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A Captivating Journey

Progressive Solutions for Growth and Profit

National Service & Parts Conference

Orlando – June 2014

2015 Audi A3 Cabriolet



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2015 Audi A3 Cabriolet

System Overview



- ▶ Fabric soft top with K-fold
- ▶ Opens or closes electro-hydraulically in less than 18 seconds at the press of a button, even while driving at speeds of up to 50 kph (~31 mph).
- ▶ The convertible top box lid is a lightweight steel construction and prevents the open convertible top from becoming dirty. It is opened and closed by two hydraulic cylinders seated on the left and right toggle levers (hinges).



2015 Audi A3 Cabriolet

Convertible Top Mechanism Display for Hands-On Inspection



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Automatic Emergency Braking (AEB)

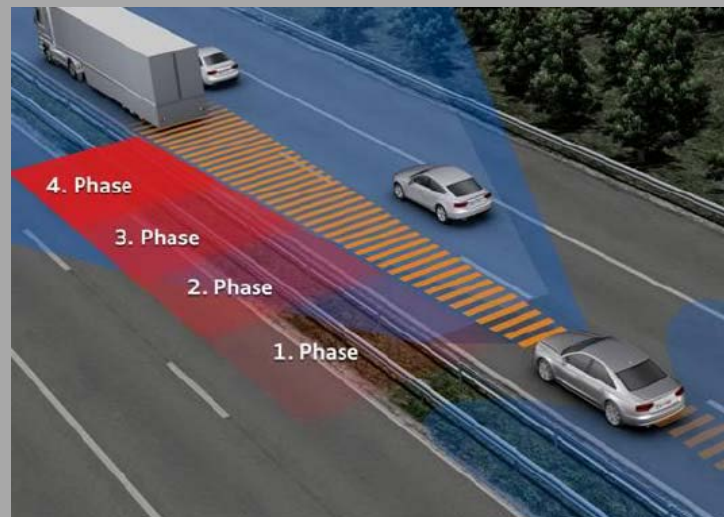
Known: Audi Braking Guard 2 with Pre Sense Front

► Audi Braking Guard 2 with Pre Sense Front:

- Automatic partial braking to reduce velocity and gain more reaction time for the driver to avoid the collision
- Automatic full emergency braking if collision is unavoidable to reduce injury risk

► Initial Introduction:

- MY12-MY15
 - A6/A7 w/ SW 160+
- MY11-MY15
 - A8 w/ SW 160+



► Phase 1:

Visual and audible warning

► Phase 2:

Warning jolt, followed by partial braking (3 m/s^2)

► Phase 3:

Stronger partial braking (up to 5 m/s^2)

► Phase 4:

Full braking (500 ms prior) 8 m/s^2



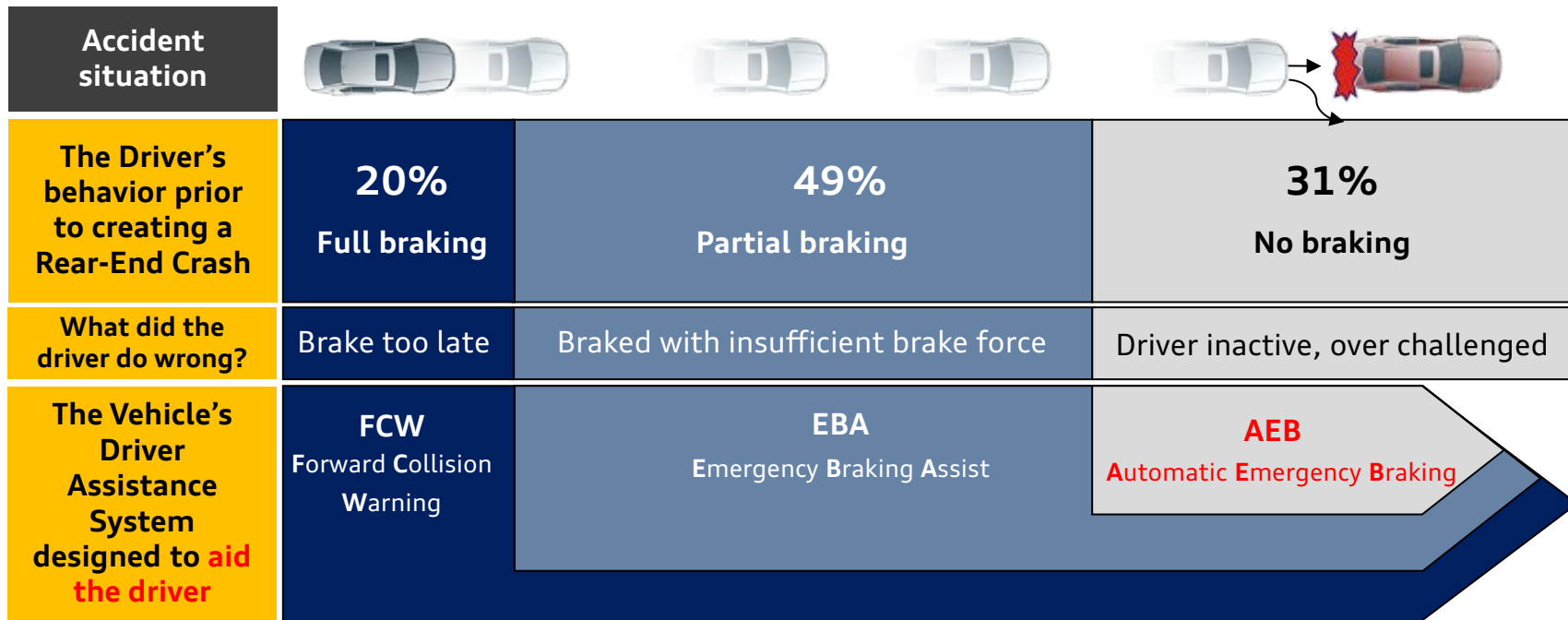
Automatic Emergency Braking (AEB) – NEW!



- ▶ **NEW FEATURE: Automatic Emergency (City) Braking:**
 - ▶ Automatic collision avoidance braking at low speed (<20kph or <12mph). System works up to 30kph but with reduced collision severity only!
- ▶ **Initial Introduction:**
 - ▶ MY13-MY15
 - ▶ *A4 PI, A5 PI, Q5 PI*
 - ▶ MY13-MY15
 - ▶ *A6, A7, A8 w/ SW 400+*
 - ▶ MY15
 - ▶ *New A3 Sedan*



Predictive Emergency Braking System Study Performed by Bosch



FCW Warning by visual, audible alert and/or brake jerk

EBA Target braking with driver brake input

AEB Automatic braking to reduce speed of the vehicle and mitigate collision



Bosch Driver Assistance Components for Audi

Long-Range Radar



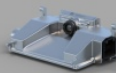
Mid-Range Radar



Multi Purpose Camera



Dual Purpose Camera



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Predictive
Emergency Braking



Lane Assistance



Light and Sight
Assistance



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Evolution of Bosch Radar Sensors

Long-Range Radar & Mid-Range Radar



LRR2

Audi A8/Q7

Since: 2004

- ▶ Range: up to 200 m
- ▶ Opening Angle: 16°
- ▶ Dimensions (HxWxD)
73 x 70 x 60 mm
- ▶ Weight: 300 g



LRR3

Audi A4/A5/Q5/A6/A7/A8

2015 S3/A3 e-tron

Since: 2009

- ▶ Range: up to 250 m
- ▶ Opening Angle: 30°
- ▶ Dimensions (HxWxD)
96 x 74 x 58 mm
- ▶ Weight: 285 g



MRR

2015 Audi A3/Cab/TDI

Since: 2015

- ▶ Range: up to 160 m
- ▶ Opening Angle: 70°
- ▶ Dimensions (HxWxD)
60 x 70 x 30 mm
- ▶ Weight: 200 g



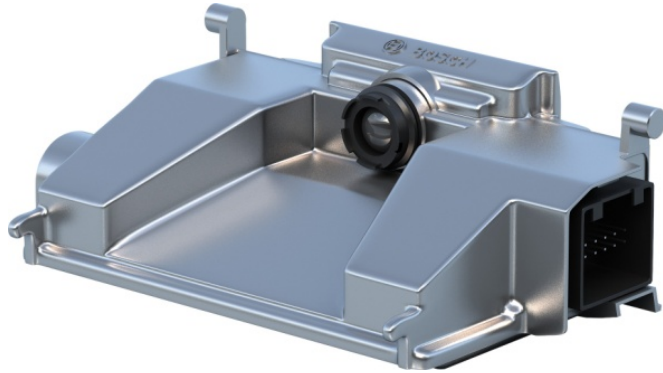
LRR4

Future Audi

- ▶ Range: up to 250 m
- ▶ Opening Angle: 40°
- ▶ Dimensions (HxWxD)
78 x 75 x 58 mm
- ▶ Weight: 240 g



Bosch Camera Systems



- **Dual Purpose Camera (DPC)**
LVDS Video Output to external Picture Processing Unit

CMOS 1024 x 512 pixel sensor

Depth of view 2.5 m ... 400 m

Frame rate 25 frames / s

This design is being phased out with newer models.



- **Multiple Purpose Camera (MPC)**
Integrated Picture Processing CPU with only CAN output

CMOS 1024 x 512 pixel sensor

Depth of view 2.5 m ... 800 m

Frame rate 30 frames / s

All new models starting with the 2015 A3 will have this.



Video-based Functions



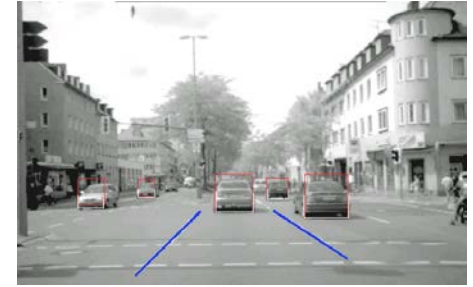
► Night Functions

Intelligent Headlamp Control
- Automatic High beam Assist



► Lane Vision

Audi Lane Assist
Audi Active Lane Assist
Support of ACC with stop & go

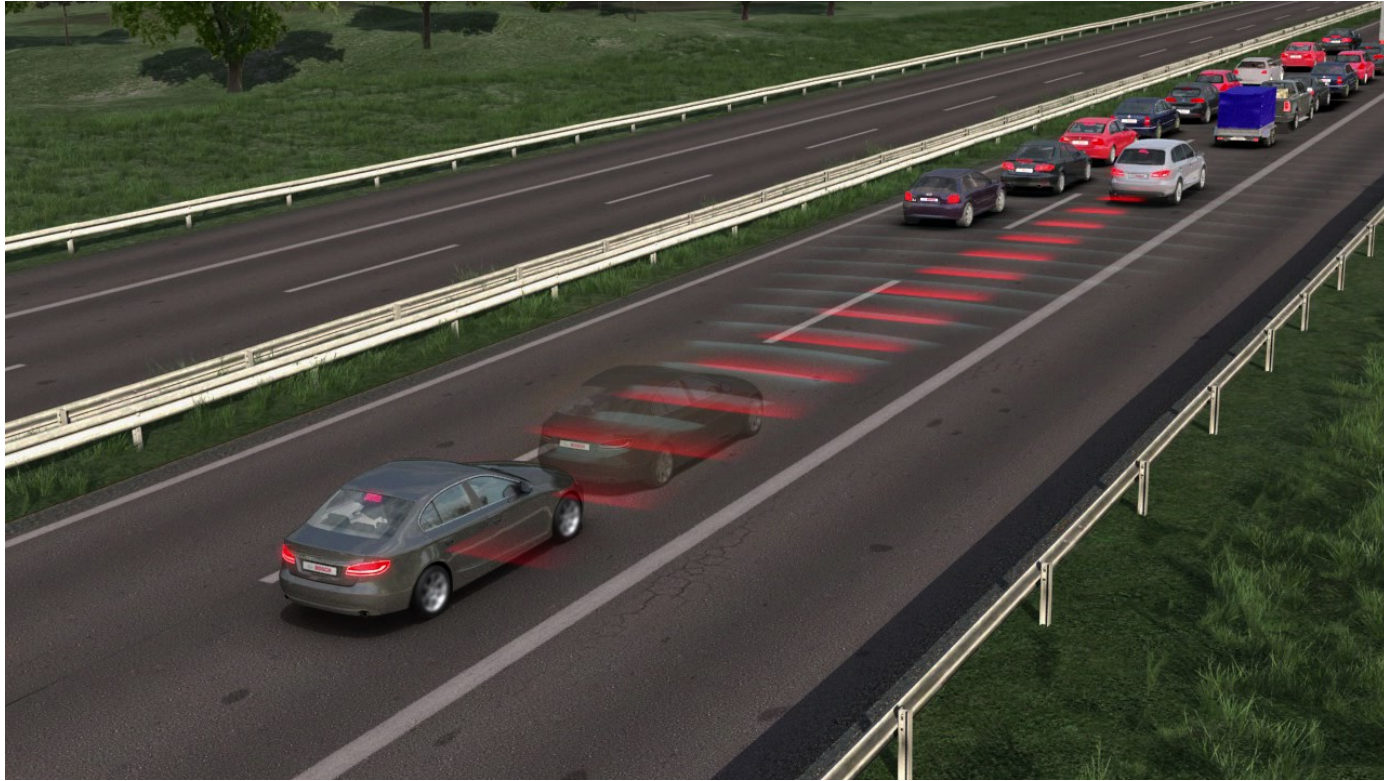


► Object Vision

Audi Pre Sense Front
Support of ACC with stop & go
Radar Predictive Safety
- Support (for FCW, AEB)
Passive Safety Support



Back-Up Material



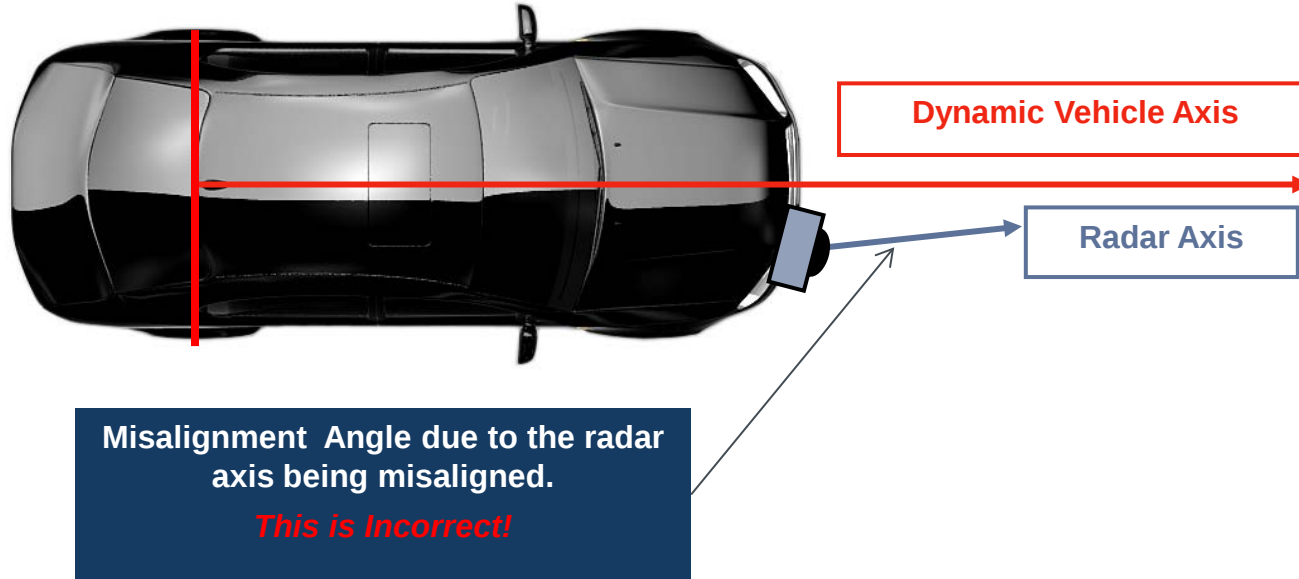
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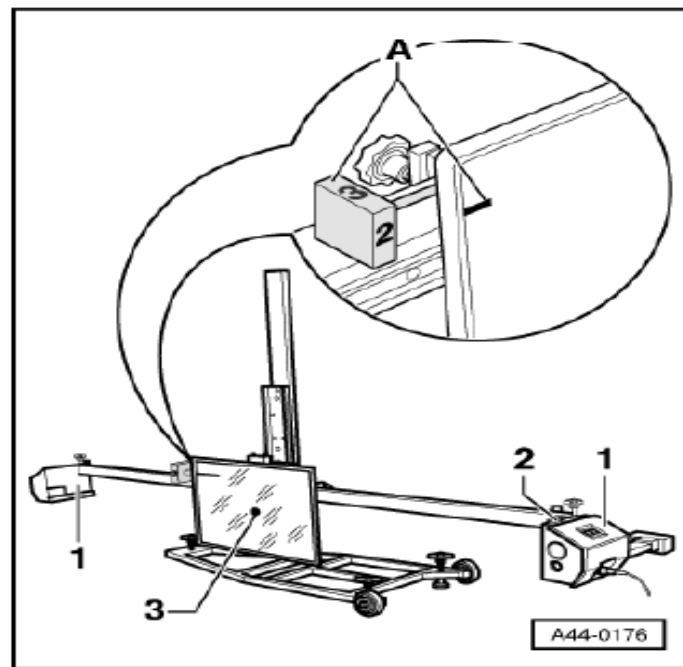
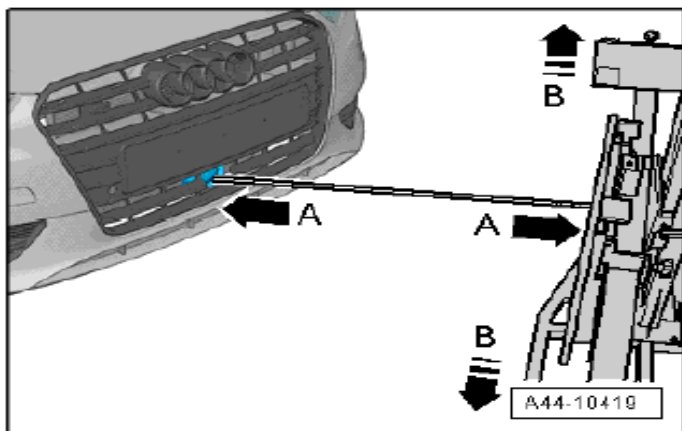


Radar Alignment

- The goal of Radar Alignment is to align the **Radar axis** with the **Dynamic vehicle axis**

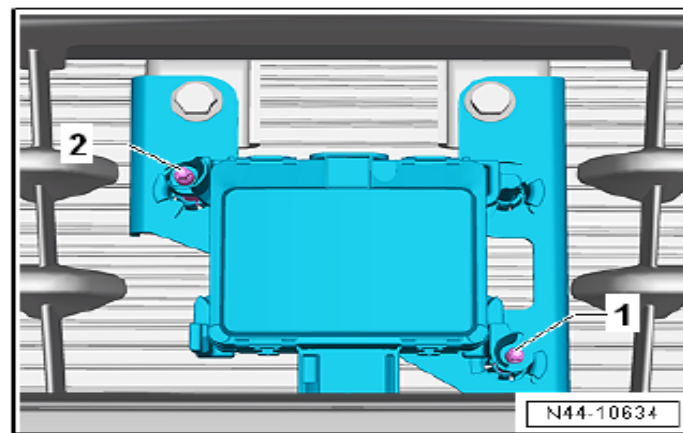
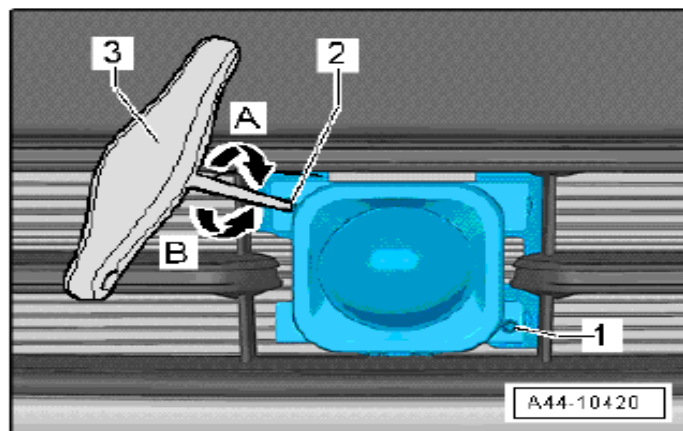


Alignment



It is critical to have the correct alignment tools and the proper setup procedure.

Alignment



Long Range Radar and Mid-Range Radar use the same adjustment procedure.

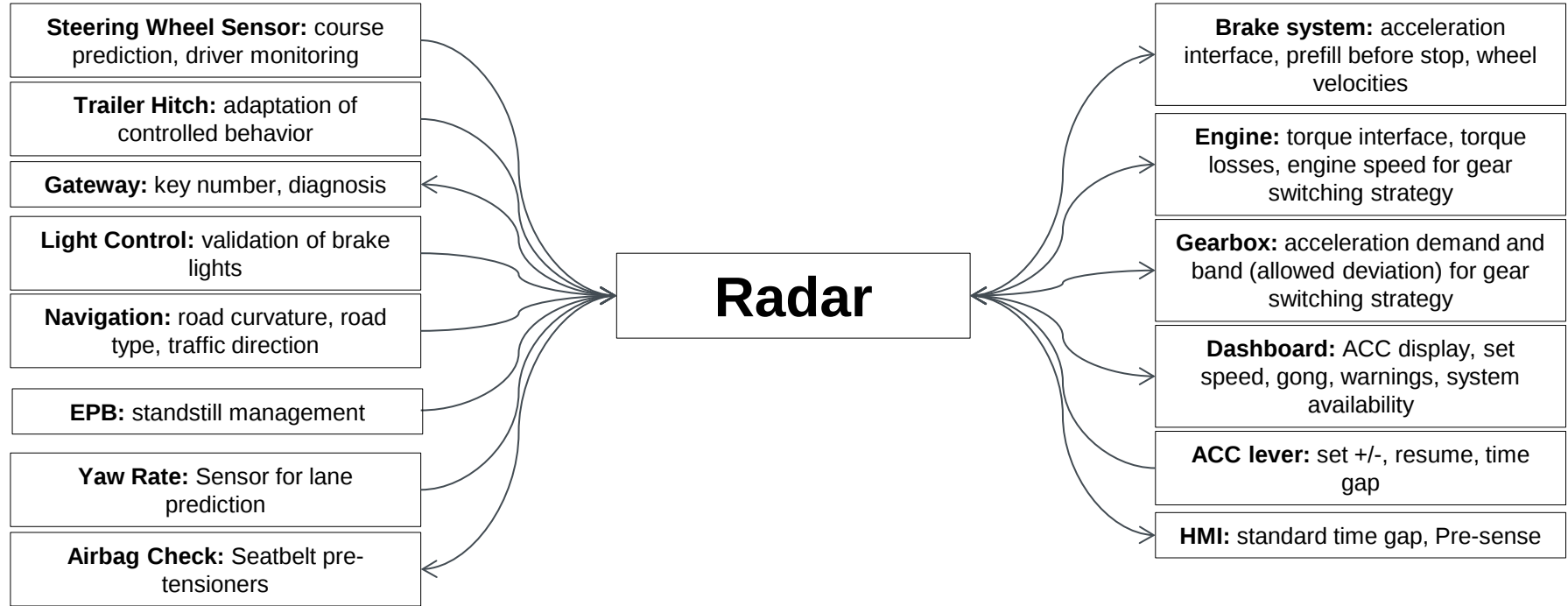
Blindness Detection (Sensor Blocked)



Radars set a DTC when the lens becomes dirty or if the rain/fog/snow become too difficult for viewing obstacles in front of it. Check for TSB's if no debris is found.



The Radar Interacts with Many Other Vehicle Systems!



General Dealership Hints

- ▶ Never open the sensor
- ▶ The radar is connected with many other ECUs in the vehicle, DTCs might give a hint to search for issues in other ECUs (brake, engine, gearbox, HMI, ...)
Before changing sensor, check other ECUs first
- ▶ After an impact to the radar or fender bender, the sensor function might shut off due to misalignment
- ▶ The sensor monitors if it is covered with snow or ice (blindness detection), a DTC pointing to 'blindness' is no reason to change the sensor
- ▶ Radom / lens heating – can remove snow and ice in cold conditions



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SoST — May/June 2014

Topic: Brakes — Noise/Diagnosis/Reporting

Details

- ▶ Current US model mix has a direct impact on the number of brake systems used in the US market.
- ▶ Introduction of new models will also add more brake variants in our market.

≈ 60

Variant

(e.g. A4, S4, RS5)

>16

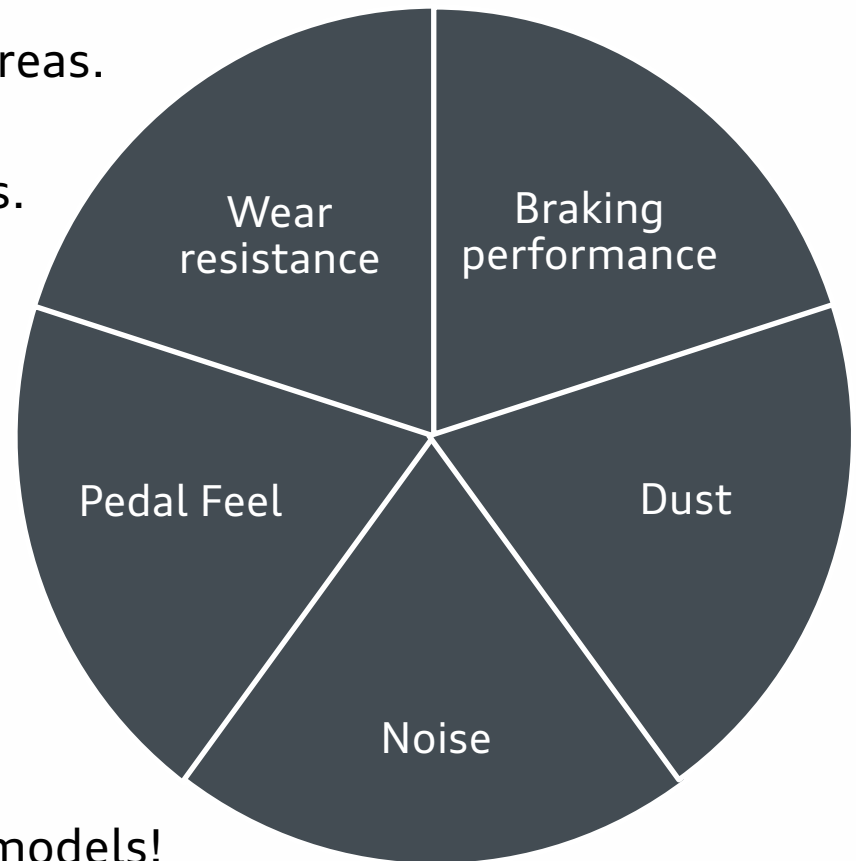
Front brake variants

15"- 19"

Front brake sizes

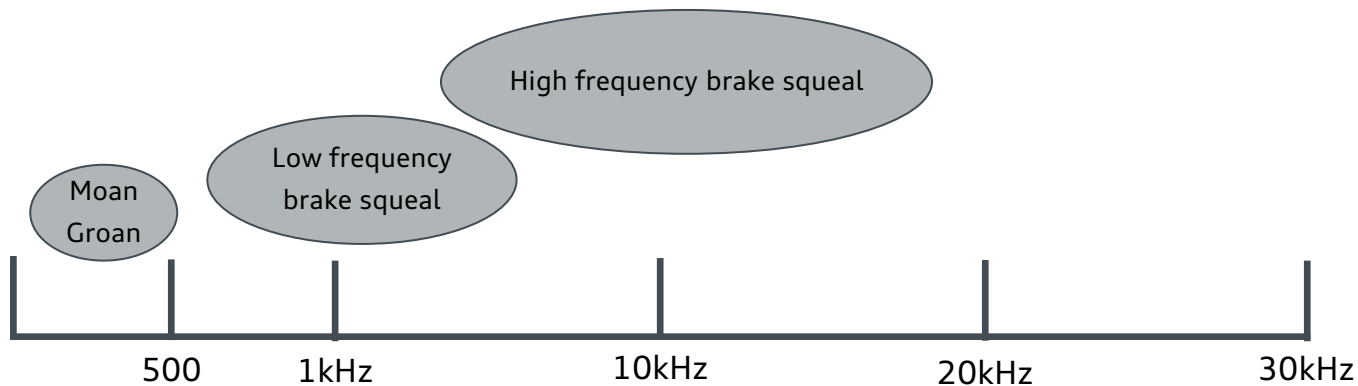
Brake development

- ▶ The following requirements are developed in conjunction with each other.
- ▶ Changing one area will impact other areas.
- ▶ Each market has unique requirements.
 - ▶ Customer expectations
 - ▶ Legal requirements
 - ▶ Technical requirements
- ▶ Each model has unique requirements.
- ▶ No “one size fits all” approach for all models!



Brake noise

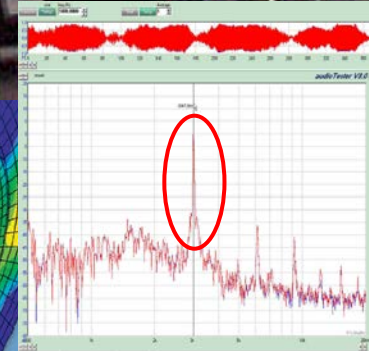
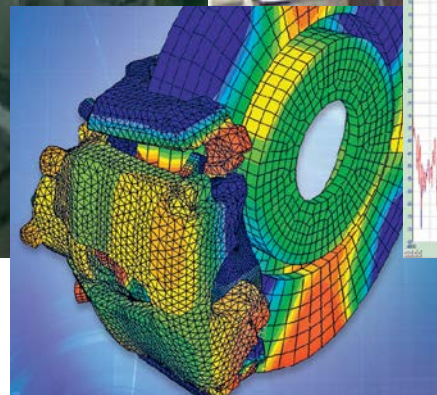
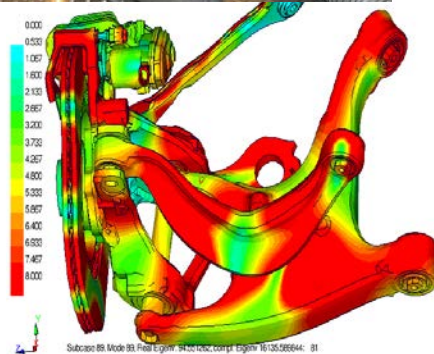
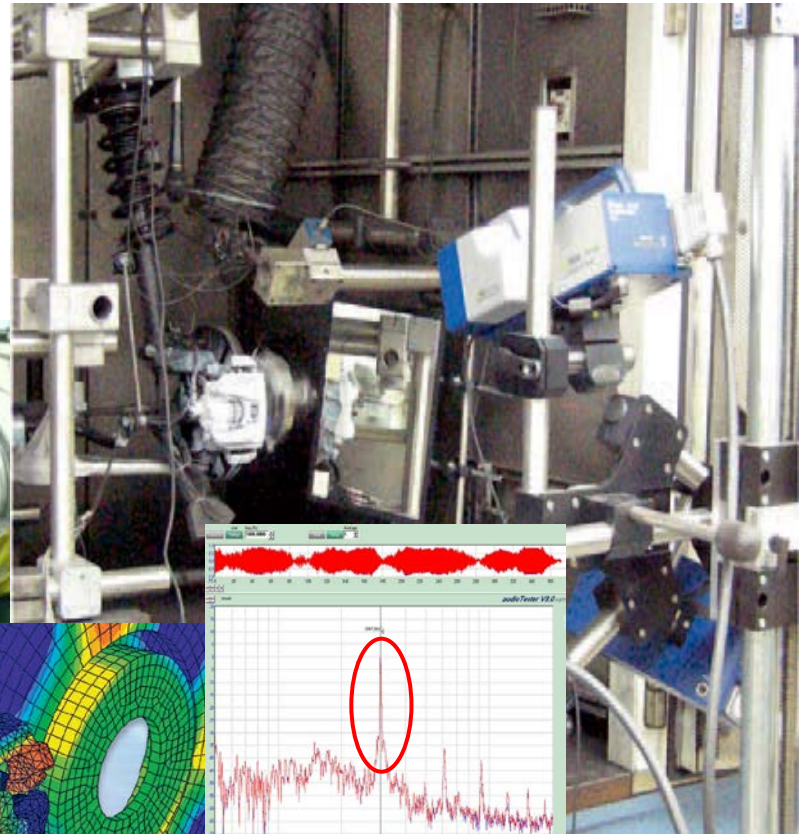
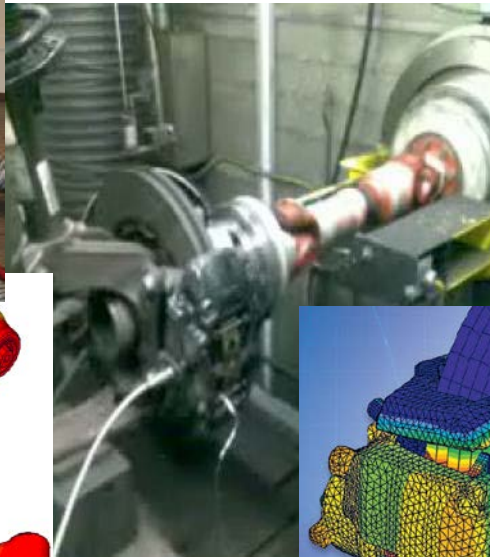
- ▶ Frequency is the number of complete cycles that occur in one second
- ▶ Sound and vibration waves are measured in Hz
- ▶ Components have a natural frequency
- ▶ Components with greatest impact
 - ▶ Low frequency: pads, discs, calipers, caliper brackets, suspension components.
 - ▶ High frequency: pads and discs



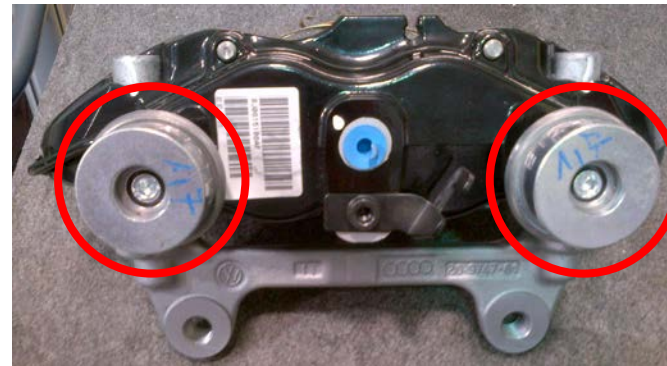
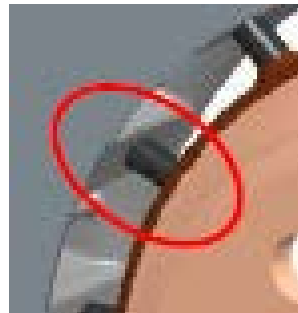
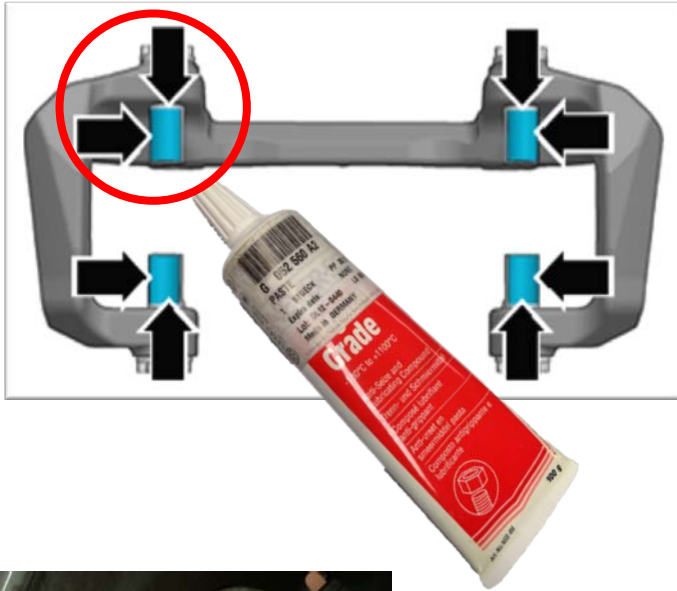
Root cause analysis

Delivering technical solutions is only accomplished with an indepth root cause analysis.

- ▶ Brake system: 2.5 years
- ▶ Brake pads: ≥ 1 year
- ▶ Brake discs: ≥ 1 year
- ▶ Team members required: ≈ 80



Solution examples



Information flow



Audi dealers



Factory

1. - Sound recordings
- Questionnaires

4. Provides a market
specific solution

3. Technical solution

2. Analyse and
report data



AoA



How can you help?

1. Always obtain a sound recording

- ▶ With a cell phone or a camera
- ▶ Customer recordings are acceptable



2. Always fill out the Questionnaire

- ▶ Provide as much data as possible
- ▶ Data is electronically extracted and used for root cause analysis

Questionnaire - Brake Complaint: Acoustics, Noise			
Vehicle Data:			
Type	Registration Date	Owner	Customer Mile
Year	Model	Year	Customer Mile
Engine No.	Service equipment (See last page, page 40)	Year Add.	Year Mile
Year Add.		Year Mile	
Test drive:			
When does the noise occur?		Customer complaint confirmed?	
Always ☐ yes ☐ no		Always ☐ yes ☐ no	
Type of noise (if possible):		When does the noise occur?	
☐ rattle / noise		Forward drive ☐ reverse ☐	
☐ grinding / scraping		Always ☐ light braking ☐ stop ☐	
☐ squeaking		Often ☐ hard braking ☐ in g. traffic light ☐	
☐ clunking		Rarely ☐ without braking ☐ during brake ☐	
☐ hissing		Very rarely ☐ emergency braking ☐	
		When does the noise occur?	
		Potentially ☐	
		Usually (2-4x) ☐	
		Often ☐	
		Always ☐	
Where does the noise possibly come from?			
Front ☐ Rear ☐ Don't know ☐ exact location if possible			

3. Attach sound recording and Questionnaire to TAC case.

or

Send sound recording and Questionnaire to *chassis@audi.com*

Closing statements

- ▶ No “one size fits all” approach for all models!
- ▶ Solutions come in many forms.
- ▶ Lubricants on brakes should only be used if required by ETKA or Elsa.
- ▶ Always check for latest TSBs prior to diagnosis.
- ▶ Sound recordings are critical for finding the root cause of the noise.



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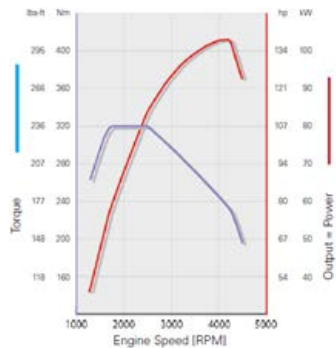
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Gen 2 vs Gen 3 2.0L TDI

Gen 2

140 HP & 236 lb-ft



Piezo fuel injector

NOx catalyst

Air to Air cooler

Standard non-VVT DOHC valvetrain

Gen 3

147.5 HP & 236 lb-ft



Solenoid fuel injector

SCR exhaust aftertreatment

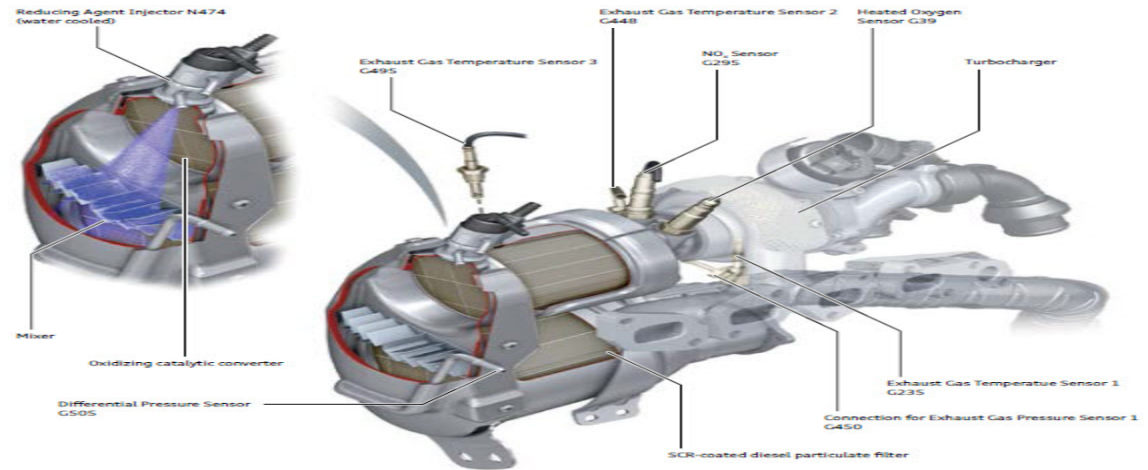
Air-Water-Air cooler

Enhanced VVT DOHC with cross-flow design



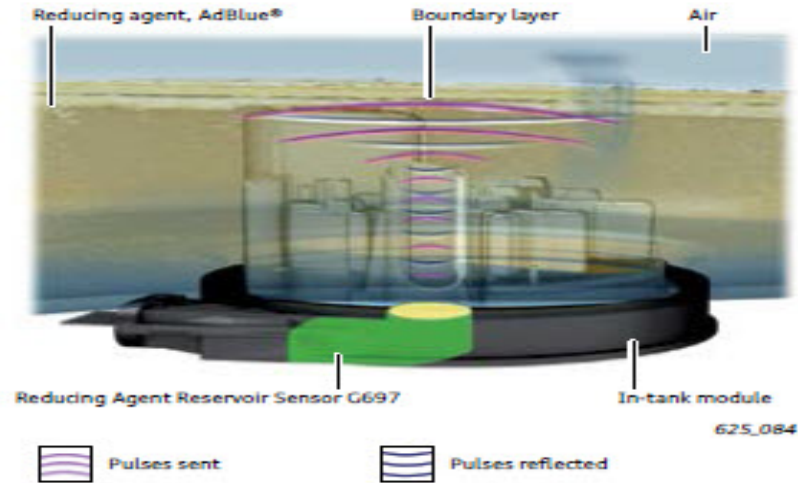
Exhaust aftertreatment technology

- ▶ SCR exhaust aftertreatment now added to the Gen 3 2.0L TDI
- ▶ Reducing Agent Injector is mounted directly downstream of the oxidizing catalytic converter above a transition funnel to the diesel particulate filter
- ▶ Reducing Agent Injector is water cooled due to a hotter mounting location
- ▶ AdBlue sprayed into exhaust before the SCR coated DPF



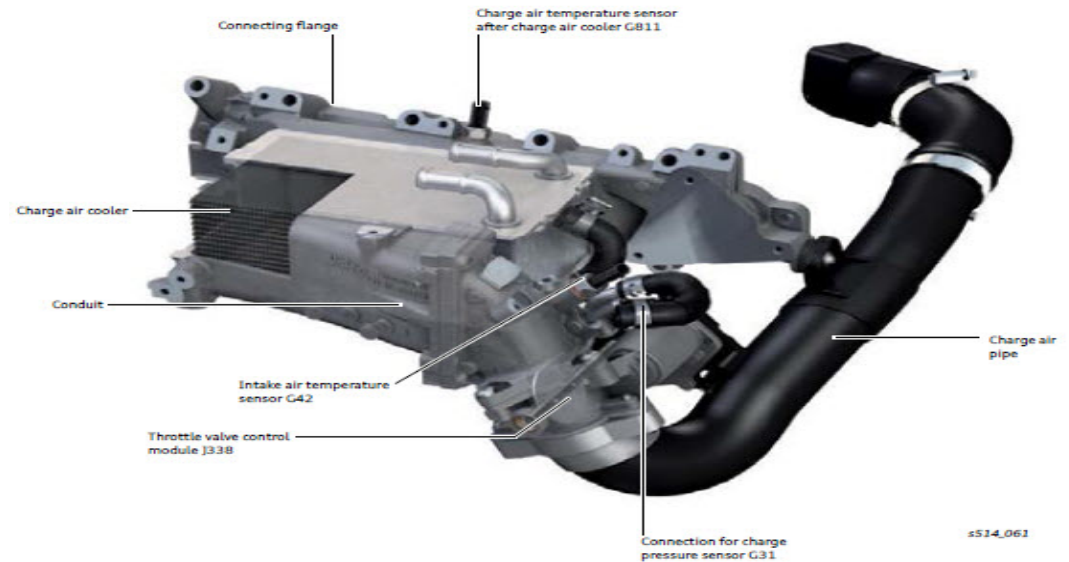
Exhaust aftertreatment technology

- ▶ AdBlue level sensor uses Ultrasonic waves to detect fluid level
- ▶ 17-liter Adblue tank
- ▶ Reducing agent quality sensor G849



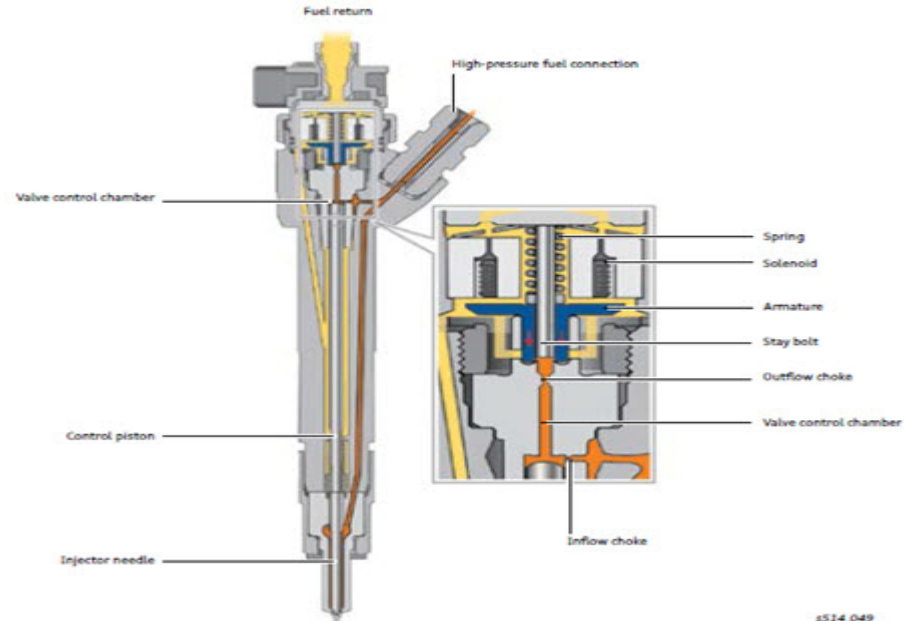
Charge air cooler

- ▶ Charge air cooler is now a air-water-air unit
- ▶ Integrated with the intake manifold
- ▶ Compact charge air cooler reduces flow losses
- ▶ Icing and condensation is avoided



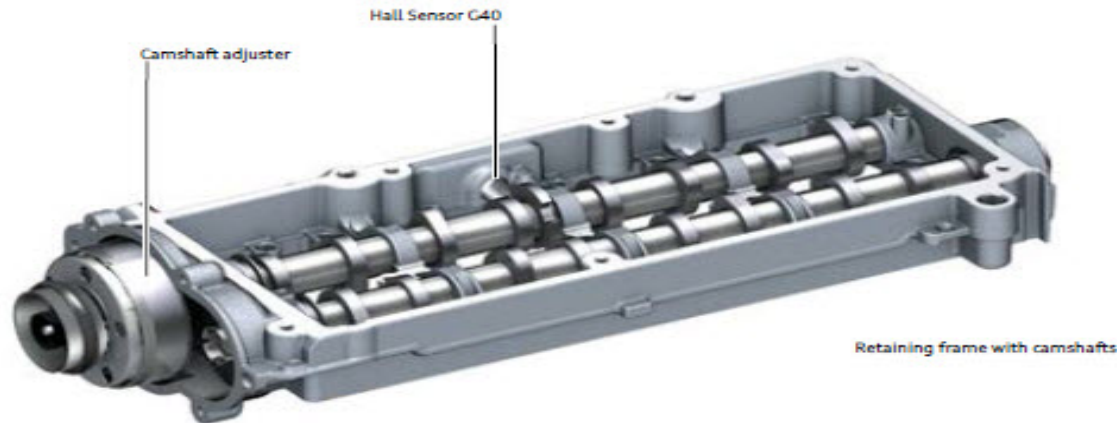
Fuel injection

- ▶ Bosch Fuel injector with solenoid valve technology
- ▶ Non-Piezo crystal
- ▶ Simplified manufacturing



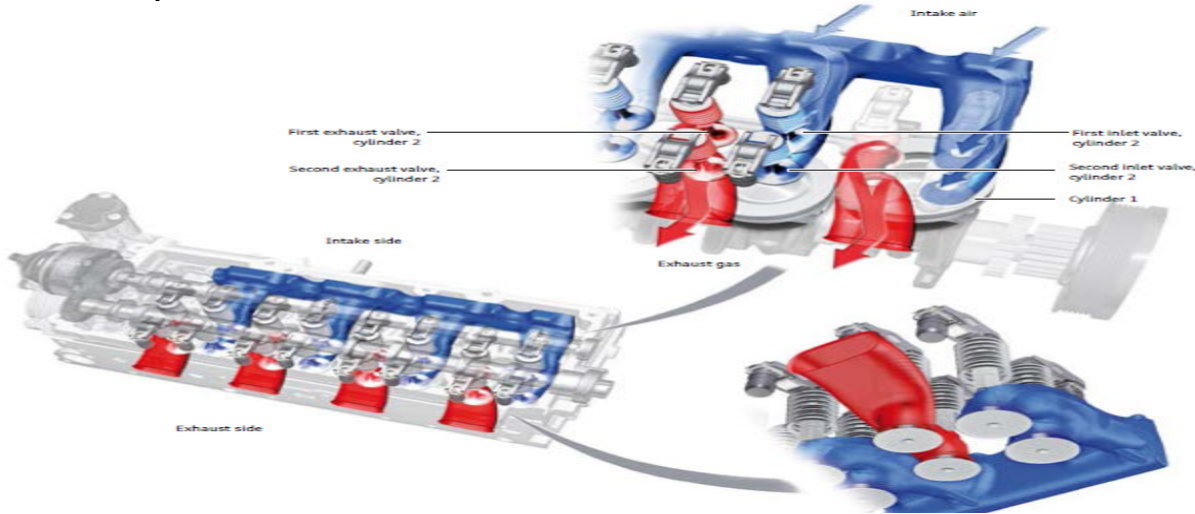
Cylinder head

- ▶ Camshafts are integrated into a retaining frame
- ▶ Camshafts can only be replaced together with the retaining frame
- ▶ #1 cam bearing utilizes a needle bearing due to higher loads from the belt drive



Cylinder head

- ▶ Valves have been rotated to the longitudinal axis of the engine
- ▶ Ports are positioned one behind each other in the direction of flow
- ▶ Each camshaft actuates both intake and exhaust valves
- ▶ Allows maximum air delivery and enhances the swirl effect in the cylinder
- ▶ Helps ensure compliance to current and further exhaust emission standards





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Audi Infotainment Update

Audi Infotainment Update

Topic overview

- ▶ MIB system (A3)
- ▶ Audi MMI connect App
- ▶ Media Cover Art, AMI adapter cables
- ▶ New update procedure for MIB Navigation database



MIB System (A3)

Changes from MMI 3G+

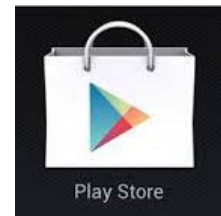
- ▶ Additional Audi connect features - Twitter, Facebook, Picture destination and Flight information
 - ▶ An additional Bluetooth profile is supported - MAP (Message access profile) as well as HFP & A2DP
- ▶ AT&T SIM card
 - ▶ 4G LTE & enhanced coverage area (dramatically reduced 2G connection)
 - ▶ LTE antennas in rear bumper (right side vs. left side)
- ▶ Radio tuner embedded in main unit
- ▶ New control panel concept
- ▶ Solid state hard drive



Audi MMI connect App

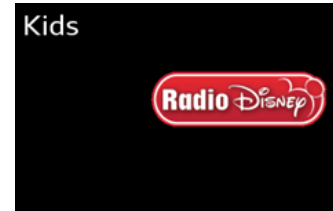
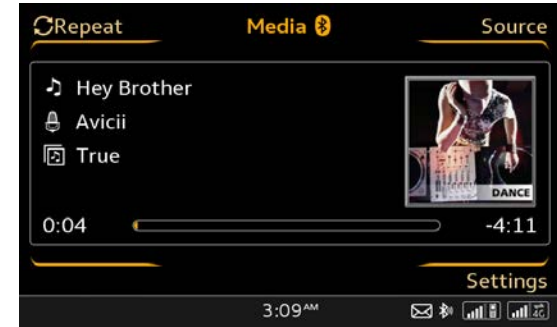
Free App - only for Audi A3

- ▶ iOS App available on iTunes App Store
- ▶ Android App available on Google Play Store
- ▶ Additional features to enhance Audi connect
 - ▶ Music stream
 - ▶ Car Finder



Media Cover Art

- ▶ MIB Gracenote® database used to show cover art for additional media sources
 - ▶ Bluetooth & Wi-Fi streaming, DVD drive
 - ▶ May see different album art in MIB than on device
 - ▶ Generic Genre art (e.g. Pop, Rock, Dance...)
- ▶ HD radio cover art/station logos broadcast over the air
- ▶ SiriusXM only shows station logos



AMI adapter cables

Current status

- ▶ AMI “Lightning” adapter cable will be available through Audi Accessories
 - ▶ Functionality differences vs. red collared cable with Apple adapter
 - ▶ Cover art is supported for MIB standard but not MIB High



- ▶ Unable to play music when 3rd party App is playing and connected to AMI
 - ▶ Apple issue



New Navigation database update procedure for A3

- ▶ 5 free updates provided for customers over 2 ½ year span
 - ▶ Twice per year a new database will be released
 - ▶ Coincides with CW 22 & CW45 updates in Production
 - ▶ Customer can download on my.audiusa.com website
 - ▶ Only current (latest) update will be available
 - ▶ Download to 32GB SD card
 - ▶ Can update entire US map or only region(s)



Map update A3 USA



Navigation update legacy products

Current status

- ▶ Will continue 1 customer update per year, at MY changeover
- ▶ MMI 3G/3G+
 - ▶ SD card & activation documents available soon
 - ▶ From MY13 **must** first update to Zug 715
 - ▶ Perform activation **before** database download
- ▶ MMI 2G & RNS-E
 - ▶ DVDs available soon



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Matrix LED headlights (not available in USA)

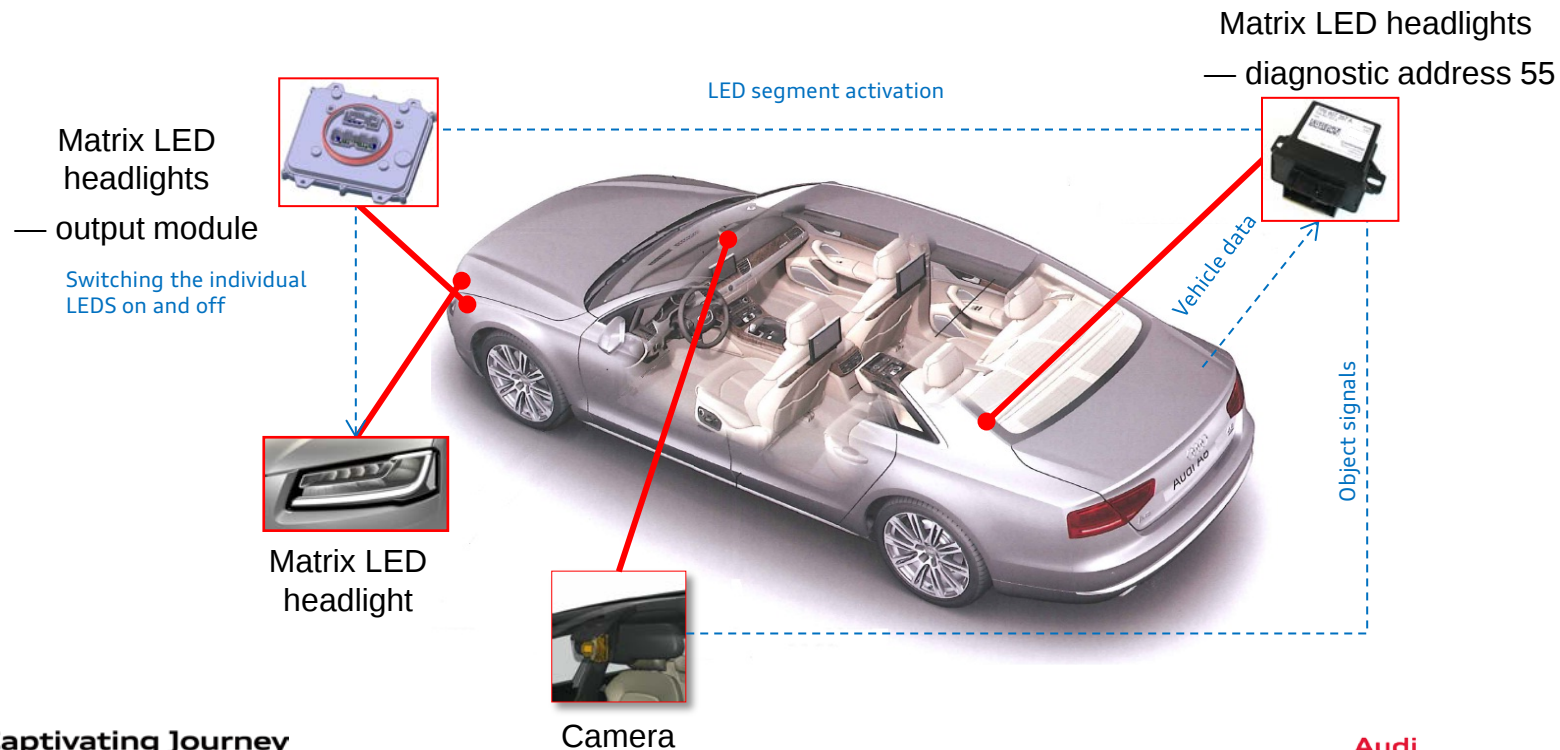
Structure

- ▶ The main beam module in the headlight consists of 25 individually addressable LEDs
- ▶ The camera detects oncoming vehicles' lights and communicates the angle and the clearance class (estimated distance) to the control unit of the matrix LED headlight
- ▶ Using the camera and vehicle data (including vehicle speed and yaw rate), the control unit of the matrix LED headlight calculates which segments need to be switched off and communicates this information to the output module
- ▶ The output module of the matrix LED headlight switches the headlight LEDs correspondingly on or off



Matrix LED headlights

Components





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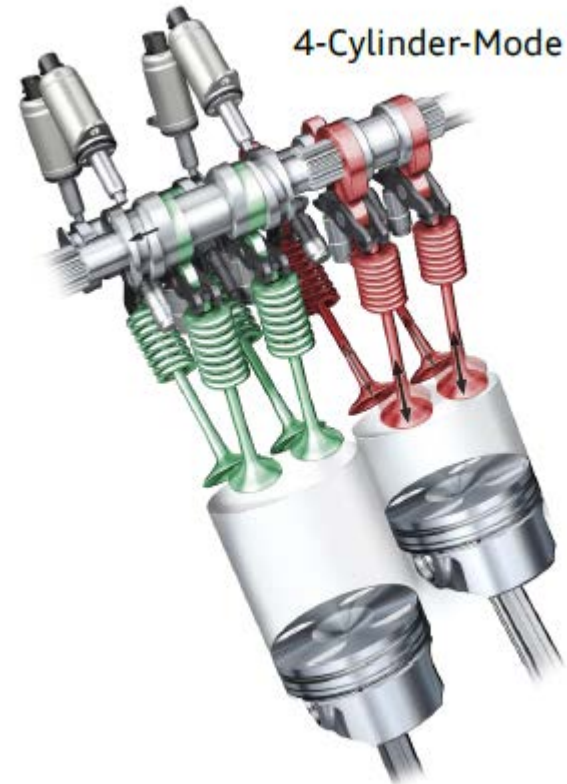
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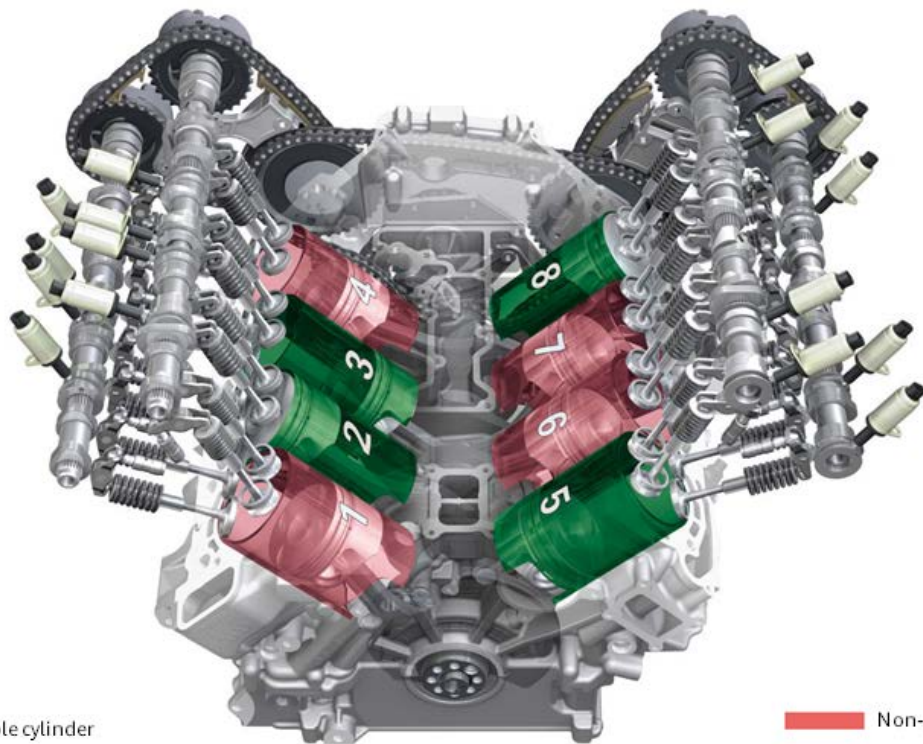
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W12 – Cylinder on demand overview

Cylinder on Demand Cylinder shift with Audi Valve Lift



4.0TFSI



 Switchable cylinder

 Non-switchable cylinder

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W12 6.3 FSI

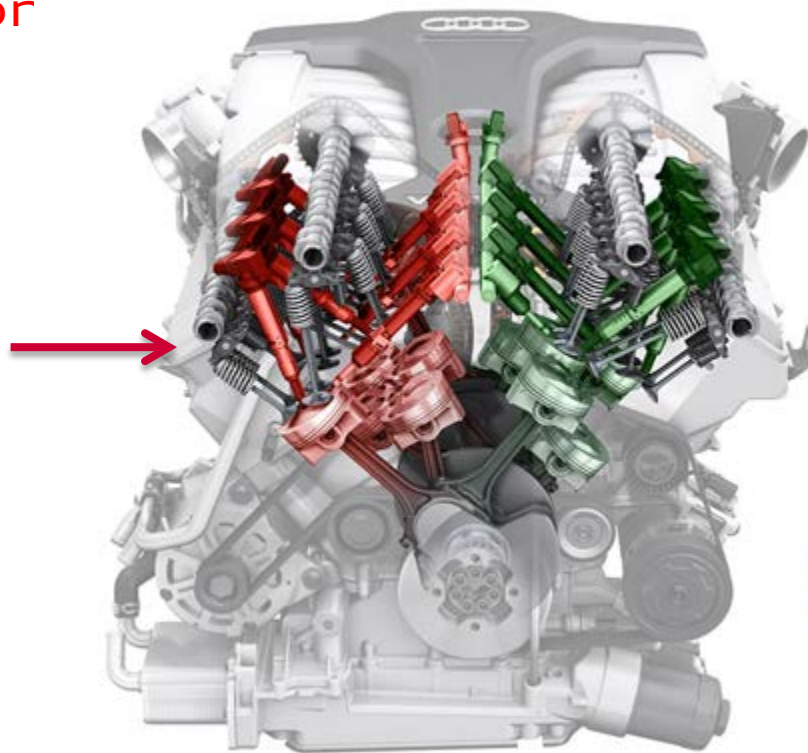
COD Operation

- ▶ Software based
 - ▶ Complete cylinder banks injection and ignition shut down. No mechanical changes.
 - ▶ Alternate between bank1 and bank2, too prevent converters from cooling off.
 - ▶ Speed > 25 mph , 4th gear or higher, engine speed 950 to 3,000 rpm
 - ▶ Efficiency in the active cylinders increases because of higher engine loads
 - ▶ Active Noise Cancellation (ANC) is used.
 - ▶ Active engine mounts are not used.
 - ▶ No stop start for W12



W12 6.3 FSI

COD Operator



Aktiviert
Activated

Deaktiviert
Deactivated



W12 6.3 FSI

Technical Specifications

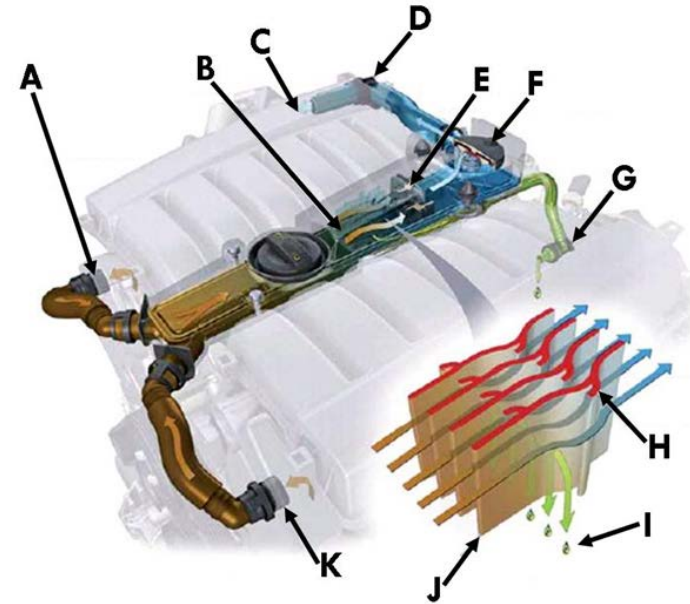
- ▶ W12 w/ Cylinder On Demand
 - ▶ 500@6200 (368kw)
 - ▶ 463lb-ft@4750(625nm)
 - ▶ Engine code CTNA with COD
- ▶ EPA mileage estimates* + 10-15% highway mileage
- ▶ Repair Authorization TSB 2026692 – MY12-15 engine and transmission concerns



W12 6.3 FSI

General Information

- ▶ TSB 2035581 oil fill
- ▶ W12 engine is built in Salzgitter Germany for VW/Audi with production moving to Bentley in 2015 for all W12 engines.



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