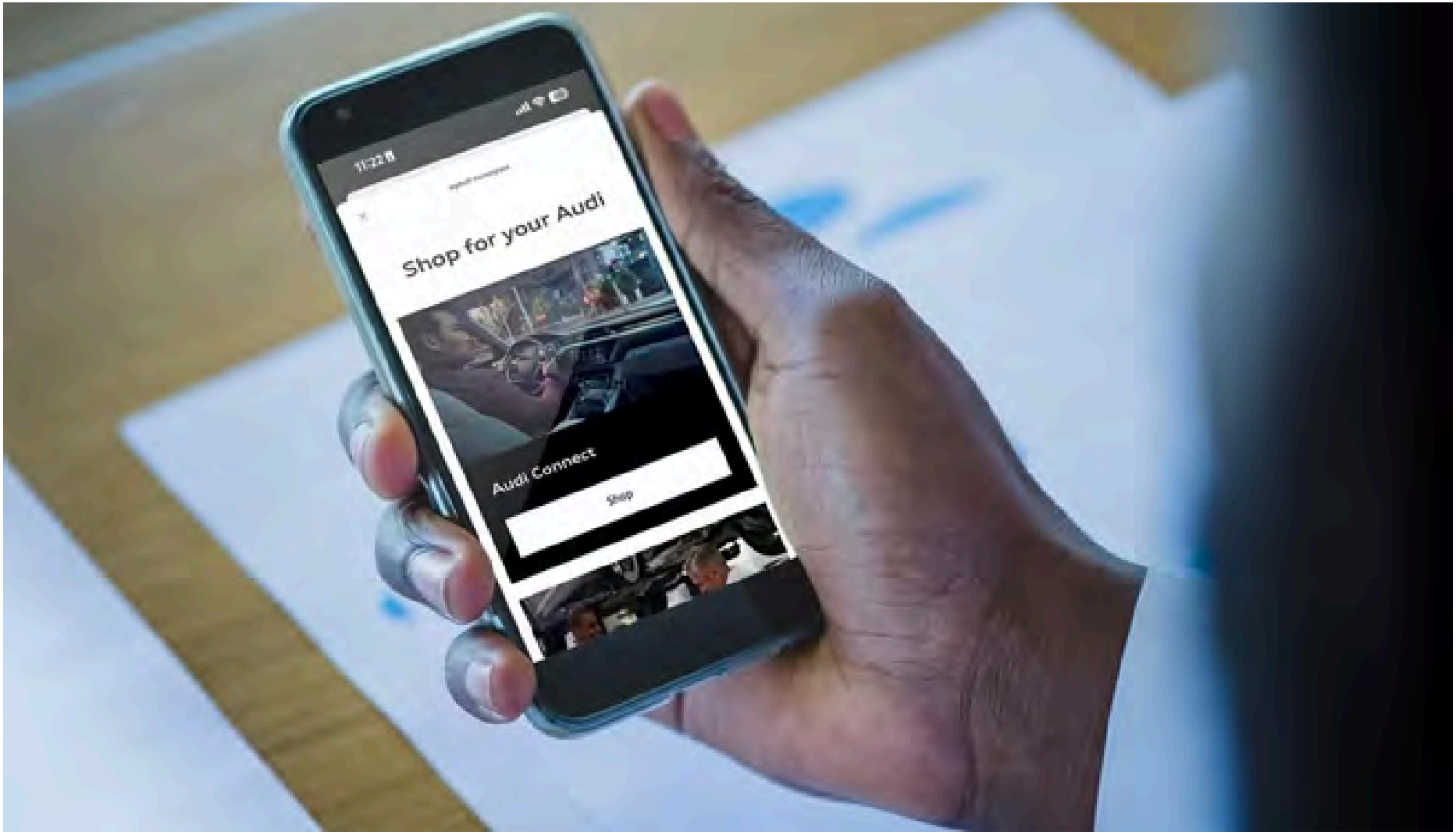
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7 The following Audi e-tron EV models support Plug & Charge: MY23 e-trons and MY24 Q8 e-tron.

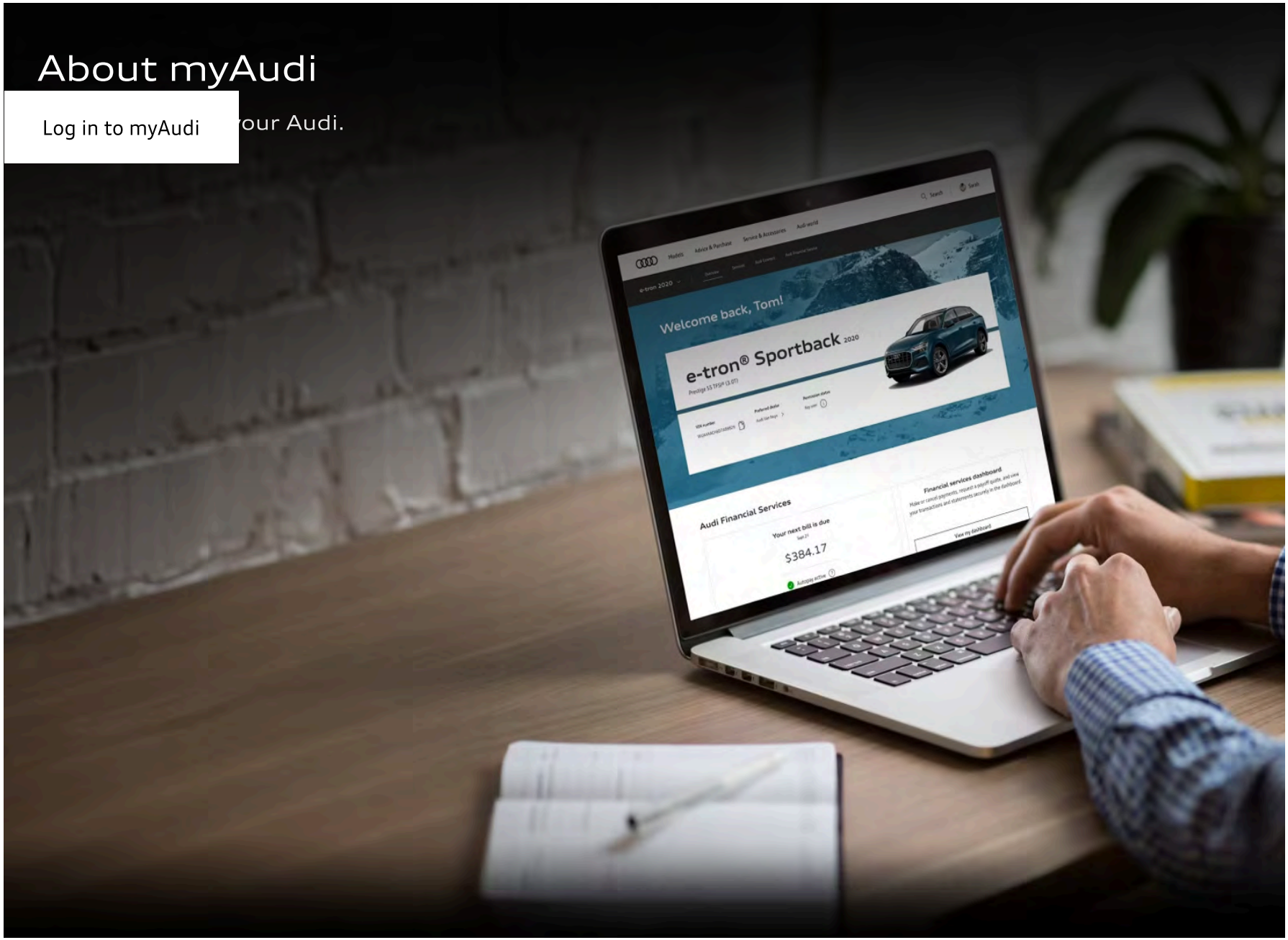
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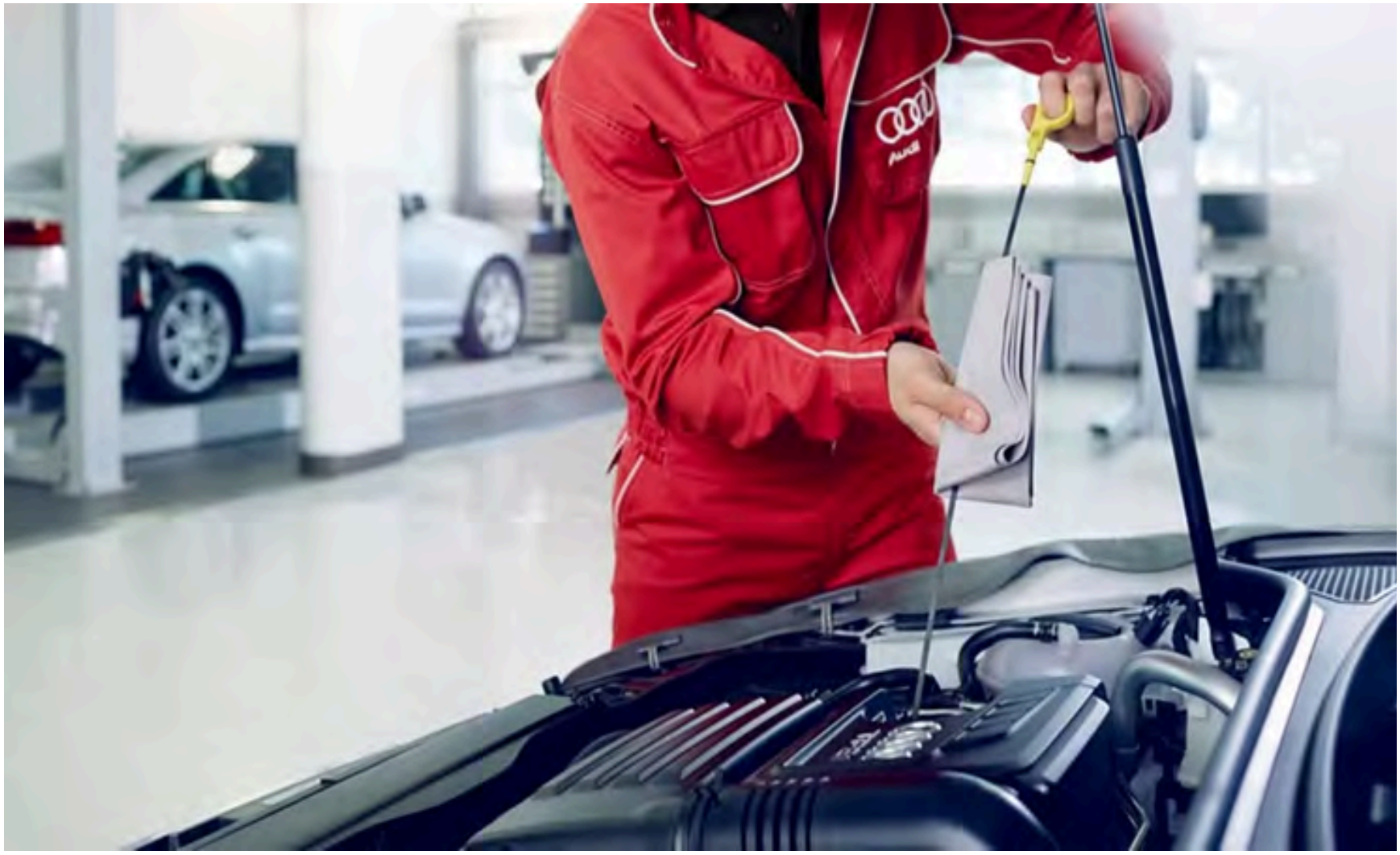
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2 Standard text and data rates may apply. See Owner's Manual for further details and important warnings about locking and unlocking your vehicle remotely. Not available on Q4 e-tron. Requires Audi Connect CARE subscription.

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6 The following Audi e-tron EV models support Plug & Charge: MY23 e-trons and MY24 Q8 e-tron.

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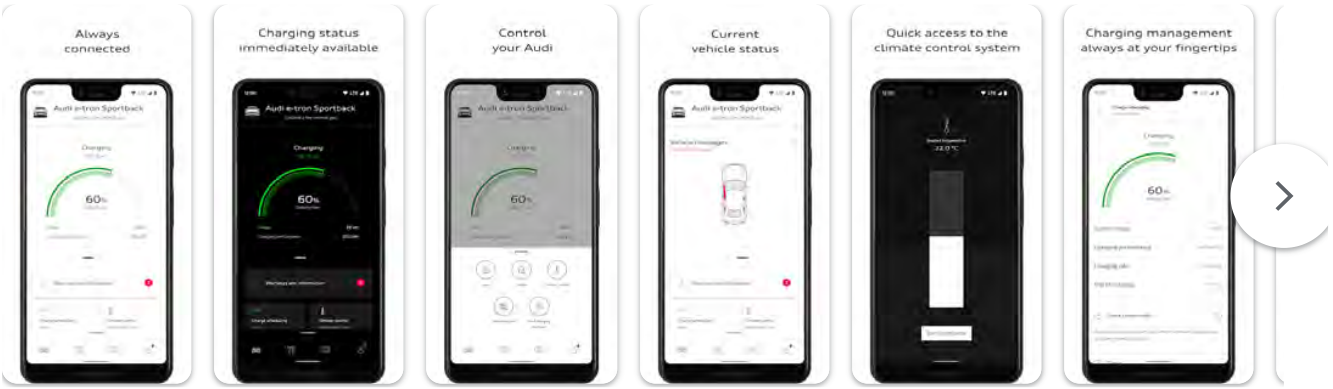
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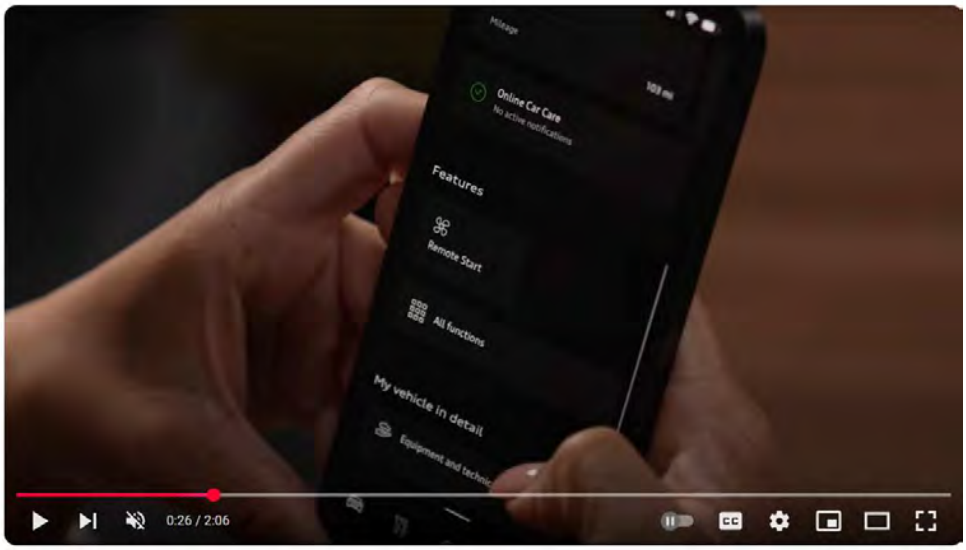
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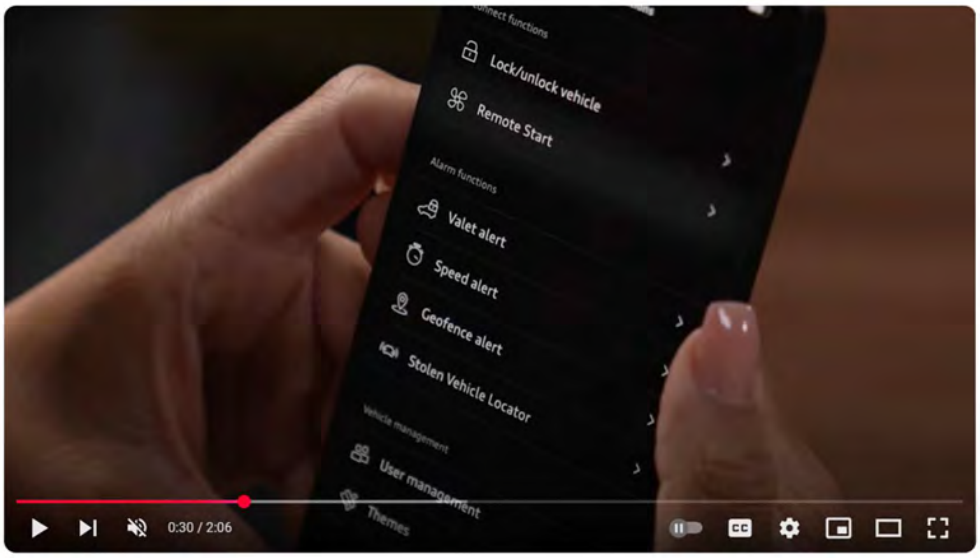
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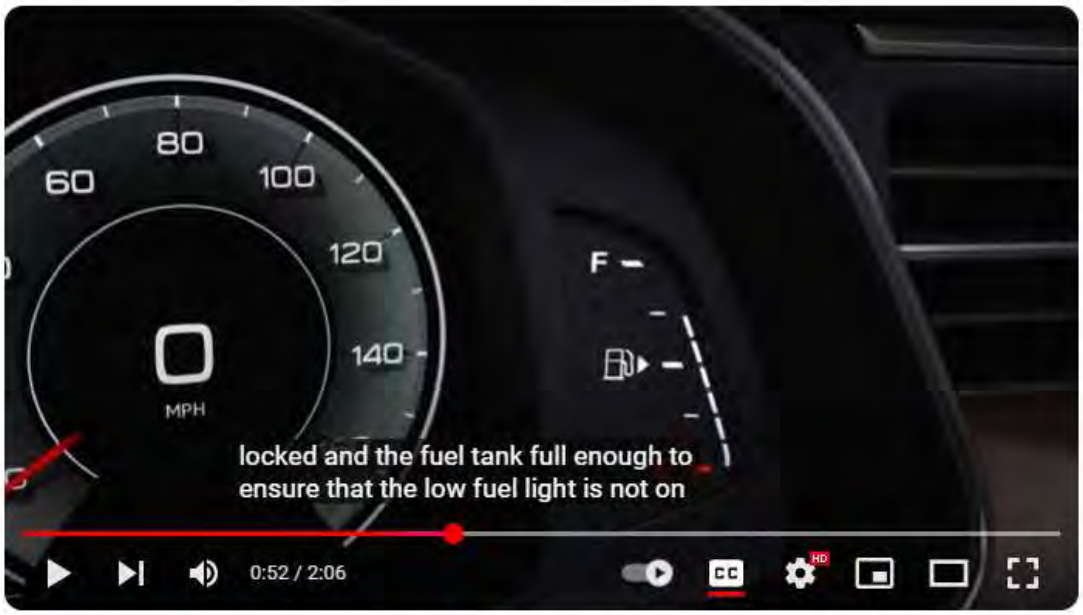
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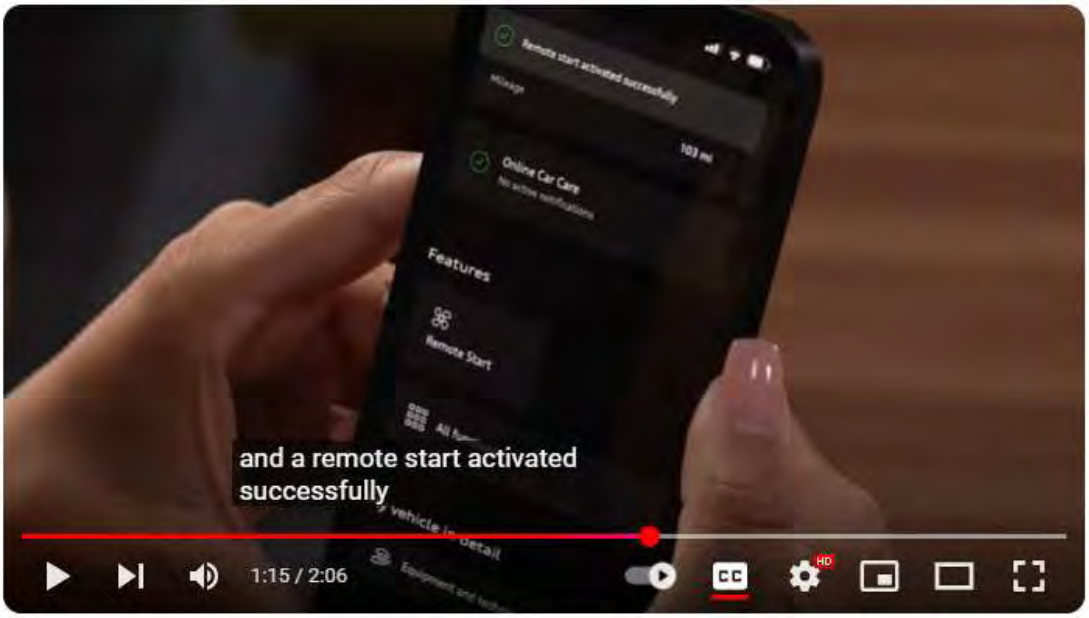
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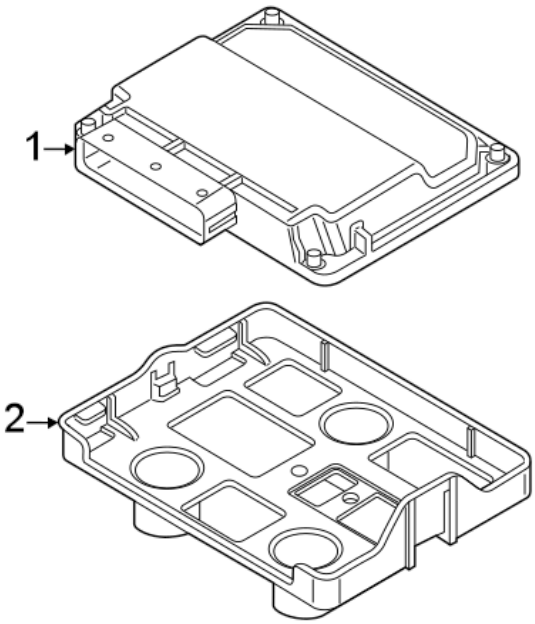
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Technology Behind Telematics Explained: How does a Vehicle Telematics Solution Work?

December 5, 2018

"Telematics is the Talk of the Town" – this won't sound as an understatement to the enthusiasts of the Automotive Industry!

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A lot has been written and spoken about how Vehicle Telematics features are shaping the future of fleet management, remote vehicle diagnostics, vehicle/asset tracking, Insurance Telematics, e-call/b-call and more

But we wanted to understand the tools and technologies that are necessary for design and development of a Vehicle Telematics solution.

And hence the idea of sharing this information with our Automotive Community was conceived.

How Does a Vehicle Telematics Solution Work?

A Vehicle telematics solution consists of the following 3 fundamental building blocks:

- Telematics Control Unit
- The Telematics Cloud Server
- The Front End- Web app and Mobile App

The following block diagram features the basic building blocks of an automotive telematics system.

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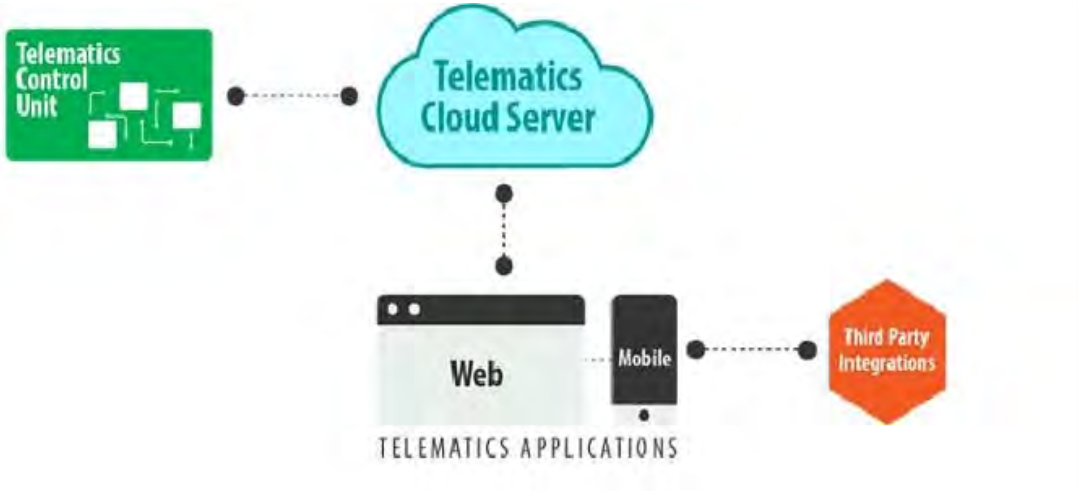


Image: Building blocks of an automotive telematics system

The Telematics Control Unit (TCU), which is the central hardware module of the telematics device, has communication interfaces with the in-vehicle network (CAN Bus) and the back-end cloud server(GPRS) . TCU collects the crucial vehicle data such as diagnostics data, real time location, and speed of the vehicle (through different interfaces) and sends them to the cloud server over wireless network such as GPRS/cellular/LTE , in a specific packaged format.

This telematics data stored in the Cloud Telematics Server is accessed by the end-users through a web app or a mobile app.

Understanding the Architecture of a Telematics System

Now, let us individually look at each of these components of telematics system and see how information flows between each of them.

1. **Telematics Control Unit(TCU):**The Telematics Control Unit(TCU) is the central component of a telematics system managing numerous functions such as:

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- Collecting vehicle data via CAN-BUS port
- Managing information collected over various communication interfaces such as CAN, GPS, UART, GUI etc.
- Memory and battery management
- Managing two way communication with the Telematics Cloud Server
- Managing the communication with the user dashboard/HMI device

The telematics control unit (TCU) makes use of a set of hardware and software modules for efficient execution of these functions. Let us have a look at these hardware and software components in detail.

(Please refer to the following architecture diagram for a better understanding of the Telematics Control Unit.)

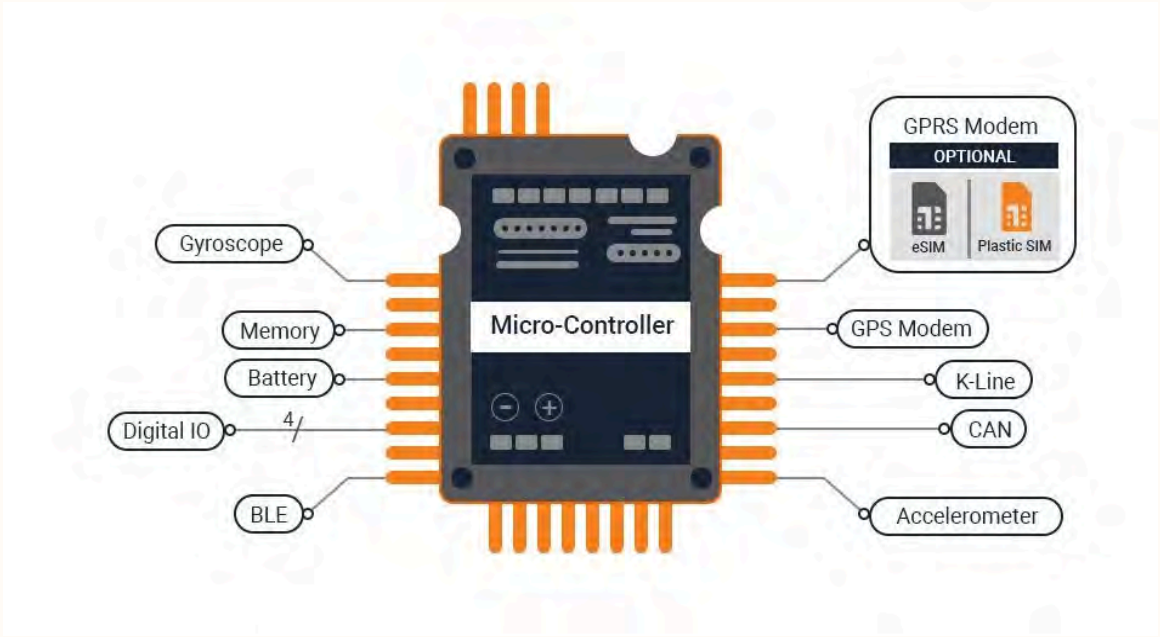


Image: Technology architecture of a Telematics Control unit

The basic framework of a **TCU hardware architecture** comprises of :



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- A **Global Positioning System**(GPS) module, for tracking the information associated with the latitude and longitude of the vehicle.
- A Central **Processing Unit,** with memory management and data processing capabilities. Commercially available telematics systems are based on microcontrollers, microprocessors or even Field Programming Gate Array (FPGA) for managing multiple processes occurring within the TCU.

Linux based processors have become popular for advanced display based telematics product development.
On the other hand, for basic telematics systems, Android based processors are popularly deployed.

High performance processor from Telit Devices, Renesas Electronics, and ST Microelectronics are commonly used for developing efficient telematics system

- A **CAN Bus** module that manages all the communication with the vehicle ECUs. Many of the commercially available telematics devices also support OBD II, MOST, LIN interfaces.The TCU communicates with the vehicle ECUs through CAN bus and fetches crucial information such as engine performance, vehicle speed, data from the Tire Pressure measuring Sensors, etc.A telematics system may also use K/Line bus to alert the user about theft (by notifying the user if the vehicle is switched on by anyone), or to enable remote locking and unlocking of the vehicle.
- A **Memory** unit, which is necessary for storing information during an unreliable or no network conditions; or in some cases, to store vehicle data for future use.This memory module is also useful for supporting advanced telematics functionalities like speech recognition.Flash and Dynamic random-access memory are some of the commonly used memory types in a vehicle telematics system.

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- **Communication interfaces** to support a wide range of communication including Wi-Fi, cellular, LTE etc.
- A **GPRS module** for data connectivity and in some cases voice based communication with remote devices. Often the GPRS module comes with a sim card, e-sim card or plastic sim cards, in addition to the GPRS modem to enable communication with remote devices over the cellular network.
- An in-built **Battery module**, with voltage rating of 3.2 to 3.4 volts, for integrated power management. The battery system is useful in a range of scenarios like :
    - As a cost-effective backup source for Real-Time Clocks when the vehicle engine is off
    - For Accessing telematics data ,for tracking and recovering stolen vehicle, when vehicle is switched off
- **Bluetooth Module,** to connect nearby devices with the telematics device, for interfacing with the end-user's mobile phone for hands-free calls, text messages etc.
- Microphone with **Audio interface** to enable features such as hands-free calls, voice based commands. It also supports stereo based output to play media files from the vehicle audio system.
- A General Purpose Input/output interface (**GPIO**) system to connect lights, buttons. This includes both analog and digital I/O type interfaces.
- The **HMI**/user interface device to showcase crucial information such as navigation maps, vehicle speed , fuel usage etc. The user can use the HMI to access features such as hands-free calls on the move, view map, playing media files etc. The HMI is connected to the TCU through a GUI or HDMI port.

Overview of the Telematics Software Components

An automotive telematics system comes with the following set of software components:

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- The Bootloader software stack for boot implementation
- Real Time Operating System (RTOS) and BSP modules
- Automotive Framework Classes that help the applications to access the primary telematics functionalities such as GPS data.
- Global Navigation Satellite Systems (GNSS) software for real-time vehicle tracking and identification of the geo location.
- Software for integration of data analytics to alert user about vehicle maintenance, fuel usage, vehicle usage patterns etc.
- Software for Multimedia device drivers.
- Device management software for Remote Over the air update of firmware (FOTA) and software (SOTA) images.
- Security Algorithms for ensuring multi-level security of the telematics code and application through device and user authentication, data encryption, Content Filtering etc.

- **Cloud Telematics Server:**Now the information collected by the TCU is sent to the cloud based telematics server through a GPRS/cellular network over HTTPS . But before the transmission, the data packets are encapsulated into MQTT messages.Once the data packets reach the cloud, data is extracted and stored into a database for further processing.

  The Cloud based telematics server consists of a web server, an application server, and a database.To learn about the data flow within a cloud application, also read: How an IoT Cloud Application Works? A Deep Dive into the Software Architecture and Data Flow.

  The web server and application server ensure a seamless exchange of data between the database and front-end application, often a web app or a mobile app.
- **The Front End:**The data stored in the telematics server can be accessed by the end user using either via a **desktop or mobile application**. Based on the specific use case, the telematics data in the server can be fed into a third party software such as computerized mapping software, to apply further business logic on the available data.**Integration of Telematics with Web/Mobile Apps**The

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telematics information when integrated with a smartphone or web app, offers numerous business opportunities for various automotive stake holders. We will have a brief look at a few such scenarios relevant in current times:

- The **fleet management** service providers use the telematics information for real-time time fleet tracking, remotely monitoring the driver, optimizing fuel usage, gain business intelligence based on analysis of vehicle data among others.



Image: Connected Vehicles with Automotive Telematics . Image Source: Autocarpro

- Telematics has paved way for a new model of insurance – **Usage Based Insurance** whereby the automotive **insurance companies** use the telematics data to serve and charge the users based on vehicle usage pattern.
- Telematics allows daily commuters to : set a notification based maintenance schedule so that they are intimated when their vehicle needs a maintenance service, to **track stolen vehicles** ,use **location based services** like enhanced navigation, traffic related information- using a desktop or mobile app.

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- The advent of telematics solutions has supported the growing popularity of **ride sharing** services for daily transits. Telematics technology enables both the ride-sharing companies and the passengers to keep a closer tab on the driver, manage payments based on the ride maps, monitor the vehicle movement through their smartphones – all in a seamless and secure manner.

Hope you liked this blog on automotive telematics technology. If you are interested to know more about the hardware and software features of a telematics system, please get in touch with our IoT consultants.

Subscribe



Vaibhav

About the Author

Vaibhav is a digital-marketing professional with a deep-rooted interest in everything automotive. Regular collaborations with automotive tech guys keep him apprised of all new trends in the automotive industry. Besides digital marketing, Vaibhav is fond of writing and music.

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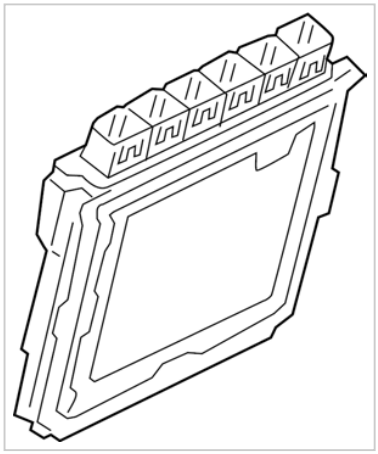
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Engine Control Module (ECM)

Part Number: **4N0906014C**

Supersession(s): **4N0-906-014-C**



(https://images.simplepart.com/images/parts/motor/parts/fullsize/1363217_7.png)



A module in a vehicle used to monitor and control many components of the vehicle's engine management system. CONTOUR. Unit. ECC. Engine Control Computer. Engine Control Module (ECM). Engine Control Unit (ECU). General Purpose Embedded Control Unit. Powertrain Control Module.

Engine Control Module

Fits A8

A8 Quattro; 4.0L.

1 person has looked at this part recently

What This Fits	This product fits 2 vehicle variants. Audi: 1 models, 2 variants between 2019 and 2020.
Product Types	
	Show More

Dealer Price

$ 2,174.99

View Warranty Info (/policy.aspx).

Fulfillment Options

Shipping ESTIMATE COST

Local Pickup

Audi Tulsa
4208 S. Memorial Dr., Tulsa, OK, 74145-4834

- 1 + Add To Cart

Audi Tulsa Dealer Info (//parts.auditulsa.com)

(/aboutus.aspx)

(https://www.audiusa.com/privacy)

(https://www.audiusa.com/)

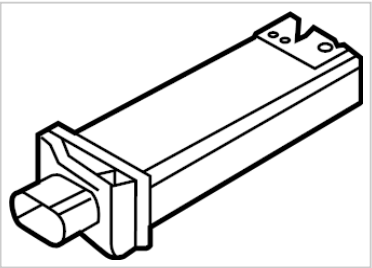
(https://parts.audiusa.com/policy.aspx)

(https://www.audiusa.com/us/web/en/terms_and_conditions/privacy.html)

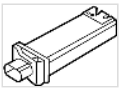
(/motor.aspx)

Tire Pressure Monitoring System (TPMS) Control Module

Part Number: **4M0907273B**
Supersession(s): **4M0-907-273-B**



(https://images.simplepart.com/images/parts/motor/parts/fullsize/1335230_5.png)



CONTOUR Unit. Tire Pressure Monitoring System (TPMS) Control Module.
433 MHz. Tire Pressure Monitoring System (TPMS) Control Module.

Tire Pressure Monitoring System Control Module

A6 Allroad. A6 Quattro. E-tron GT. E-tron Quattro. E-tron Sportback. RS e-tron GT. RS5; 433 mhz. RS6 Avant. S6. TPMS sensor.

Tire Pressure Monitor Control Module - Repair or Replace

If your TPMS light is on or you can't reset your tire pressure monitoring system, your 2019 Audi A8 may need a replacement tire pressure monitor control module.

18 people have looked at this part recently

What This Fits	This product fits 228 vehicle variants. Audi: 26 models, 228 variants between 2018 and 2025.
Product Types	
	Show More

Dealer Price

$ 184.50

View Warranty Info (/policy.aspx).

Fulfillment Options

Shipping ESTIMATE COST

Local Pickup

Audi Tulsa
4208 S. Memorial Dr., Tulsa, OK, 74145-4834

- 1 + Add To Cart

Audi Tulsa Dealer Info (//parts.auditulsa.com)

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(https://www.audiusa.com/)

(https://parts.audiusa.com/policy.aspx)

(https://www.audiusa.com/us/web/en/terms-and-conditions.html) (https://www.audiusa.com/us/web/en/privacy.html)

(/motor.aspx)

Technical Service Bulletin

91 No diagnostics communication to the telematics control module

91 20 21 2056076/9 October 19, 2020. Supersedes Technical Service Bulletin Group 91 number 20-77 dated June 12, 2020 for reasons listed below.

Model(s)	Year	VIN Range	Vehicle-Specific Equipment
A4, A5	2019	All	With ConBox
Audi e-tron Sportback	2020	All	With ConBox
A6, A7, A8, Q5, Q7, Q8, and Audi e-tron quattro	2019 - 2020	All	With ConBox

Condition

REVISION HISTORY		
Revision	**Date**	**Purpose**
9	-	Revised title (Generalized title) Revised *Condition* (Added possible DTC information and clarified general applicability) Revised *Service* (Updated reset time and added GWA reset)
8	06/12/2020	Revised *Condition* (Added Note to TSB 2055945) Revised *Additional Information* (Added TSB)
7	02/21/2020	Revised *Warranty* (Added Labor Op)

Customer states:

- An SOS Warning is displayed in the instrument cluster (Figure 1).

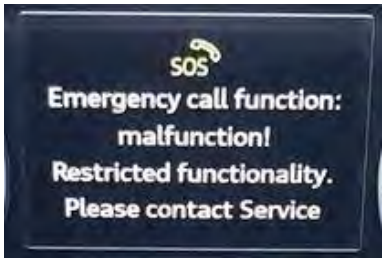


Figure 1. *Emergency call malfunction warning.*

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Or

- Connectivity features like remote locking and unlocking are not working.

Or

- No diagnostics communication can be established to the control module for emergency call module and communication unit (telematics control module or ConBox), J949 (address word 0075) during vehicle diagnostics.

Workshop findings:

- **No diagnostics communication** can be established with the control module for emergency call module and communication unit (telematics control module or ConBox), J949 (**address word 0075**).
- Multiple DTCs regarding communication with the telematics control module may be stored in other control modules. However, DTCs are not required to be stored for this TSB to be applicable.

Note:

This TSB only applies to vehicles that have no diagnostics communication to the telematics control module, J949 (address word 0075). If DTC U153E00 is entered in the telematics control module, J949 (address word 0075), please reference TSB 2055945: *91 SOS Emergency call function deactivated message in the cluster, DTC U153E00 stored in the telematics module.*

Technical Background

A software bug can cause the control module to freeze during cold start.

Production Solution

Not applicable.

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Technical Service Bulletin

Service

1. Remove and unplug the telematics control module, J949 (address word 0075) according to the repair manual in Elsa.
2. Open the battery compartment of the telematics control module, J949 (address word 0075) and disconnect the backup battery (Figures 2 - 3).

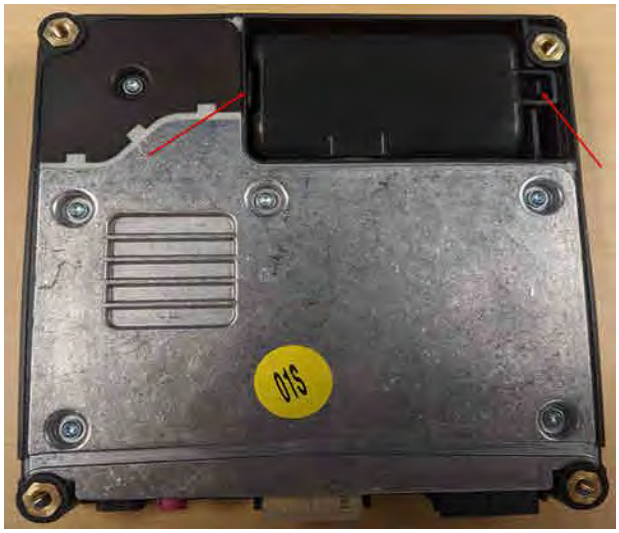


Figure 2. *Backup battery compartment location.*

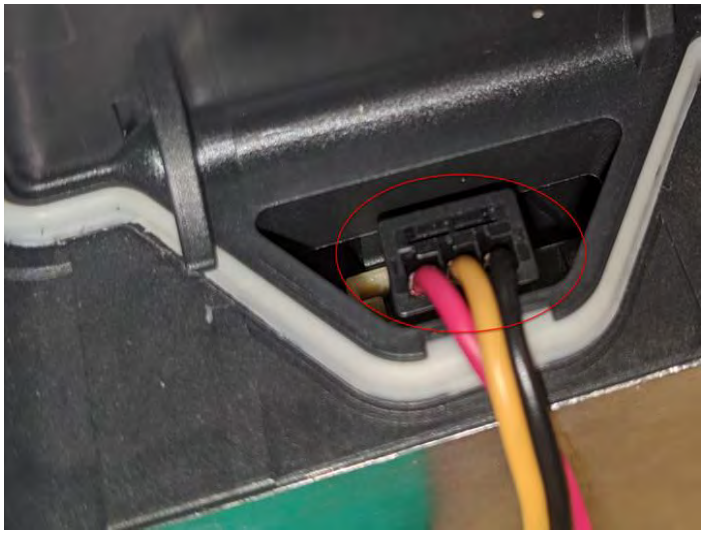


Figure 3. *Backup battery connector (no release mechanism).*

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3. Remove the fuse supplying power to the Data Bus on Board Diagnostic Interface (J533). Please consult ElsaPro or the vehicle's manual as to the fuse location for the specific model you are working on.
4. Leave the battery and Gateway fuse disconnected for approximately 20 minutes.
5. Reinstall the backup battery back into the telematics control module, J949 (address word 0075).
6. Reinstall the telematics control module, J949 (address word 0075) back into the vehicle.
7. **If ODIS still cannot connect** to the telematics control module, J949 (address word 0075), follow the ODIS test plan.

Note:

The vehicle is not able to be moved under its own power while J533 is without power. Please make sure the vehicle is parked in a suitable location for the duration of the procedure.

Warranty

Claim Type:	• 110 up to 48 Months/50,000 Miles. • G10 for CPO Covered Vehicles – Verify Owner. • If the vehicle is outside any warranty, this Technical Service Bulletin is informational only.		
Service Number:	9170		
Damage Code:	0039		
Labor Operations:	Telematics control module remove + reinstall	9170 1950 **Or** 9170 1900 **Or** 9170 1952	See SRT and associated predecessor by model
	Remove and reinstall the telematics control module backup battery	9170 9999	5 TU
	Remove and reinstall the fuse for the Data Bus on Board Diagnostic Interface	9035 9999	5 TU
Diagnostic Time:	GFF	0150 0000	Time stated on the diagnostic

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			protocol (Max 20 TU)
	Road test prior to the service procedure	No allowance	0 TU
	Road test after the service procedure	No allowance	0 TU
Claim Comment:	As per TSB #2056076/9		

All warranty claims submitted for payment must be in accordance with the *Audi Warranty Policies and Procedures Manual*. Claims are subject to review or audit by Audi Warranty.

Additional Information

The following Technical Service Bulletin(s) may be necessary to complete this procedure:

- TSB 2055945, *91 SOS Emergency call function deactivated message in the cluster, DTC U153E00 stored in the telematics module.*
- Owner's Manual: Fuses.
- Elsa: Wiring Diagrams / Component Locations: Fuses.

All part and service references provided in this TSB (2056076) are subject to change and/or removal. Always check with your Parts Department and/or ETKA for the latest information and parts bulletins. Please check the Repair Manual for fasteners, bolts, nuts, and screws that require replacement during the repair.

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Operating Manual

Audi connect (myAudi)

Operating Manual
Audi connect (myAudi)
Englisch 11.2014
152.566.AMH.20

152566AMH20

www.audi.com

Audi
Vorsprung durch Technik

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Date of publication: 17.10.2014

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152.566.AMH.20

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Introduction

First steps

Registration

A one-time registration is required in order to be able to use the full range of myAudi functions.

- ▸ Use your Internet browser to open the website **www.audi.com/myaudi**.
- ▸ Select your country.
- ▸ Click on **Register now** and fill in the form.
- ▸ Click on **Next**.

Shortly afterwards you will receive a welcome e-mail to the e-mail address you entered.

- ▸ To complete your registration, please click on the appropriate link in the welcome e-mail.
- ▸ Enter your password in your Internet browser.
- ▸ Click on **Login**.

You can now log into myAudi at any time using the access data you have just created.

Note

If you cannot find the registration e-mail in your inbox, please also check your junk mail folder.

Adding a vehicle

To be able to use all myAudi services specially designed for your vehicle, you must first add your vehicle to myAudi.

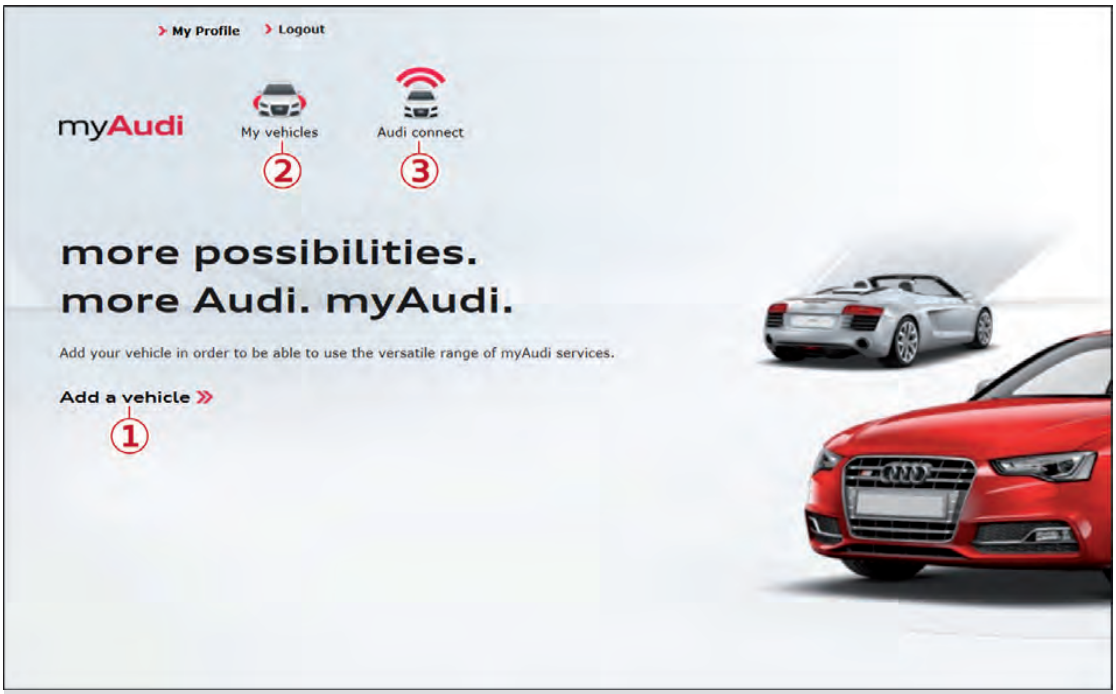


Fig. 1 Adding a vehicle

- ▸ As soon as you have logged in, select ① **Add a vehicle** ⇨ *Fig. 1*. **Or**: In the upper navigation bar, click on ② **My vehicles** > **Register car**.

The **myAudi - personal vehicle management** page will be displayed.

The **Add vehicle** window will open.

- ▸ Enter the chassis number (VIN) of your vehicle. ▶

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► Click on **Add**. Your vehicle will then be created.

You can then configure your **Audi connect services** or store further details about your vehicle ⇨ *page 16*.

Your newly created vehicle will be displayed and your myAudi PIN will be generated ⇨ *page 13, Fig. 5*.

In countries which support this service, you can connect your vehicle to your myAudi account using your myAudi PIN and call up data in the vehicle ⇨ *page 13*.

Note

– A maximum of five vehicles can be added per user.
– You can delete a vehicle at any time using the **Edit** option.
– The chassis number (VIN) can be found in the vehicle's registration documents.

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Audi connect services on myAudi

Calling up Audi connect services

After creating your vehicle on myAudi, you can set up your Audi connect services.

- ▸ In the upper navigation bar, click on ③ **Audi connect** ⇨ *page 2, Fig. 1*.
- ▸ Click on **Display available services** next to the relevant vehicle.
- ▸ Click on the Audi connect service you wish to use.

General notes

– This manual describes the Audi connect services offered on the myAudi platform at the time of going to print. Some of the contents described here will not be available until a later date, or may only be available in certain markets.

– The availability, scope, provider and price of the services offered can vary, as can the way in which the services are displayed on the screen. These variations depend on your country, model, model year, device and mobile phone contract. Please refer to the notes on safety and usage in the “Audi connect” chapter of your MMI Operating Manual.

– It is only possible to use Audi connect services in conjunction with Audi connect (including car telephone kit) and the optional MMI Navigation System plus.

– Depending on the vehicle model, an initial activation at www.audi.com/myaudi and, in some cases, a personal configuration on the myAudi site are necessary before some Audi connect services can be used.

– Some Audi connect services need to be connected to your myAudi account before you can use them for the first time ⇨ *page 13*.

Overview of Audi connect services on myAudi

The following Audi connect services are currently available on myAudi (these may vary according to vehicle model):

Audi connect service	A1, A4, A5, A6, A7, A8, Q3, Q5, Q7	A3	A6, A7[a)]	TT
Facebook		●	●	●
Twitter		●	●	●
Online news (personalised)		●	●	●
Train information		●	●	●
Flight information		●	●	●
City events	● b)	●	●	●
Picturebook navigation		●	●	
Destination input using myAudi/Google Maps	●	●	●	●

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Audi connect service	A1, A4, A5, A6, A7, A8, Q3, Q5, Q7	A3	A6, A7[a)]	TT
Map update[c)]		●	●	●
myAudi special destinations[c)]		●	●	●

a) From model year 2015 onwards

b) From model year 2014 onwards

c) Also available for vehicles with MMI Navigation System plus without Audi connect.

Map update

Before you start

The Audi connect map update service allows you to download up-to-date maps for your MMI, save these on an SD card and then transfer them to your vehicle.

Requirements

– There must be a formatted SD card with at least 32 GB of memory space in your (computer's) card reader.
– There must be sufficient free memory space on your computer's hard drive to store the selected map package, as the map package is temporarily stored on the hard drive while it is being downloaded. The size of the selected map package is displayed on myAudi.

Checking version of maps

Check the individual country versions in your vehicle.

Select the following on the MMI:

– MENU button > **Setup MMI** > **Version information** > **Navigation database country versions**. Or:
– MENU button > **Settings** > left control button > **System maintenance** > **Version information**.

Compare the version information with the information in your myAudi account, referring to the year stated.

If a map update is available, you can update your maps ⇨ *page 5, Downloading map update*.

Downloading map update

▸ Log into www.audi.com/myaudi with your user data.
▸ Click on the Audi connect service **Map update**.

Only *one* update can be downloaded and imported into the MMI using an SD card at any one time.

If you wish to update more than one country package, either download the entire package or repeat the download and update procedure one by one for each country package.
▸ Make sure that your formatted SD card is in your (computer's) card reader.
▸ Select the desired map package.
▸ Click on **Prepare package**. This opens the Audi connect download client.
▸ Select your SD card as the storage location when requested to do so by the Audi connect download client.

The download is started and the download status is displayed.

The selected files are automatically loaded onto your SD card.
▸ Once the files have been downloaded, remove the SD card from your (computer's) card reader.

Note

– Please use the suggested Java application program to open the Audi connect download client. It does not need to be saved.
– Your vehicle is equipped with the latest maps at the time of delivery. ▶

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– You can also have the new navigation data installed by an Audi dealer (carries additional charges).

Importing map update into the MMI

▸ Insert the SD card with the update files into one of the MMI's SD card slots.

Select the following on the MMI:

▸ MENU button > **Setup MMI** > **System update**.

Or:

▸ MENU button > **Settings** > left control button > **System maintenance** > **System update**.

▸ Select and confirm the source (**SD1** or **SD2**).

▸ Select and confirm **Start update**.

The data in the navigation system will then be updated; the status of the update procedure will be shown on the infotainment display.

You can continue using the navigation system while the update is being performed.

▸ To complete installation of the new maps, confirm the update.

Your MMI will be restarted. If route guidance was active, the navigation system will be briefly interrupted and will then automatically resume operation after the MMI is restarted. The updated maps can now be used for navigation.

Note

– The update procedure on the MMI may take up to two hours, depending on which map update is selected. The update is interrupted if the engine is switched off, for example, but automatically resumes at the same point when the vehicle is restarted.
– To ensure that the maps are updated correctly, the SD card should not be removed from the slot during a map update.
– When imported, the new map package overwrites the map package stored on the MMI.
– The speech dialogue system is not available while a map update is taking place.

myAudi special destinations

Before you start

You can search for your own special destinations (points of interest) on the Internet and transfer them to the MMI using an SD card.

You can compile a selection of destination lists on your computer from various Internet sources. Using the Audi connect service **myAudi special destinations**, you can convert the destination lists stored on your computer into a combined database and import them into the MMI using an SD card.

The individual destination lists can be identified on the MMI according to the names/categories you allocate to them and can be used separately. You can also assign a particular symbol to each destination list to make them easier to identify on the map.

Requirements

– There must be a formatted SD card with at least 2 GB of memory space in your (computer's) card reader.
– There should be no other files on the SD card.

File formats

A destination list can be created using files in the following formats:

– .csv
– .asc
– .ov2
– .gpx
– .kml

The following formats are permissible for uploading your own images:

– .jpg
– .gif
– .png
– .bmp
– Output dimension: 33 x 33 pixels
– Max. dimension: 200 x 200 pixels
– Max. size: 5 MB

LAG-VW00002347

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Creating destination lists for the MMI

- ▸ Search the Internet for "POI downloads" (or similar) to find a destination list with the special destination of your choice (e.g. nearby golf courses) and save it on your computer.
- ▸ Log into www.audi.com/myaudi with your user data.
- ▸ Click on the Audi connect service **myAudi special destinations**.
- ▸ Click on ① **Add personal POI** ⇨ *page 7, Fig. 2*.

The window **Add POI** is opened.

- ▸ Enter the list name of your choice for your new myAudi special destination. The list name is the name which will later appear on the MMI.
- ▸ Click on **Upload list**.
- ▸ Select the file from the destination list on your computer; please note the permissible file formats ⇨ *page 6*.
- ▸ Click on **Select different icon** to assign a symbol for the MMI map display to the destination list. You can also use the **Upload a new icon** function to use an image stored on your computer.
- ▸ To confirm these entries, click on **Save**.

The selected destination list is now converted for import into the MMI and saved in your myAudi account as a new myAudi special destination under **Individual special destinations**.

In your myAudi account, you can combine up to 50 destination lists stored on your computer in one database and import them into the MMI (max 250,000 entries per database).

When the destination list is converted, the files are automatically renamed so that they can be read by the MMI.

Note

– If you do not select a symbol for your destination lists, the standard symbol is used.
– The destination lists can be edited or deleted at any time.

Importing myAudi special destinations into the MMI using an SD card



Fig. 2 Preparing a selection of destination lists for import

Copying myAudi special destinations onto an SD card

- ▸ Make sure that your formatted SD card is in your (computer's) card reader.
- ▸ In your myAudi account, select all myAudi special destinations ② ⇨ *Fig. 2* that you would like to import into the MMI.
- ▸ Click on **Download**.
- ▸ Use the suggested Java application program to open the Audi connect download client.
- ▸ Read and if necessary confirm the information text.
- ▸ Select and confirm your SD card as the storage location when requested to do so by the Audi ▶

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connect download client. The download is started and the download status is displayed.
▸ Click on **Finish** to confirm the completed download.

Check if there is now a folder called “Personal-POI” and a file with the name “metainfo2.txt” on your SD card. These files must not be edited or moved before they are imported into your MMI.
▸ Remove the SD card from your (computer's) card reader.

You can now update the data in your vehicle.

Importing myAudi special destinations into the MMI

▸ Insert the SD card with the update files into one of the MMI's SD card slots.

Select the following on the MMI:
▸ MENU button > **Setup MMI** > **System update**. Or:
▸ MENU button > **Settings** > left control button > **System maintenance**.
▸ Select and confirm the source (**SD1** or **SD2**).
▸ Select and confirm **Start update**. The data in the navigation system will then be updated; the status of the copying procedure will be shown.
▸ To finish importing the new myAudi special destinations, confirm the update by selecting **OK**.

The myAudi special destinations must now be activated in the map display so that they can be used for the navigation system.

Note

– Please use the suggested Java application program to open the Audi connect download client. It does not need to be saved.
– Please note that only *one* selection of destination lists can be imported into the MMI at any one time. If you have already imported a selection of myAudi special destinations into the MMI, this will be overwritten when the new selection is loaded.

Activating myAudi special destinations in the map view

Select the following on the MMI:

▸ NAV button > control button **Settings** > **Map content**. Or:
▸ NAV/MAP button > right control button > **Map settings** > **Map content**.

The imported myAudi special destinations are listed and can be identified by the list names you assigned to them.
▸ Select all myAudi special destinations that you would like to be shown in the map display.
▸ Press the BACK button.

The selected myAudi special destinations are now displayed in the map view and can be used for route guidance.

Facebook

Linking your myAudi account with Facebook

Your myAudi account must be linked with Facebook so that you have access to your Facebook data on the MMI. You only need to do this once.

Important: You must have a Facebook account.

▸ Click on the Audi connect service **Facebook**.
▸ Click on the Facebook symbol on the right-hand side of the toolbar.
▸ Click on **Log in to Facebook**.
▸ Enter your Facebook user data.
▸ Click on **Log in**.

Your Facebook account is now authorised for use with myAudi.

Note

– You can only connect *one* Facebook account to your myAudi account.
– Audi connect enables access to Facebook for specific vehicle models. Audi cannot guarantee that this service will be available indefinitely; this is the responsibility of Facebook.

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Managing dynamic status messages

You can use your myAudi account to create or edit Facebook status messages and use them as templates on the MMI system.

Creating a new Facebook status message

- ▸ Click on the **New status message** tab.
- ▸ Enter your message and enter key words (e.g. current location) by clicking on the required key word in the appropriate place.
- ▸ Click on **Save**.

Your message will be saved and can then be called up in the vehicle. When a status message is sent, the key words are then automatically replaced with the current values (e.g. current location) in the vehicle.

Deleting status messages

- ▸ Click on the × (delete) symbol next to the status message you wish to delete.
- ▸ Confirm that you wish to delete the message.

The selected Facebook status message will be deleted.

Twitter

Linking your myAudi account with Twitter

Your myAudi account must be linked with Twitter so that you have access to your Twitter data on the MMI. You only need to do this once.

Important: You must have a Twitter account.

- ▸ Click on the Audi connect service **Twitter**.
- ▸ Click on the Twitter symbol on the right-hand side of the toolbar.
- ▸ Click on **Log in to Twitter**.
- ▸ Enter your Twitter user data.
- ▸ Click on **Log in**.

Your Twitter account is now authorised for use with myAudi.

Note

– You can only connect *one* Twitter account to your myAudi account.

– Audi connect enables access to Twitter for specific vehicle models. Audi cannot guarantee that this service will be available indefinitely; this is the responsibility of Twitter.

Managing dynamic status messages

You can create your own Twitter status messages in your myAudi account and then use them on the MMI.

Creating a new Twitter status message

- ▸ Click on the **New status message** tab.
- ▸ Enter your message and enter key words (e.g. remaining time to destination) by clicking on the required key word in the appropriate place.
- ▸ Click on **Save**.

Your message will be saved and can then be called up in the vehicle. When a status message is sent, the key words are automatically replaced with the current values (e.g. remaining time to destination) in the vehicle.

Deleting status messages

- ▸ Click on the × (delete) symbol next to the status message you wish to delete.
- ▸ Confirm that you wish to delete the message.

The selected Twitter status message will be deleted.

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Picturebook navigation

Adding a new destination image

You can create destination images with location information in your myAudi account for use with the route guidance on the MMI system.

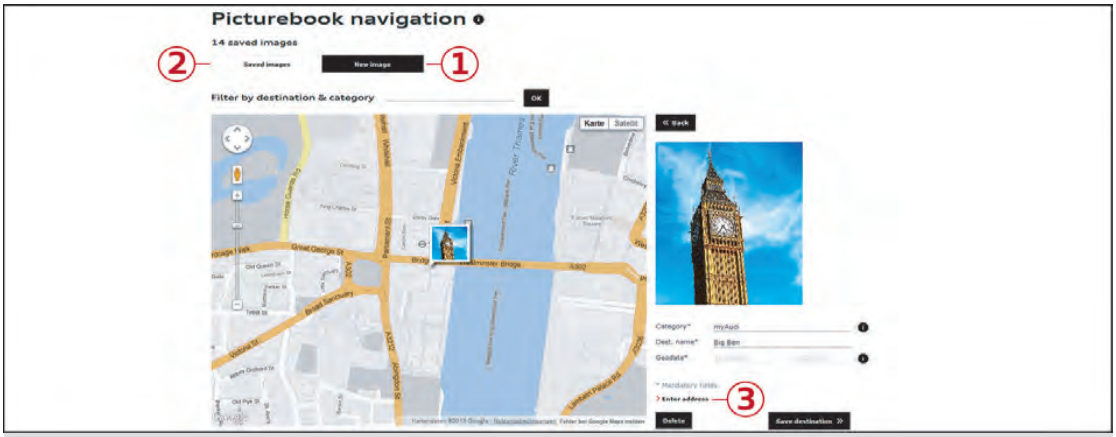


Fig. 3 Destination image details

- ▸ Click on tab ① **New image** ⇨ *Fig. 3*.
- ▸ Select an image file. Please note the permissible file formats.
- ▸ Click on **Select image**.
- ▸ Enter a category (e.g. favourite restaurants), the name of the destination and its location information.
- ▸ Alternatively, you can set the location information for the destination via ③ **Enter address**.
- ▸ Click on **Save destination**.

The destination will be saved and can then be called up on the MMI.

The following file formats are permissible for destination images:

– **File formats**: .jpg, .tif
– **Minimum dimension**: 256 x 256 px
– **Maximum file size** per image: 2 MB

Note

With the help of the myAudi mobile assistant app, you can use the “Picturebook navigation” function to create new destination images with your smartphone and send them to your vehicle via myAudi.

Editing destination images

Changing the details of a destination image

- ▸ Click on **View** under the **Saved images** tab ②.
- ▸ Click on the desired image. The image details will be displayed.
- ▸ Make the desired changes.
- ▸ Click on **Save destination**.

Changing location information

- ▸ Click on **View** under the **Saved images** tab.
- ▸ Click on the desired image.
- ▸ Click and hold the mouse pointer on the destination image on the map.
- ▸ Drag the destination image onto the location on the map that you would like to have saved as the image's location and let go of the destination image.
- ▸ Click on **Save destination**.

Deleting a destination image

- ▸ Click on **View** under the **Saved images** tab.
- ▸ Click on the desired image.
- ▸ Click on **Delete** and confirm the query. ▶

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Note

When you delete a destination image in your myAudi account, it remains saved on the MMI. Further information on deleting destination images on the MMI can be found in the MMI Operating Manual in the chapter “Navigation” under “Picture destinations”.

Calling up destination images on the MMI

- Select on the MMI: NAV button > control button **Destination** > **Picture destinations**.
- Select: Control button **Settings** > **Fill picture box** > **myAudi**.

Please refer to your vehicle's MMI Operating Manual for more details about calling up destination images on the MMI.

Destination input via myAudi

Adding a new destination

You can use myAudi to create your own navigation destinations or special destinations and send these to your vehicle.

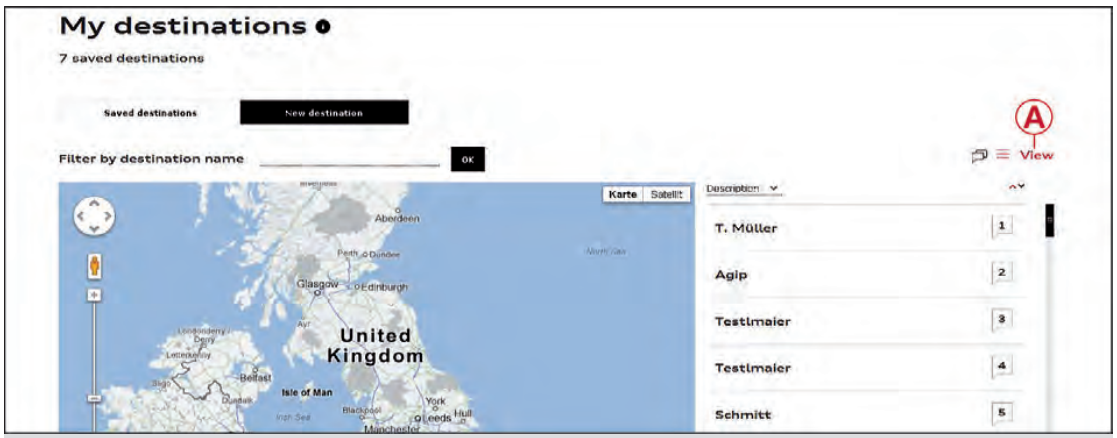


Fig. 4 Destination input: list view

Searching for a special destination

- Click on the **New destination** tab.
- In the input box **Where?**, enter the address you wish to use as your destination on the MMI.
- In the input box **What?**, enter the special destination you would like to search for (e.g. hotel).
- Select the radius within which you would like to search for the special destination.
- Click on **Search**. All special destinations found within the chosen vicinity of the destination will be listed.
- Select a special destination and click on **Save destination**.

The destination will be saved and can then be called up on the MMI ⇨ *page 12, Calling up online destinations on the MMI*.

If the search does not display the special destination you are looking for, you can **enter your destination directly**.

Entering a destination directly

- Click on the **New destination** tab.
- Click on **Enter destination directly**. The window **My destinations** will open.
- Fill in the form.
- Click on **Save**. ▶

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The destination will be saved and can then be called up on the MMI ⇨ *page 12, Calling up online destinations on the MMI*.

Editing destinations

- ▸ Click on the **Saved destinations** tab.
- ▸ Click on Ⓐ **View** ⇨ *Fig. 4*. A list of your saved destinations will be displayed.
- ▸ Select your chosen destination and click on **Edit destination**.
- ▸ Edit the data or add new data as desired and then click on **Save**.

Note

With the help of the myAudi mobile assistant app, you can use the “Online destinations” function to add new destinations with your smartphone and send them to your vehicle via myAudi.

Calling up online destinations on the MMI

Select the following on the MMI:

- ▸ NAV button > control button **Destination** > **Online destinations** > **Call up dest. from myAudi account**. Or:
- ▸ NAV/MAP button > left control button > **myAudi contacts**.
- ▸ If necessary, enter your myAudi PIN and select a navigation destination.

Further information on calling up online destinations on the MMI can be found in the MMI Operating Manual in the “Navigation” chapter.

Destination input using Google Maps

Creating an account

You can save destinations from Google Maps in your myAudi account and send them directly to your vehicle.

Important: You must have a Google account.

- ▸ Click on the **Add account** tab.
- ▸ Create a user name to identify your vehicle in the input box **My account/Account ID**[1)].

Your account will then be created.

Destinations from Google Maps

Storing a vehicle in a Google account

- ▸ Use your Internet browser to open the website **www.google.com/maps/sendtocar**.
- ▸ Click on **Add car or GPS device**.
- ▸ Select the manufacturer **Audi** from the drop down menu.
- ▸ Enter the user name set in your myAudi account in the **My account/Account ID**[1)] field.
- ▸ Enter a display name if you wish to do so.
- ▸ Click on **OK**.

Your vehicle will be saved in your Google account and can be edited or deleted at any time.

Sending a location to your vehicle

- ▸ Use Google Maps to search for an address you would like to use as a destination on the MMI.
- ▸ Click on **Send to car** in the search field.
- ▸ Select the desired vehicle from the drop down menu.
- ▸ Click on **Send**.

The new address will be saved in your myAudi directory and can be called up on the MMI ⇨ *page 12, Calling up online destinations on the MMI*.

Note

When you send an address from Google Maps to your vehicle, this address is automatically saved in your myAudi directory. This may cause addresses already saved to be overwritten.

[1)] The wording in the text field varies depending on which Internet browser is in use.

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Online news

Creating a new newsfeed

You can configure your own newsfeeds and have personalised messages displayed for you on the MMI.

- ▸ Click on the **New newsfeed** tab.
- ▸ Enter the URL of the desired RSS feed.
- ▸ Click on **Next**.
- ▸ Enter the title of your choice for the newsfeed.
- ▸ Click on **Subscribe**.

The new newsfeed will be created and can then be called up on the MMI ⇨ *page 13*.

The following format is permissible for creating newsfeeds: "http://www.abx.com/rss.xml".

Note

There are already pre-configured newsfeeds in the newsfeed list.

Deleting a newsfeed

- ▸ Click on the × (delete) symbol near the newsfeed you wish to delete and confirm the deletion message.

Calling up a newsfeed on the MMI

- ▸ Select on the MMI: MENU button > **Audi connect** > **Online news**.

All newsfeeds saved in your myAudi account will be listed.

- ▸ Select and confirm a headline.

Connecting vehicle to myAudi

Some Audi connect services (e.g. Facebook) need to be connected to your myAudi account before you can use them for the first time.

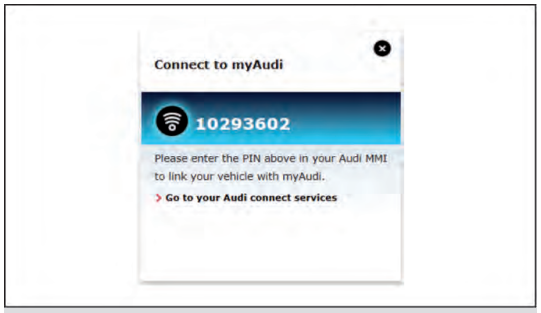


Fig. 5 Your myAudi PIN

- ▸ Click on the symbol ② ⇨ *page 15, Fig. 7* within an Audi connect service or in the vehicle overview under the vehicle of your choice.

Your myAudi PIN will be displayed.

- ▸ Note your myAudi PIN so that you can enter it in the vehicle.

Select the following on the MMI:

- ▸ MENU button > **Audi connect** > **Login**. Or:
- ▸ MENU button > **Audi connect** > right control button > **Login**.

- ▸ Enter your eight-character myAudi PIN. Alternatively, log in with your myAudi user data.

You can then import the data from your myAudi account (e.g. destination images) into the MMI.

Note

After you have added a vehicle, your myAudi PIN will always be displayed on the homepage as soon as you have logged in.

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Other settings

Managing vehicles

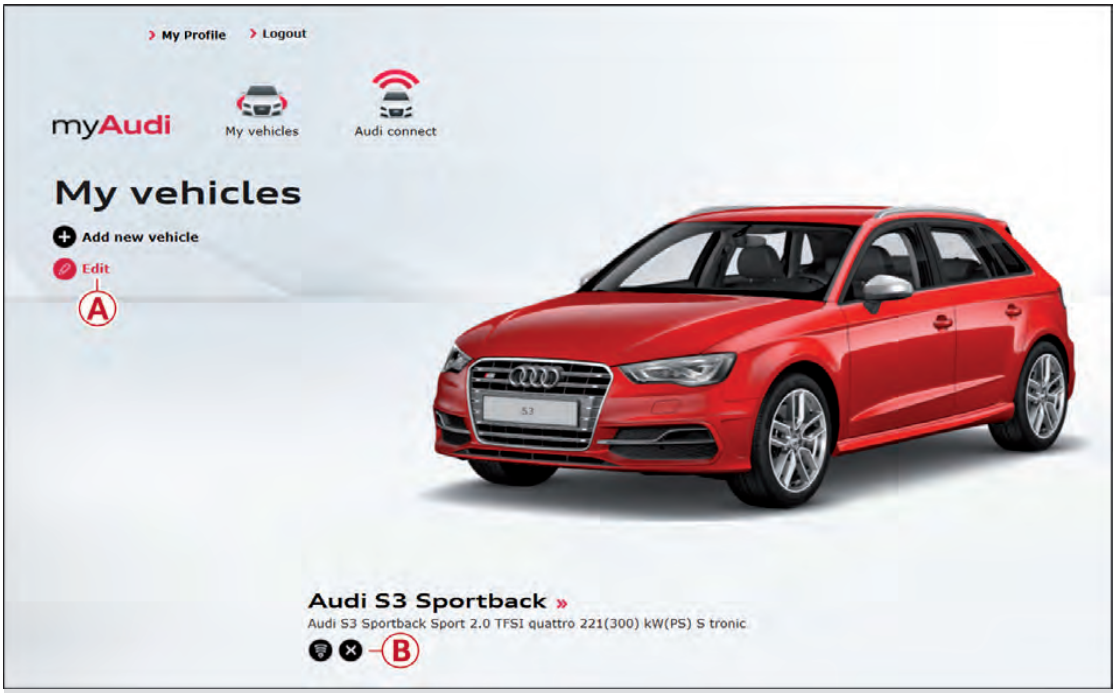


Fig. 6 Deleting a vehicle

Adding another vehicle

- ▸ Click on (2) **My vehicles** ⇨ *page 2, Fig. 1* in the upper navigation bar.
- ▸ Click on **Register car**.

You will be taken to the vehicle overview and the **Add vehicle** window will open.

- ▸ Enter the chassis number (VIN) of your vehicle.
- ▸ Click on **Next**.
- ▸ Confirm the message **Vehicle added** that will appear after a short time.

The vehicle you have just created will be displayed.

Deleting a vehicle

Click on menu item (A) **Edit** ⇨ *Fig. 6* in the vehicle overview.

- ▸ Click on symbol (B) **Delete vehicle** ⇨ *Fig. 6* under the vehicle you wish to delete and confirm the deletion message.

All data stored for your vehicle will be deleted.

Note

The chassis number (VIN) can be found in the vehicle's documents.

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Calling up status messages

You can have the current status of every Audi connect service displayed.

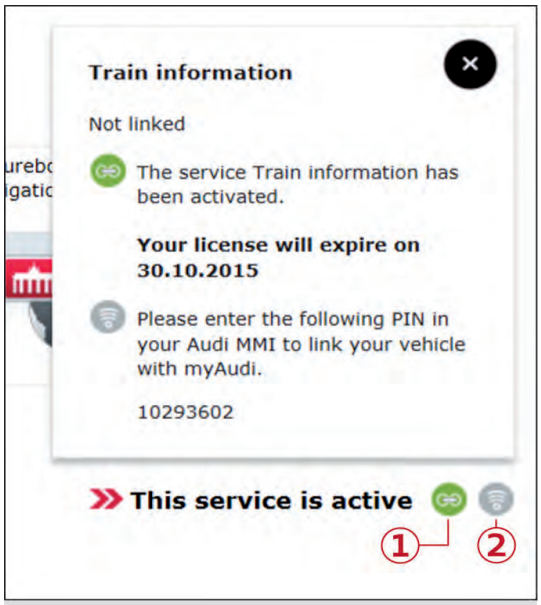


Fig. 7 Displaying status messages

Displaying status messages

- In the upper navigation bar, click on ③ **Audi connect** ⇨ *page 2, Fig. 1*.
- Click on **Display available services** next to the relevant vehicle.
- Click on the Audi connect service you wish to use.
- Click on the symbol ① or ② on the right-hand side of the toolbar ⇨ *Fig. 7*.

The following status messages are displayed:

① **Activation status of the Audi connect service shown in green/grey**: The Audi connect service is activated/not activated.

To activate an Audi connect service, you must use it once in the vehicle. Once the Audi connect service has been activated in the vehicle, the validity of the licence for this service is shown in your myAudi account.

② **Connection status of the vehicle shown in green/grey**: The vehicle is connected/not connected to myAudi ⇨ *page 13*.

Note

It is only necessary to activate a service *once* for each vehicle.

Your myAudi profile

Editing your personal data

- Click on **My Profile** in the upper navigation bar ⇨ *page 14, Fig. 6*.
- Click on the **Personal data** tab.
- Edit the data or add new data as desired and then click on **Save**.

Editing your contact data

- Click on the **Contact data** tab.
- Edit the data or add new data as desired and then click on **Save**.

Changing login data

- Click on the **Login data** tab.
- Change your **Login data** as desired and then click on **Save**.

Storing personal Audi dealer

- Click on **My Profile** in the upper navigation bar.
- Click on the **Audi Partner** tab.
- Click on **Add Audi Partner** and enter the contact data of your personal Audi Partner.
- Select the corresponding Audi dealer from the overview.
- Click on **Store as my dealer**.

Deleting profile

- Click on **My Profile** in the upper navigation bar.
- Click on the **Delete profile** tab.
- Click on **Delete profile** again and confirm the query.

CAUTION

Please note that when you delete your account, all saved data are permanently deleted.

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Vehicle information

After adding your vehicle to myAudi, you can add further information and display vehicle details.

- ▸ Click on ② **My vehicles** ⇨ *page 2, Fig. 1* in the upper navigation bar and select a vehicle.
- ▸ Click on the **Details & equipment** tab.

Detailed information on your vehicle is displayed.

Editing vehicle details

- ▸ Click on the ⊞ near **Vehicle details**.
- ▸ Click on **Change information**.
- ▸ Enter the required information about your vehicle.
- ▸ Click on **Save** to confirm your entry.

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From your **Costa Mesa commute to adventures in Newport Beach**, driving a new Audi provides you with a wide range of technology features to enjoy. There's plenty to appreciate in every new Audi model but one feature that we often hear praise about is Audi connect®. Audi connect® allows you to stay connected to your Audi vehicle, which can enhance every drive.

From remote services to navigation upgrades, the Audi connect® details are nearly endless, depending on what you're looking for from your Audi vehicle. Find out more about the Audi connect® details today with our team at Audi Fletcher Jones, and let us know when you're ready to **start shopping online** for an Audi vehicle.

Every Purchase at Audi Fletcher Jones Includes



Airport Shuttle & Parking



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We use cookies and browser activity to improve your experience, personalize content and ads, and analyze how our sites are used. For more information on how we collect and use this information, please review our Privacy Policy. California consumers may exercise their CCPA rights here.

There is also Audi connect® NAV, which offers additional upgrades to your navigation system for an even more convenient driving experience in the Irvine area. If you have any questions about activating Audi connect®, you can always visit our team for further assistance.

Audi connect® Subscription Costs

There are three main Audi connect® packages available for you to choose from. Each Audi connect® package offers exceptional convenience for your Huntington Beach travels and you won't be let down.

With that being said, pricing and features for each Audi connect® subscription can vary depending on what you're looking for when you add Audi connect® to your vehicle. Take a look at the three Audi connect® options and find out how much they cost:

- **Audi connect® CARE: Included** with the purchase of every new Audi.
- **Audi connect® NAV:** $15 a month or $150 a year (6-month complimentary trial for new Audi vehicles).
- **Audi connect® PLUS with Full-Speed Wi-Fi:** $25 a month or $250 a year (6-month complimentary trial for new Audi vehicles).

Audi connect® Services Explained

What are the Audi connect® services you can opt for? Audi connect® can help you feel more connected to your Audi when you're driving in Santa Ana. From the **Audi Q5** to the **Audi Q8**, you can enjoy added technology features when you choose to upgrade to one of the available Audi connect® packages. Here are a few features you get when you opt for each Audi connect® option:

Audi connect® CARE

- Emergency Call
- Remote Lock/Unlock
- Remote Start
- Stolen Vehicle Locator
- Vehicle Status Report

Audi connect® NAV

- Real Time Traffic
- Satellite Imagery/Maps
- POI Search
- Traffic information
- Natural Voice Recognition
- Connected real-time EV Charging Location stations

Audi connect® PLUS with Full-Speed Wi-Fi

- Full-speed Wi-Fi
- Audi App Store
- Amazon Alexa

Experience Audi connect® Services With Audi Fletcher Jones

New Audi models come standard with Audi connect® CARE so when you're ready to experience what Audi connect® is all about, you can visit our team in Costa Mesa for a closer look. In the meantime, be sure to stop by our showroom if you'd like more information about Audi technology. Do you have any questions for our team at Audi Fletcher Jones? Please **contact us** online for assistance.

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Have Audi questions? Speak with one of our Team Members today!



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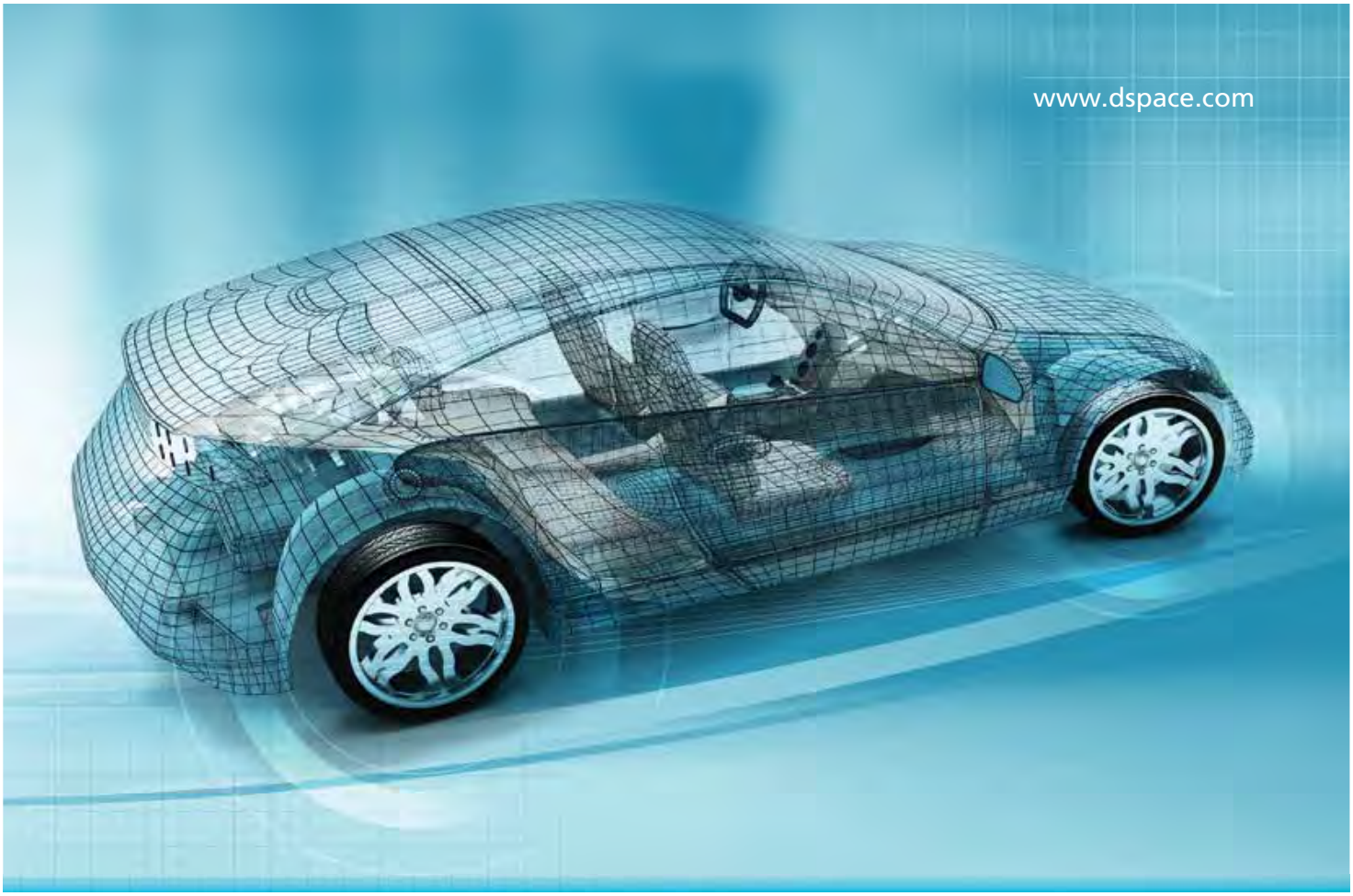
ISSUE 7

ASAM

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Hans-Georg Swolana
Chairman of
Board of Directors,
ASAM e.V.

Dear Reader,

We are happy to present the 7th edition of the ASAM Solutions Guide, the official directory of ASAM standards, ASAM members and ASAM related products. In the past years, this guide has been a companion for members and people interested in ASAM standards alike. It will give you a comprehensive overview on ASAM standards, their usage and ASAM compliant products.

When we started the production of the ASAM Solutions Guide in 2006, we had 113 members. Today, we count 151 members. We are proud of this growth, as it teaches us that standardization is an important issue. Companies worldwide are looking for solutions that help them to integrate tools (plug and play), to connect software applications and to allow a seamless data exchange.

ASAM is a strong partner for standardization. We have succeeded in providing a standards portfolio that many companies trust in and rely on. We will continue to support standardization projects in the future: I am particularly proud that in 2014 four new standardization project groups have started. The hiring of a Business Development Manager who will analyze market trends and evaluate their standardization potential will significantly enhance ASAM capabilities to the benefit of all, ASAM members and users.

We know that all achievements are only possible with the help of our members: their cooperation, their ideas, their initiative, and their excellent development work. We would like to thank our members for their support and their trust in ASAM and encourage all those who are not members yet, to become part of this active and innovative community.

Sincerely,

Hans-Georg Swolana
Chairman of the Board of Directors
ASAM e.V.

ASAM | Association for Standardisation of Automation and Measuring Systems

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ACADEMICS

b-tu, virtual vehicle, Fachhochschule Köln, Ostfalia University of Applied Sciences, FZI, Hochschule für Angewandte Wissenschaften Hamburg, HHN Hochschule Heilbronn, HOCHSCHULE TRIER, HTW, ika INSTITUT FÜR KRAFTFAHRZEUGE RWTH AACHEN UNIVERSITY, Technische Hochschule Ingolstadt, vkm, IAD, UNIKASSEL VERSITÄT, Universität Stuttgart, ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

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ASAM PROVIDES A STANDARDS PORTFOLIO THAT MANY COMPANIES TRUST IN AND RELY ON. IN 2014, A NUMBER OF ACHIEVEMENTS HAVE BEEN ACCOMPLISHED:

ASAM started the development of four new ASAM standards

In addition to its existing 22 standards ASAM has launched four new projects that will further complement the current portfolio. The first two projects below provide the foundation for an entire new class of tools in our industry. The project "Extension of OTX" was proposed to ASAM because our members appreciate the efficient platform of ASAM for standard development.

- **ASAM MCD-2 CERP**
  (Data Description for Calibration Expert Systems)
  This project aims to standardize the description of dependencies between calibration parameters allowing interdisciplinary teams to document and use this knowledge for the calibration of embedded systems.

- **ASAM CSL** (Calibration Sequence Language)
  This new standard will define the semantics and exchange format of a language for the description of calibration processes. The standard allows that the IP of how to calibrate an ECU is captured in a vendor-independent language.

- **ASAM POD Access**
  This project aims to standardize the configuration of POD-adapters (plug-on device) of a calibration system and their software interface toward the ECU (electronic control unit). The standard will ease the integration of different PODs in one ECU, or will ultimately allow changing PODs without any changes in the ECU's software.

- **Extension of OTX (ISO 13209)**
  ASAM develops additional functionality for the ISO OTX standard. Although an ISO standard, the development for the OTX extension is carried out within the ASAM organization. The results will then be transferred to ISO to be included in ISO 13209 part 4.

These initiatives demonstrate that there is a need for further standardization in the industry. In order to take innovative and visionary standardization forward, ASAM intends to hire a Business Development Manager who will analyze market trends and standardization potential across company borders.

ASAM has further improved its member communication and how members can get involved at ASAM

One major goal of ASAM is to increase member involvement both by providing better transparency on current ASAM activities and offering opportunities to participate. Processes have been set up that enable all members, whether in or outside of Germany, 'newbie' or 'veteran', to participate in the standardization process.

1. **Email alerts that Call for Participation:** All members may comment on project proposal and/or subscribe to upcoming work groups.

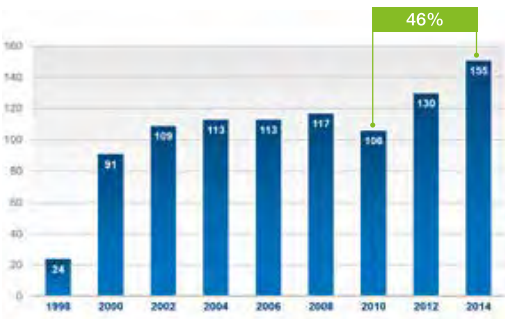
2. **Status Updates on the ASAM website:** Members can get an update on the current status of ASAM projects at any time (www.asam.net/projects.html).

3. **Email alerts that Call for Public Review:** Some work groups have decided to carry out a public review for a new or revised standard before release. This process will make sure that the new standard is useful, complete, implementable, free of errors or ambiguities and will not interrupt processes.

These processes require an increased email frequency. If you feel that the volume has increased too much, it is recommended to update your preferences in your next newsletter (see footer of your next email). This will limit the email traffic to the topics of your interest.

ASAM is internationally gaining in significance

For the past four years ASAM has experienced an increase in members that matches its early days: since 2010, the number of members has increased by more than 40%.

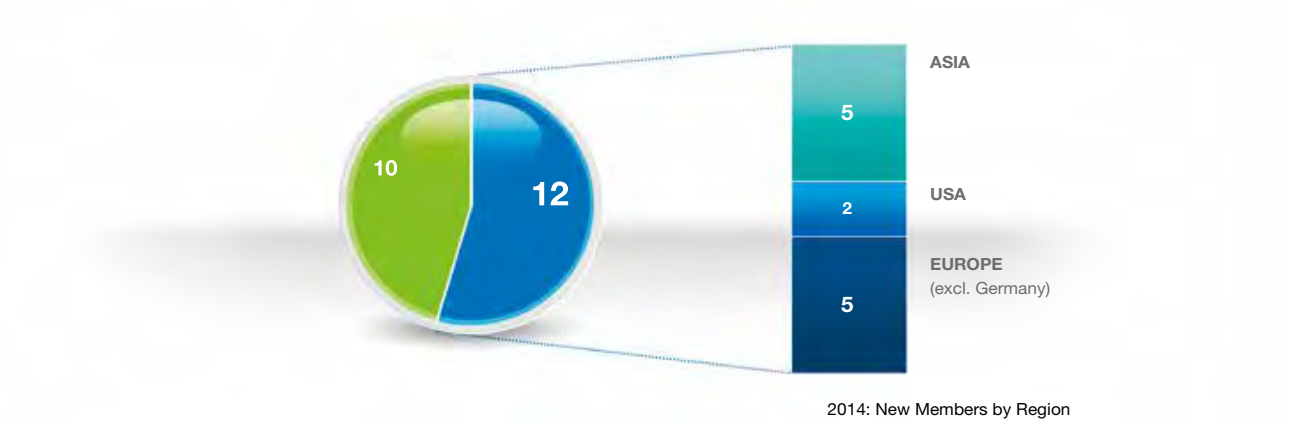


Member Growth

This member growth is – to a great extent – driven by international companies: More than 50% of the new members are from abroad.

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2014: New Members by Region

Although the number of new European members is increasing immensely, two regions shall be pointed out in particular: the US and Japan

In the US many OEMs are rejoining after being shaken by the automotive crisis in 2008–2010: GM rejoined in 2011 and Ford Motor Corp. in 2014. The first US standardization work groups has recently released the associated standard "ASAM ODS WebServices" which is published together with the ASAM ODS base standard. Currently, US members are interested in a pre-project that will identify technologies to enable ASAM ODS for Big Data applications.

In Japan, ASAM supported the Japanese ASAM Interest Group (JAIG), an initiative by Japanese OEMs that aimed to study ASAM standards and learn about their application (see use case, p.28). JAIG was founded in 2012 and has now officially ended its two-year term. The feedback from Japanese companies was unanimously positive. Many of the JAIG participants have already joined ASAM, among them Toyota, Honda, Nissan, Hino, Keihin, and several tool suppliers. More companies are expected to follow. Some JAIG members are already executing various comprehensive ASAM projects within their companies.

ASAM continues to encourage exchange among experts both on ASAM related and non-related topics

With the ASAM International Conference in 2013, ASAM hosted, for the first time, an event that did not purely focus on ASAM related topics. Numerous speakers presented current topics within and outside the ASAM scope. The aim was to stimulate discussions that might subsequently trigger new standardization initiatives.

On Dec. 08/09, 2015, ASAM is hosting the 2nd ASAM International Conference. This time **"Big Data in Future Car Development – Chances for Engineering, Value for the Driver"** shall be discussed. Once again, interesting, forward-looking lectures are expected that will be inspiring for your business and for further standardization. For more information see www.asam.net/international-conference.

ASAM continues to collaborate with other standardization organizations

we are in close contact with Eclipse that is hosting the open-source project openMDM since end of 2014; we established direct relations to AUTOSAR and agreed to jointly review new proposals and overlapping changes to our standards; we became an associate member of the ARTEMIS Standardization Working Group that will setup a process to move EU-funded research project results into public standards)

The number of ASAM compliant tools grew

Especially on the ASAM ODS market there a lot of movement could be noticed: Within the past two years, the number of ASAM servers has doubled and the application of the standard is constantly growing.

ASAM is constantly proving that it is a strong partner for standardization. It will continue to support new standardization projects and to promote the usage of ASAM standards in the years to come.

ASAM | Association for Standardisation of Automation and Measuring Systems

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STANDARDS THAT CREATE AN ENGINEERING, SIMULATION, TESTING AND AUTOMATION WORLD WHERE DEVICES AND SOFTWARE APPLICATIONS CAN BE FREELY INTERCONNECTED AND DATA CAN BE SEAMLESSLY EXCHANGED.

BACKGROUND

Automotive manufacturers are being forced to seek out new ways to cut costs while at the same time increasing electronic content to deliver new features to consumers. Standards-based solutions can contribute to both of these goals by making it easier to integrate low-cost off-the-shelf solutions in unique ways to develop cutting edge features for their customers. ASAM standard interfaces, protocols, and data exchange formats help automobile manufacturers survive and thrive in difficult times by enabling engineering teams to deliver the features that customers want while driving down costs.

ABOUT ASAM

ASAM is short for Association for Standardization of Automation and Measuring Systems. The association was founded in 1998 as an initiative of German car manufacturers. ASAM has since established itself as a reliable and strong partner for standardization projects. The ASAM organization was created with the goal of offering a platform for the development of universal standards. End users of a standard (OEMs and system suppliers) bring in their requirements and work together with tool vendors, service providers, and universities to commonly develop and maintain standards. All ASAM members have the opportunity to actively influence the development of the standards. ASAM is a registered association (e.V.) with the head office located near Munich, Germany. The association has currently more than 150 members from the Automotive OEM, Tier-1, and tool supplier communities, as well as universities.

SCOP

Measurement & Calibration

The ASAM standards in the measurement & calibration area support the ECU calibration process. The standards allow to seamlessly connect tools throughout the entire tool chain from the ECU to calibration data management systems. ASAM standards describe calibration protocols for typical automotive bus systems, file formats for unambiguous data exchange and APIs that provide remote access for tools and automation systems. ASAM standards for measurement & calibration are implemented in almost every calibration system on the market.

Diagnostics

ASAM standards in the diagnostics area support the development of diagnostic routines of an ECU and their communication to external devices. They allow a manufacturer-independent description of diagnostic services, error codes, parameters and interfaces available on an ECU. Furthermore, ASAM provides an API for programmatic and vendor-independent access to those features, e.g. from workshop testers.

ECU Networks

The lower-levels of vehicle bus systems are well standardized at ISO, SAE or other standardization organizations. However, they all have their proprietary description format, when it comes to specifying the actual communication on the bus (messages, frames, timing, etc.). ASAM MCD-2 NET (FIBEX) closes this gap by providing a formal data model and file exchange format for this purpose. The standard supports the most popular Automotive bus systems, which are FlexRay, MOST, CAN, TTCAN, LIN and Ethernet.

Software Development

The primary focus of ASAM standards in the software development area is to support the collaboration between customers (OEMs) and its suppliers. ASAM standards cover specific steps in the ECU software development process, for instance, by providing a formal and functional description of software components, software documentation generation, data format for change requests and a blockset for model-based development.

Test Automation

Test systems consist of many components, e.g. tools that control the tests, tools that execute the tests, test scripts, simulation models, sensors, actuators, the units-under-test and much more. They all need to communicate with each other and exchange data. ASAM standards provide APIs for integrating test components from different vendors into a seamlessly working system. If applied consequently, individual components of a test system can be exchanged without the need to re-write test scripts, simulation models, drivers or other major integration efforts.

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Data Management & Analysis
ASAM standards for Data Management & Analysis allow to store, search, retrieve and analyze large amounts of data from test stands, data loggers or other sources in the testing area. Clearly defined semantics of the data, APIs for data access, format definitions for database and exchange files makes the data independent from their source and usable on an enterprise level. ASAM standards and compliant tools are an enabler to draw the maximum value from costly test data.

ASAM PROVIDES:

- **For End users:** Easy system integration (plug & play) for automation and measurement systems with ECUs; exchangeability of tools (independent from manufacturer); seamless data exchange; data interpretation without misunderstandings and ultimately a competition boost. Long-term applicability guarantees the safeguarding of investments.
- **For Tool suppliers:** The ability to influence the standards with your knowledge; the ability to minimize development costs due to standardized requirements of various OEMs; the ability to share development costs through a common approach; and an increase in marketing potential.
- **For ASAM service providers:** Know-how about standards; better technical solutions (e.g. connect data loggers with ODS data bases); a door-opener to clients; and a cost advantage due to using a few standards for many customers.
- **For Research institutes:** The opportunity to do industry-oriented research.

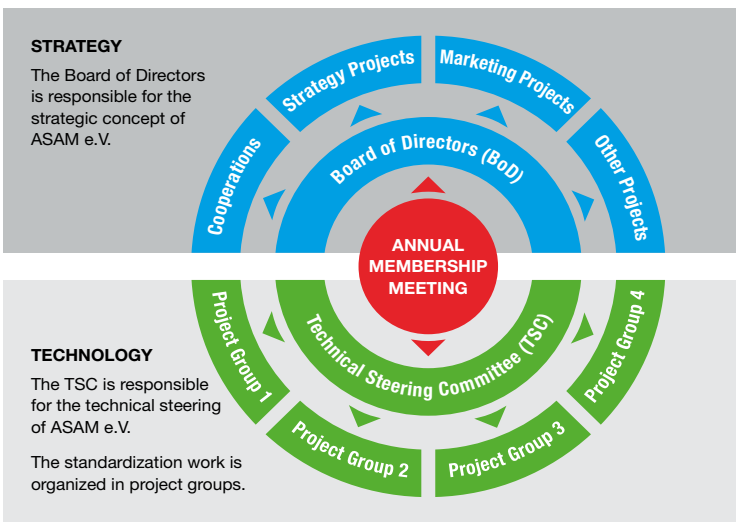
ASAM e.V. – THE ORGANIZATION

ASAM is set up as an incorporated association. This structure allows the integration of new members in the existing organization.
The highest decision-making body of ASAM e.V. is the **Annual Membership Meeting**. Each company has voting rights in proportion to its annual membership fee. The delegates elect the Board of Directors and the Technical Steering Committee for alternating two-year terms. Additionally, they accept the annual financial report, approve changes of the statutes and vote upon any decisions of strategic importance.
The Board of Directors (BoD) has operational control of the association, but is bound to the decisions of the membership meeting. The Board represents ASAM in all legal and public matters, it is responsible for the finances of the association, decides on the admission or expulsion of members, sets guidelines for the other committees and the head office, develops a long-term strategy for the association and monitors its execution.

The Technical Steering Committee (TSC) focuses mainly on technical and market aspects of ASAM standards. The primary goal of the TSC is to ensure that the standard portfolio of ASAM meets market requirements and stays competitive. The committee evaluates technical proposals, monitors the progress of ongoing projects, and reviews and releases new or revised standards.
The actual development work of standards is done by the **ASAM Project Groups**. These groups may work on the development of future versions of a standard (FVD Projects), or carry out maintenance tasks on a standard such as minor revisions or bug fixing (Maintenance Projects). New standard proposals are initiated by the members and submitted to the TSC for approval.
The central coordination role comes from the **ASAM Head Office** near Munich/Germany. It takes care of the distribution of standards, maintains an IT infrastructure for the Project Groups, provides first-level expertise on its standards, carries out technical marketing and provides general membership services.

ASAM cooperates closely with other organizations, e.g. ISO, AUTOSAR, Eclipse, ARTEMIS Standardization Working Group, MOST Cooperation (FIBEX-4MOST) and CAN in automation (CIA). With its representation in Pune, India, ASAM has created more support to advance its standards worldwide.

Organizational Structure



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MEASUREMENT & CALIBRATION

Standard *Market Name*	*Type*	*Title*	*Version*	*Content Characterization*	*Technology Reference*
ASAM CDF	BS	Calibration Data Model Format	2.0.0	Format Description (XML)	
ASAM MCD-1 CCP	BS	CAN Calibration Protocol	2.1.0	Protocol Definition	
ASAM MCD-1 XCP	BS	Universal Measurement and Calibration Protocol	1.2.0	Protocol Definition	
	AS	CAN Transport Layer	1.2.0	Transport Layer Specification	
	AS	Ethernet Transport Layer	1.2.0	Transport Layer Specification	
	AS	SxI Transport Layer	1.2.0	Transport Layer Specification	
	AS	USB Transport Layer	1.2.0	Transport Layer Specification	
	AS	FlexRay Transport Layer	1.2.0	Transport Layer Specification	
ASAM MCD-2 MC ASAP2 / A2L	BS	Data Model for ECU Measurement and Calibration	1.7.0	Format Description (NON-XML)	
ASAM MDF	BS	Measurement Data Format	4.1.1	Format Description (Binary)	
	AS	Naming of Channels and Channel Groups	1.0.0	Format Description (Binary)	
	AS	Bus Logging	1.0.1	Format Description (Binary)	
	AS	Measurement Environment	1.0.0	Format Description (Binary)	
	AS	Classification Results	1.0.0	Format Description (Binary)	

DIAGNOSTICS

ASAM MCD-2 D ODX	BS	Data Model for ECU Diagnostics	2.2.0	Format Description (XML)	Communication Parameter Specifications
	AS	Authoring Guidelines	1.0.0	Format Description (XML)	

ECU NETWORKS

ASAM MCD-2 NET FIBEX	BS	Data Model for ECU Network Systems	4.1.1	Format Description (XML)	Communication Parameter Specifications

SOTWARE DEVELOPMENT

ASAM CC	BS	Container Catalog Data Model Format	3.0.0	Format Description (XML)	
ASAM FSX	BS	Functional Specification Exchange Format	1.1.0	Format Description (XML)	
ASAM ISSUE	BS	Issue Exchange Format	3.1.1	Format Description (XML)	
ASAM LXF	BS	Layout Exchange Format	1.0.0	Format Description (XML)	
ASAM MBFS	BS	Model Based Function Specification Standard Blockset	1.0.0		MATLAB, Simulink
ASAM MDX	BS	Meta Data Exchange Format for Software Module Sharing	1.2.0	Format Description (XML)	

BS: Base Standard, AS: Associated Standard, SW: Software

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TEST AUTOMATION

Standard *Market Name*	*Type*	*Title*	*Version*	*Content Characterization*	*Technology Reference*
ASAM ACI	BS	Automatic Calibration Interface	1.4.0	API	Corba
ASAM ATX	BS	Automotive Test Exchange Format	1.0.0	Format Description (XML)	
ASAM GDI	BS	Generic Device Interface	4.5.0	Set of Standards	C++ API
	AS	COM Communication Type	3.0.0	Transport Layer Specification	
	AS	IP4 Communication Type	3.0.0	Transport Layer Specification	
	AS	LPT Communication Type	3.0.0	Transport Layer Specification	
	AS	SoftSync Communication Type	3.0.0	Transport Layer Specification	
	AS	USB	3.1.0	Transport Layer Specification	
	AS	Chassis Dyno Device Capability Profile	1.0.0	Application Area Companion	Skeleton
	AS	Crash Device Capability Profile	1.0.0	Application Area Companion	
	AS	MCD-3 Device Capability Profile	2.1.0	Application Area Companion	Skeleton
	AS	MDAQ Device Capability Profile	2.0.0	Application Area Companion	Skeleton MDAQ Profile Definition
ASAM ASAP3	BS	Automation/Optimization Interface for ECU Calibration System	2.1.1	Protocol Definition	
ASAM MCD-3 MC	BS	Application Programming Interface or MC Systems	3.0.0	API	COM/DCOM
ASAM MCD-3 D MVCI D-Server API	BS	Application Programming Interface for D Systems	3.0.0	API	COM/DCOM, JAVA, C++
ASAM XIL	BS	API for ECU Testing via XIL	2.0.1	API	.NET (C#), PYTHON, XIL Software

DATA MANAGEMENT & ANALYSIS

ASAM CEA	BS	Components for Evaluation and Analysis	2.2.0	API	JAVA, .NE
ASAM ODS	BS	Open Data Services	5.3.0	Set of Standards	RPC API, CORBA API
	AS	Open Data Services via Web Services	1.1.1	Application Area Companion	

SOFTWARE

Standard *Market Name*	*Type*	*Title*	*Checked Version(s)*	*Checked Objects*
ASAM MCD-2 MC Checker A2L Checker	SW	ASAM MCD-2 Checker	up to V1.6.1	a2l, aml
ASAM ODS Checker	SW	Data Source Checker	up to V5.1.0	atf, atfx, ODS API

BS: Base Standard, AS: Associated Standard, SW: Software

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MEASUREMENT & CALIBRATION

Calibration Data Format

ASAM CDF

An essential part of control algorithms in an automotive ECU are parameters, i.e. scalars, curves and maps. These have a major impact on the control behavior of the ECU and are typically determined through an iterative calibration process. Calibration parameter values are a result of this process. They are produced over time from different tests, for different software versions of an ECU and for different hardware versions of the controlled system. Calibration engineers need the values and further information about their maturity level to be able to decide on further actions. Calibration values are typically processed by multiple tools of the ECU development process, such as calibration data management tools, model-based development tools, code generators, calibration expert systems and product life-cycle management tools. This requires a common file format that is understood by all tools.

ASAM CDF (Calibration Data Format) defines a description format to describe the values of ECU calibration parameters and associated meta data in a well-defined XML format. ASAM CDF is a complementary standard to ASAM MCD-2 MC, in that MCD-2 MC describes the properties of the calibration parameters and CDF describes their values and associated information about their origin and quality.

ASAM CDF supports all data types used in the ASAM MCD-2 MC standard like scalars, curves, maps, arrays and structures. ASAM CDF additionally defines six dedicated maturity levels plus one “undefined” state. These maturity levels can be mapped to company-specific definitions. This allows transferring and correctly interpreting maturity information between different systems.

APPLICATION AREAS

The ASAM CDF standard is widely used in the automotive industry and is supported by every major calibration tool on the market. It is aligned with other ASAM standards like ASAM MCD-1 XCP/CCP, ASAM MCD-2 MC and ASAM MCD-3 MC/ASAP3.

STANDARD AUTHORS

Continental Automotive AG, dSPACE GmbH, ETAS GmbH, Robert Bosch GmbH, Vector Informatik GmbH, XI-Works

Universal Measurement and Calibration Protocol

ASAM MCD-1 XCP

ASAM MCD-1 XCP (Universal Measurement and Calibration Protocol) defines a bus-independent, master-slave communication protocol to connect ECUs with calibration systems. XCP is short for Universal Measurement and Calibration Protocol. The primary purpose of XCP is to adjust internal parameters and acquire the current values of internal variables of an ECU. The first letter X in XCP expresses the fact that the protocol is designed for a variety of bus systems. The standard consists of a base standard, which describes memory-oriented protocol services without direct dependencies on specific bus systems. Several associate standards contain the transport layer definitions for CAN, FlexRay, Ethernet (UDP/IP and TCP/IP) and serial links (SPI and SCI).

ASAM MCD-1 XCP accesses parameters and measurement variables in a memory address oriented way. The properties and memory addresses of this data are described in the A2L-file format, which is standardized through ASAM MCD-2 MC. The A2L-file contains all the information necessary to access and correctly interpret the data that is transmitted via the XCP protocol. This means that access to a specific parameter or variable does not need to be hardcoded into the ECU application. In other words, the ECU contains only a generic XCP-protocol stack, which responds to memory access requests from the calibration system. Different calibration and measurement tasks can be performed by different configurations of the calibration system without recompiling and reprogramming the ECU application code.

ASAM MCD-1 XCP was designed with two main objectives. Firstly, to keep the impact on ECU resources, such as CPU load, RAM consumption and flash

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memory, as low as possible, and secondly, to achieve a maximal data transmission rate over the communication link with minimal protocol overhead. The standard also describes the organization of the ECU memory segments used by the ECU software. This allows memory-type specific access. It additionally describes the ECU interface for data read and write access.

APPLICATION AREAS

ASAM MCD-1 XCP is an established and mature standard since 2003 and is used by both OEMs and ECU manufacturers. Compliance to ASAM MCD-1 XCP reduces the variety of calibration systems as well as avoiding the need to create specific ECU implementations for specific application tasks. ASAM MCD-1 XCP originates from the predecessor standard ASAM MCD-1 CCP, which was a measurement and calibration protocol specific to the CAN bus.

STANDARD AUTHORS

Accurate Technologies Inc., Continental Automotive GmbH, CSM GmbH, Daimler AG, dSPACE GmbH, ETAS GmbH, RA Consulting GmbH, Robert Bosch GmbH, Vector Informatik GmbH

ASAM MCD-2 MC

Data Model for ECU Measurement and Calibration

An essential part of ECU software development is the calibration of control strategies parameters. This means the adaption of scalars, curves and maps to achieve an optimized and appropriate system behavior. Internal variables need to be read from the ECU to evaluate the effectiveness of the calibrated software. Such operations are carried out by tools which need a detailed description of the calibration parameters and internal variables. They furthermore need to have a description of the device interface to the ECU for read and write access. This description is typically produced by function developers, software engineers, tool & instrumentation experts, and is used by calibration engineers.

The ASAM MCD-2 MC standard (aka ASAP2) was developed to take into consideration the needs of all groups involved in the calibration process. The standard defines a description format that describes the calibration parameters (called CHARACTERISTIC) and internal variables (called MEASUREMENT) of ECU software. The description includes elementary information like addresses, data types, dimensions, identifiers and much more. To convert the ECU internal characteristic and measurement implementation values into physical values, ASAM MCD-2 MC describes computation methods for their conversion between both representations. Calibration engineers can work with the ECU data in a familiar format without having to understand ECU-internal data formats. Software engineers can provide this data to them or even get the description files automatically generated from code generators. An included mechanism ensures that description files can originate from different sources.

The standard also describes the organization of the ECU memory segments used by the ECU software. This allows memory type specific access. It additionally describes the ECU interface for data read- and write access. Users can create their own descriptions for their specific ECU interfaces via the ASAM Meta Language (AML).
The standard allows the connection of software development tools, calibration tools and ECU calibration interfaces with a neutral description format (A2L). All tools that support the description format are able to exchange and process the included information, hence there are no vendor-specific or technology-specific dependencies between tools of an ASAM-compliant calibration tool-chain.

APPLICATION AREAS

The ASAM MCD-2 MC standard is widely used in the automotive industry and supported by every major calibration tool on the market. ASAM MCD-2 MC V1.7.0 introduced several features needed to calibrate AUTOSAR-compliant ECUs. This includes the introduction of virtual calibration labels, which allow to calibrate highly optimized data structure as they are used in the

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MEASUREMENT & CALIBRATION

AUTOSAR basic software modules DEM and DCM. Furthermore, the format now supports the definition of BLOBs (binary large objects) and structured data types. The standard is aligned with other ASAM standards like ASAM MCD-1 XCP/CCP, ASAM CDF and ASAM MCD-3 MC/ASAP3.

STANDARD AUTHORS

AVL List GmbH, Continental Automotive GmbH, dSPACE GmbH, ETAS GmbH, M&K (Mess- & Kommunikationstechnik GmbH, Robert Bosch GmbH, Softing AG, Vector Informatik GmbH, Visu-IT! GmbH

Measurement Data Format

ASAM MDF

Many software applications still use proprietary file formats to store acquired or calculated data. As a consequence, an exchange of data between different tools usually requires time-consuming data conversions that involve potential loss or alteration of information. The development of such converters is expensive and error-prone. Hence, a commonly accepted standard format greatly improves the seamless exchange of data between tools.

MDF (Measurement Data Format) is a binary file format which stores recorded or calculated data for post-measurement processing, off-line evaluation or long-term storage. MDF was originally developed as a proprietary file format in the 90s for use in the automotive industry, primarily for the areas of ECU development, calibration and testing. Since then, the format has evolved into a de-facto industry standard and is supported by many tools on the market, particularly by all leading tools in the measurement & calibration area. In 2009, MDF has been transferred to ASAM as an official industry standard.

As a compact binary format, ASAM MDF offers efficient and high performance storage of huge amounts of measurement data. MDF is organized in loosely coupled binary blocks for flexible and high performance writing and reading. Fast index-based access to each sample can be achieved by loss-free re-organization (i.e. sorting) of the data. Distributed data blocks even make it possible to directly write sorted MDF files. The file format allows storage of raw measurement values and corresponding conversion formulas, therefore raw data can still be correctly interpreted and processed by post-processing tools.

Since it became an ASAM standard, MDF has been developed in close alignment with other ASAM standards such as MCD-2 MC (ASAP2) or ODS. Consequently, ASAM MDF supports special data types and information particularly required in the automotive area, e.g. structures and arrays (curves/maps), bus events and synchronized video data.

In addition to the plain measurement data and all necessary meta information for its interpretation, MDF can also store descriptive and customizable supplementary data within the same file. MDF 4.0 offers flexible extensibility via generic XML fragments and a range of new features like custom signal grouping, events or attachments.

LATEST ADDITIONS AND IMPROVEMENTS

The latest releases of MDF, version 4.1.0 and 4.1.1, introduced:

- compression of measurement data
- memory-efficient storage for channels with constant value or variable data length
- storage of bus traffic for common bus systems
- storage of classification results
- storage of additional information about the measurement environment
- transformation of a not-finalized file to a finalized file

STANDARD AUTHORS

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DIAGNOSTICS

ASAM MCD-2 D

Data Model for ECU Diagnostics

The electronics of passenger and commercial vehicles can be diagnosed, configured and programmed with new software. The design of these functions is specific to a vehicle model and/or manufacturer and thus the diagnostic capabilities of every vehicle and built-in ECU are highly individual. Within the life-cycle of the vehicle (engineering, production, service, end-of-life) many tools and applications access the ECU for testing, activation, de-activation, configuration and updating purposes. Before the standardization of ODX (Open Diagnostic Data Exchange) the diagnostic and configuration capabilities as well as the flash data descriptors were specified in non-standardized, mostly non-machine readable data formats (e.g. Word, PDF). Consequently, the relevant data had to be manually entered into all tools of the life-cycle, which is error-prone, expensive and impedes fast development cycles.

ODX addresses these challenges by providing an XML-based, machine-readable data format to specify and exchange vehicle and ECU diagnostic capabilities including variants throughout the vehicle life-cycle. ASAM took great care in producing a semantically well-defined data model that is the foundation for the data format. Together with the related standards ASAM MCD-3 D and ISO 22900-2 (D-PDU API), an architecture for vehicle communication has been defined that permits seamless processing of diagnostic, configuration and flash reprogramming data. This architecture enables the complete reuse of diagnostic data throughout the ECU's life-cycle and thus prevents errors and reduces effort for the creation of test-, configuration- and reprogramming-sequences.

Furthermore, ODX is independent of particular vehicle diagnostic protocols such as the KW 2000 (ISO 14230), UDS (ISO 14229) or SAE J1939. ODX is designed as a data model to describe the structure of data streams (aka "diagnostic services") and arbitrary protocols. In addition, specific descript ion formats have been defined to describe configuration data structures, flash re-programming data and vehicle functions.

ODX allows for some variance of how the vehicle and ECU capabilities are expressed. As a uniform usage of ODX within the process leverages greater benefits in using the data, it is an established best practice to formulate authoring guidelines for the creation of ODX and implement these guidelines in editors and/or checking tools.

APPLICATION AREAS

The standard ODX can be employed anywhere in the vehicle life-cycle where vehicle electronics are tested, configured of flash re-programmed. OEMs employing this standard have reported considerably reduced setup times in the production of new models, highly reduced vehicle communication problems with diagnostic scan tools and much better support for vehicle variants.

STANDARD AUTHORS

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ECU NETWORKS

Data Model for ECU Network Systems

ASAM MCD-2 NET

During the implementation of ECU software, the correct configuration of the operating system's network stack is a fundamental requirement in ensuring the interoperability of ECUs within automotive networks. The configuration includes the definition of exchanged signals, datatypes and their explicitly defined declarations for various automotive communication systems. This information is typically provided in interface descriptions created by OEMs and forwarded to their ECU suppliers.

The ASAM MCD-2 NET standard (called FIBEX) provides a uniform, XML-based interface description for configuring the software of automotive networks. The standard allows the definition of network topologies, consisting of ECUs with network ports and gateways. The standard consists of a generic interface description and technology-specific extensions for FlexRay, MOST, CAN, TTCAN, LIN and Ethernet. Technology-specific properties are described for each network port. For example, addresses as well as transport protocols and the reserved ports are described for Ethernet and IP. Furthermore, the interface description contains a list of sent and received signals for each ECU. In the case of service-oriented communication, service provider instances and consumers are listed for each ECU.

ASAM MCD-2 NET is used for the design, configuration, monitoring and simulation of communication on automotive networks. For example, the standard supports auto-generation of software code for ECUs and the configuration of test tools for simple testing of ECUs. Test tools, which can import the interface description, are able to interpret network traces or carry out residual network simulation.

APPLICATION AREAS

The ASAM MCD-2 NET standard is widely used in the automotive industry and is harmonized with the AUTOSAR system template. The current version 4.1.1 made the standard compatible with AUTOSAR 4.1 and resolved a few bugs.

STANDARD AUTHORS

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SOTWARE DEVELOPMENT

Container Catalog

ASAM CC

ASAM CC (Container Catalog) is used for describing engineering objects such as source code, compiled objects or documentation files. The objects are described with meta information such as creator, name, description, version, engineering domain, configuration and storage location. The standard is primarily used for exchanging information about engineering objects between OEMs and suppliers. Since ASAM CC-compliant description files are based upon XML with a standardized schema, tools and data repositories can import and export the data easily. Incremental data exchange is supported.

ASAM CC has the following main features:

- Description of the repository structure
- Description of the meta data for engineering objects
- Extensibility of the data model
- Revision information and change histories
- Support for linking
- Support for conditional document configurations (conditional compilation)
- Support for content view filtering

STANDARD AUTHORS

Continental Automotive AG, MAN Truck & Bus AG, Robert Bosch GmbH, XI-Works

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ASAM FSX

Functional Specification Exchange Format

A lot of companyes use common word processors or their own documentation systems to create functional specifications for software components. These systems are typically based on proprietary formats e.g. Word, PDF or HTML. This becomes a problem when different parties undertake projects. OEMs which develop parts of the ECU software and want to exchange their software components with one or more suppliers have to provide different documentation formats. Suppliers that have to integrate software components from different parties have to process different types of functional documentation formats and merge them with their own documentation to create a complete documentation of the ECU software.

Consequently, integrated documents often appear to be fragmented and inconsistent. Styling, layout and content structure may vary greatly across a document. Different documents aren't linked to each other by cross references and don't have shared tables of contents or indexes. This makes the readability and traceability of the documentation worse. Documentation, which is patched together in such a way, can give a confusing and unprofessional impression to readers.

The exchanged documents, furthermore, do not allow for parsing and extraction of data like labels, revision numbers and status of the software. The exchanged data formats are mostly pure presentation formats, which do not support a defined document content structure. Authors are allowed to do everything everywhere. This reduces the possibilities of automated data post-processing.

The functional documentation of software has to meet additional requirement like variant handling (i.e. create documents for each variant of a software component), handling of multilingual documents (i.e. create documents for different languages) and filtering of content (e.g. documents for internal and external use).

Different formats, the lack of machine-readability and no support for creating different versions of the documentation causes an increased workload for OEMs and suppliers. ASAM FSX (Functional Specification Exchange) overcomes those problems by defining an XML-based, machine-readable format for the creation, processing and exchange of functional documentation of software for ECUs. ASAM FSX has the following main features:

- Description of software functions
- Standardized documentation structure
- Possibility to extend the documentation structure
- Full featured XML text model
- Support for multilingual texts
- Linking and indexing support
- Revision information and change histories
- Support for conditional document configurations (conditional compilations)
- Support for content view filtering

The standard is primarily used in the areas of model-based software development and software functional documentation. ASAM FSX is complementary to ASAM MDX, which contains the interface definitions of software functions.

STANDARD AUTHORS

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SOTWARE DEVELOPMENT

Issue Exchange Format

ASAM ISSUE

The development of software for electronic control systems is becoming increasingly widespread, either within one company or spread over several companies. Iterative and highly dynamic software development cycles between car makers and their suppliers cause an increasing amount of change requests, problem reports, and require a decreasing amount of time for solutions to be found. All parties involved have to concentrate on the actual issue content and not waste time on administrative tasks. Without automation the percentage of administrative work can easily amount to 50% of the total work needed to resolve an issue. This situation represents an increasing challenge for the automotive industry.

There is, furthermore, a clear motivation to go for a standardized cross-industry solution. Bilateral approaches between OEMs and system suppliers decrease productivity, as system suppliers would typically have to maintain several OEM-specific solutions in parallel. Previous to the ASAM-based solution, Email, fax and shared drives were the main channels for issue related information exchange. This had many disadvantages, as typically data consistency and progress tracking could not be ensured along the lifecycle of an issue request.

The ASAM ISSUE standard was created to overcome the problems of different exchange systems, information inconsistency and lack of progress tracking. The ISSUE schema is able to transport relevant information for an issue (e.g. identifier, title, responsible, lifecycle status, short textual description, delivery information, issue context, attachments) and is able to act as a tool-independent format for the exchange of change requests and problem reports between companies and their tools.

The schema of the ASAM ISSUE standard is flexible enough for process adaptations, but is still strict enough to allow content checks. In order to benefit from the ISSUE standard, it is necessary to export / import issues to the company-defined configuration & change management system. Some systems on the market provide such an ISSUE interface. The status of an issue remains fully transparent for all involved parties, as the complete lifecycle of an issue is supported and status changes are propagated.

STANDARD AUTHORS

Audi AG, BMW AG, Continental Automotive GmbH, MAN Truck & Bus AG, Porsche AG, Robert Bosch GmbH

Layout Exchange Format

ASAM LXF

The results of data post-processing are typically compiled in an automatically generated report. Tools that generate such reports use a description file that defines the layout of the reports. ASAM LXF standardizes the layout format description so that it can be defined once for a specific report and then shared among different reporting systems. This reduces the effort to maintain layout descriptions to a minimum and ensures that reports of the same type look the same, even though they have been created by different tools.

ASAM LXF (Layout Exchange Format) defines an XML-based format for describing layouts for graphical content used by data post-processing applications and automated document generators. A layout description contains the definition of a master layout, canvases, page formats, fonts and colors. The master layout determines the general page design, e.g. by specifying a header and footer, which are used on all pages. A page may contain just one canvas or a matrix of canvases. A canvas defines a drawing area and contains a set of graphical elements, such as images, lines, ellipses, rectangles, charts, tables or text. Elements can be grouped in one container. The XML format may contain embedded formulas that are resolved during runtime.

APPLICATION AREAS

ASAM LXF is harmonized with and typically used in conjunction with ASAM CEA, which produces the content for generated reports.

STANDARD AUTHORS

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ASAM MBFS

Model Based Function Specification

Embedded software development increasingly relies on model-based development and graphical programming. This has the advantage that control algorithms are more understandable to engineers, are better documented and that the specification is written in an executable format. Models are frequently the input for production code generators.

The core of model-based development is the blockset, which essentially represents the programming language of the model. Several vendor-specific tool-suites emerged on the market, that use different blocksets with different semantics and different graphical representations. Although the blocksets are similar among all vendors, their differences still make conversion of models between different tool-suites very labor intensive and error-prone. Embedded software developers have to therefore learn different blocksets, which is an additional effort.

ASAM MBFS (Model Based Function Specification) over comes this problem by setting a standard for a blockset library. The blockset consists of 70 blocks, which cover the typical functionality needed in embedded software development. The standard includes blocks for linear and non-linear math operators, logical and relational operators, counters and timers, integrators, filters, curves, maps, delays, switches and memory blocks. ASAM MBFS defines for each block:

- the graphical representation (icon, ports)
- input, output, internal states and temporary variables
- the semantics (verbal description and pseudo code)
- test vectors

APPLICATION AREAS

Blocksets that are implemented according to ASAM MBFS are available in major tool-suites for model-based development and graphical programming. They are supported by code generators for production code generation. ASAM MBFS includes a description of a reference implementation in MATLAB/Simulink.

STANDARD AUTHORS

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ASAM MDX

Meta Darte Exchange Format for Software Module Sharing

The development of software for automotive ECUs is typically carried out in distributed development processes, where software originating from different suppliers and engineering groups have to be integrated into one executable. Software integration is a highly repetitive and iterative task. If the suppliers used different interfaces or software architectures for the same software system, then the initial software integration will fail and cause time consuming debugging and issue-resolution activities. Failed software integrations are one of the major causes of ECU projects running out of time and budget.

To solve this problem, automotive companies have defined a description format via the ASAM MDX standard, which describes software functions, their interfaces, owned data and scheduling in a standardized XML-format. ASAM MDX contains the following definitions for functions and data:

- Software components, -features, -classes and -services
- Variables, calibration parameters and system constants
- Base types
- Type definitions for structures, enumerations and unions
- Units, constraints, computation methods, address methods and much more data properties

This format allows the user to unequivocally specify all integration aspects of the embedded software functions. OEMs have the advantage that they can link supplied software with the overall system without permanently running into integration issues. Suppliers can hide their know-how by delivering just the object code. The object code can still be linked and calibrated, even though the sources of the supplied software are not known by the integrator. Since MDX

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SOTWARE DEVELOPMENT

is technology- and vendor-independent, it allows all involved parties in a software development process to use the tools of their choice, as long as they are able to import and export MDX-compliant description files. ASAM MDX can describe all data constructions (measurements and characteristics) defined in ASAM MCD-2 MC and the AUTOSAR Software Component Template. Furthermore, ASAM MDX is complementary to ASAM FSX, which contains the behavioral description of software functions.

STANDARD AUTHORS

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TEST AUTOMATION

Automatic Calibration Interface

ASAM ACI

The majority of ECUs in a vehicle undergo the calibration development step. The calibration of some vehicle components can be very complex and time consuming. This is particularly true for internal combustion engines. The role of an engine ECU is to continuously measure a large amount of engine data (requested load, speed, fuel and air temperature, etc.) and to calculate a set of optimal control output signals. The control strategies of the engine ECU have to meet contradicting optimization goals (high torque at low fuel consumption and emission, etc.) in a multitude of different environment and dynamic load conditions. Running the tests on an engine dynamometer to find the optimal calibration parameters, curves and maps is a function of many input parameters and conditions. This complex task can hardly be done manually anymore within acceptable time and cost limits. Consequently, test stands are increasingly equipped with systems that automate the calibration task.

ASAM ACI (Automatic Calibration Interface) defines an interface between test stand automation systems (TAS) and automated calibration systems (ACS). The interface consists of an object-oriented, client-server API, which offers four services. The services are requested by the ACS (the client) and carried out by the TAS (the server):

- **Player service:** controlling of test stand actuators for set-point adjustment
- **Recorder service:** recording of measurement values (mean or actual) from the test stand
- **Watcher service:** monitoring of out-of-bounds channel values
- **Device service:** further services such as ECU-specific and test stand-specific operations

The services allow the ACS to preset the unit-under-test, request specific measurement tasks and retrieve the measurement values from the TAS. Based on these services, an ACS can automatically run a set of predefined tests, modify tests based upon earlier test results and even modify ECU calibration parameters of the unit-under-test. Client and server may reside on different host systems and communicate via TCP/IP. ASAM ACI is suitable for both static and transient test executions. The interface is currently not suitable for supporting an ACS that has to respond under real-time conditions.

APPLICATION AREAS

ASAM ACI was initially developed with engine calibration in mind. However, the standard has been successfully used in other test environments such as wind tunnels, electrical motor test stands and in-vehicle test systems.

STANDARD AUTHORS

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ASAM ATX

Automotive Test Exchange

Increasing complexity in the field of automotive electronics together with extended quality requirements causes additional investments for test automation. A lot of ECU projects use customized and vendor-specific turn-key test systems. For instance, such test systems typically use test automation software that is rigidly coupled with specific measurement & calibration hardware. The test automation software additionally stores test cases in proprietary formats. As a consequence of this, the choice of test software and test hardware, which can work together seamlessly, is very limited and often dictated by the turn-key system vendor.

If a user of testing systems is determined to use best-in-class systems that do not originate from one vendor, he will be confronted with an increased workload to maintain the different systems with regards to know-how, support, version compatibility and other issues. This is particularly true when different software systems are used for test case development. This can lead to the following problems:

- Know-how cannot be easily transferred from one test bench to the other (additional training costs for employees)
- Switch to the newest testing technology will always be difficult because of tool-specific formats and test-hardware incompatibility
- Test cases cannot be easily ported from one test system to another

ASAM ATX (Automotive Test Exchange) overcomes those issues by providing a standardized XML format, which enables the exchange of test data between different test systems. ATX supports the ISTQB "Certified Tester" syllabus methodology and can be used for many activities in the test process, e.g. test specification, test planning, test execution and test evaluation. The following data is handled by ASAM ATX:

- Test projects
- Test specifications
- Meta data of test cases, test steps and test actions, e.g. version information, documentation and implementation information
- Test programs
- Test libraries
- Test data (parameter values)
- Test suites (execution plans)
- Test reports and test result data

APPLICATION AREA

ASAM ATX is frequently used in conjunction with ASAM HIL in hardware-in-the-loop test systems.

STANDARD AUTHORS

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TEST AUTOMATION

Generic Device Interface

ASAM GDI

ASAM GDI (Generic Device Interface) was developed for providing an independent integration interface between measurement & control devices and test bed automation systems. Previously, this area was characterized by an almost unmanageable number of individual and incompatible devices. Integration of devices depended strongly on the availability of device drivers for specific operating systems, physical interfaces and protocols. Since test beds have a long lifetime, devices of different generations had to coexist in one system. All this caused high integration efforts, whenever a device had to be integrated or exchanged in an existing test bed system.

The goal of the standardization was to reduce cost and time efforts for the creation, support and maintenance of such complex automation systems and their measurement and control devices. Ideally, a new device would be integrated in a plug-and-play fashion with minimal to no integration efforts. Therefore, the GDI standard defines a four-layer architecture:

- **LAYER 4 - Coordinator:** The coordinator connects application programs to devices, i.e. by routing required application functionalities to device functionalities. The coordinator is configured via a parameterization instance description file (PID), which contains all abstract data sinks and sources and their connection to devices.
- **LAYER 3 - Device Driver:** The device driver provides uniform, virtualized access to the device via a model of the devices functionality and internal states. The device driver is described by the device capability description file (DCD).
- **LAYER 2 - Platform Adapter:** Provides standardized interfaces to specific devices and OS functions.
- **LAYER 1 - Transport Layer:** Provides the transport layer and communication types for communicating with devices via IPv4, USB, SoftSync, COM or LPT.

This approach abstracts the test bed automation system from the operating system, communication busses, protocols and measurement & control devices. As a result, ASAM GDI allows a device-independent application execution and application-independent device integration. This allows quickly exchanging devices in existing test beds, or conversely migrating to a new test automation system with less effort while still using existing measurement & control devices.

APPLICATION AREAS

ASAM GDI is used in chassis dynamometers, engine dynamometers, emission test benches and transmission test beds. Furthermore, GDI-compliant devices are used in car assembly lines, e.g. for fluid-filling stations, and in service areas where miscellaneous measurement modules are integrated into a shop floor tester. The standard is also used for the integration of data loggers and measurement modules for supplier-independent device configuration.

LATEST ADDITIONS AND IMPROVEMENTS

The most recent version, ASAM GDI 4.5.0 was released in 2011. This version includes the parameterization instance description (PID) file format in XML, which provides a mapping of required application functionalities onto device functionalities. The PID file allows exchanging a device in a testing system without needing to make any modifications to the test bed automation software. Furthermore, the latest ASAM GDI version was harmonized with the corresponding ISO Standard 20242.

STANDARD AUTHORS

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ASAM MCD-3 MC

Application Programming Interface for MC Systems

One of the major tasks of ECU development is the calibration of control strategies, i.e. tuning of parameters and look-up tables and the recording of values of internal variables during the runtime of the ECU. This is done via various busses, bus protocols or proprietary plug-on devices between the ECU and an application system. These are technology-dependent and can be vendor-specific. MC-servers are used to provide uniform calibration access to ECUs independent of the used busses, protocols or interfaces. The main objective of ASAM MCD-3 MC is to provide a remote control interface for such MC-servers, primarily by providing measurement and calibration services via an OO-API to the upstream tool-chain. The main advantage of the API is the encapsulation of vendor-specific and technology-dependent communication interfaces. The standard allows that any client application, such as test automation systems or automated calibration systems, can connect via the MC-server to an ECU and carry out typical measurement and calibration tasks. Several ECUs can be connected to one MC-server and accessed in parallel through client applications.

To be able to access data on an ECU, the MC-server reads an A2L data description file (ASAM MCD-2 MC), which contains a description of available calibration parameters (CHARACTERISTICS) and measurement variables (MEASUREMENTS). The MC-server then makes services available to access this data. Characteristics of the type 'scalar', 'curve', 'map', 'cube 3D', 'cube 4D', 'cube 5D', 'value block' and 'ASCII' can be adjusted. Measurement tasks are available via the Collector, Watcher and Recorder services. The Collector acquires the values of MEASUREMENT or CHARACTERISTIC objects with a common rate over a defined period of time (continuous data acquisition). The Recorder is a means to managing high bandwidth measurements that the MC-server acquires from the ECU or other external inputs, but which cannot be transferred from the MC-server to client applications synchronously because of the lower available bandwidth. Measurement data is therefore stored in a file that can be retrieved by client applications later on. A Watcher is a service which continuously monitors measurement values and triggers events if a predefined condition evaluates to "true". Multiple Watchers can be defined to monitor multiple variables at the same time. The Watcher may be used to start and stop Collectors or Recorders.

The standard is used for calibration and measurement purposes in development, testing and production of ECUs. ASAM MCD-3 MC currently coexists with the older ASAM ASAP3 standard, which is dependent on specific interfaces (RS232, TCP/IP) and still holds a significant market share.

The ASAM MCD-3 MC API is specified in an object-oriented but technology-independent UML model and mapped to DCOM. This allows to easily add new programming language mappings to the standard without having to change the core of the standard.

LATEST ADDITIONS AND IMPROVEMENTS

The latest release of ASAM MCD-3 MC is version 3.0.0. It improves the loading-time of MC-servers and the connection and release of client applications.

STANDARD AUTHORS

AFT GmbH, AVL List GmbH, Robert Bosch GmbH, BMW AG, D2T, Daimler AG, dSPACE GmbH, ETAS GmbH, IMC Meßsysteme GmbH, M&K Mess- und Kommunikationstechnik GmbH, Porsche AG, HORIBA GmbH, Continental Automotive GmbH, Visu-IT! GmbH, Vector Informatik GmbH

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TEST AUTOMATION

Application Programming Interface for D Systems

ASAM MCD-3 D

The ECUs of passenger and commercial vehicles can be diagnosed, configured and programmed with new software. These use-cases are performed through serial bus communication on established vehicle busses like CAN, K-Line or even Ethernet. Many different diagnostic protocols are used for the communication between an external test device and the ECU, e.g. UDS, KW2000 or J1939. Common to all these protocols is that the data stream is hexadecimal encoded and cannot be interpreted without detailed documentation of the data content. Before the standardization of ASAM MCD-3 D, it was common practice to implement diagnostic, flash reprogramming and configuration applications on the basis of these hexadecimal encoded messages. The increasing complexity of ECUs, their high number of variants and shortened development cycles made it virtually impossible to continue implementing diagnostic applications in this manner.

The standard ASAM MCD-3 D is employed anywhere in the vehicle life-cycle where vehicle electronics are tested, configured or re-programmed. The standard describes the API of a diagnostic kernel that is able to interpret the hexadecimal encoded messages and provides them as human-readable data values to an application. In order to achieve this, a compliant diagnostic kernel interprets an ODX data description file (ASAM MCD-2 D), which contains a full description of diagnostics data and their conversion between the physical and encoded views. The diagnostic kernel is also capable of resolving ECU variants and thus allowing the implementation of applications valid for multiple variants. Employing a diagnostic kernel is a key aspect of establishing an ODX-based diagnostic process chain as such a kernel guarantees uniform interpretation of the ODX data.

It was an important design goal of the ASAM MCD-3 D standard to cover all known vehicle communication use-cases based on diagnostic protocols and to establish a solution that is independent of the used protocol. An application developer needs to have no further knowledge of particular diagnostic protocols when implementing against the API. The ASAM MCD-3 D API is specified in an object-oriented but technology-independent UML model and then mapped to popular software technologies such as Java, C++ or DCOM. This allows to easily add new programming language mappings to the standard without having to change the core of the standard.

LATEST ADDITIONS AND IMPROVEMENTS

The latest release of ASAM MCD-3 D is version 3.0.0. Its main additions were the support for ASAM MCD-2 D / ODX V 2.2.0 and the integration of DoIP (Diagnostics over Internet Protocol) capabilities.

STANDARD AUTHORS

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ASAM XIL

Generic Simulator Interface

ASAM XIL is an API standard for the communication between test automation tools and test benches. The standard supports test benches at all stages of the development and testing process – most prominently model-in-the-loop (MIL), software-in-the-loop (SIL) and hardware-in-the-loop (HIL). The notation "XIL" indicates that the standard can be used for all "in-the-loop" systems. This has the advantage that it enables users to freely choose testing products according to their requirements and integrate them with little effort.

The standard furthermore decouples test-cases from real and virtual test systems. This allows to transfer tests between different test systems with little to no migration effort. Consequently, tests can be easily re-used. Know-how is much easier transferred from one test bench to another, resulting in reduced training costs for development- and test engineers.

The ASAM XIL API comprises access to the following components of the simulation system:

- Reading/writing parameters in simulation models
- Capturing/generating signals in simulation models
- Capturing, reading and writing of ECU variables
- Capturing of network messages (CAN only with current version)
- Exchanging data with an ECU via diagnostic services
- Controlling electrical error simulation hardware (e.g. to set up short circuits)

APPLICATION AREAS

The ASAM XIL API is primarily used by hardware-in-the-look simulators (HIL systems) for testing ECU in real-time. The standard has been successfully applied in powertrain, steering and electric lighting tests.

QUALITY ASSURANCE

Cross tests for ASAM HIL installations have been carried out in 2012 and are planned for the future to ensure compatibility between test automation software and HIL test systems.

STANDARD AUTHORS

AUDI AG, AVL List GmbH, Berner & Mattner Systemtechnik GmbH, BMW AG, Robert Bosch GmbH, Continental Automotive GmbH , D2T, Daimler AG, dSPACE GmbH, ETAS GmbH, HORIBA Automotive Test Systems GmbH, M&K Mess- und Kommunikationstechnik GmbH, MBtech Group GmbH & Co. KGaA, National Instrument Corporation, RA-Consulting GmbH, Softing Automotive Electronics GmbH, TraceTronic GmbH, Vector Informatik GmbH

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DATA MANAGEMENT & ANALYSIS

Component for Evaluation and Analysis

ASAM CEA

Plenty of test-data post-processing applications are available on the market, which have either a proprietary plug-in architecture or no plug-in capabilities at all. Customized solutions for such applications, such as data file importers, special mathematic algorithms or special graphic elements, cannot be easily reused in another application and would require significant porting effort.

ASAM CEA (Component for Evaluation and Analysis) defines an application framework and functional components for the evaluation and analysis of test measurement data. The standard is most commonly used for the development of reusable application components for processing and visualization of testing data. It defines everything to create components in a standardized way in order to be able to be used in different programs from different manufacturers. If the application framework is compliant with the CEA-standard, then CEA-components can be loaded and used by the application. If the framework follows modern SW-architectural rules (e.g. object oriented, event driven, full-state, etc), then it will be easy to implement the functions needed for CEA-compliance.

The standard describes the necessary techniques for component developers. ASAM CEA defines a component-based framework within a producer-consumer architecture. For a well-defined runtime sequence structure, events are defined which inform “consumers” of any change within the content. The framework can be extended by plug-in components. The interfaces, data items and events are clearly defined to obtain interchangeable components between CEA-compliant frameworks.

The standard itself is described as completely technology independent. It is tested and examples are available for C/C# and Java. In addition, a sample framework together with sample components are available as part of the standard to allow interested companies to start developing their own CEA-based applications.

APPLICATION AREAS

ASAM CEA-compliant software is used in many industry applications. Many of them are running as web-based solutions inside a Measurement Data Management (MDM) system:

- **Engine / turbocharger test bench:** Online visualization, user interface and test-data post-processing.
- **Battery test stand:** Post-processing of test stand data.
- **Gear test stand:** Post-processing of terabytes of data incl. customized statistics components in a client-server application.
- **Data logger:** Vehicle test data analysis with logged data incl. GPS, movies and time signals.
- **Crash-data post-processing:** Importing of raw test data, creating MME13499-compatible data structures and generation of standardized reports.
- **Calibration lab for sensors:** Creating multi-page calibration reports.

STANDARD AUTHORS

AMS GmbH, Daimler AG, Horiba GmbH, Porsche AG, Volkswagen AG

Open Data Services

ASAM ODS

Numerous solutions in testing, evaluation and simulation within the automotive industry have their own administrative systems and proprietary formats to store data, with very different approaches in maintaining descriptive information. Extending and modifying such solutions, and connecting them to third party components, is a growing challenge as complexity is continuously increasing. Also the demand for unified knowledge bases as a foundation for data mining and for cross-disciplinary collaboration cannot be met by such diverse and usually inaccessible information pools. New ideas from new players in the market will hardly find their way into legacy systems unless an easy and standardized way for information access is available. Finally, the need for product lifetime storage & retrieval calls for standardized methodologies that may be used even if tools and businesses have been discontinued.

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The ASAM ODS (Open Data Services) standard focuses on persistent information storage & retrieval. The main objectives are to reduce costs and risks within projects and to provide a reliable basis for applications that produce and/or consume information. Using standardized interfaces and common data structures minimizes the efforts for system integration within heterogeneous environments and significantly eases information exchange. It moreover allows the integration of light-weight solutions that work on a standardized information pool. A fully standardized persistence layer secures the investments made in such data server systems, as information becomes independent from specific implementations.

ASAM ODS specifies:

- A common data model (base model) for unambiguous and complete definition of data, providing a rough classification by adding semantics to the data, which finally enables different systems to interpret similar data in the same way. It serves as a basis for many derived application models, which themselves cover the needs of specific application areas.
- Interfaces to store & retrieve data in ODS servers in a standardized way, including interfaces to maintain a formal description (meta-information) of the actual application model. This allows systems to generically operate on different ODS data sources.
- Standardized text-based formats (ASAM Transport Format) for exchanging data and meta-information between different systems & platforms (two variants: ATF/CLA, ATF/XML).
- A database model for relational databases used to physically store the information. It also allows exchanging database files between systems with the same data base management system.
- Application models, reflecting typical scenarios for the use of ASAM ODS. Currently models for NVH data, test bed calibration data, workflow descriptions and results, crash test data, geometrical data, and data from bus communications are provided.

APPLICATION AREAS

ASAM ODS is predominantly used in the area of test automation and test bed systems, but is not limited to this area and can be used wherever information must be stored in a consistent manner. Application areas are: Test Data Management, Measurement & Calibration, Integration of Automation and Measurement Systems, Simulation, Data Post-Processing, Reporting, etc.

LATEST ADDITIONS AND IMPROVEMENTS

Version V5.3.0 shows following major improvements:

- UTF-8 support is extended to the data base and the interfaces: texts may now use characters of the complete Unicode set.
- Interfaces are added to manage external files by an ODS server without the need for shared drives or FTP connections.
- Changing/accessing information can be uniquely logged by an ODS server.
- Bit-based access to binary files is available, including data types like 12-bit integers.
- An application model for bus data was added, describing how to store messages sent via CAN, LIN, FlexRay, MOST, or Ethernet.
- Mass data may now be searched on the server side, using API methods.
- Web services interface for simplified access of clients to an ODS server via HTTP.

QUALITY ASSURANCE

- A checker tool for ASAM ODS is available. It may be used to find errors in the underlying database as well as in ATF files.
- Cross tests are organized from time to time. They are open for all ASAM members and allow to check ODS-based interoperability of applications, thereby improving the quality of the standard.

STANDARD AUTHORS

Audi AG, AVL List GmbH, BMW AG, Cologne University of Applied Science, Daimler AG, EPOS CAT GmbH, HEAD acoustics GmbH, HighQSoft GmbH, HORIBA Automotive Test Systems GmbH, LMS International NV, Müller-BBM VibroAkustik Systeme GmbH, National Instruments Corporation, Porsche AG, Robert Bosch GmbH and Volkswagen AG

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Japan ASAM Interest Group (JAIG)

Featured Standard

How to Use ASAM Standards – a Collaborative Learning Approach

SUMMARY

Since 2009, representatives from large Japanese OEMs, such as Honda, Toyota, Nissan, Mazda, Suzuki, Mitsubishi, Fuji Heavy Industry, Daihatsu and Hino, debated the use and potential benefits of international standards in the area of ECU development and testing. They each independently recognized that the use of standards could be beneficial in terms of connecting different departments and remote development sites, to improving work flows with their suppliers and ultimately to breaking out of the narrow boundaries of in-house, custom-made tools that all too often are high in costs and low in features. ASAM standards have been quickly identified as leaders in the embedded tools area and became a focal point of interest.

Before committing to ASAM standards, Japanese OEMs needed to understand the content of the standards and their application in practice. The main question was if and how ASAM standards could be used on an enterprise level.

Solution: As the information provided in the standard documents were not sufficient to evaluate their potential for Japanese OEMs, a group of nine OEMs, six Tier-1 suppliers and 32 tool vendors formed the Japanese ASAM Interest Group (JAIG) with the purpose to:

- Figure out technical issues and use-cases that are common among the JAIG members
- Jointly learn relevant ASAM standards and understand their application
- Promote a local tool supplier base in Japan that is knowledgeable about ASAM Standards

The members of JAIG quickly identified the areas of Test Data Management, Automated Testing and Measurement & Calibration as the major points of interest for their work. Training sessions were organized for the ASAM MCD standards, ASAM CDF and ASAM XIL. Tool demos from vondors and technical discussions helped to become familiar with these standards. Additional tool demos from vendors and discussions on common technical problems were enough for the members to become familar with these standards. For other, more complex standards, a pilot implementation of a tool or tool-chain was set-up to understand its application. This article describes the pilot implementation for ASAM ODS.

Key Benefits: This joint and thorough approach not only guarantees a deep understanding of the benefits and limitations of the standards, but also creates acceptance both inside the company and among the network of Japanese OEMs and their suppliers. JAIG may be seen as a role model for other regions to get up to speed with standards and to quickly draw benefits from them in the day-to-day development activities of automotive companies.

SITUATION

ASAM ODS in particular is a complex standard that is IT-driven and thus difficult for engineers with little or no IT-focus to understand. This standard requires practical experience to understand its full capabilities. However, Japanese OEMs have identified this standard as a powerful tool to make better use of data both on micro (department) and macro (enterprise) levels.

SUCCESS STRATEGY

One of the primary success factors of JAIG is the paradigm of collective learning in a community. Specialists in one technical area with alike interests met regularly and worked jointly to learn, understand and apply the standards of their professional area. It soon became clear that learning via presentations was not sufficient to understand the benefits and limitations of ASAM ODS. The group members called for real life scenarios. Therefore, it was decided that as a second step a real use case to demonstrate the abilities of ASAM ODS should be prepared. Although Japan has no tradition in this kind of cross-company collaboration, this approach worked quite well. The group succeeded in setting up a prototype ODS server and was able to try out its functions and understand the benefits of ASAM ODS.

Step 1: LEARNING: The following objectives have been determined for the work group during the phase of studying the standard:

- Learning and understanding the basic terms and structures of ASAM ODS, such as the ATFX file structure, the usage of MIME types for complex engineering data, the base model, application model and the ASAM ODS API;
- The set-up of an environment for a model-based development system. The task was to integrate validation data on an enterprise level as well as to allow integration of CAE and CAT;
- The group wanted to get an idea of the ASAM ODS solutions available in the market and what it meant for local companies to invest in the standard to create a local eco system of tool vendors in Japan.

Experts from Germany and India conducted initial training sessions. Real use cases were demonstrated and explained. These experts also helped the group define a use case that covers all basic concepts of ASAM ODS such as ATFX file, MIME type, application models, etc.

Step 2: PILOT PROJECT: For the pilot project an example in the area of noise, vibration and harshness (NVH) was used. Using an example from this area seemed to have several advantages:

- NVH already provides a precise definition of engineering data such as octave analysis, order analysis etc;

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Kaoru Aoki
HONDA R&D Co.,
JAIG moderator

- It provides the possibility to store measurement conditions and measurement points along with test data that can be reused for CAE;
- An NVH use case allows data sharing between different departments and different tools;
- Many important NVH tool vendors offer ASAM ODS compliant tools.

In order to see the benefits of the reusability of data, the use case focused on connecting enterprise level metadata to test data.

According to the agreed use case, a test ODS cloud server was set-up and maintained by PVMsys. The OEMs provided NVH sample data. Further data from tools were imported into the ODS server. Based on that set-up, different tool vendors demonstrated the connectivity of their tools to the data, proving that the system works well with all ASAM compliant tools.

The solution provided all next generation technology: it used an ODS server in the cloud, a smart importer for different data and provided connectivity of tools via a VPN connection. A special web application was implemented as user interface.

CHALLENGES

The work group faced some challenges throughout the project. The main challenge was to convince the OEMs to provide NVH sample data. Another challenge was where to host the ODS demo server; thus the idea of using a cloud-based solution was born. Third, IT security barriers had to be overcome in each company. VPN connections to external servers were blocked at most OEMs. Providing dedicated laptops that could then connect to the cloud server solved this problem.

Other challenges identified during the project include:

- The standardization of engineering metadata
- How to build an eco-system around ASAM ODS with Japanese tool vendors providing ASAM compliant products
- How to convince management to invest in processes around ASAM standards and products

Although the major work is done, some issues that the Pilot Project Work Group wants to further examine remain:

- Carry out performance benchmarks with different solutions;
- Investigate the possibility of ODS server clusters that connect on an enterprise-level.

"The collaboration in workshops and study groups helped every participant enormously to understand ASAM standards and how to apply them in practical use-case scenarios. We are thankful to the tool suppliers and to ASAM in Germany for their support. For us, as an OEM, it is important that this knowledge further increases in Japan and leads to a domestic supplier-base that uses standards in their products and services. We believe that then the benefits of standards will fully materialize."



JAPAN ASAM INTEREST GROUP (JAIG) Members

BUSINESS BENEFITS

The main advantage was the fact that the entire community could learn about and understand a complex standard.

- They were able to learn about the usage of ASAM ODS both on the macro and micro levels: On an enterprise level, ASAM ODS helped streamline processes of the whole company. On a department level, it helped to use data more effectively in various tools thus increasing the availability and value of the existing data.
- An ASAM ODS based solution helped with inter-department communication.
- The project demonstrated that CAE – CAT integration is possible and reduces development time.
- The project also identified a new approach called product validation management (PVM).

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MTU Aero Engines AG

Featured Standard: **ASAM ODS**

ASAM ODS Used in Multi-National Development of the Turboprop Engines for the Airbus A400M

SUMMARY

The Airbus A400M is a European joint project to develop and produce a military transport aircraft for tactical airlift operations. The maiden flight of the A400M was in December 2010 and the first aircrafts are being delivered to France in 2013 and Germany in 2014. The technologies used in the A400M are considered to be a bridge to the next generation of civilian aircrafts. This is specifically true for the advanced TP400-D6 turboprop engine. With a maximum output of 8,203 kW, it is currently the most powerful single-rotation turboprop engine in the western world. Despite its power, it is very fuel efficient for its class.

The TP400-D6 turboprop engine is developed by Europrop International GmbH, a joint-venture of MTU Aero Engines, Snecma, Rolls-Royce and Industria de Turbo Propulsores. The TP400-D6 is a complete new design developed from scratch. To enable the partnering companies to carry out this collaborative development project, they had to set up processes and data exchange methods that allows efficient cooperation in this ambitious project. ASAM ODS turned out to be an important part of this endeavor.

SITUATION

The construction of an engine starts with finite-element models and calculations of the solidness and stability of the construction. Tests with prototype engines have to be carried out to optimize the engine design, to validate the calculated robustness of the construction and to ensure that limits are not exceeded. A significant portion of this are NVH-tests that require to dynamically measure acceleration, vibration speed, strain and pressure. Sample rates reach up to 102 kHz. The amount of data produced in such tests is enormous and easily reach terabytes of size.

The joint-venture companies were soon confronted with the question how to exchange test data among each other. Each partner uses its own types of sensors, measurement systems and data storage formats, provided by different tool suppliers. Furthermore, tests are carried out at different locations. The resulting test data then has to be transported to other locations for post-processing and evaluation. The involved companies had to come to an agreement how to share and exchange the data in an efficient way to keep this project manageable. Since each company works with proprietary systems, there was no obvious answer to this question.

SUCCESS STRATEGY

From the beginning of the project, MTU Aero Engines and its tool supplier Müller-BBM VibroAkustik Systeme proposed to use ASAM ODS for exchanging test data. The standard offers two essential components that are needed by all partners:

- an NVH application model, which provides a semantic definition for the test data
- an XML-based file format (ATFX) for data serialization and file-based data exchange

The tools from Müller-BBM are aware of the ASAM ODS NVH application model and have an importer and exporter for the ATFX-file format. Since all other system suppliers agreed to the ASAM ODS, the partners settled on ASAM ODS as the standard for test data exchange. The most important reasons for their decision were:

- long-term stability of the standard: no frequent changes of file formats, which would jeopardize interoperability of tools and potentially causes loss of data
- public standard: fully documented file format and tool-vendor independence
- availability of tools: sufficient support of the standard by COTS products

Based on this decision to use ASAM ODS, the partners made further internal agreements to exchange raw, time-series data and to use a specific catalog of units. Since every company required additional data to be stored along with measured raw data, the ASAM ODS NVH application model was extended by each company with their specific meta data. Data exchange between the four partnering companies now had a solid foundation.

CHALLENGES DURING THE PROJECT

Once the decision was made for using ASAM ODS, it still took about a year to develop ATFX importers and exporters for all tools used by the joint-venture companies. Software engineers engaged in the development of the tools mentioned that the standard is quite complex and not easily understandable, but also acknowledged that it is a solid and well-thought-out standard. Once this challenge was overcome and the tools were developed, data exchange worked seamless between the involved companies.

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Egon Preinesberger
Senior Manager Special Measurement Techniques,
MTU Aero Engines AG:

"The multi-national European project TP400-D6 turboprop engine forced us to find a common standard for test data exchange. ASAM ODS was the right standard to help us solve this problem. The standard enabled us to implement a test data exchange infrastructure between the joint-venture companies just in time when it was needed."

As expected at the beginning of the project, the amount of data produced for testing the TP400-D6 turboprop engine was enormous. MTU Aero Engines produced about 10 terabytes of NVH test data throughout the project. This amount of data could not be transported via the Internet for cost and security reasons. The data was stored in ATFX-files of 2 to 10GB of size, saved on hard disks and then sent via express mail to the other partners for further use.

BUSINESS BENEFITS

This seemingly low-tech method worked flawless and proves that big technical challenges between companies can actually be solved once they agree on the use of common standards. The joint-venture companies continue to use internal and proprietary databases within their own companies. But with the agreement on using ASAM ODS, they were actually able to exchange test data between them without having to spend major efforts in data conversion or maintaining data quality. Without using a public standard such as ASAM ODS, the companies would have to develop their own standard for their joint-venture project and would probably be still negotiating the technical details until today, when the project is almost finished. ASAM ODS significantly accelerated this process and allowed to implement a data exchange infrastructure that was ready in time when it was actually needed.



Aero Engine TP400-D6

OUTLOOK

The initial effort to introduce a data exchange format in the European aircraft engines industry is done. From the perspective of MTU Aero Engines, it would just make sense to continue to use ASAM ODS on a European scale and to further benefit from the established data exchange infrastructure. MTU Aero Engines also plans to use ASAM ODS as an internal standard for data exchange and intends to propose the use of ASAM ODS with his business partners Pratt & Whitney and GE in the US to gain the same benefits.



EPI Europrop International GmbH was created by four leading European aero-engine companies to manage the TP400 engine program.

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Detroit Diesel Corp.

Featured Standards: **ASAM MCD-2 MC, ASAM MDF**

Tool migration using ASAM MCD-2 MC

For over 70 years, Detroit Diesel has designed and built the heavy-duty engines that fuel commerce and transportation across North America and around the world. The engines power a wide range of heavy-duty vehicles. To ensure the high level of quality and reliability of its engines, Detroit Diesel carries out extensive testing before they go into production. This includes on-vehicle testing on test tracks and public roads. Continuous logging of data from powertrain controllers and subsequent evaluation and analysis of the data plays a vital role in this process.

SUMMARY

Challenge: Daimler Trucks North America with its subsidiaries Freightliner and Detroit Diesel used a variety of tools to log data from its engineering vehicle fleets. Due to the lack of having a common data format and ability to log measurements from more than 20 CAN based devices, another tool was needed for recording and displaying data.

Solution: A new tool has been identified and the first migration phase has been successfully completed. The main interest for this Case Study is logging data; other capabilities from the tools described are irrelevant.

Key Benefits: The migration process has been very smooth because all tools are compatible with ASAM a2l files. Without being much aware of it, Daimler Trucks North America is benefiting from ASAM standards by having common data formats and using interchangeable software tools.

SITUATION

Freightliner and Detroit Diesel operate 3 truck fleets:

- Reliability Growth, verify functionality of production intended hardware and software.
- Chassis validation, main focus is hardware and software development related to vehicle systems. In order to calibrate for different environments such as sea level, high altitude, hot ambient and cold ambient, part of this fleet undergoes remote testing during summer and winter.
- Powertrain validation; similar objective as Chassis validation with the exception of focusing on powertrain systems instead of vehicle systems.

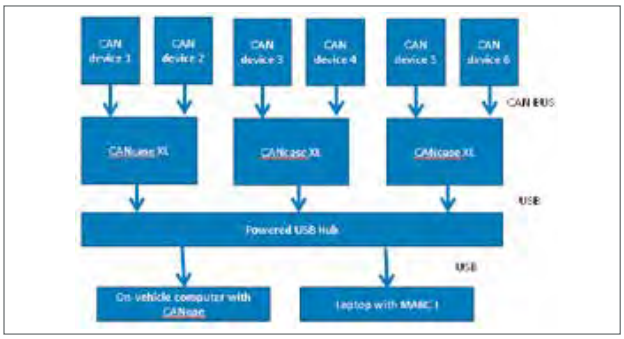
Freightliner and Detroit Diesel need the ability to handle data streams from multiple connected devices and show live data from 100's of channels, which are displayed on a 50" screen inside a class 8 sleeper cab vehicle.

TOOL USAGE PREVIOUSLY:

Fleet	Tool	MDF format	Display data	*.a2l compatible	20+ Devices
Reliability Growth	CANcase	yes	no (net needed)	yes	yes
Chassis validation	CSM	yes	no	yes	no
Powertrain validation	MARC I	no	yes	yes	no

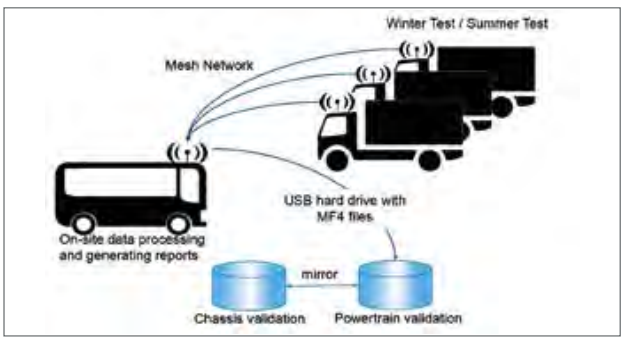
None of the existing tools were able to handle all tasks. In addition, having one common tool would ease the process of managing and sharing configuration, training and measurement lists.

Vector CANcase XL modules are used as the interface between the CAN bus and data loggers.



CAN to USB Interface

During remote testing, all data is saved on a server that resides within a modified coach bus for post processing. The bus is equipped with a mesh network that automatically receives data from nearby vehicles.



High level data architecture remote testing

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Chris Niessen
Senior Engineer, Powertrain Integration,
Detroit Diesel Corporation

"I support ASAM because it enables plug and play of software tools"

The main processing modules are for engine, aftertreatment, transmission and chassis. In addition, other modules handle tasks such as instrumentation and fault code management, adding up to 20 modules.

SUCCESS STRATEGY

None of the existing tools were able to connect 20+ devices, log data in MF4 format and display live data. A new tool was needed for recording and displaying data.

Vector CANape can handle all required task and it is compatible with ASAM *.a2l files. ASAM MCD-2 MC (aka ASAP2) defines a description format for internal ECU variables used for measurement and calibration purposes. Any replacement data logger had to be compatible with a2l files because they are also used with MARC I, CSM and CANcase. Most engineers are not aware that the ASAM MCD-2 MC standard plays a major role in making this a smooth migration. No adjustments have to be made to the existing *.a2l files.

TOOL USAGE POST MIGRATION:

Fleet	Tool	MDF format	Display data	*.a2l compatible	20+ Devices
Reliability Growth	CANcase	yes	net needed	yes	yes
Chassis validation	CANape	yes	yes	yes	yes
Powertrain validation	CANape	yes	yes	yes	yes

The migration timeline includes a dual phase where both legacy and CANape recorders are simultaneously active. Phase 1: Ramp up Powertrain validation usage of CANape and keep logging data with MARC I. This dual-phase ensures that no data is lost during any unanticipated problems with CANape. After this short period of time, MARC I logging is stopped. In a similar approach, Phase 2 replaces the CSM loggers at Chassis validation, which is currently in the dual logging phase. The Reliability Growth fleet continues to work with CANcase loggers who have a similar functionality as CANape without the ability or need to display live data.

CHALLENGES

It took 1 year of testing and validation for the implantation at the Powertrain validation. CANape runs on a rugged dedicated in-vehicle computer. Due to the high demands on the CPU initially running constantly on 100%, the in-vehicle computers had to be upgraded twice to newer and more powerful models, currently running on the 3rd iteration. In addition, the heavy burden on the CPU was furthermore reduced by limiting the number of simultaneously recording channels at various sampling rates to currently 1073.
Many engineers became accustomed to .famos files recorded in MARC I. Since CANape stores data in ASAM MF4 format, some engineers are reluctant to use CANape recordings and still use MARC I on occasion for secondary data logging.

Although running without issues, the Chassis and Powertrain validation fleets are considered to be a high level user within Vector, testing the upper limits of the system with currently 20+ connected devices.

BUSINESS BENEFITS

- Ability to display and record 20+ devices
- Increased program robustness has ensured that very few measurements are lost during recording outside of normal program issues (operating system crashes, driver initialization error, memory overrun, etc)
- Measurement files are captured in ASAM MF4 format, increasing the number of tools that can process fleet data:
  - In-house data mining tool based on Matlab that was previously only compatible with Reliability Growth and Chassis validation.
  - Automated jBEAM report generator
  - Uniplot, CANape, DIAdem, ASAM ODS, etc.
- CANape allows loggers to be controlled by scripts, eliminating the task of manually triggering logs and coming up with measurement filenames on the fly by having a standardized naming convention
- Added data transparency by having rich, descriptive metadata about Vehicle, configuration and route in each file header by entering information into a custom CANape panel

OUTLOOK

The migration process is nearly completed. Due to the ever increasing number of devices and measurement channels, more powerful in-vehicle computers are needed with USB 3.0 interface to accommodate additional data throughput.

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HighQSoft GmbH & Robert Bosch GmbH

Featured Standard: **ASAM ODS**

Integration of an ASAM ODS Analysis Server for Automated Measurement Data Evaluation

SUMMARY

Challenge: At Robert Bosch GmbH Diesel Systems, measurement data has become large scale; the number of files and data volume has skyrocketed. Today, engineers and experts in the domain are losing time and resources by manually developing and executing duplicate analysis programs, which they run only once, locally, on their hard-drives. In 80% of the cases, the tasks are repetitive as they inherit standard data validation and evaluation.

Solution: The approach to a solution was identified by integrating an analysis framework into the existing system architecture of the Product Lifecycle Management Database (PLCD), which includes an ASAM ODS database for measurement data management. The server-side framework defines and provides a workflow, which integrates automated evaluation calculations based on, for example, DIAdem scripts, MATLAB scripts or pure Java.
The concept of the analysis server enables the system to register ASAM ODS server event notifications and combine them with measurements of a defined MIME-type and a corresponding, predefined third-party tool evaluation.

Key Benefits: The key benefit of the analysis server is that it takes away most of the repetitive analysis tasks from the engineers, thereby allowing them to spend their time on specific evaluations. In addition, analysis results, such as reports, are generated in a standardized manner and remain comparable for further evaluation within ASAM ODS. Next to being able to process large-scale measurement data in a fully automated manner, the solution enables a convenient approach for evaluating characteristics over multiple tests.

SITUATION

The PLCD project at Bosch started with the Automotive Diesel Systems Department and is to be rolled out throughout the corporation. It currently covers multiple test stands for injector testing but is designed to cover other domains in the future.

The current implementation of the PLCD project runs in a productive ASAM ODS environment and is very advanced in data acquisition, data preparation and validation; it also integrates a web-based front-end data management and work-flow GUI. Although these steps are already up and running, the focus is on improving the process of evaluating managed data.

As of now, evaluations are mostly done by downloading files from the ASAM ODS server to a common shared drive to then process it further. As a requirement for the year 2015, Bosch wants to standardize this part of the work-flow in order to provide an overall streamlined solution to their internal costumers.

The idea of integrating an analysis server with PLCD was primarily influenced by the proof-of-concept at Daimler AG, where such a system for road-load data analysis has been running well in a productive environment since 2010; that system was partly developed by HighQSoft GmbH. The objective for Bosch is a re-launch of the concept with a generic implementation that incorporates lessons learned, new requirements and features.

CHALLENGES

Saving measurement data on a shared drive led to two major problems: first, the download of files from the ASAM ODS server onto the shared drive created redundancies and second, diversified analysis scripting led to varying implementation and non-comparable results.

These two problems created inefficiency in the following ways:

- Repetitive tasks occupied the employees' time and prevented them from focusing on their "actual work." In addition, the number of analyses to be executed was rising faster than employees could track. Finally, the resulting data was not properly fed back into the ASAM ODS system; therefore, comparison of analysis results was not feasible.

- These challenges led to the decision to implement a server-side framework to integrate automated execution of evaluations. The objective is to process new and incoming ASAM ODS measurement data based on their MIME-type and pre-defined analysis programs in order to retrieve standardized and comparable result sets.

LAG-VW00002394

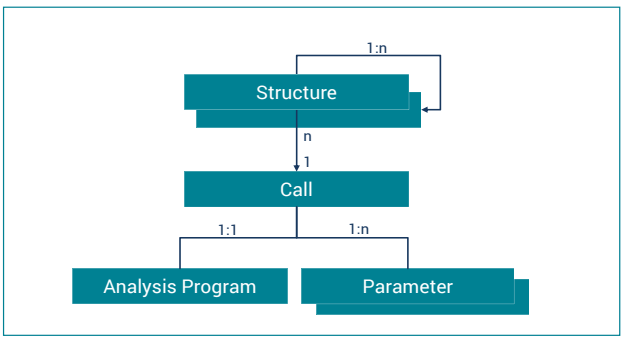
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Uwe Mannsperger
Robert Bosch GmbH

"The semantic description of measurement data in ASAM ODS is an inevitable prerequisite for automated and targeted analysis, as we plan to do it with our prospectively even larger scale data."

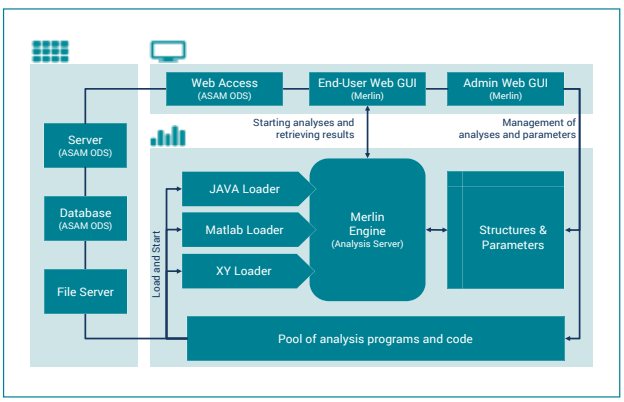
SUCCESS STRATEGY

We solved the aforementioned problems by implementing an analysis server application based on the ASAM ODS standard. The analysis server manages workflow by executing an evaluation. Its tree-like structure incorporates calls, analysis programs and parameters.The analysis program itself is a third-party script to be run by the analysis server with the third party's tools, such as DIAdem, MATLAB or pure JAVA.



Schematic representation of entities and relations of an evaluation

The result of an evaluation might be multifaceted and depend on the engineers' case-by-case requirements. An evaluation may produce simulated measurement data rewritten into ASAM ODS, evaluation reports to be attached to instance elements or a notification sent to a user group.



Schematic architecture of the analysis server and its integration into ASAM ODS

A web interface also allows engineers to administer analyses programs and their parameter sets for automated scheduling. In addition, they may retrieve results and are also able to trigger specific evaluations.

CHALLENGES DURING THE PROJECT

An additional challenge related to the manual measurements downloads and individual analyses is that the data volume on the shared drives grew exponentially. Due to the large number of files, we have developed a tool to support the identification of redundant data on ASAM ODS and on the shared folder. The tool allows an administrator to set up searches to identify, copy, move and/or delete the files based on various comparison modes. The administrator can dispense with the data according to the company's data guidelines. This tool is available on a web interface.

BUSINESS BENEFITS

The integration of the analysis server and the setup of an automated data workflow could significantly reduce the efforts of engineers to work through redundant tasks. The solution increases the quality of result sets through standardization, thereby enabling comparability.

As evaluation structure may be defined very flexibly. Moreover, an evaluation may contain multiple subsequent analysis programs and integrate multiple measurements into, for example, fleet analysis. Therefore, the solution meets the requirement of Bosch to be reused in different domains.

Another important fact is that the solution is designed to provide the workflow to automate data analysis; the know-how of the analysis is to be provided by the individual engineers and therefore stays within the enterprise.

In terms of IT infrastructure, the solution permits the analysis of large-scale data volumes right where they are produced. The scalability of the solution is given vertically (machine performance, CPUs and memory) as well as horizontally over multiple machines. Data traffic over networks and data redundancy on shared drives is reduced.

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Müller-BBM VibroAkustik Systeme GmbH & AUDI AG

Featured Standard: **ASAM ODS**

Further Simplifying Pass-By Measurements

SUMMARY

Challenge

The complexity of exterior noise measurements (later called pass-by testing) and the amount of acquired data required for development, homologation and conformity, are continuously increasing because of stricter regional regulations. To overcome this challenge, highly automated procedures are implemented for the measurement and reporting tasks. In addition, a link to the existing IT infrastructures is established based on an open data format.

Solution

Fulfilling the complex task of pass-by measurements requires a close correlation between fully autonomous components and the integration of data analysis and reporting into existing IT environments. This is why state-of-the-art components, all designed to perfectly perform the required individual tasks, are integrated into the openMDM-based MeDaMAk system at AUDI AG.

Key Benefits

The open ASAM ODS ATF/XML format ensures a consistent data flow from the central assignment system via the acquisition, and later, either the interpretation or the integration of the data in simulations with minimal resource allocation. Information relevant to pass-by is incorporated into the ASAM ODS model. As the solution can be seamlessly expanded for diversified standards, long-term data accessibility and interpretability are inherent in the solution.

SITUATION

The increasing complexity of pass-by testing followed by time/cost pressure has made smart workflow systems the preferred approach to achieving the targets required. Over the past three years, AUDI AG has established a powerful pass-by measurement and analysis solution by combining PAK family components. These components have been embedded into the openMDM-based MeDaMAk solution. The PAK family members, PAK software and PAK edp, ensure easy, rugged and secure data acquisition and further interpretation. One may ask how this solution can be made even more efficient in the workflow? The answer is by combining the existing tools and defining interfaces as well as workflows.

CHALLENGES

The PAK family is a standardized solution for easily and efficiently determining a variety of exterior noise regulations and test scenarios. The PAK system has been connected to the company-wide openMDM platform in close cooperation with the AUDI AG Processes and Methods R&D Department.

All level values and additional quantities for comfort and driving dynamics acquired with PAK are stored in the central data management system, using the ASAM ODS ATF/XML standard. The acquired data can subsequently be viewed worldwide on the Intranet with PAK edp. Various data views are offered, ranging from the Lurban single-number values of homologation required by those responsible for production, to the level curve of the single runs or intermediate results, which provide the level of detail required for the development process.

This makes it easy to compare NVH-based levels, especially in the pass-by environment. Hence, PAK edp features the AUDI AG as an ideal benchmarking tool across the development of series, facilitating a powerful comparability of the development stages in the series. The context-based evaluations are configured from the customer's workflow, e.g., even different combinations of tires and exhaust systems can be easily compared.

SUCCESS STRATEGY

In order to master the increasing complexity in the existing environment, Müller-BBM VibroAkustik Systeme has developed intelligent, networked components.

Equipped with such task-dedicated systems and supported by well-defined and standardized customer processes, users can simply focus on driving to perform perfect pass-by runs. As soon as the system is switched on, the PAK MKII data acquisition unit immediately provides all the available sensor signals live. Its stand-alone ability enables even a single operator to have all the necessary information always available online. Measurement results are safeguarded through improved data quality as well as by process automation in setups and driving. Due to the open ASAM ODS ATF/XML format, after a measurement has been finalized, users benefit from the barrier-free data exchange within their existing IT landscape. The results can also be compared with simulated pass-by or COP measurements based on the ASAM ODS standard.

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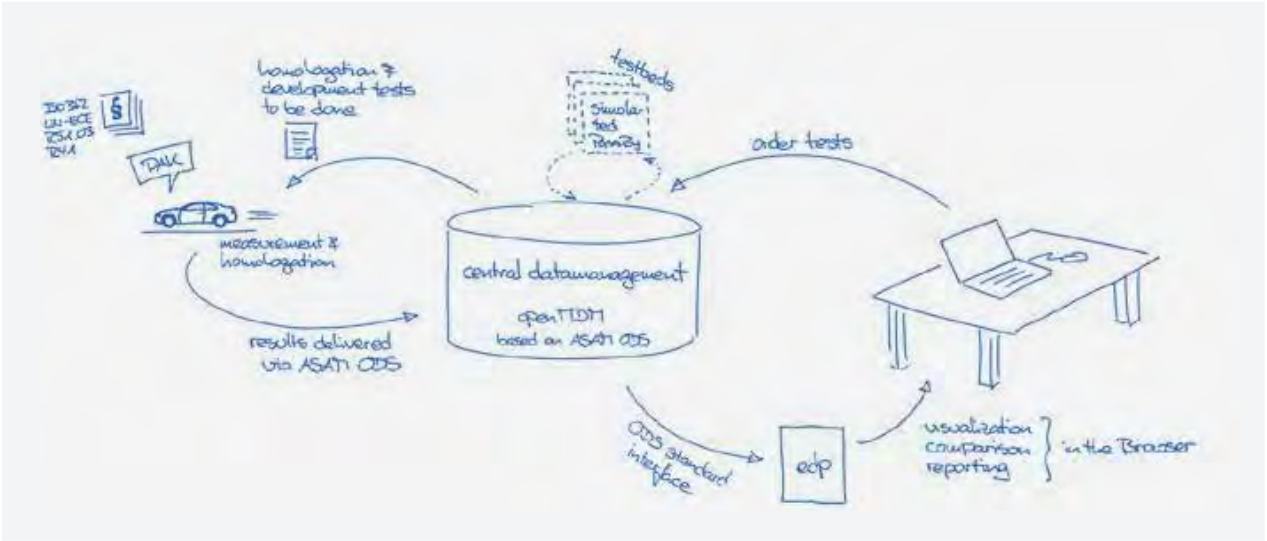
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Tino Teske
AUDI AG, Acoustics,
Type Approval and Exterior Noise

Christian Rechner
AUDI AG,
CAT Processes and Methods R&D

"The ASAM ODS based storage helps me to manage all my test data from pass-by-noise, testbed and driving measurements in one single system. Everyone of my colleagues now has the possibility to choose their tool for reporting and post processing, no matter the source data format."

"The standardization of process and data management was established years ago and is continuously being further developed, based on ASAM ODS."



Pass-By measurement workflow

Despite the component-based approach, the integrity of information is always assured. The consistency of all the components defines the high degree of freedom in the workflow. Users benefit from sustainable information. The ASAM ODS standard enables data to be viewed independent of a manufacturer and/or device.

CHALLENGES DURING THE PROJECT

Exterior noise measurements are challenging tasks that require both solid data transparency and easy data management from the assignment to the measurement up to the report. What is exceptional for the pass-by measurements is that the parent process is split into several independent tasks, for example for the driver, the central system or reporting. This allows the task to be broken down into all participating labor shares and software building blocks. No matter what components are chosen, all information has to be consistently merged again at the end.

BUSINESS BENEFITS

The PAK family solution offers an easy workflow for the complex exterior noise procedures in the environment of the increasing portfolio of series and variations within series. This pass-by solution is consistent over the different stages of test specification, the test procedure, and up to the test report. Coupled with high temporal and cost efficiency, the process safety remains constant over versatile user characteristics. Moreover, it is extremely robust against external failures.

Applying best practices, standalone components have benefits such as single-user operation or the simultaneous measurement of multiple vehicles on the test track; thus the cost of the measurement can be reduced as measurement campaigns can take less time and the capacity of the test track can be completely utilized. All data is fully integrated into the existing as well as the newer IT infrastructures owing to ASAM ODS.

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dSPACE GmbH & Tula Technology

Featured Standard: **ASAM HIL**

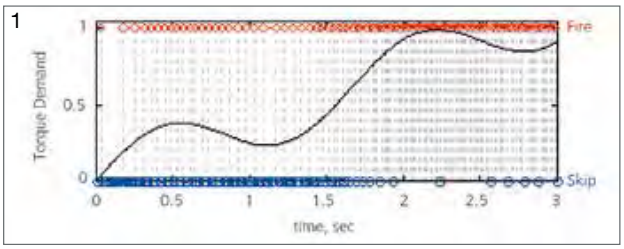
Dynamic Firing Order

Dynamic Cylinder Deactivation Improves Engine Efficiency

Imagine a combustion engine where each cylinder can be fired variably or skipped to provide the torque demanded by the driver. The engineers at Tula Technology, headquartered in Silicon Valley, have made this vision a reality and are expecting a series production with several OEMs.

Dynamic skip fire (DSF) is the name of the new technology at Tula. By deciding if and when each individual cylinder is ignited, DSF enables a particularly efficient engine operation. The engine control determines the number and sequence of cylinders that need to be fired in order to provide the required torque (*figure 1*).

1

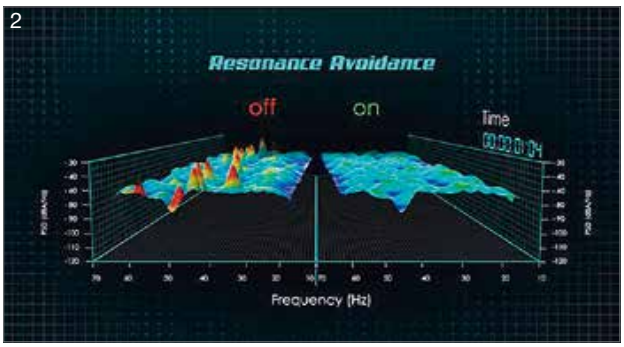


Dynamic Skip Fire decides when to fire each cylinder.

Dynamic Firing Increases Comfort and Efficiency

One of the biggest concerns involved in cylinder deactivation lies in deploying production-ready NVH (noise, vibration, harshness) powertrain behavior. To make this possible, intelligent algorithms developed by Tula avoid unfavorable frequencies, thus ensuring a comfortable driving experience at any time. By continuously timing the firing order, the DSF avoids resonance frequencies, thereby obtaining noise suppression and vibration reduction (*figure 2*).

2



Intelligent algorithms avoid resonance frequencies, thereby optimizing driving comfort.

Cost-Effective Solution

Among the low-cost, fuel-efficient technologies available on the market, DSF is the most efficient with fuel savings of up to 20%. Another advantage is its compatibility with other fuel-saving technologies such as direct injection, turbocharging, start/stop systems, and mild or full hybrids. Several OEMs and Tula are working together to get the technology ready for series production.

Development Tasks for Practical Use

Tula's main strength is in algorithms for variable cylinder deactivation and NVH suppression. To demonstrate the practical feasibility of the algorithms, the algorithms need to be implemented and executed in a demonstration vehicle. This is done with a prototyping system that controls a GMC Yukon Denali V8 engine. But before the algorithm is used on a real engine, it must undergo functional validation first. Hardware-in-the-loop (HIL) is the best test environment for this. To reduce the overall development time up to completion of the quality assurance (QA) tests, the HIL system should also be available for development tasks. Both the software developers and the testing and QA engineers must have access to the HIL test bench. In addition, the HIL test bench must be acessible from several locations.

Combined Tool Chain

To run the prototype of the DSF technology on customer platforms, Tula chose dSPACE's rapid prototyping tool MicroAutoBox II.

To validate the functions of the controller software, Tula developed a HIL test bench that uses the current ASAM HIL API (ASAM = Association for the Standardisation of Automation and Measuring Systems).

The HIL test bench receives the analog and digital I/O signals from the hardware and software of a third-party engine simulation. The engine simulation also transmits the crank and camshaft signals to dSPACE MicroAutoBox II, which in turn executes the DSF software. dSPACE AutomationDesk is the test management tool for performing the tests on the DSF software. All the components and AutomationDesk communicate through a common interface.

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James McKeever
Senior Embedded Software Test Engineer,
Tula Technology, Inc.

"Our goal is complete automation for the tests. That is why we use dSPACE AutomationDesk with the ASAM HIL API."

Challenge for the Combined Tools

Several different processes had to be combined to ensure a reproducible and reliable process: retrieving the source code and automation test scripts, compiling the source code for the test benches, loading executable files on the target HIL test bench, executing automated test scripts, generating summaries, and archiving the results for review and auditing.

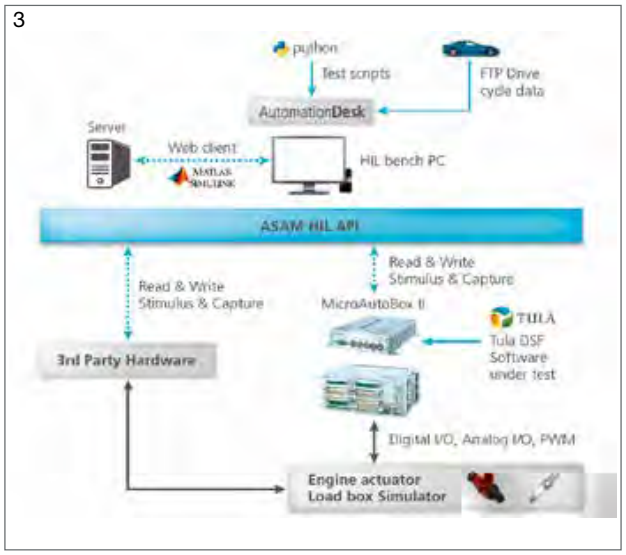
Automation to Reach the Goal

To implement the process steps, Tula created suitable software solutions. The first solution combines the engine simulation with dSPACE MicroAutoBox II via AutomationDesk as the framework for test automation. The implementation is done using the current version of the ASAM HIL API standard. With the HIL API, the Python-based test scripts can be written and executed as AutomationDesk test cases.
All test cases are available as AutomationDesk projects, which can be executed on the HIL test bench in both closed and open loop. This is usually done when implementing existing fuel test profile (FTP) vehicle cycles. In AutomationDesk projects, it is also possible to collect and record data for the test cases, compare this against predefined pass-fail criteria, and generate comprehensive reports on the performed test runs.

WebCarLab – The Optimal Solution

To ensure that the tests are performed from a central source code storage and to enable multiple remote access to the HIL test bench, Tula developed the web-based test automation tool WebCarLab (*figure 3*). The application communicates with a software configuration management (SCM) system and provides a web interface. WebCarLab has an intuitive user interface that lets users to run tests on the HIL test bench either interactively or in batch mode (batch processing). After the user has chosen a mode, WebCarLab checks the code from the SCM system and performs the selected test cases. In addition to generating test reports, WebCarLab creates all the artifacts that lead to the test results and archives the test reports for future audits.

3



The web-based tool WebCarLab allows remote access to the complex HIL test bench.

Conclusion

Tula is using an automated HIL test bench to develop innovative functions for dynamic cylinder deactivation in internal combustion engines. On the test bench, the controller software is validated for in-vehicle use. With MicroAutoBox II, Tula implements the functions in the demonstration vehicle, reaching fuel savings of up to 20% without sacrificing ride comfort.

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ASAM – your partner for standardization.

- 15 years of experience in standardization
- Well established and recognized organization for standards development
- High industry acceptance of ASAM standards
- Large ecosystem of tool suppliers

ASAM

LIST OF MEMBERS: OEMs

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www.audi.com

BMW AG
www.bmw.com

Daimler AG
www.daimler.com

Ford Motor Company
www.corporate.ford.com

General Motors Company
www.gm.com

HINO Motors, Ltd.
www.hino-global.com

Honda Motor Co., Ltd.
world.honda.com

MAN Truck & Bus AG
www.man-mn.com

Nissan Motor Co., Ltd.
www.nissan.co.jp/EN

ADAM OPEL AG
www.opel.com

Porsche AG
www.porsche.com

PSA PEUGEOT CITROËN Automobiles
www.psa-peugeot-citroen.com

SAIC Motor Corporation Ltd.
www.saicmotor.com

Toyota Motor Corporation
www.toyota-global.com

Volkswagen AG
www.volkswagen.com

Volvo Car Corporation
www.volvocars.com

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TIER-1 SUPPLIERS

Robert Bosch GmbH

The Robert Bosch GmbH company and its employees are as from the very beginning partners of the ASAM e. V. We are involved in the definition of standards applicable to various topics being related to automotive control units. We will integrate the ASAM standards into our products according to our customers' wishes.

www.bosch.com

Continental Automotive GmbH

As a leading international supplier of automotive electronics and mechatronics it is essential to fully support industry standards instead of dedicated and proprietary solutions. Especially within the context of calibration, measurement, diagnosis and for distributed OEM-supplier development Continental relies on ASAM standards.

www.continental-corporation.com

Cummins Inc.

Cummins Inc., a global power leader, is a corporation of complementary business units that design, manufacture, distribute and service engines and related technologies, including fuel systems, controls, air handling, filtration, emission solutions and electrical power generation systems. Cummins earned $1.66 billion on sales of $17.3 billion in 2012.

www.cummins.com

DELPHI Corporation

As a leading international supplier of automotive electronics and mechatronics it is essential to fully support industry standards instead of dedicated and proprietary solutions. Especially within the context of calibration, measurement, diagnosis and for distributed OEM-supplier development Continental relies on ASAM standards.

www.delphi.com

DENSO Corporation

DENSO is one of the largest global automotive suppliers of advanced technology, systems and components, heading toward an automotive society where cars put less drag on the environment and drivers have fewer worries about traffic accidents. Everything we do at DENSO is based on our philosophy: "Contributing to a better world by creating value together with a vision for the future." This philosophy helps to make us a corporation that is trusted by people around the world.

www.globaldenso.com

Detroit Diesel Corp.

For over 70 years, Detroit Diesel has designed and built the heavy-duty engines that fuel commerce and transportation across North America and around the world. Our engines drive a wide range of heavy-duty vehicles, and now we're offering our own line of axles built with the same precise engineering and rock-solid durability you expect from our engines.

www.demanddetroit.com

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Keihin Corporation

At a time of substantial changes in automobiles and motorcycles, Keihin is evolving with the aim of continuing to lead the world as a "manufacturer of integrated systems." We are further broadening our old perspective of pursuing the world's highest quality for individual parts by working on advanced integration of mechanics and electronics to achieve optimization in whole energy management systems.

www.keihin-corp.co.jp

Motorenfabrik Hatz GmbH u. Co. KG

Hatz is a specialist in 1 to 4-cylinder diesel engines which are used in all manner of applications, such as construction machinery, compressors and utility vehicles. Besides, Hatz produces components for the automotive industry and systems like pumps, generating sets and scalable electricity stations based on customer demand.

www.hatz-diesel.com

MTU Friedrichshafen GmbH

MTU is one of the world's leading manufacturers of large diesel engines and complete propulsion systems. Together with MTU Onsite Energy, MTU is one of the leading brands of Rolls-Royce Power Systems. Its product range is the widest and most modern in the sector. It covers diesel engines as well as complete propulsion systems for ships, for heavy agricultural, rail and military vehicles, and for the oil and gas industry.

www.mtu-online.com

TRW Deutschland Holding GmbH

TRW Automotive is one of the world's largest suppliers of automotive components and systems. One of the industry's top financial performers, TRW's global sales were $14 billion in 2010. Headquartered in Livonia, Michigan, USA, the Company, through its subsidiaries, operates in over 185 facilities in 26 countries and employs more than 60,000 people worldwide. TRW Automotive supplies both active, passive and integrated safety products to all major OEM vehicle manufacturers and their suppliers.

www.trwauto.com

ZF Friedrichshafen AG

ZF is a global leader in driveline and chassis technology with 121 production companies in 26 countries. In 2013, the Group will presumably achieve a sales figure of around €17 billion with 73,600 employees. In order to continue to be successful with innovative products, ZF annually invests about 5 % of its sales in research and development. ZF is one of the ten largest automotive suppliers worldwide.

www.zf.com

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TOOL VENDORS

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A&D Company, Limited

A&D Company specializes in measurement, control and simulation solutions for powertrain testing and vehicle development. Our open, flexible and cost-effective tools are designed to fit a wide variety of applications, from durability and performance to hardware-in-the-loop simulation and hybrid/electric vehicle development and testing. Our complete range of products includes torque transmitters (wheel, axle, drive plate), FFT analyzers, hydraulic testing systems, data acquisition and control and combustion analysis systems, as well as real-time simulation systems and model-based automated calibrations tools.

A&D Data Acquisition Products

Type	Software for engine/pow ertrain test cell automation systems
Functionalities	Automation system for engine/powertrain/EV/HEV test cells
ASAM Standards	ASAM ACI, ASAM MCD-3

A&D ORION

Type	Software automated ECU calibration
Functionalities	Automated calibration of ECUs on the test bed.
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-1 CCP, ASAM MCD-3

A&D Real-Time Platforms

Type	Development Environment for A&D-DSP system
Functionalities	Utilizing real-time OS, executing measurement, controls, real-time simulation
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-1 CCP

A&D Real-Time Software Development Environment

Type	Development Environment for A&D-DSP system
Functionalities	Model Builder, C or Execution Code Generation, GUI Generation, Execution System
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

A&D VirtualConsole

Type	Graphical User Interface (GUI) Designer
Functionalities	Arranging GUIs, Measuring values and graphs, linking with external applications
ASAM Standards	ASAM MCD-3

Contact: Mr. Takeshi Nakamura, Mail: take-n@aandd.co.jp

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www.ams-soft.de

A.M.S. Software GmbH

Since 1995, the A.M.S. Software GmbH develops flexible, extensible and long-lasting software and hardware products in close collaboration with their customers. We design and integrate systems for customers of many branches of industry. The main focus of our work lies in the

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areas of instrumentation, control and automation (ICA), verification, visualization, archiving, databases and data management. We have comprehensive know-how in the system software LabVIEW as well as in other products of National Instruments. Among our long-time customers are well-known companies in the area of automotive, machine construction, aviation, semiconductors, electrical devices and domestic appliances.



ACANIS

Type	CAN Monitoring & Simulation
Functionalities	ACANIS - a universal software tool for CAN networks. ACANIS assists during the development of CAN-based systems by offering an integrated, interactive and ergonomic analysis and testing environment. ACANIS is dedicated to all National Instruments NI-CAN and NI-XNET interfaces. An easy-to-use bus simulation is also included and can be extended via LabVIEW by the customer. www.acanis.de
ASAM Standards	ASAM MCD-2 NET (FIBEX)
Contact:	Mr. Peter Schwarz, Mail: peter.schwarz@ams-soft.de

Accurate Technologies, Inc.



Accurate Technologies Inc. (ATI) is a global, independent supplier of control system development tools headquartered in Wixom, Michigan, USA. ATI's portfolio of hardware and software products provides easy to use, customizable solutions to accelerate controls system design, rapid prototyping, in-vehicle calibration and network analysis.

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JP sales_jp@ accuratetechnologies.com

CANLab™ Network Analysis Software

Type	Multi-bus Network Analysis Tool
Functionalities	Complete solution for bus communication, data logging and data analysis via industry standard network protocols such as Controller Area Network (CAN) including J1939 and Local Interconnect Network (LIN). Includes a built-in CCP interpreter.
ASAM Standards	ASAM MCD-1 CCP

VISION Network Hub

Type	CAN and ISO 9141
Functionalities	Hardware supporting simultaneous calibration and measurement of memory emulated, CANCCP, ISO 9141 KWP2000 base controllers, and measurement of analog, thermocouple and pulse sensors (EDAQ required).
ASAM Standards	ASAM CDF, ASAM MCD-1 CCP, ASAM MCD-1 XCP

VISION™ Calibration & Data Acquisition Software

Type	Measurement and Calibration System
Functionalities	Support for simultaneous calibration of memory emulated, CAN CCP, ISO 9141 KWP2000 based vehicle electronic control units, and measurement of analog and thermocouple sensors. Includes advanced data analysis and export. ASAM MCD-2 MC and VB scripting interface. Platforms supported: Windows 98, NT, 2000, XP
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-3
Contact:	Ms. Diane Rogers, Mail: drogers@accuratetechnologies.com

LAG-VW00002405

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Fax + 66 2 7564459

www.aimagin.com

Aimagin Company Limited

Aimagin Co.,Ltd. specializes in Simulink Blockset development for embedded system design using code generation and model-based design techniques. Our core product, Waijung Blockset, enables engineers to easily implement real-time networked (wire and wireless) or stand-alone monitoring and control systems. Waijung blockset supports such ARM Cortex - M series MCU as STM32 and nRF51x.

Waijung

Type	Embedded Software Development Tool
Functionalities	Simulink Blockset for Embedded System Development and Code Generation for ARM Cortex - M0, M1, M3 and M4
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L)

Contact: Mr. Krisada Sangpetchsong, Mail: admin@aimagin.com

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AMS GmbH

AMS is the specialist for measurement and analysis of engineering data, especially data from test and simulation. The award-winning data processing software jBEAM is a platform-independent tool for data acquisition, analysis and visualization. AMS is intensively committed in the CEA and ODS standards.

AMS-ATF Importer/Konverter

Type	CEA Component
Functionalities	Import/export of ODS-ATF files, incl. extensive checking functionality
ASAM Standards	ASAM ODS

jBEAM

Type	CEA Framework for desktop usage
Functionalities	Complete area of data import, data analysis, and data visualization
ASAM Standards	ASAM CEA, ASAM ODS

jBEAM-Web

Type	Library for web based applications
Functionalities	Complete area of data import, data analysis, and data visualization
ASAM Standards	ASAM CEA, ASAM ODS

Contact: Mr. Bernhard Sünder, Mail: bernhard.suender@jBEAM.de

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ArcCore AB

Being one of the vendors providing AUTOSAR products to the automotive market, we bring a new way of developing and offering state-of-art products and services to the market. It can easily be described in three words: Standards, Open and Innovative.

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BSWBuilder

Type	Tool
Functionalities	Configuration of Autosar BSW
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

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Autient, Inc.

Autient is an engineering services company specializing in automotive ECU software development and test systems.

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www.autient.com

AVL LIST GMBH

AVL is the world largest privately owned and independent company for the development of powertrain systems with internal combustion engines as well as instrumentation and test systems.

CAMEO calibration environment

Type	Software for the automated calibration of combustion engines and transmissions
Functionalities	Online control of the calibration process and offline global modeling
ASAM Standards	ASAM ACI, ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-3

CONCERTO Data Postprocessing Software

Type	For interactive & automated data postprocessing in automotive application
Functionalities	Data format conversion & management, data analysis, calculation & visualization
ASAM Standards	ASAM CEA, ASAM ODS

CRETA™ Calibration Data Browser

Type	Calibration Data Browser
Functionalities	The AVL CRETA Calibration Data Browser allows calibration engineers of engine and transmission control units to interactively visualize any control unit maps, curves and parameters while studying or reading the application note of a control unit.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

CRETA™ Calibration Data Management

Type	Enterprise Calibration Data Management for engines, transmissions and hybrid.
Functionalities	As a central calibration data management system of xCU parameters, AVL CRETA™ allows the central storage, conflict-free merging and traceable documentation of calibration datasets during series calibration projects.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

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iGEM Offline

Type	AVL iGEM Offline test data evaluation is an innovative solution for efficient data analysis of exhaust emission tests according to legislative demands
Functionalities	iGEM Offline includes a series of effective tools and offers the possibility for authorized users to change or expand an existing record configuration. The Formula Editor helps to change calculation variables and formulas and add them into the database. The configuration can be adapted to comply with new legislation or modified technical conditions. Report templates can be created and modified easily via drag and drop operations in the Report Layout Editor. Sever al different types of reports can be created besides the typical standard reports such as online and modal reports; specimen, equipment and consumable data record sheets; statistics COP and audit reports; testing series reports and also combinations of different types of reports.
ASAM Standards	ASAM ODS

PUMA Open Test Bed Automation

Type	Software for test bed automation for stand alone and networked environments
Functionalities	Automation system for engine, transmission/powertrain and chassis dyno test beds
ASAM Standards	ASAM ACI, ASAM CEA, ASAM GDI, ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-3, ASAM ODS

SANTORIN Data Management Server

Type	Software for ASAM ODS compliant data storage, access and exchange
Functionalities	ODS Server for ODS data models, ODS data browser & Admin clients
ASAM Standards	ASAM ODS

Test Factory Management Suite (TFMS)

Type	Process data management software for test fields
Functionalities	Test request handling, Test equipment management, scheduling of resources, UUT management, reporting, utilization optimization
ASAM Standards	ASAM ODS

TestGate

Type	Web based software for remote monitoring of test fields
Functionalities	Graphical overview of the test field, overview of test beds and online values
ASAM Standards	ASAM ODS

Contact: Mr. Gerald Sammer, Mail: gerald.sammer@avl.com

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b-plus GmbH

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b-plus GmbH was founded 1996 in Deggendorf, Germany, and is an innovative provider of systems and development services. We offer automotive, automation and embedded systems solutions. We have a long term experience and significant know-how in project and product areas such as industrial networking, design of complex control system software or the design of embedded µController and PC hardware solutions. Various development teams realize sound solutions for sophisticated industrial and safety relevant automotive applications. b-plus

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sees itself as a reliant full service provider, beginning with the well-founded consulting, the conception and the management of a project up to the realization and is thus the professional partner of the customer, beginning with the development phase up to the series production and system integration.

CANTucan

Type	CAN gateway and bus simulator
Functionalities	Designed for the use in development, test and diagnosis environment for communication networks in cars, trucks and laboratories - Fast and easy to use by complete tool based device configuration - Interactive configuration via USB or CAN - Tool chain integration by XCP (via USB or CAN) - ECU conform firmware and hardware architecture - Smallest dimensions and robust aluminum housing for on-board use - Reduced time to market and non-recurring engineering cost
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP

GiraBITE

Type	Universal flash-/parameterization-tool
Functionalities	Flashing of bootloader or firmware for updates of ECU software. Hardware independent support of various bus interfaces in production. - Configurable Flash processes, Use via command line or GUI support of different CAN and FlexRAY™ bus interfaces, ODX flash container
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-2 NET (FIBEX)

UNIBoot

Type	Universal Bootloader for ECUs
Functionalities	Security: Seed & key support, SafeMode according to ISO26262 - Hardware independent: support of various chip manufacturers - Configuration: static configuration, standard and extended CAN identifier - Update toolchain: UNIBOOT Manager
ASAM Standards	ASAM MCD-1 XCP

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BASELABS GmbH

The Baselabs GmbH is focused on the data fusion in multiple sensor scenarios. We provide software and consulting services for the implementation of advanced driver assistance systems (ADAS) and automated vehicles. The design of environment perception algorithms and the convenient provision of these algorithms to our customers is a key part of our offering. Exemplary customers are Bosch, Denso and Daimler.

BASELABS Code

Type	Code Generator
Functionalities	BASELABS Code is a prototypical C-Code generator to generate C-Code from a data fusion system that has been developed using BASELABS Create.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

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BASELABS

BASELABS Consulting

Type	Service
Functionalities	Consulting for the implementation of complex driver assistance systems. Special focus on algorithm development for the environment perception.
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L)

BASELABS Create

Type	Software development tool for statistical signal processing algorithms
Functionalities	BASELABS Create provides sophisticated algorithms for driver assistance systems as ready-to-use components and allows new algorithm developments. It is suitable for all sensor-based driver assistance applications and increases the efficiency of the design process.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

BASELABS Modules

Type	Customer-specific software applications
Functionalities	With BASELABS Modules, we offer our customers software components in the field of data fusion and environment perception that are provided on a ready-to-use basis. Examples are multiple object tracking (MOT) applications or car-2-car (C2C) communication applications.
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L)

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Beijing Rainfe Technology Ltd. was founded in 2007. It is one of the top ten PLM solutions providers in China (according to Cimidata report 2010). The company focuses on design/simulation and testing solutions through its enterprise software platform and engineering tools. Beijing Rainfe's clients come from the aerospace, marine, defense, auto, and energy industries.

tdm3000

Type	Test data management system
ASAM Standards	ASAM ODS

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DIGITOST 天健通泰科技

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Beijing Tianjian Tongtai Technology Co. Ltd. Specializes in data acquisition, management, analysis and Enterprise Test Business Solutions for manufacturing sector. Our main product is 神鹰™ODS-based Data Acquisition Middleware, 神鹰™ TDM (Test Data Management), 神鹰™ LIMS (Laboratory Information Management System), Test Data Process and Analysis Solution, Enterprise Test Information Integration Solution.

神鹰™ TDM

Type	Software
Functionalities	Test Data Management
ASAM Standards	ASAM ODS

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神鹰™ASAM ODS SERVER
Type Software
ASAM Standards ASAM ODS

神鹰™ASAM-ODS Data Acquisition Middleware
Type Software
Functionalities Data Acquisition, Data Monitor, File Format
ASAM Standards ASAM ODS

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Berner & Mattner Systemtechnik GmbH

Berner & Mattner specializes in systems engineering, development and testing of complex electronic and mechanical systems. We are a strategic partner for our customer\'s development departments of the automotive, transportation, mechanical engineering, energy, space and defence industries and provide customized products and engineering solutions. In the automotive sector, we develop diagnostic and model-based ECU functions, distribute innovative tools, supply and operate test systems, design and calculate mechanical components/assemblies, offer safety and systems engineering, provide consulting on state of-the-art test methods.

Consulting for Diagnostic ECU specifications based on MCD-2D (ODX)
Type Consulting
ASAM Standards ASAM MCD-2 D (ODX)

Diagnostic Applications based on MCD-3
Type Application development
Functionalities DoIP, CAN, KWP2000, UDS, ODX, OTX, MCD-3 evaluation & verification
ASAM Standards ASAM MCD-3

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BETA CAE Systems S.A.

BETA CAE Systems S.A. offers state-of-the-art CAE software systems that meet the requirements of all simulation disciplines, for many sectors, including the automotive motorsports and aerospace. The company's products, ANSA pre-processor, μETA post-processor, and SPDRM simulation-process-data-and-resources manager, hold a worldwide leading position.

μETA
Type Post-processor for FEA & CFD simulation results and test data.
Functionalities μETA provides an embedded ASAM ODS browser specifically designed to ensure flexibility, performance and ease of use in navigating and querying ASAM ODS data sources. It provides an overview to the data hierarchy included in the data model and a powerful query tool for retrieving data from the server. All functionality is also available through scripting thus, allowing the full automation of tasks involving interaction with ASAM ODS data sources.
ASAM Standards ASAM ODS

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Brüel & Kjær

Brüel & Kjaer Sound and Vibration A/S

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Brüel & Kjær is a world-leading manufacturer and supplier of sound and vibration measurement systems. Our focus areas are automotive businesses, ground transportation, aerospace, space, defence, airport environment, urban environment, telecom and audio. Brüel & Kjær has an unparalleled portfolio of sound and vibration measuring equipment and is a renowned deliverer of innovative instrumentation solutions.

ASAM ODS Connectivity

Type	8605
Functionalities	Data exchange using ATF/XML format
ASAM Standards	ASAM ODS

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C.L.GERHARTL
Smart Systems

C.L.GERHARTL Smart Systems GmbH

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C.L.GERHARTL Smart Systems focusses on hard and software development for the automotive industry. The company offers consultation and engineering services, and tools for the development of complex embedded system networks. C.L.GERHARTL Smart Systems also provides the complete development of testing devices and tailored software. C.L.GERHARTL Smart Systems applications are also used in industry and research.

CL-S21

Type	Embedded system
Functionalities	Data logger, Gateway CAN, LIN, A/D
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 D (ODX), ASAM MDF

CL-S42

Type	Embedded modular system
Functionalities	Data logger, Gateway, control system, rapid prototyping system
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 D (ODX), ASAM MCD-2 MC (ASAP2/A2L), ASAM MDF

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CAETEC

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CAETEC is one of the leading companies in developing data acquisition hardware like data loggers and measuring devices for automotive testing. The ARCOS data logger family is the most powerful and flexible data logger for fleet testing. The CLIC devices are the newest and fastest data acquisition modules for analogue signals in vehicles.

ARCOS

Type	data logger
Functionalities	CCP/XCP measuring on CAN & Flex Ray
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX)

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ARCOS

Type	data logger
Functionalities	ATFX/mdf 4 data format
ASAM Standards	ASAM ODS, ASAM MDF

µCROS

Type	data logger
Functionalities	CCP/XCP measuring on CAN & Flex Ray
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX)

µCROS

Type	ata logger
Functionalities	ATFX/mdf 4 data format
ASAM Standards	ASAM ODS, ASAM MDF

Contact: Mr. Stephan Bacher: Mail: bacher@caetec.de

carts GmbH

carts GmbH is a leading producer of premium test benches, and supports mainly automotive companies with new and further developments of high-valued automation solutions. The scope of products ranges from single test bench through customization of special purpose solutions up to completely virtual lab car, allowing to operate all important ECU in real time. carts' HiLs are in action worldwide and set trends on markets.

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cbb software GmbH

We are a software company developing software for the automotive, energy and testing branch. We are working for research and development departments of known automobile manufacturers. Furthermore do we develop software products for the power industry and other industries.

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CMORE Automotive GmbH

We are experts in the development of new systems in the field of vehicle electronics as well as the validation of sensor-based driver assistance and safety systems. At our facilities in Lindau (Bodensee) and Boeblingen, (both Germany) our range of services encompasses not only embedded software development, we also execute complex projects for our customers, and manage them throughout the entire product development process, from prototyping and testing to series production. A key focus in the development of the automotive branch is highly-automated an autonomous driving. With our expertise and know-how we thrive to become one of the pioneers of autonomous driving.

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MORE AUTOMOTIVE

PODBOX

Type	Diagnosis ECU
Functionalities	The multifunctional platform for the automated reporting of test drives, as well as a measurement and diagnostic unit. Its compact design combined with its numerous interfaces permits the PODBOX to be used in the laboratory and also in the vehicle. A highlight of the PODBOX is its independence from operating system, as all data are accessible via a web browser.
ASAM Standards	ASAM MCD-2 D (ODX)

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Cognitran

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PL

Cognitran provide the tools that help companies gain control over complex business activities and provide innovative ways to deliver product-specific and market-specific information to end users via the Internet. Our systems deliver cost efficiencies by re-using data across multiple information types and programs with our advanced linguistic tools minimising translation costs. All solutions are built on non-proprietary and modular XML technology using advanced software and techniques. Existing work has met industry-wide acclaim for the use of pioneering technology and our customer base includes many global manufacturing companies. Through our core products we deliver an end to end solution for OEM publication requirements 1. ISIS – a fully integrated online AfterSales Package, incorporating maintenance and repair documentation, diagnostics and service history. 2. Blaise – a comprehensive document creation and management system which simplifies content re-use and gives you total control over the creation, translation and publishing process.

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CONTROLTEC
UNLOCKING THE POWER OF DATA

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Established in 2009, Control-Tec is a start-up technology-based company specializing in vehicle data acquisition systems & custom analysis software for the light and heavy-duty transportation industries. Our Vehicle Data Recorders record data in near real-time from the vehicle and upload the data via cellular from all over six continents.

CT-1000

Type	Data Logger
Functionalities	Vehicle Data Acquisition & Telematics
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MDX

Qualifier

Type	Automated Vehicle Validation Service
Functionalities	Data Acquisition & Analysis, Telematics, Cloud
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MDX

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CPAC Systems AB

CPAC is a system integrator for the vehicle industry. Our business is the development and manufacturing of safety critical control systems for industrial vehicles, marine vessels and trucks. We combine technology and business development in a way that brings greater value to our clients. Our basis is our deep knowledge in developing and integrating safety-critical electronic control systems for every type of commercial vehicle. Our entrepreneurial culture and business mind-set helps us to identify and evolve those features that really make a difference. The end result is often far better than anyone anticipated. In other words, we take control forward.

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US Chesapeake

CSM GmbH

CSM is an owner-managed independent technology company and a leading supplier for modular measuring equipment and data loggers for automotive industry. CSM is known for very small and rugged, high precision modules, designed for use in extreme environment. Leading OEMs and their suppliers use these products for tests and measurements in vehicles and in test benches worldwide.

INCA AddOn

Type	SW AddOn for ETAS INCA Development Tool
Functionalities	Configuration and handling of CSM MiniModules in INCA
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

MiniModules

Type	Measurement modules for analog data
Functionalities	Acquisition of analog signals and output to CAN or EtherCAT
ASAM Standards	ASAM MCD-1 XCP

UniCAN 2

Type	Failsafe µ-controller based datalogger
Functionalities	CAN bus data acquisition and monitoring, fleet management, J1939
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP

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D2T

D2T Powertrain Engineering offers a large selection of modular solutions, which are easy to integrate and fully compliant with other equipment and software on the market. It also provides test bed engineering solutions and powertrain engineering services. Its worldwide presence enables D2T to offer the full range of its services and products to all transport sector manufacturers.

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MORPHEE

Type	Test bed automation system
Functionalities	One single system covering automation, ECU calibration and real-time simulation on a test cell. Reliable, powerful, open and upgradeable as it is, MORPHEE is a perfect solution for controlling your test cells as safely as can be. Whatever kind of test facility you have, MORPHEE adapts to your working methods and provides you with the latest technology in order to reduce your development time.
ASAM Standards	ASAM ACI, ASAM MCD-3, ASAM ODS

OSIRIS

Type	Combustion analysis system
Functionalities	Real time combustion analysis in a test cell or on-board a vehicle. OSIRIS is a turn-key fast acquisition system. Originally designed to sample data at each engine revolution crank angle, it can also work as a time based oscilloscope. Fast to install and easy to use, it covers all needs of engine engineers during every step of a powertrain development.
ASAM Standards	ASAM MCD-3

TEST MANAGER

Type	Test data management system
Functionalities	This data base solution perfectly fits the collaborative working environment of modern test centers. TEST MANAGER is an essential add-on to MORPHEE for maximum productivity at reduced administration costs. It provides central handling, sharing and protection of the test data of all your co-workers, from the test demands to the result files, including test procedures. It is based on robust, powerful and proven data bases and easily adjusts to customer specific data flow and data models.
ASAM Standards	ASAM ODS

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DSA has a very wide experience in electrical and electronic testing at all stages of the vehicle life cycle. Our expertise lies in systems, hardware and software products for supporting diagnostic processes in engineering, manufacturing and aftersales. DSA delivers and operates its high-quality systems globally. Our customers include the international automotive and automotive supplier industry.

Authoring Guidelines & Process Setup

Type	Consulting & Technical Documentation
Functionalities	Interested in setting up ODX- and/or OTX-based diagnostic processes within your organization? We have all the necessary know-how to define efficient and streamlined processes for all process participants starting with the supply-chain and covering engineering, production, service and the independent after-market. We document your processes, define and specify the necessary authoring guidelines for ODX and OTX and help your tool suppliers to implement process and guidelines into the tools. Please ask for our project references.
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-3, ASAM MCD-3 D

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PRODIS.Authoring

Type	Diagnostic Data and Application Authoring Tool
Functionalities	PRODIS.Authoring is a full-fledged authoring environment to edit, maintain, test and release all your diagnostic data and applications for dealerships and workshops. Its elaborate ODX import functionality and graphical test application authoring capabilities - including OTX support - make it the number one authoring tool for service diagnostics worldwide. Apart from the support of these cutting edge standards, it comprises features for the integration of technical documentation (RMI -Repair & Maintenance Information), wiring diagrams, part locators, repair videos etc. Its module to author and maintain helpful guided diagnostics has received astonishing market attention. With PRODIS.Authoring you provide vehicle platform data releases to be executed in our lean and fast service diagnostic runtime system PRODIS.RTS with one button click. A key feature of PRODIS.Authoring is its elaborate support for variant management in the life-cycle of your vehicle platforms.
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-3, ASAM GDI

PRODIS.Automation

Type	Authoring tool for engineering and production diagnostic, flash programming and configuration applications
Functionalities	PRODIS.Automation is the most advanced solution for the graphical authoring, maintenance and release of diagnostic, flash programming and configuration applications for your engineering and production purposes. It comprises our renown ODX Browser, which allows for the efficient drag&drop implementation of sequences, also compliant to the new OTX standard. Interfaces for vehicle communication (ASAM MCD-3D) as well as test stand and test equipment integration (ASAMGDI) are integrated into the tool. PRODIS.Automation ships with an integrated version and configuration management solution, ideally supporting team collaboration and traceability of all changes.
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-3, ASAM MCD-3 D, ASAM GDI

PRODIS.MCD

Type	ASAM MCD-3D Diagnostic Kernel
Functionalities	PRODIS.MCD is our implementation of the ASAM MCD-3D standard. We support versions 2.0.2 and the newest standard version 3.0.0. PRODIS.MCD is recognized as the fastest implementation of the standard in terms of execution time and supports unchallenged parallelism to communicate with many ECUs simultaneously. PRODIS.MCD has the capability to operate on ODX data of all three major released versions (2.0.1, 2.1.0, 2.2.0) of the ODX standard, even if multiple files of different standards are mixed within one project! To ensure safe and fast distribution of the ODX data to testers in the field (pilot, production, service) PRODIS.MCD ships with an intelligent data converter that releases a very compact binary file. With respect to VCI integration, PRODIS.MCD can integrate VCIs compliant to the ISO 22900-2 D-PDU API standard as well as VCIs compliant to the SAE J2534-1 standard. PRODIS.MCD is part of our extensive diagnostic test tool suite PRODIS, but can also be licensed as a separate product for integration into your diagnostic tool chain. By the way - this product is also DoIP-ready!
ASAM Standards	ASAM MCD-3, ASAM MCD-3 D

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PRODIS.MVCI (Modular Vehicle Communication Interface)

Type	Diagnostic hardware interface with MCD-3D compliant software interface
Functionalities	Our VCI hardware is always equipped with support for the ISO 22900-2 (D-PDU API) standard. As such our VCIs are an ideal basis for MCD-3D implementations, like our PRODIS.MCD, PRODIS.RTS and PRODIS.WTS. By the way - this product is also DoIP-ready.
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-3, ASAM MCD-3 D

PRODIS.OET

Type	Engineering test tool to interactively test compliance between an ECU or a set of ECUs and their ODX specification.
Functionalities	With PRODIS.OET you can interactively test your ODX data against an ECU (prototype) or against simulations. The testing of partially integrated vehicle electronics is also supported. All tests and test results are recorded and can be reported in different formats, e.g. for exchange with the ECU developer or for archiving. The automatic repetition of previous tests as well as the monitoring and analysis of all ongoing bus communication are key features of the tool. And if you want to integrate your parameterized ODX services and jobs into test sequences: Just drag them out of OET and drop them in a graphical PRODIS.Automation or PRODIS.Authoring test sequence. Naturally, PRODIS.OET comprises our renown implementation of the ASAM MCD-3D standard PRODIS.MCD.
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-3, ASAM MCD-3 D

PRODIS.RTS

Type	Diagnostic runtime system for vehicle & machine manufacturing plants
Functionalities	PRODIS.RTS is our benchmark-winning diagnostic runtime system for all manufacturing plants. It supports utmost parallelism in communicating to ECUs and comprises both our renown PRODIS.MCD (implementing ASAM MCD-3D) and a full GDI Stack for communication to test equipment and test stands, like rolls, filling, robots etc. Apart from this standardized functionality PRODIS.RTS is an automation system with full support for digital vehicle data supply, quality data storage, worker guidance etc. PRODIS.MCD is designed for robustness in the field and can be operated multi-shift around the clock
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-3, ASAM MCD-3 D, ASAM GDI

PRODIS.Share

Type	Internet Distribution Platform for Diagnostic Data
Functionalities	Consistently and efficiently shipping diagnostic data, including ODX and OTX data, to the field (e.g. to service technicians or dealerships) has become a key challenge. PRODIS.Share solves all your needs for a flexible, secure and highly available internet-based distribution platform. It is capable to serve diagnostic data packages and core software to thousands of dealerships simultaneously through cloud replication services. But, it is also possible to deliver a patch release to only one or a small set of dealerships for tryout. With PRODIS.Share the need for DVDs to distribute service tester updates to the field is history.
ASAM Standards	ASAM MCD-2 D (ODX)

PRODIS.WTS

Type	Diagnostic runtime systems for service uses cases
Functionalities	PRODIS.WTS is our cutting-edge diagnostic and flash runtime system

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for all vehicle service purposes. It runs in more than 18.000 installations worldwide in dealerships of 9 machine and vehicle OEMs. Its flexibility in accommodating specific workflows and CI requirements as well as its full support for ASAM standards MCD-3D and ODX, ISO standard 22900-1 and SAE standard J2534 make it a future-ready tool that also supports all known requirements of Euro 5/6 and V/VI legislation, respectively. As such it has been successfully analyzed for compliance by representatives of the European legislation body. As you would expect with any member of the PRODIS family, PRODIS.WTS is very fast and allows for the parallel communication to all ECUs in the vehicle.

Supported ASAM Standards ASAM MCD-3, ASAM MCD-3 D

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dSPACE stands for complete development systems for electronic controls in automotives, aerospace and mechatronics. dSPACE systems are used in R&D applications in industry and universities where fast time-to-market and solid results are key requirements. Typical applications are system and software architecture design, rapid control prototyping, automatic production code generation, hardware-in-the-loop simulation and calibration.

AutomationDesk

Type Automated testing for hardware-in-the-loop (HIL) simulation

Functionalities AutomationDesk is a powerful front-end tool for automated testing of the application software or diagnostic functions of electronic control units (ECUs).

ASAM Standards ASAM MCD-3, ASAM XIL

ControlDesk Next Generation

Type Experiment and instrumentation software for ECU development

Functionalities The software includes functionalities for layouting experiments, instrumentation, measurement, post-processing, ECU calibration, as well as diagnostics access. It offers synchronized data capture across ECUs, RCP and HIL platforms, and bus systems, and has an integrated project and experiment management.

ASAM Standards ASAM CDF, ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 D (ODX), ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX), ASAM MCD-3, ASAM XIL, ASAM COMMON MDF

dSPACE ECU Flash Programming Tool

Type ECU flash programming

Functionalities Software for programming the ECU flash memory via XCP on CAN, XCP on Ethernet, various types of on-chip debug ports like JTAG/NEXUS, NBD/AUD, JTAG/OCDS, DAP and JTAG/ SDI and the dSPACE Generic Serial Interfaces GSI1 and GSI2.

ASAM Standards ASAM MCD-1 XCP

dSPACE Ethernet Configuration Package

Type Hardware-in-the-loop (HIL) simulation

Functionalities Convenient software tool for configuring a dSPACE system as a simula-

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dSPACE

	tion node in a Ethernet network. It relies on network data available in a FIBEX representation. It is also used to generate the communication code and controller configuration.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

dSPACE FlexRay Configuration Package

Type	Hardware-in-the-loop (HIL) simulation and rapid control prototyping
Functionalities	Convenient software tool for configuring a dSPACE system as a simulation node in a FlexRay network. It relies on network and scheduling data available in a FIBEX or AUTOSAR representation. It is also used to generate the communication code and controller configuration.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

dSPACE XCP Service

Type	XCP service to be implemented on the ECU
Functionalities	ECU service code for XCP on CAN and Ethernet (TCP/IP, UDP/IP) supporting measurement, calibration, bypassing and ECU flash programming.
ASAM Standards	ASAM MCD-1 XCP

Platform API Package

Type	Package of application programming interfaces (API) for accessing simulation platforms
Functionalities	Program interfaces in .NET and Python for reading, writing, stimulating and capturing model variables on dSPACE real-time platforms.
ASAM Standards	ASAM XIL

RTI Bypass Blockset

Type	Rapid control prototyping (primarily bypassing) and hardware-in-the-loop (HIL) simulation
Functionalities	Simulink® blockset providing ECU read and write access from dSPACE real-time platforms via different kinds of ECU interfaces such as CCP, XCP, DPMEM PODs or on-chip debug ports. The blockset is especially designed for the dialog-based configuration of bypass applications. It allows ASAM MCD-2 MC (ASAP2) files to be imported and ECU variables to be selected via a convenient browser. It handles conversion formulas and the selection of bypass hooks automatically. In addition, the RTI Bypass Blockset supports on-target (internal) bypassing, allowing the bypass model to be compiled and downloaded directly into the free flash memory and RAM of the target ECU. For this, model parameters and signals are automatically added to the ECU's ASAM MCD-2 MC (ASAP2) file.
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L)

SystemDesk

Type	System and software architecture development
Functionalities	SystemDesk supports the development of software architectures and distributed automotive electrics/electronics (E/E) systems. Such systems can be modeled according to the AUTOSAR standard. Existing communication matrix files can be imported in SystemDesk to specify network communication. When AUTOSAR software components are modeled or imported in SystemDesk, available ASAM MCD-2 MC (ASAP2) models can be imported as well. During generation of the AUTOSAR run-time environment (RTE) and virtual ECUs (V-ECUs), ASAP2 file generation is also performed for variables that are tagged for calibration and measure-

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	ment according to the AUTOSAR concept. When V-ECUs are built, instances of the XCP service (XCP on Ethernet – TCP/IP) are implemented in the V-ECU code. Thus, the V-ECUs and variables described in the ASAM MCD-2 MC (ASAP2) files can be accessed during simulation.
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX)

TargetLink

Type	Production code generation (for ECU development)
Functionalities	TargetLink is a software system that generates production code (C code) straight from the MATLAB®/Simulink®/Stateflow® graphical development environment. The C code generation options range from plain ANSI C code to optimized fixed- or floating-point code for AUTOSAR platforms. Versatile code configuration options ensure that the production code copes with processor constraints. Converting graphical models directly into production code ensures perfect consistency between model and code at all times. Since the same model will always result in the same proven code, TargetLink's code generation is deterministic and thus guarantees the highest software quality. Every step can be tested against the specification via the built-in simulation features.
ASAM Standards	ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L)

Variable Editor

Type	Variable description file editor
Functionalities	Convenient tool for visualizing, editing and creating ECU description files according to the AE MCD-2MC standard.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

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Dynamometer Services Group Ltd.

DSG Ltd. is a UK based privately owned company supplying systems for diesel and petrol engine, vehicle, transmission, component development and end of line testing worldwide. Drawing on over 40 years of experience we focus on our customers' requirements to ensure that our solutions are both technically and commercially viable and successful.

DaTAQ Pro

Type	Test Bed Control System Software
Functionalities	Data Acquisition, Test Bed Control
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L), ASAM ASAP3

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E.S.R. Labs GmbH

E.S.R. Labs is a software startup company focusing mainly on embedded software in the automotive industry. On the supplier side we continued to roll out state of the art software technologies in a number of projects for different OEMs. Part of our portfolio are Autosar-Tools, different SW stacks as well as ODX and Fibex tools.

E.S.R. FIBEX Tools

Type	Product
Functionalities	FIBEX editor, FIBEX library
SAM Standards	ASAM MCD-2 NET (FIBEX)

E.S.R. ODX Tools

Type	Product
Functionalities	ODX editor, ODX library
ASAM Standards	ASAM MCD-2 D (ODX)

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Eberspaecher Electronics GmbH & Co. KG

Eberspaecher Electronics belongs to the pioneers in the field of the automotive bus system FlexRay, which is used in particularly safety critical enviroments. Eberspaecher Electronics develops and manufactures hardware and software platforms for the evaluation of FlexRay in various customer environments. Eberspaecher Electronics is leading in the sales of FlexRay interface platforms and provides a wide range of further FlexRay products for remaining bus simulation, gateways and signal manipulation.

CHI Generator

Type	Export tool to generate CHI (Controller Host Interfaces) files out of FIBEX files
Functionalities	The CHI Generator reads the FIBEX file and supports the CHI export of the communication controllers Bosch E-Ray, FreeScale MFR4200, MFR4300, MFR4310, MPC5567 and Fujitsu MB88121, MB91F465X.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

CHI Generator RBS

Type	Export tool to generate CHI (Controller Host Interfaces) files to stimulate a couple of ECUs described in a FIBEX file
Functionalities	The CHI Generator reads the FIBEX file and supports the CHI export of the communication controllers Bosch E-Ray, FreeScale MFR4200, MFR4300, MFR4310, MPC5567 and Fujitsu MB88121, MB91F465X. The physical ECUs of an RBS (remaining bus simulation) together with a number of ECUs, which are to be simulated, will be defined, and thus a CHI file for an ECU simulating the remaining bus will be exported.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

FlexConfig Developer

Type	Configuration tool for FlexRay networks
Functionalities	FlexConfig Developer is a cost-effective, powerful and user-friendly design

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	and configuration software for automotive networks. New networks are easily created by using wizards. Existing networks are clearly displayed and can be changed easily. With the help of the numerous export options, almost every hardware platform can be configured with the network data.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

FlexConfig RBS

Type	Creation of complete hardware based remaining bus simulations (RBS) and gateways for FlexRay / CAN
Functionalities	FlexConfig RBS is a configuration software tool consisting of three packages: RBS (remaining bus simulation), gateway and control (signal manipulation). In combination with the FlexXCon midget hardware platform is made available a compact, high-performance, comprehensive solution for applications such as: • ECU development • Rapid prototyping • Function tests • Test benches
ASAM Standards	ASAM MCD-2 NET (FIBEX)

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Elektrobit (EB) establish itself among the key suppliers of embedded automotive software solutions. Apart from the development of future-oriented products, the company also specializes in services and consulting for the automotive industry, supplying serial-software-solution implementations for a broad range of AUTOSAR and FlexRay, Infotainment, Navigation, HMI and Driver Assistance systems.

EB tresos Busmirror

Type	Rest Bus Simulation Solution
Functionalities	EB tresos Busmirror is able to emulate missing FlexRay nodes in the network (rest bus simulation). This allows developers to test their own ECU software performance in interaction with emulated ECUs and to simulate potential error scenarios. Functions can be processed on the hardware in real-time using target user-modules.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

EB tresos Designer

Type	Network design tool for AUTOSAR based embedded systems
Functionalities	The EB tresos Designer is a versatile system design tool for the generation of CAN and FlexRay network configurations. Powerful wizards support the configuration of the interdependent protocol parameters and immediately highlight parameter constraint violations. Standardized exchange formats like ASAM MCD-2 (FIBEX) enable the further use of the generated communication matrix in other COTS tools and the whole EB tresos product family, e.g. EB tresos Studio or EB tresos Inspector.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

EB tresos Inspector

Type	Measuring and analysis tool in FlexRay and CAN networks
Functionalities	EB tresos Inspector seamlessly integrates both FlexRay and CAN bus

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systems. Measurements are displayed in frame and signal analysis windows. It can be used for gateway and run-time analysis and entails various signal-display instruments such as bar and pointer instruments as well as y-t oscilloscopes.

ASAM Standards: ASAM MCD-2 NET (FIBEX)

EB tresos Studio

Type: Basis Software Configuration for AUTOSAR Modules

Functionalities: EB tresos Studio is a feature-rich configuration environment for basic software components in accordance with AUTOSAR. It allows to configure, validate and generate basic software in an easy-to-use graphical user environment. Through its open interfaces it can be extended with customer-specific software modules. Consequently, legacy parameter descriptions, like BDC, LDF or OIL, can be imported as well, making it the ideal tool for company-wide software deployment.

ASAM Standards: ASAM MCD-2 NET (FIBEX)

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Emotive is an independent expert for automotive diagnostic systems. Based on the diagnostic standards OTX (ISO 13209), ODX (ISO 22901) and the MVCI D-Server (ISO 22900) emotive offers modern and innovative software products for the diagnostic process chain. Emotive supports their customers to implement their diagnostic concepts through consulting, training and custom developments.

Open Test Framework

Type: Software

Functionalities: The EMOTIVE Open Test Framework (OTF) is a complete and native development environment for OTX (ISO 13209). It has been architected for the designing, visualization, maintaining and testing of a new generation of more reliable tester applications. Strictly based on standardized common language and communication mechanisms, the testing Know-how can be exchanged between different departments within the company (Development, Production, Service etc.) and between OEMs and suppliers.

ASAM Standards: ASAM MCD-2 D (ODX), ASAM MCD-3 D

OTX-API

Type: Software Library

Functionalities: The OTX-API provides client applications with easy, fast and reliable access to OTX data model. The main task is loading of OTX projects and the editing and validating of OTX procedures.

ASAM Standards: ASAM MCD-2 D (ODX)

OTX-Runtime-API

Type: Software Library

Functionalities: The OTX-Runtime-API provides client applications with easy, fast and reliable access to OTX for runtime execution. The main task is loading of OTX projects, browsing the structure and executing of procedures.

ASAM Standards: ASAM MCD-2 D (ODX), ASAM MCD-3 D

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OTX-Viewer

Type	Firefox Addon
Functionalities	The emotive OTX/PTX-Viewer Firefox Addon gives the user the opportunity to view and analyze single OTX files as well as whole OTX projects (PTX) in a very easy and convenient way without a lot of requirements and installation effort. The only requirement is the well-known Mozilla Firefox Browser. The following section describes the installation and usage of the OTX/PTX-Viewer.
ASAM Standards	ASAM MCD-2 D (ODX)

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Esterel Technologies GmbH



Esterel Technologies is a leading provider of critical systems and software development solutions for the aerospace, defense, rail transportation, nuclear, and industrial & automotive domains. System and software engineers use SCADE® solutions to graphically design, verify, and automatically generate critical systems and software applications with high dependability requirements. Esterel Technologies SCADE product solutions easily integrate, allowing for development optimization and increased communication among team members.

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SCADE Suite

Type	Software development environment
Functionalities	model based software development, certified/qualified
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

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ETAS GmbH



ETAS provides innovative solutions for the development of embedded systems for the automotive industry and other sectors of the embedded industry. As a systems provider, ETAS supplies a multifaceted portfolio that covers the range from integrated tools and tool solutions to engineering services, consulting, training, and support. Security solutions in the area of embedded systems are offered by the ETAS subsidiary ESCRYPT. Established in 1994, ETAS GmbH is a 100-percent subsidiary of the Bosch Group, with international locations in 14 countries in Europe, North and South America, and Asia.

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ETAS ASCET

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS ASCMO – Accurate Prediction of Complex System Behavior: ETAS ASCMO facilitates the optimization and calibration of complex systems in virtual environments on the PC. The use of ETAS ASCMO significantly reduces the effort required for testing on real-world systems, e.g., at the test bench or in the vehicle. ETAS ASCMO uses a data-based model of high accuracy to describe system behavior. The model is based on a minimal number of measurements taken on the actual system.
ASAM Standards	ASAM COMMON MDF

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ETAS ASCMO

Type	Software development environment
Functionalities	model based software development, certified/qualified
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

ETAS EHANDBOOK

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS EHANDBOOK – Interactive ECU Documentation: ETAS EHANDBOOK is an interactive documentation solution for efficient ECU calibration. It offers a large variety of views and chained links for improved ease of navigation through extensive ECU documentation. ASCET and Simulink® are translated into new interactive models to understand the ECU functions and their dependencies in an easy way. This allows calculation and highlighting of signal flows across model hierarchy boundaries, too. ETAS EHANDBOOK links to ETAS INCA to facilitate the live display of values from INCA experiments and to create INCA experiments more quickly. The entire contents (texts, structures, graphics, models) of the ECU documentation is stored in a so-called EHANDBOOK Container. The generation of it based on input data in standard ASAM formats.
ASAM Standards	ASAM CC, ASAM FSX, ASAM MDX

ETAS EHOOKS

Type	Function Development, Software Engineering, Measurement, ECU Calibration, and Diagnostics Tool
Functionalities	ETAS EHOOKS – Bypass Hook Insertion Tool: ETAS EHOOKS is a software tool that facilitates the efficient insertion of bypass hooks into ECU software. The EHOOKS user can place bypass hooks directly into the HEX & A2L files without knowledge of software details – there is no need for access to either ECU source code or ECU software build environment. EHOOKS ECU ports are developed with the support and involvement of the Tier 1 ECU software development team. This allows EHOOKS to do a very high quality job of placing the hooks into the ECU software, but also makes EHOOKS very simple to use.
ASAM Standards	ASAM MBFS, ASAM MCD-2 MC (ASAP2/A2L)

ETAS INCA

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS INCA – Integrated Environment for Measurement, ECU Calibration, and Diagnostics: INCA is a universal product family for online and offline calibration of ECU function parameters, controlled via a graphical user interface or remote access. INCA performs the measurement of signals obtained from ECUs and from the vehicle environment, and incorporates powerful tools for managing ECU projects and parameters, analyzing measured and reading diagnostic data, as well as flash programming.
ASAM Standards	ASAM CDF, ASAM MCD-1 CCP, ASAM MCD-1 XCP, ASAM MCD-2 D (ODX), ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX), ASAM MCD-3 MC, ASAM MDF

ETAS INCA-FLOW

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS INCA-FLOW – Guided and Automated Calibration: INCA-FLOW provides a graphical development environment enabling calibration engineers to specify automation sequences for INCA without the need for

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	programming. To ensure results of consistent quality, INCA-FLOW is fully integrated with INCA and supports best-practice processes for calibration, validation, and measurement.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L), ASAM MDF

ETAS INCA-VLINK

Type	Measurement, Calibration, and Diagnostics Tool
Functionalities	ETAS INCA-VLINK – Blockset for Measurement and Calibration on Windows: The ETAS INCA-VLINK Blockset for Measurement and Calibration on Windows allows the calibration and validation of Simulink® models running as executable programs on standard Windows PCs. The Blockset provides a build environment for generating virtual prototypes from Simulink® models with one click. Recorded measurement data can serve as function stimuli. After the generation, executable prototypes can be easily distributed and calibrated with INCA.
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L), ASAM MDF

ETAS INTECRIO

Type	Function Development Tool
Functionalities	ETAS INTECRIO – Integrated Prototyping Environment: INTECRIO Integrated Prototyping Environment supports the development of embedded control software through integrated functions modeled in the engineers familiar ASCET-MD, MATLAB®/Simulink®, AUTOSAR, and/or C code development environment. INTECRIO provides a common environment for prototyping control functions on the PC or in the real world by means of rapid prototyping hardware.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX)

ETAS INTECRIO-RLINK

Type	Function Development Tool
Functionalities	TAS INTECRIO-RLINK – Prototyping Blockset: With INTECRIO-RLINK, function developers can perform all steps of prototype configuration and generation directly in Simulink®. The Prototyping Blockset supports configuration tasks for the various ETAS prototyping targets and their connectivity with ECU bypass plus sensor and actuator signals. In addition, the Windows PC is supported for non-realtime prototyping
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L), ASAM MCD-2 NET (FIBEX)

ETAS ISOLAR-A

Type	Software Engineering Tool
Functionalities	ETAS ISOLAR-A – AUTOSAR Authoring: ISOLAR-A is an AUTOSAR authoring tool. It is built on Eclipse technology and uses the Artop framework to enable easy integration into existing development environments. ISOLAR-A can be integrated with other AUTOSAR-compliant tools from ETAS or third-party vendors.
ASAM Standards	ASAM MCD-2 NET (FIBEX)

ETAS ISOLAR-EVE

Type	Software Engineering Tool
Functionalities	ETAS ISOLAR-EVE – AUTOSAR Software Validation: ISOLAR-EVE is an Eclipse-based environment for the configuration of virtual ECUs. ISOLAR-EVE is closely integrated with the ETAS ISOLAR-A AUTOSAR authoring tool and the application software behavior modeling/auto-coding tool

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	ETAS ASCET. ISOLAR-EVE is open to other AUTOSAR-compliant authoring and behavior-modeling tools as well as to manually coded AUTOSAR application software components.
ASAM Standards	ASAM MCD-1 XCP, ASAM MCD-2 MC (ASAP2/A2L)

ETAS LABCAR-AUTOMATION

Type	Test and Validation Tool
Functionalities	ETAS LABCAR-AUTOMATION – Automated ECUTesting: Develops, manages, and executes abstract and test bench-independent automated tests for embedded software. To ensure high-quality automated tests, the tool supports different activities and roles in the testing process.
ASAM Standards	ASAM MCD-2 D (ODX), ASAM MCD-2 MC (ASAP2/A2L), ASAM XIL

ETAS LABCAR-OPERATOR

Type	Test and Validation Tool
Functionalities	ETAS LABCAR-OPERATOR – ECU Test Configuration and Operation: Configures and operates Hardware-in-the-Loop testing systems for the validation and verification of automotive embedded software. LABCAR-OPERATOR provides virtual instrumentation, data and signal flow management, signal generation, and real-time data logging.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L), ASAM XIL

ETAS XETK/ETK

Type	ECU Interface
Functionalities	ETAS XETK/ETK – Universal ECU Interfaces: XETKs/ETKs comprise parallel or serial Electronic Control Unit (ECU) interfaces for calibrating, flashing, measuring, rapid prototyping (bypass), and debugging. XETKs/ETKs are designed to support function development for, and calibration of, automotive ECUs in harsh environments (operating temperature ranges from -40 °C to +110 °C), XETKs/ETKs provide excellent power-on (cold start) features, proven reliability, high performance, low latency, and high data throughput. XETKs support the ASAM XCP standard.
ASAM Standards	ASAM MCD-2 MC (ASAP2/A2L)

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Founded in 1978, FEV is an internationally recognized leader in the design and development of internal combustion engines and supplier of advanced test and instrumentation systems. In 2011, the FEV Automatisierungssysteme GmbH has been established to combine the company-wide expertise in automation systems. This newly established subsidiary can look back on many years of experience in the proper and efficient operation of engine test cells. This enhances FEV's position as a highly competent and experienced provider of advanced test cell solutions. We only offer test cell equipment to our customers that has already met the arduous operational demands presented by our own powertrain test facilities and engineering staff.

TestCellManager TCM

Type	Test Bed Automation System
Functionalities	Engine Driveline and component test beds automation a. data acquisition
ASAM Standards	ASAM ACI

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GIGATRONIK Ingolstadt GmbH

GIGATRONIK is a development partner specialized in the field of automotive electronics and information technology. We develop solutions in the field of System Architecture & Electrical Systems, Component Development, System Integration & Testing, Vehicle Integration, Process & Project Management, Diagnostics, Data Management, Environmental Systems and Rapid Application Prototyping.

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MDM Based Systems

Type	www.mdm-community.org
Functionalities	Data management
ASAM Standards	ASAM ODS

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HBM United Kingdom Limited (HBM-nCode)

nCode products are provided by HBM, a world-wide technology and market leader, offering products and services across the entire measurement spectrum, from virtual to physical. For over 30 years, nCode has been the leading brand for durability and data analysis solutions. Its technologies help customers understand product performance, accelerate product development, and improve design. The power and ease of nCode technologies are a direct result of its world-class development process and in-depth experience in a broad range of industries. nCode product development is ISO9001 certified. HBM-nCode has a global team of regional sales and application engineers that are available through offices in Europe, North America and Asia.

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nCode GlyphWorks

Type	Analysis Software
Functionalities	A graphical, process-oriented environment that contains a wide range of data processing and visualization capabilities with specialized options for durability such as fatigue analysis, accelerated testing, and frequency domain tool such as ride quality and rotating machinery analysis. The ASAM ODS connectivity capability in GlyphWorks enables users to browse, search and select data from ASAM ODS database.
ASAM Standards	ASAM ODS, ASAM MDF

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HEAD acoustics GmbH

HEAD acoustics is a worldwide leading supplier of products and consulting services for sound and vibration analyses. With the technical reproduction of human hearing we set international standards, moreover we pursue a holistic approach which includes all aspects of human perception of sound and vibration occurrences.

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ArtemiS SUITE

Type	Software
Functionalities	Sound & Vibration Acquisition & Analysis The ArtemiS SUITE provides you with an integrated system solution for sound and vibration analysis. The software is also optimally suited for troubleshooting and sound engineering in the noise and vibration area. You can use the ArtemiS SUITE for sound optimization and sound design for technical products, the evaluation of environmental noise and many other purposes. The software combines tools for sound and vibration analysis, structured data management and reporting that are embedded in a straightforward, easy-to-use interface. Enjoy the modern look and feel and the sophisticated concept!
ASAM Standards	ASAM ODS

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HGL markets a wide range of innovative digital acquisition, storage and analysis products, ranging from hand-held to full rack-based test cell systems. Customer benefits include: large channel counts, higher bandwidths, shorter tests and reduced costs. HGL also provides professional consultancy services for vibration analysis, software development and test measurement support.

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HighQSoft GmbH is a worldwide leading and independent supplier of ASAMODS based Product Verification & Validation Management (PVM) business enterprise architecture solutions. This includes the specification, design and implementation of verification & validation data infrastructure solutions in order to manage all kinds of physical data derived during the process of product development. The expertise of our company is to provide solutions that integrate time-, frequency- and event-based engineering verification & validation data from any source - physical or virtual - measured, calculated or simulated - into a well-defined, standardized ASAM ODS database. Furthermore and next to the data import and storage, our business enterprise architecture solutions – which reach from a single test stand to an enterprise – warrant the overall accessibility of the data and various exchange options with different systems and environments. Embedding Legacy Applications such as Archiving, Data Analysis, Reporting – as well as open third-party interfaces - seamlessly integrate the provided solution into given data management infrastructures of the client`s organization. HighQSoft GmbH is a supporter and active member of the openMDM community.

Avalon ODS Server Suite

Type	ASAM ODS 5.3.0 compliant server application
Functionalities	Our Avalon ODS Server Suite is the reference server implementation of the ASAM ODS Standard and is backbone to the majority of ODS 5.3 compliant data storage solutions for OEMs and suppliers within the worldwide automotive industries. The server is fully compatible with all ASAM ODS features and Application Models and holds the flexibility to

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	store and manage measurement data of any technical domain (e.g. Noise-Vibration-Harshness, Road-Load, Engine, Wind-Tunnel, Crash, Brakes, ...), integrates several Measurement Data Format Files (e.g. MDF4.1, MDF3.x) and provides inter-exchangeability with the ASAM Transport Format file (ATFx). The generic and platform independent implementation of the standalone Java server application provides highest standards in performance, session multithreading and memory management for Windows and Linux 64-bit distributions.
ASAM Standards	ASAM ODS, ASAM MDF

Basic Web Server

Type	ODS Web server for convenient web access to measurement data and implementation of specific work-flows-/use-cases.
Functionalities	Our Basic Web Server is an application for convenient ODS data access via web. The application provides generic data management functionality to dynamically navigate through, search, identify as well as export / post-process measurement data. It offers a basic but customer specific approach to search, identify and then manage or forward / process required measurement data without greater efforts nor stressing hardware infrastructure or bandwidth. Key features of the application are: • ODS data navigation – data navigator with configurable navigation trees – presentation of instance meta-information and dependencies, tabular and graphical channel quick view – presentation of AoFile dependencies • data search - with multiple and configurable search patterns and • data favorites and cart • user/application • data export options (ATF, CSV) • Tool interfaces (e.g. DIAdem) The PVMsys ODS Basic application relies on the requirements of the ASAM ODS base model only. The basic application is therefore ready to use independently to the application model used. The application is based on our Integration Platform and therefore allows further development / adaption to specific use-cases.
ASAM Standards	ASAM ODS, ASAM MDF

Consulting

Type	It's a service
Functionalities	The consulting is based on the company's expertise on business enterprise architecture solutions for verification & validation data management. The consulting usually addresses e.g. the specification of architecture and setup for new solutions, the specification, design and implementation of import tools but also is available for identification of other ODS issues and finding their solution.
ASAM Standards	ASAM ODS

Merlin Analysis Server

Type	Analysis Server for integration of automated analysis (DIAdem, JAVA, ...) into your ODS solution
Functionalities	Merlin is a CORBA server application for evaluation and analysis in an ASAM ODS environment. It is a service component based application

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with an underlying OSGi technology. The list of available evaluation components can be dynamically extended by any application that follows the administration service interface. A ready to use administration tool application is available. An evaluation is defined to return a result, which normally is a report, an image or just a status. The evaluations can be run automatically in a background execution, e.g. after import or periodically, or can be used from other application that needs to have a growing list of evaluations. Well known use-cases for Merlin are verification of mass data and assign attribute content depending on result, calculation of new channels, creating of report and export files or archiving parts of data storage. The development of an evaluation is easy and is supported by abstract classes.

ASAM Standards ASAM ODS, ASAM MDF

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HORIBA Automotive Test Systems Part of the HORIBA Group has developed global leadership in the exhaust gas analysis, powertrain research and development and various certification test system fields. HORIBA is able to provide total solutions to its customers, with full turnkey capability for driveline, engine, powertrain and vehicle tests. HORIBA serves manufacturers and suppliers in every industry that utilizes internal combustion, turbine engines, including automotive, heavy-duty/off road, lawn and garden, marine, aerospace, locomotive and recreational and utility vehicles.

DIVA: – Data – Interpretation – Visualization – Analysis

Type Software for Graphical Evaluation and Analysis of Post-Test Data
Functionalities Chassis, Engine, Driveline, Powertrain, Brake, Emission Testing, Post-Processing, Reporting
ASAM Standards ASAM ODS

STARS

Type Automation System
Functionalities Engine, Driveline, Vehicle and Brake Test Bed Automation; Component Test Bed Automation; Distributed Operation; Automatic Engine ECU Calibration; Small, Light Duty and Heavy Duty Engine Emission Test Application Suite; Web Based Remote Status Monitoring; Integrated Automatic Engine ECU Calibration Option
ASAM Standards ASAM MCD-3 MC, ASAM ASAP3, ASAM ACI, ASAM ODS

VETS ONE: Vehicle Emission Test System

Type Automation Software for Vehicle Emission Testing
Functionalities Chassis, Automation System for Chassis Dyno, Vehicle Emission Testing, Laboratory Management
ASAM Standards ASAM MCD-3 MC, ASAM CEA, ASAM ODS

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IASYS is an independent system integration company that provides test automation and data management solutions based on ASAM standards. IASYS provides automation solutions for Engine Test Bed / Brake Test Bed / Vehicle chassis dynamometer / Transmission Test.

Orbit e

Type	Engine Testing Automation System
ASAM Standards	ASAM ACI, ASAM MCD-3, ASAM ODS

Orbit Enterprise

Type	Test data management system for Emission / Component
Functionalities	Orbit Enterprise system allows the user to management test data from different systems into central repository which is based on ODS standard.
ASAM Standards	ASAM ODS

Orbit x

Type	Emission Host System for Vehicle / Engine testing
Functionalities	An emission host system allows to complete automatic execution of legislative emission testing on chassis dynamometer / engine dynamometer.
ASAM Standards	ASAM ODS

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ICS is a partner for the complete product lifecycle - from evaluation and consulting to realisation and maintenance. The domains are Automotive, Transportation and Aerospace & Defence (e.g. Embedded Control Systems, RAMS, Verification & Test, Quality Assurance). Our wide diversification helps us to understand the problems of our customers. A competent knowledge of technologies, methods and standards enables us to transfer this knowledge into applicable solutions.

Consulting

Type	Consulting, engineering
Functionalities	Consulting in regards to organization and standardization of measurement data storage
ASAM Standards	ASAM ODS

Data Modelling

Type	Consulting, engineering
Functionalities	Design of application models based on the ASAM ODS Standard
ASAM Standards	ASAM ODS

Tool Development

Type	Consulting, engineering
Functionalities	Development of individual applications for user-friendly access to ASAM ODS / ATFX based data. Converter to ATFX.
ASAM Standards	ASAM ODS

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