# 12 14 521 Replace crankshaft sensor

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

## PRELIMINARY WORK

### 1 – Removing the acoustic cover

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

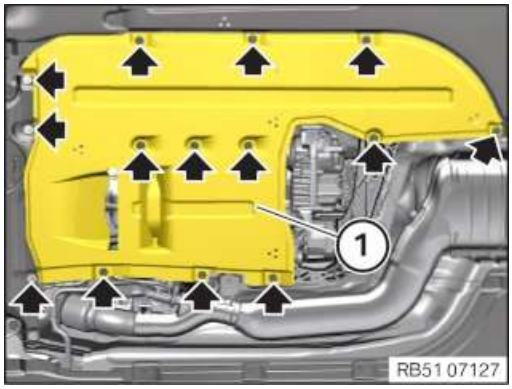
- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

### 2 – Remove rear underbody protection

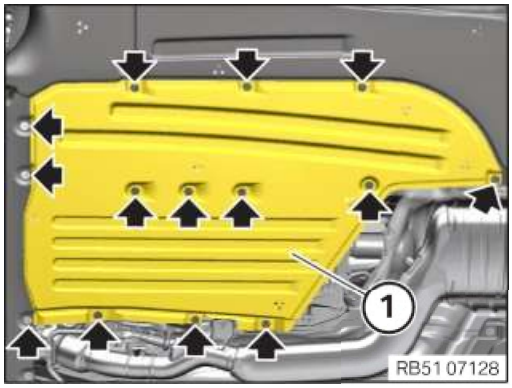
cardiagn.com




- **Version 1:**

  Remove screws (arrows).

  Feed out the rear underbody protection (1).

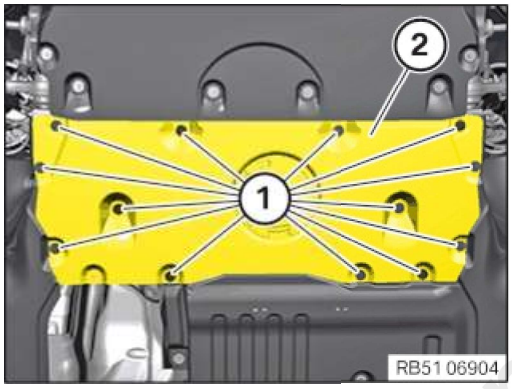



- **Version 2:**

  Remove screws (arrows).

  Guide out rear underbody protection (1) and remove it.

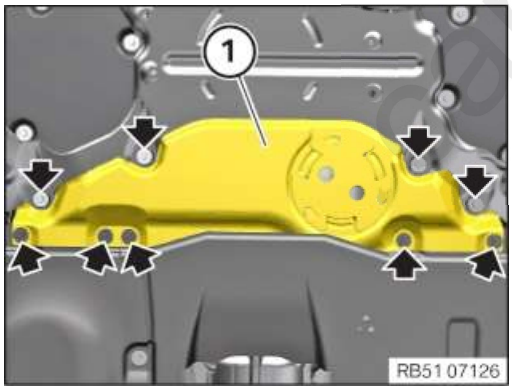
**3 – Removing the centre underbody protection**




- **Version with rear-wheel drive:**

  Loosen screws (1).

  Remove centre underbody protection (2) .




- **Version with all-wheel drive:**

  Remove screws (arrows).

  Feed out and remove the centre underbody protection (1).

**MAIN WORK**

**4 – Removing the crankshaft sensor**

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**RISK OF DAMAGE**

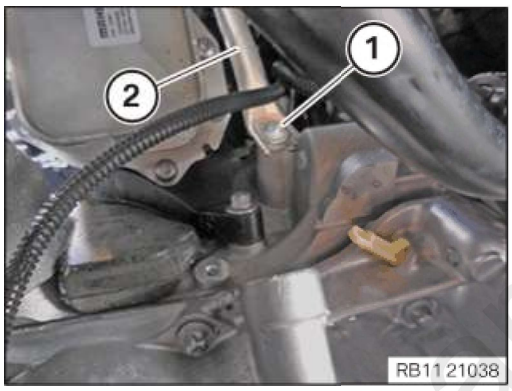
**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

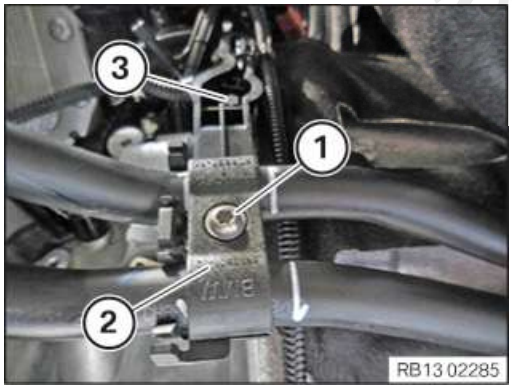
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



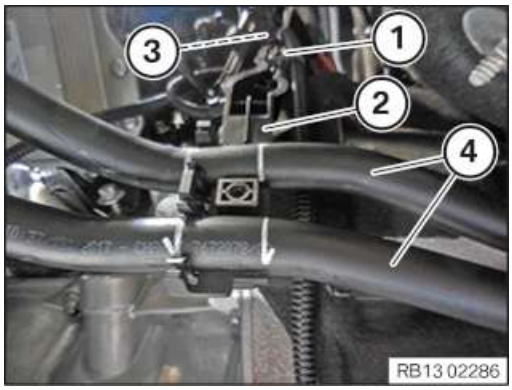

- Loosen screw (1).



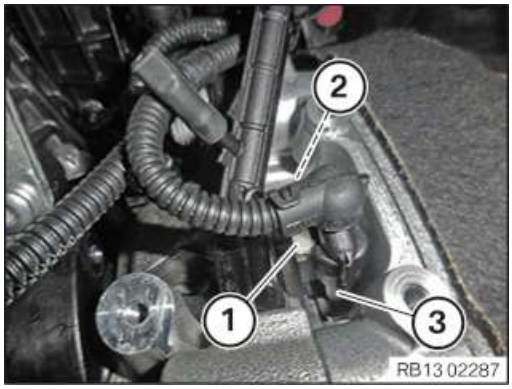

- Loosen screw (1).
- Guide out and remove manifold support (2).




- Loosen screw (1).
- Guide out and remove holder (2).
- Loosen screw (3).

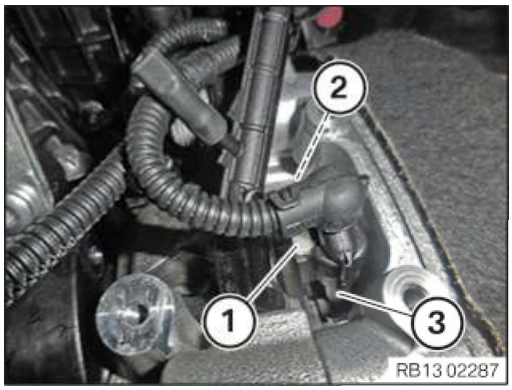



- Loosen clamp (1).
- Pull holder (2) out of guide (3).
- Pull holder (2) out of transmission oil lines (4) and remove it.




- Unlock connector (1) and pull off.
- Loosen screw (2).
- Guide out and remove crankshaft sensor (3).

**5 – Installing the crankshaft sensor**



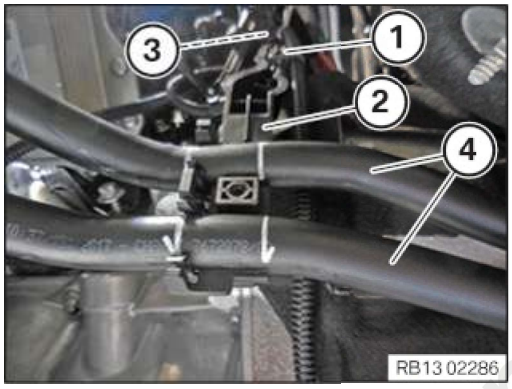

- Feed in and install the crankshaft sensor (3).
- Tighten down screw (2).

**Crankshaft sensor to crankcase**

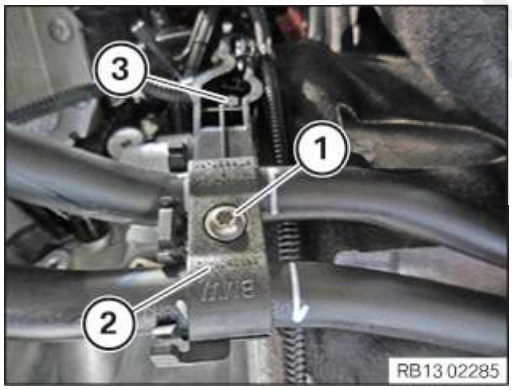
| | | | |
|---|---|---|---|
| Crankshaft sensor | | Tightening torque | 4,5 Nm |

- Connect and lock the connector (1).

  The connector (1) must engage audibly.




- Insert and install the holder (2).
- Make sure that holder (2) is installed correctly in guide (3).
- Position transmission oil line (4) on holder (2).
- Secure the clamp (1).




- Tighten down screw (3).

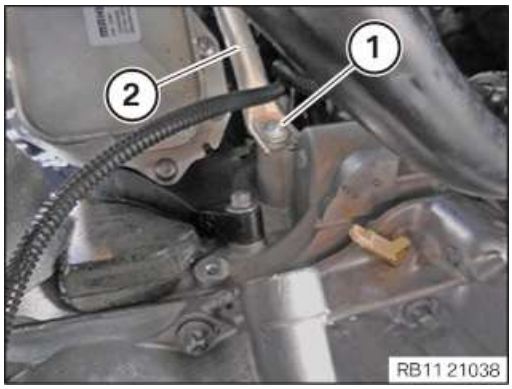
**Holder to end cover**

| | | | |
|---|---|---|---|
| M6X16 | | Tightening torque | 8 Nm |

- Insert and position the holders (2).
- Tighten down screw (1).

**Holder for transmission oil line**

| | | | |
|---|---|---|---|
| Screw | *Renew screw.* | Tightening torque | 5 Nm |




- Guide in and position manifold support (2).
- Hand-tighten the bolts (1).




- Tighten the screws (1).

**Manifold support to intake plenum**

| | | | |
|---|---|---|---|
| M6x25 | | Tightening torque | 8 Nm |



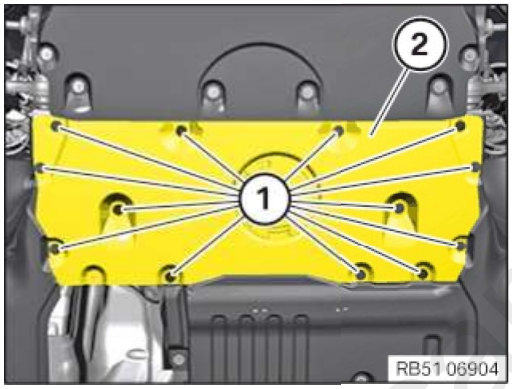

- Tighten screws (1) on manifold supports (2).

**Manifold support to crankcase**

| | | | |
|---|---|---|---|
| M6x16 | | Tightening torque | 8 Nm |

## POSTPROCESSES

### 6 – Installing the centre underbody protection



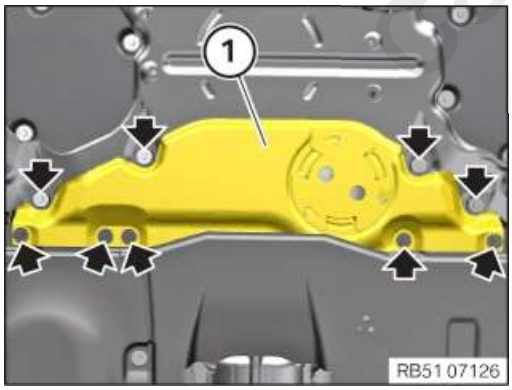

- **Version with rear-wheel drive:**

  Position central underbody protection (2).

  Tighten the screws (1).

**Underbody protection**

| | | | |
|---|---|---|---|
| Hexagon screw | | Tightening torque | 3 Nm |




- **Version with all-wheel drive:**

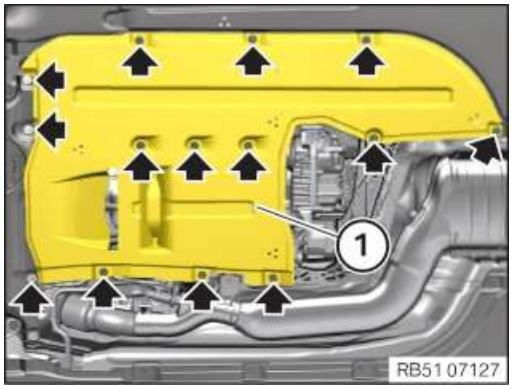
  Guide in and install the centre of underbody protection (1).

  Tighten screws (arrows).

**Underbody protection**

| | | | |
|---|---|---|---|
| Hexagon screw | | Tightening torque | 3 Nm |

### 7 – Installing underbody protection at rear



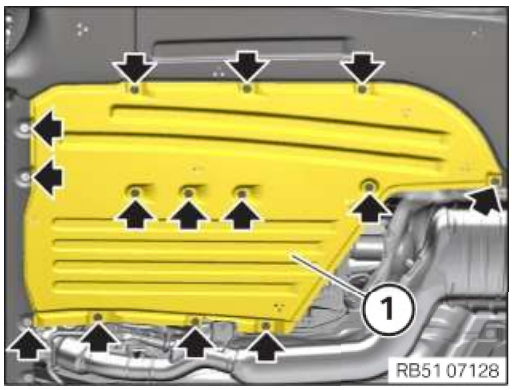

- **Version 1:**

  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

**Underbody protection**

| | | | |
|---|---|---|---|
| Hexagon screw | | Tightening torque | 3 Nm |




- **Version 2:**

  Insert and install the rear underbody protection (1).

  Tighten screws (arrows).

**Underbody protection**

| | | | |
|---|---|---|---|
| Hexagon screw | | Tightening torque | 3 Nm |

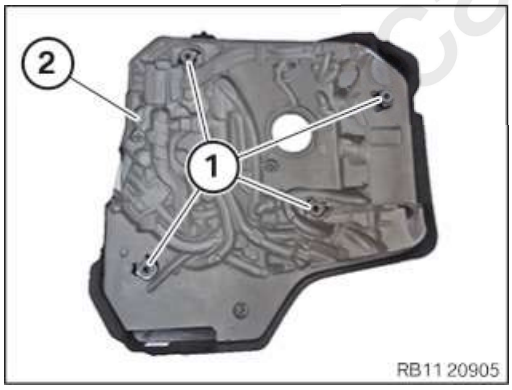
**8 – Install acoustic cover**

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Check all rubber mounts (1) of acoustic cover (2) for correct seating.




- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

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## Additional Information

### Overview of Tightening Torques

| **Crankshaft sensor to crankcase** | | | Used in step 5 |
|---|---|---|---|
| Crankshaft sensor | | Tightening torque | 4,5 Nm |

| **Holder to end cover** | | | Used in step 5 |
|---|---|---|---|
| M6X16 | | Tightening torque | 8 Nm |

| **Holder for transmission oil line** | | | Used in step 5 |
|---|---|---|---|
| Screw | *Renew screw.* | Tightening torque | 5 Nm |

| **Manifold support to intake plenum** | | | Used in step 5 |
|---|---|---|---|
| M6x25 | | Tightening torque | 8 Nm |

| **Manifold support to crankcase** | | | Used in step 5 |
|---|---|---|---|
| M6x16 | | Tightening torque | 8 Nm |

| **Underbody protection** | | | Used in step 67 |
|---|---|---|---|
| Hexagon screw | | Tightening torque | 3 Nm |

### Links

| **Repair instructions** | **Used in step** |
|---|---|
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 4 |

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# 12 14 602 Replacing knock sensor

## PRELIMINARY WORK

### 1 – Disconnecting all battery earth leads




- See additional information.

### 2 – Removing the acoustic cover

**WARNING**

**Hot surfaces.**

**Risk of burning!**

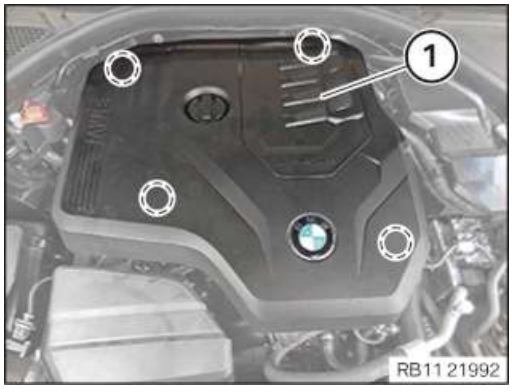
- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

### 3 – Removing the clean air pipe with the resonator

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**WARNING**

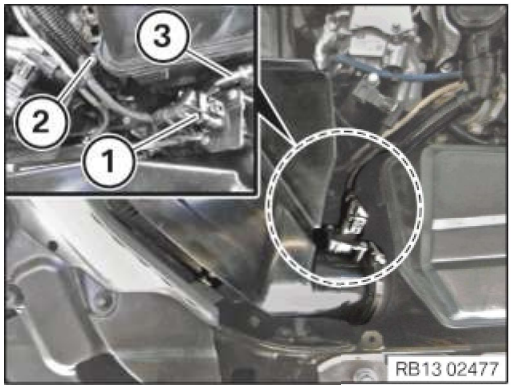
**Hot surfaces.**

**Risk of burning!**

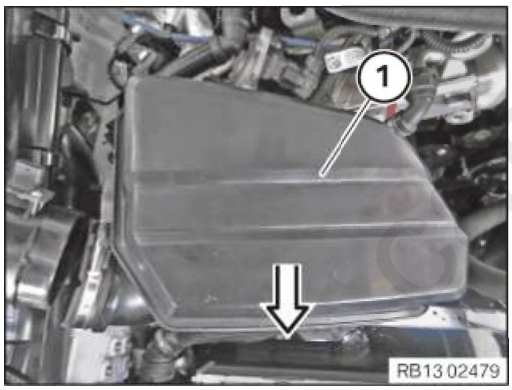
- Perform all work only on components that have cooled down.



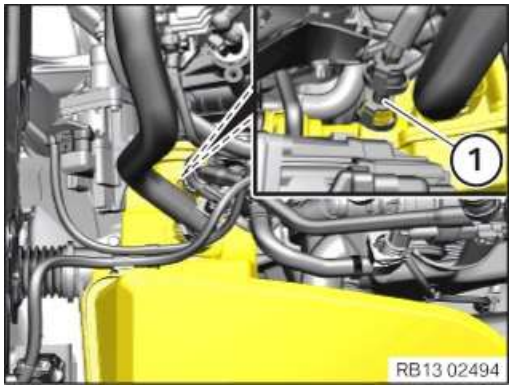

- Unlock the locks (1).
- Feed the engine ventilation line (2) out and set it aside.



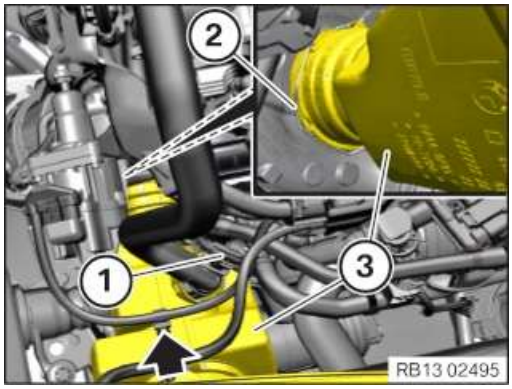

- Unlock plug connection (1) and disconnect.
- Loosen clamp (2).
- Unfasten clamp (3).
- Separate the clean air pipe with resonator from the intake filter housing.




- Press and hold clean air pipe with resonator (1) in the direction of the arrow.




- Unlock and disconnect the tank ventilation line (1).




- Loosen the clamp (arrow).
- Unlock plug connection (1) and disconnect.
- Unlock the clamp (2).
- Feed out clean air pipe with resonator (3) and remove.

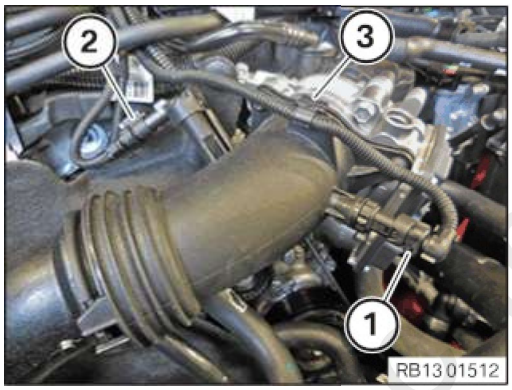
**4 – Removing the throttle body**

**RISK OF DAMAGE**

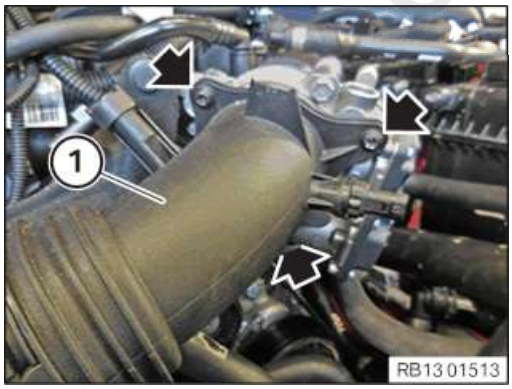
**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

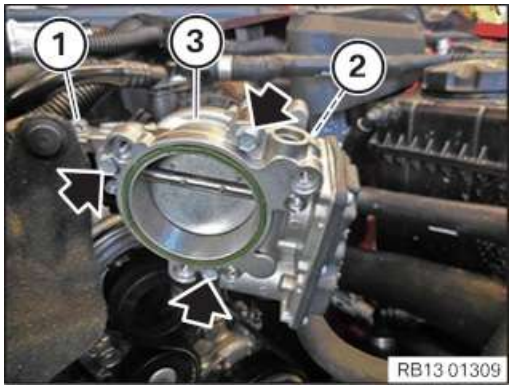



- Unlock and loosen connector (1).
- Unlock and loosen connector (2).
- Unlock and loosen clamp (3).



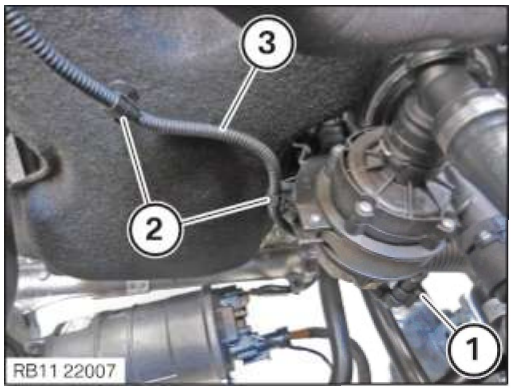

- Remove screws (arrows).
- Feed out charge air line (1) and place to one side.

mfdiag.com

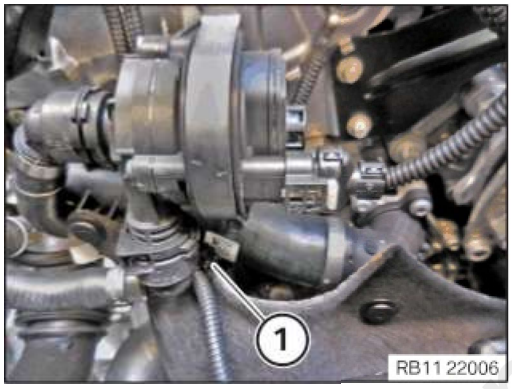



- Loosen screw (1).
- Remove screws (arrows).
- Unlock and loosen connector (2).
- Remove the throttle bodies (3).

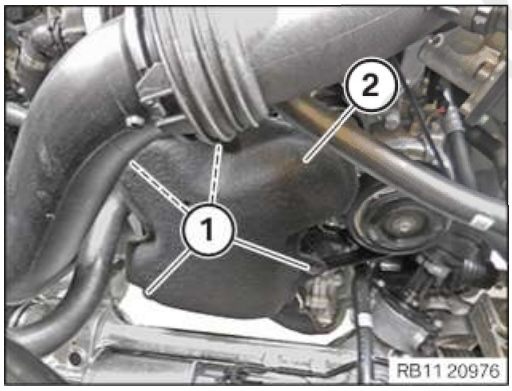
**5 – Removing the acoustic cover for the engine at the front**




- Unlock plug connection (1) and disconnect.
- Loosen clamps (2).
- Remove the wiring harness section (3) and put to one side.




- Loosen clamp (1).




- Detach all expanding rivets (1).
- Guide the acoustic cover (2) out and remove.

**6 – Releasing the electrical auxiliary coolant pump for the charge air cooler or the air conditioning condenser**

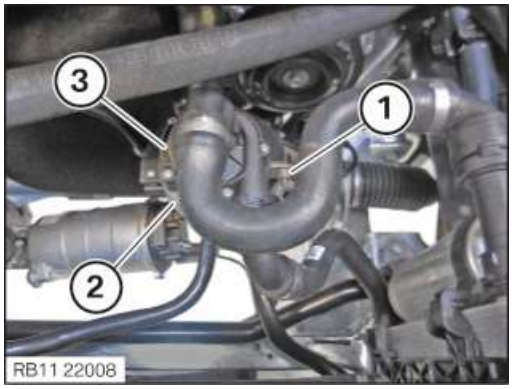
**RISK OF DAMAGE**

**Non-visible damage to the coolant pump.**

**Forcibly removing, installing or dropping the coolant pump down will damage it.**

- Remove and install the coolant pump without damaging it and without applying external force.
- Avoid impacts/knocks to the coolant pump (e.g.. by tools, falling down, hard contact with base).
- Renew coolant pump after being dropped or hard impacts/knocks.

diagn.com




- Loosen nut (1).
- Thread out holder (2) and set aside.
- Guide out the electrical auxiliary coolant pump (3) and set it aside.

**7 – Removing the drive belt for alternator**

**CAUTION**

**Spring preload.**

**Danger of injury!**

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

**CAUTION**

**Component with preload.**

**Danger of injury!**

- Reduce preload as far as possible before disassembly. Relieve component.

**TECHNICAL INFORMATION**

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

**TECHNICAL INFORMATION**

The drive belt must be replaced if contaminated with coolant- and oil residues.




- Increase the preload on the belt tensioner in **the direction of the arrow** using standard tools (1).
- Secure the belt tensioner with the special tool 0 496 268 (11 0 390).
- Guide out the drive belt for the alternator (2) and remove it.

**8 – Removing the alternator**

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**WARNING**

**Working on 12 V vehicle electrical system.**

**Risk of short circuits! Risk of fire!**

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

**WARNING**

**Hot surfaces.**

**Risk of burning!**

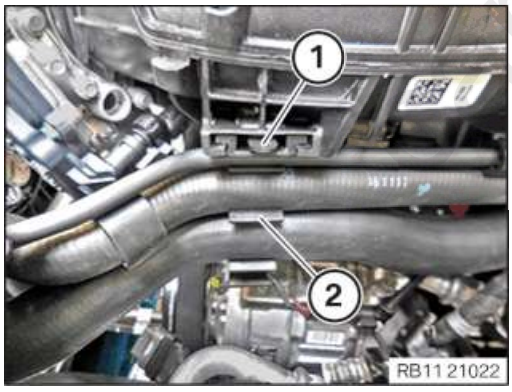
- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

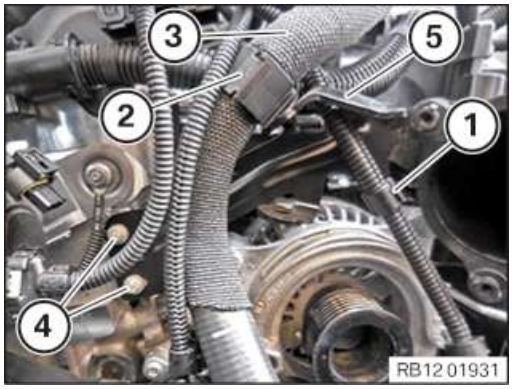
**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

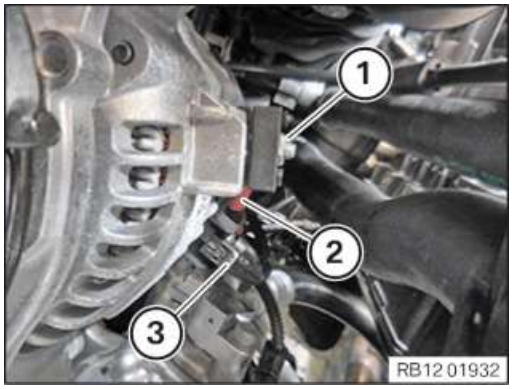
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



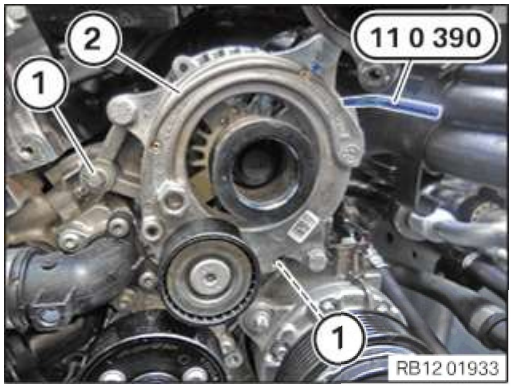

- Unlock the lock (1).
- Thread out holder (2) and set aside.



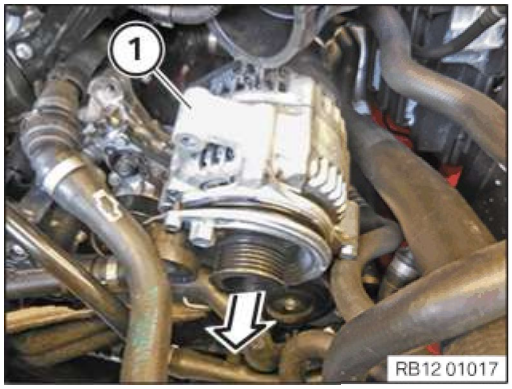

- Loosen clamp (1).
- Loosen clamp (2).
- Feed out coolant line (3) and place to one side.
- Loosen screws (4).
- Thread out holder (5) and set aside.




- Unfasten nut (1).
- Thread out positive battery cable (2) and set it aside.
- Unlock and loosen connector (3).




- Make sure that the special tool 0 496 268 (11 0 390) is fitted correctly.
- Loosen screws (1).
- Disconnect the alternator (2).




- Feed the alternator (1) out toward the front in the direction of the arrow.

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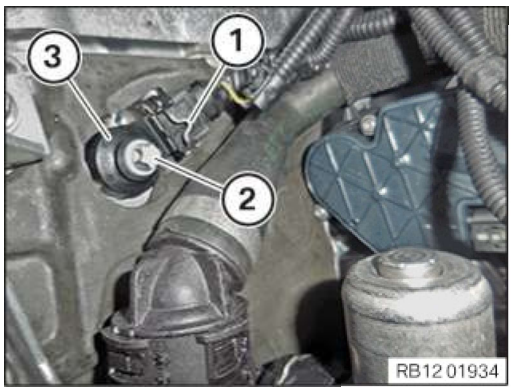
### 9 – Remove the knock sensors for cylinders 1 to 2

**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

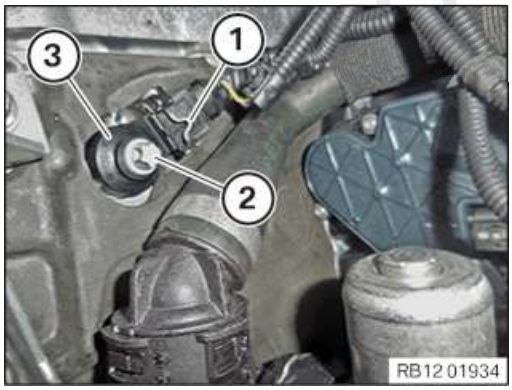



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove the knock sensor (3).

### 10 – Install the knock sensor for cylinders 1 to 2

**TECHNICAL INFORMATION**

When installing the knock sensors, the tightening torque must be observed.
Non-compliance with the tightening torque can lead to malfunction.




- Clean the contact surface of the knock sensor at the crankcase.
- Install knock sensor (3).
- Tighten down screw (2).

**Knock sensor to crankcase**

| | | | |
|---|---|---|---|
| M8x30 | Observe tightening torque without fail! | Tightening torque | 21,5 Nm |

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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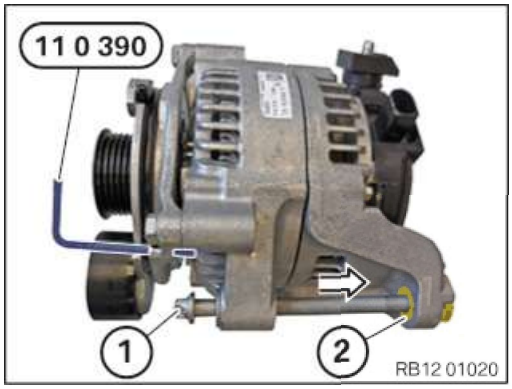
## 11 – Installing the alternator

**WARNING**

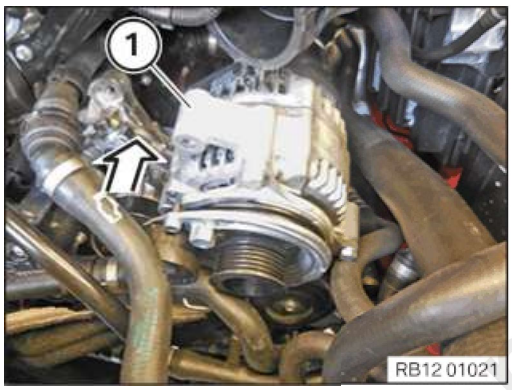
**Working on 12 V vehicle electrical system.**

**Risk of short circuits! Risk of fire!**

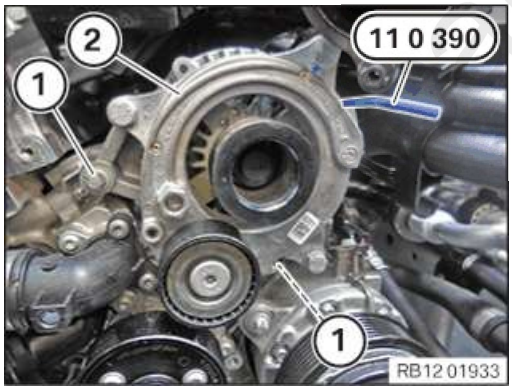
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.




- Make sure that the special tool 0 496 268 (11 0 390) is fitted correctly.
- Slightly push back the threaded support sleeve (2) in the direction of the arrow to facilitate the installation of the alternator.
- Screw the screw (1) into the threaded support sleeve (2).
- Press back the threaded support sleeve (2) using the bolt (1).
- Once again unscrew the screw (1) from the threaded support sleeve (2).




- Guide in alternator (1) in the direction of the arrow and position it.

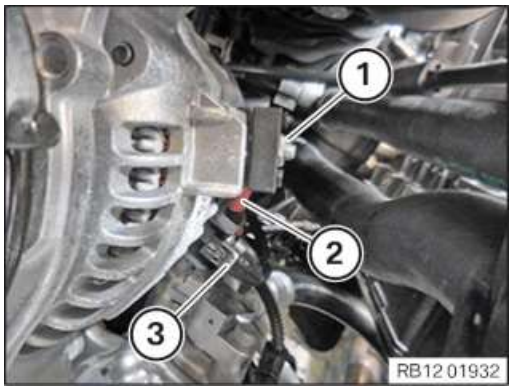



- Install the alternator (2).
- Tighten the screws (1).

**Alternator to component carrier**

| | | | |
|---|---|---|---|
| M10x75 | | Tightening torque | 38 Nm |
| M10x125 | | Tightening torque | 38 Nm |

- Make sure that the special tool 0 496 268 (11 0 390) is fitted correctly.

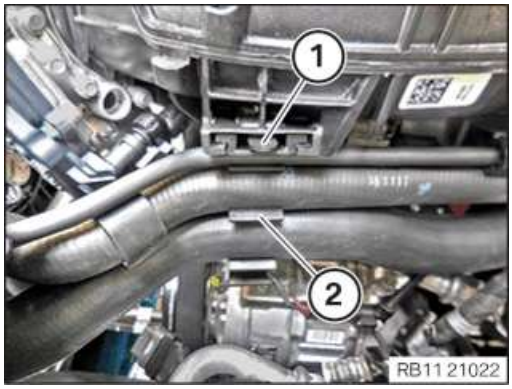



- Insert and install the positive battery cable (2).
- Tighten nut (1).

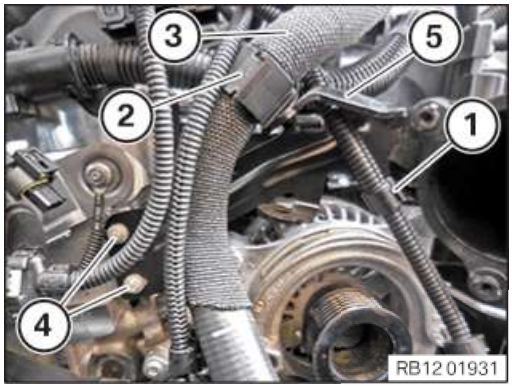
**Positive battery cable to the alternator**

| | | | |
|---|---|---|---|
| M8 | | Tightening torque | 19 Nm |

- Connect and lock the connector (3).
- The connector (3) must engage audibly.




- Insert and install the holder (2).
- Ensure that the lock (1)engages audibly.




- Insert and position the holders (5).
- Tighten down screws (4).

**Manifold support for intake air to cylinder head**

| | | | |
|---|---|---|---|
| M6X16 | | Tightening torque | 8 Nm |

- Guide coolant line (3) into clamp (2) and install it.
- Secure clamps (2).
- Secure the clamp (1).

## 12 – Installing the drive belt for alternator

**Overview of drive belt for alternator**




**1. Drive belt for alternator**

**TECHNICAL INFORMATION**

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

**TECHNICAL INFORMATION**

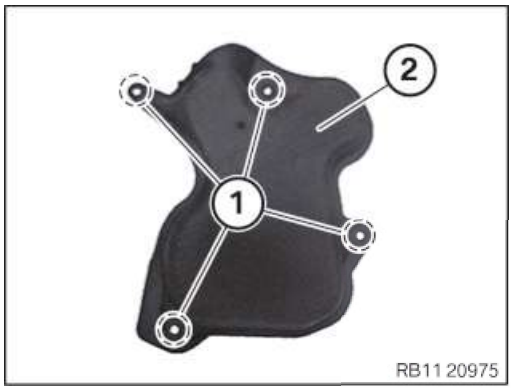
The drive belt must be replaced if contaminated with coolant- and oil residues.

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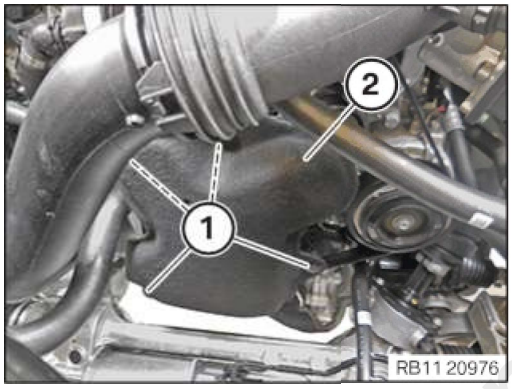

- Position the drive belt for alternator (2) on the ancillary components.
- Increase the preload on the belt tensioner in **the direction of the arrow** using standard tools (1).
- Feed the special tool 0 496 268 (11 0 390) out of the belt tensioner and remove it.

**13 – Install the acoustic cover for the engine at the front**

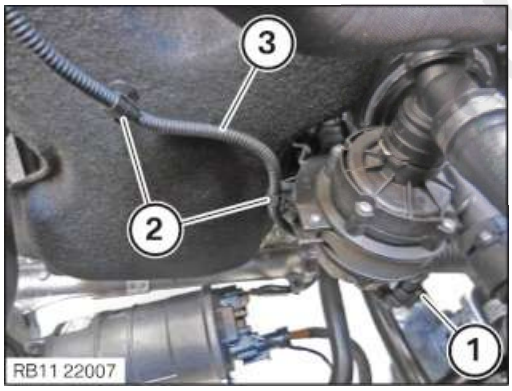



- Check if acoustic cover (2) in marked area (1) is damaged and replace acoustic cover (2) if necessary.

  **Parts:** Acoustic cover

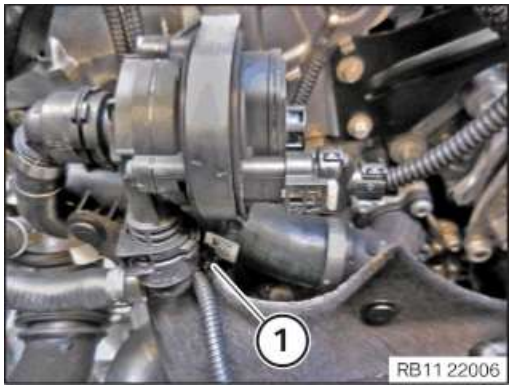



- Thread in and position the acoustic cover (2).
- Mount all expanding rivets (1).



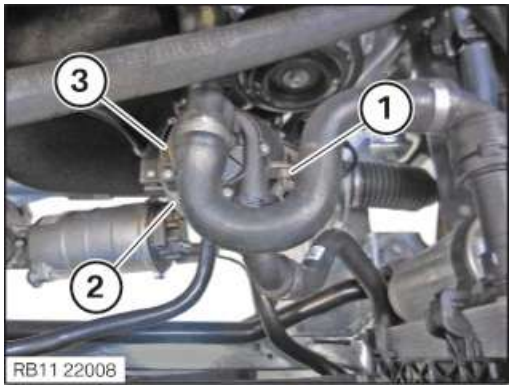

- Feed in and position wiring harness section (3).
- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.




- Secure clamps (1).

**14 – Mounting the electrical auxiliary coolant pump for the charge air cooler/air conditioning condenser**

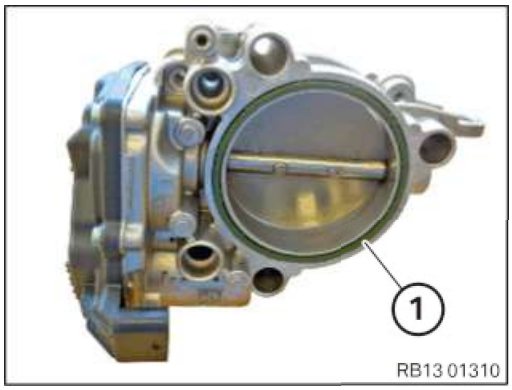



- Feed in and position the electrical auxiliary coolant pump (3).
- Insert and install the holder (2).
- Tighten nut (1).

**Electric coolant pump to holder**

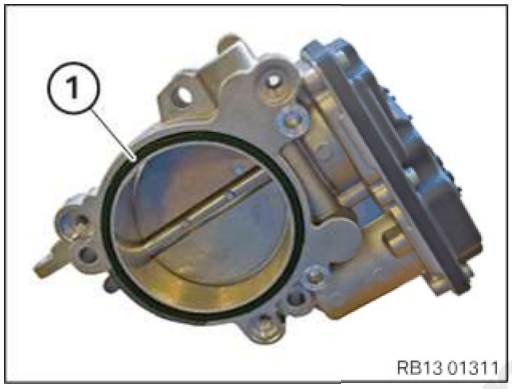
| | | | |
|---|---|---|---|
| M6 | | Tightening torque | 8 Nm |

**15 – Installing the throttle body**



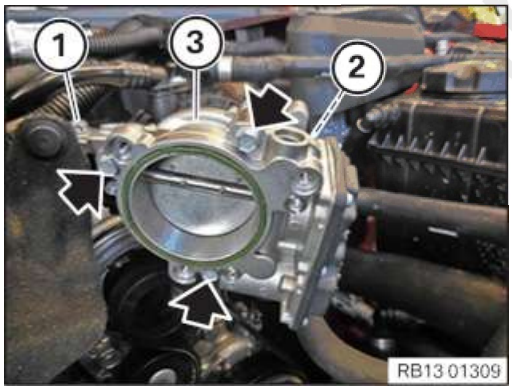

- Renew sealing ring (1).

  **Parts:** Sealing ring




- Renew sealing ring (1).

  **Parts:** Sealing ring




- Feed in and install the throttle body (3).
- Connect and lock the connector (2).
- Tighten screws (arrows).

**Throttle body to intake plenum**

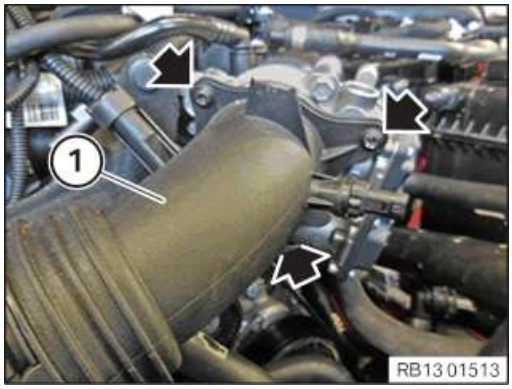
| | | | |
|---|---|---|---|
| M6X50 | | Tightening torque | 7 Nm |

- Tighten down screw (1).

**Throttle body to holder**

| | | | |
|---|---|---|---|
| M6X25 | | Tightening torque | 8 Nm |

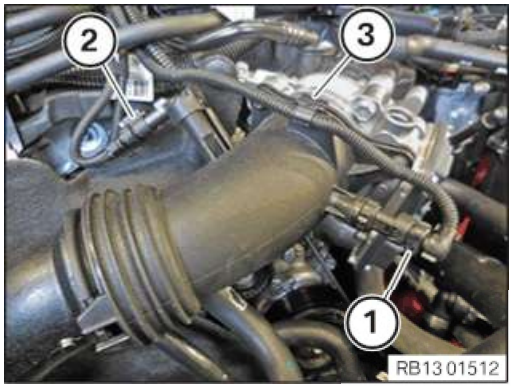
.diagn.com




- Insert and install charge air line (1).
- Tighten screws (arrows).

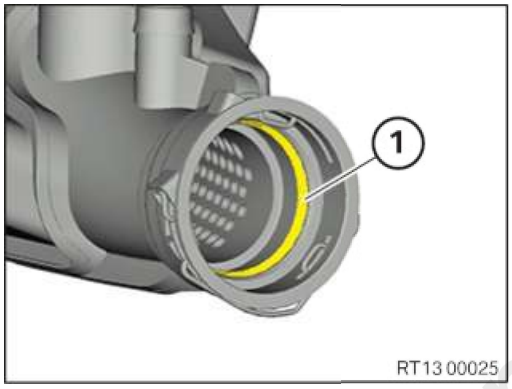
**Charge air line to throttle body**

| | | | |
|---|---|---|---|
| M6 | | Tightening torque | 8 Nm |




- Connect and lock the connector (1).
- Connect and lock the connector (2).
- Secure clamps (3).

**16 – Installing the clean air pipe with resonator**

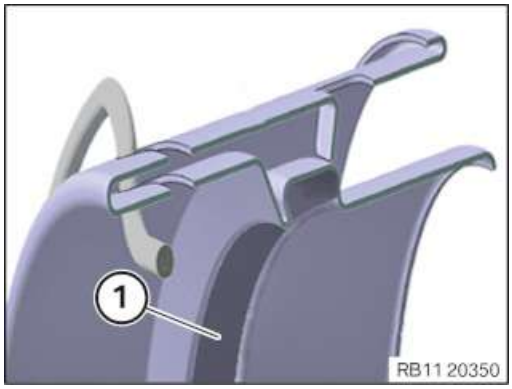



- Check the seal (1) for damages, replace if necessary.

▶ **Replace damaged gasket**

**TECHNICAL INFORMATION**

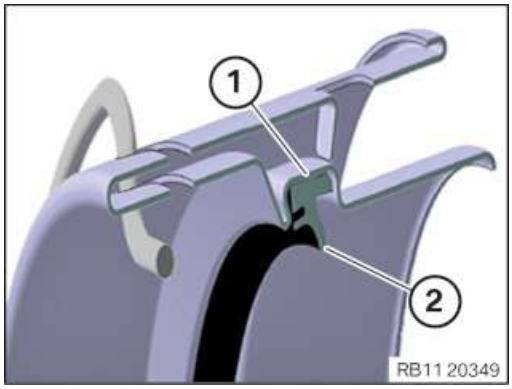
Do not use pointed or sharp-edged tools for the installation and/or removal.




- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.

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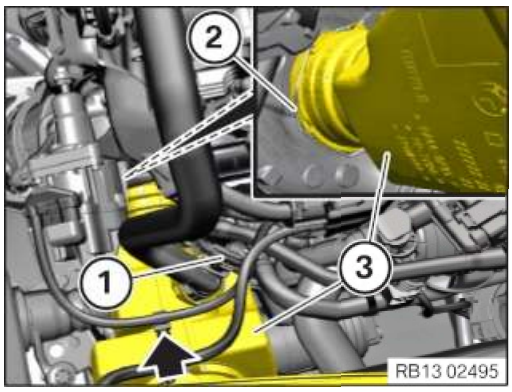

- Renew gasket.

  **Parts:** Gasket
- Install seal dry without lubricant or mounting agent.

**TECHNICAL INFORMATION**

Incorrect assembly is possible. Ensure correct installation position.

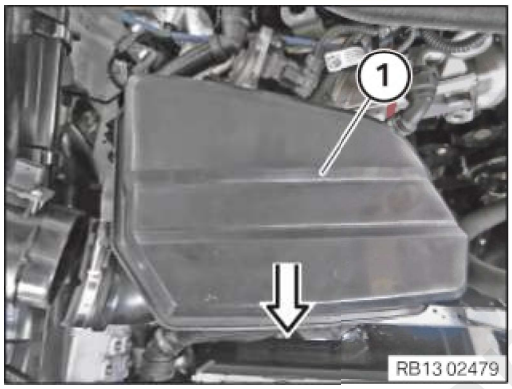
- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



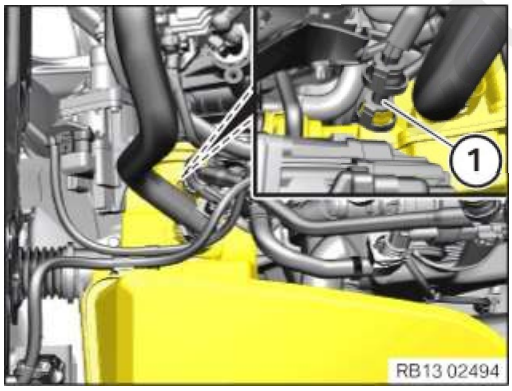

- Guide in and install the clean air pipe with resonator (3).
- Lock clamp (2).

  The clamp (2) must engage audibly.
- Connect connectors (1) and lock.

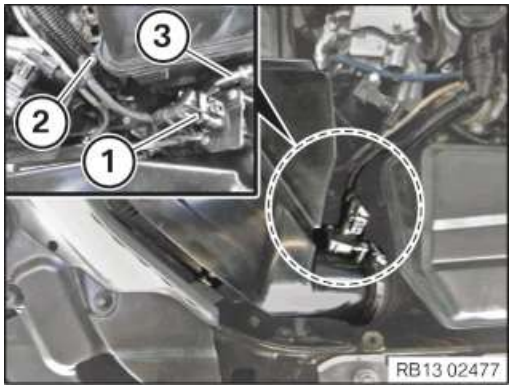
  The connector (1) must engage audibly.
- Secure clamp (arrow).




- Press and hold clean air pipe with resonator (1) in the direction of the arrow.




- Connect and lock the tank ventilation line (1).




- Connect the clean air pipe with resonator to the intake filter housing.
- Tighten clamp (3).

**Clean air pipe to upper section of intake filter housing**

| | | | |
|---|---|---|---|
| Clamp | | Tightening torque | 3 Nm |

- Secure the clamp (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

diag.com




- Insert and install the engine ventilation line (2).
- Ensure that the locks (1) engage audibly.

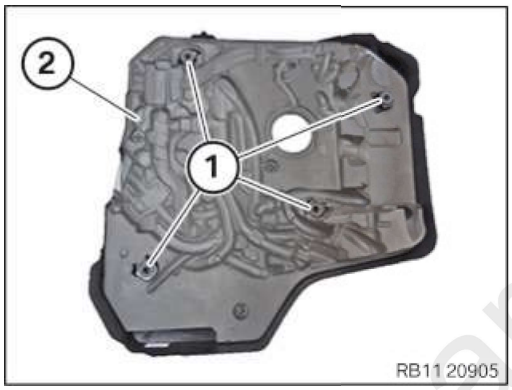
**17 – Install acoustic cover**

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Check all rubber mounts (1) of acoustic cover (2) for correct seating.




- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

**18 – Disconnecting all battery earth leads**

ardiagn.com




- See additional information.

## Additional Information

### Overview of Tightening Torques

| Knock sensor to crankcase | | | Used in step 10 |
|---|---|---|---|
| M8x30 | Observe tightening torque without fail! | Tightening torque | 21,5 Nm |

| Alternator to component carrier | | | Used in step 11 |
|---|---|---|---|
| M10x75 | | Tightening torque | 38 Nm |
| M10x125 | | Tightening torque | 38 Nm |

| Positive battery cable to the alternator | | | Used in step 11 |
|---|---|---|---|
| M8 | | Tightening torque | 19 Nm |

| Manifold support for intake air to cylinder head | | | Used in step 11 |
|---|---|---|---|
| M6X16 | | Tightening torque | 8 Nm |

| Electric coolant pump to holder | | | Used in step 14 |
|---|---|---|---|
| M6 | | Tightening torque | 8 Nm |

| Throttle body to intake plenum | | | Used in step 15 |
|---|---|---|---|
| M6X50 | | Tightening torque | 7 Nm |

| Throttle body to holder | | | Used in step 15 |
|---|---|---|---|
| M6X25 | | Tightening torque | 8 Nm |

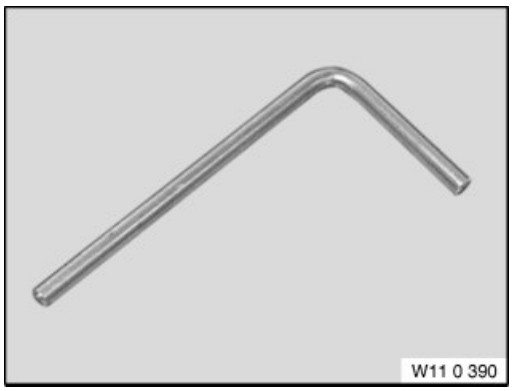
| Charge air line to throttle body | | | Used in step 15 |
|---|---|---|---|
| M6 | | Tightening torque | 8 Nm |

| Clean air pipe to upper section of intake filter housing | | | Used in step 16 |
|---|---|---|---|
| Clamp | | Tightening torque | 3 Nm |

### Overview of Special Tools

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**0 496 268 (11 0 390) Pin**




| Common | Used in step 781112 |
|---|---|
| Usage | (roll pin) For securing new tensioning pulley (poly-V belt) |
| Included in the tool or work | |
| Storage location | B24 |
| Replaced by | |
| In connection with | |
| SI-Number | 01 15 07 (390) |

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## Links

| Repair instructions | Used in step |
|---|---|
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 118 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 118 |
| 61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
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| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 20 900 Disconnecting and connecting battery earth lead | 118 |
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 4 |
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 4689 |


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# 12 14 604 Replacing knock sensor

**WARNING**

**Working on 12 V vehicle electrical system.**

**Risk of short circuits! Risk of fire!**

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

**RISK OF DAMAGE**

**Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).**

**Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.**

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

## PRELIMINARY WORK

### 1 – Disconnecting all battery earth leads




- See additional information.

### 2 – Remove the seal for the rear bonnet




- Feed the cable (1) out of the brackets toward the front.
- Remove the rear bonnet seal (2) from the guide toward the inside.

### 3 – Removing the acoustic cover

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**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

**4 – Removing acoustic cover at rear**




- Unclip the acoustic cover (1) in the marked areas and remove it to the top.

**5 – Removing the DME control unit**

rdiagn.com

**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

**TECHNICAL INFORMATION**

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

**TECHNICAL INFORMATION**

In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

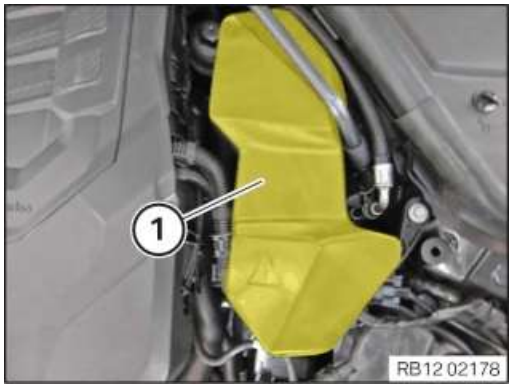
**TECHNICAL INFORMATION**

Control unit must be programmed after it is replaced.

For additional information see: 61 00 ... Programming/encoding control unit(s)

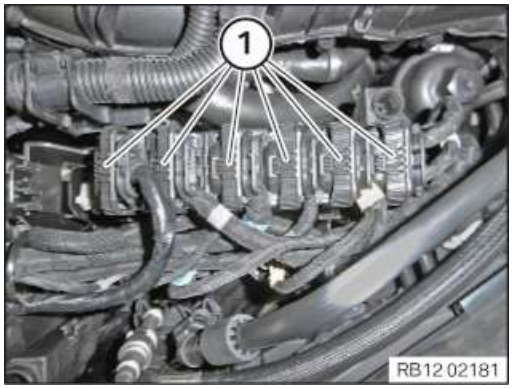
**TECHNICAL INFORMATION**

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

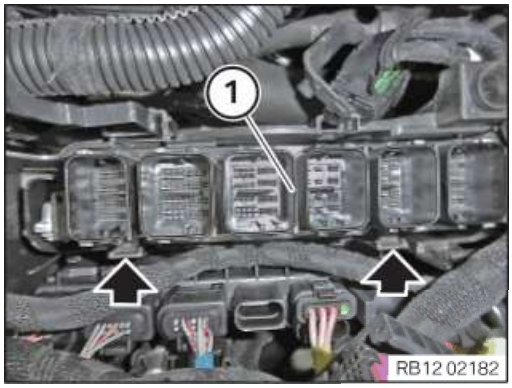



- Pull the cover (1) towards the top and feed out.

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- Unlock and disconnect the plug connection (1).




- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

**6 – Removing integrated supply module (PDM)**

**WARNING**

**Working on 12 V vehicle electrical system.**

**Risk of short circuits! Risk of fire!**

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

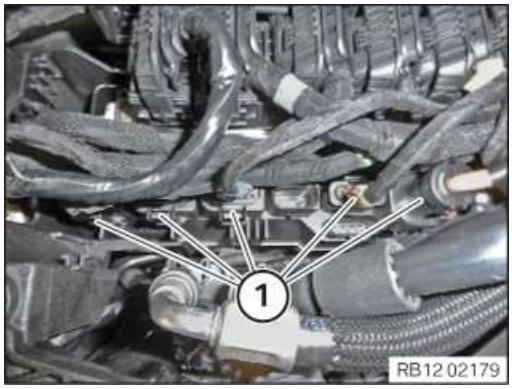
**RISK OF DAMAGE**

**Electrostatic discharge.**

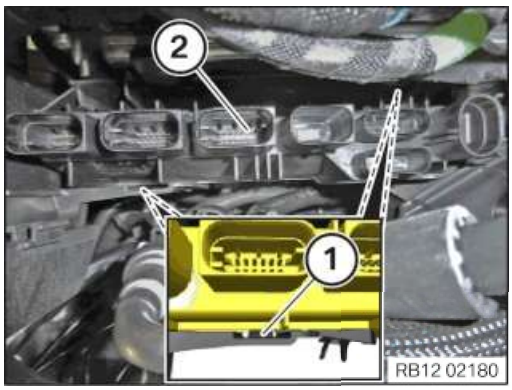
**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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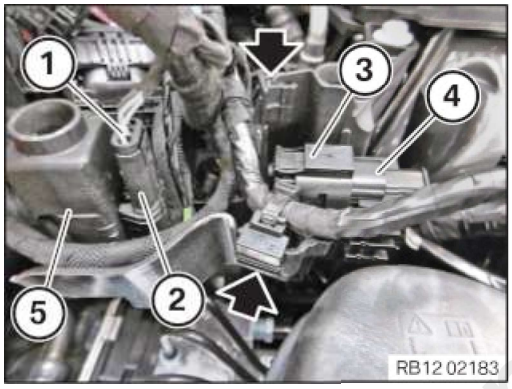



- Unlock and disconnect plug connections (1).

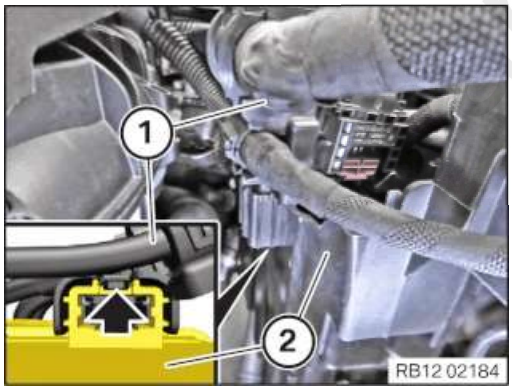



- Unlock the latch mechanisms (1).
- Guide out and remove integrated supply module (PDM) (2) upwards.

**7 – Removing the control unit holder**




- Unlock plug connection (1) and disconnect.
- Unlock the connector (2) and disconnect from the starter (5).
- Unlock plug connection (3) and disconnect.
- Unlock the connector (4) and disconnect from the starter (5).
- Release the clamps (arrows).

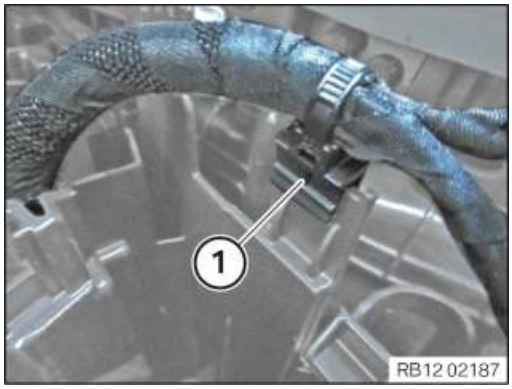



- Unlock the lock (arrow).
- Disconnect the cable plug (1) upwards from the control unit holder (2).

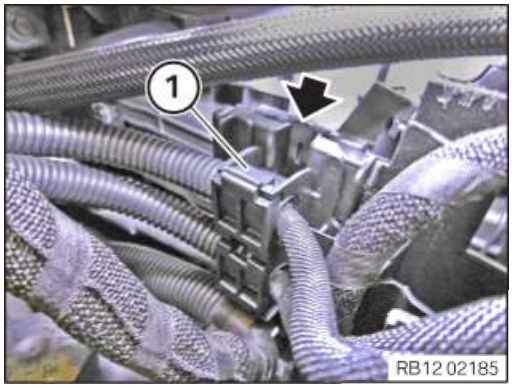



- Loosen clamp (1).

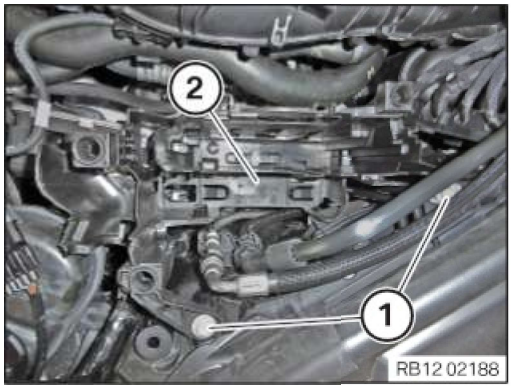
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- Loosen clamp (1).




- Unlock the lock (arrow).
- Feed out the cable clip (1) upwards and set it aside.




- Loosen screws (1).
- Guide out and remove the control unit holder (2).

**8 – Remove tank vent valve**

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

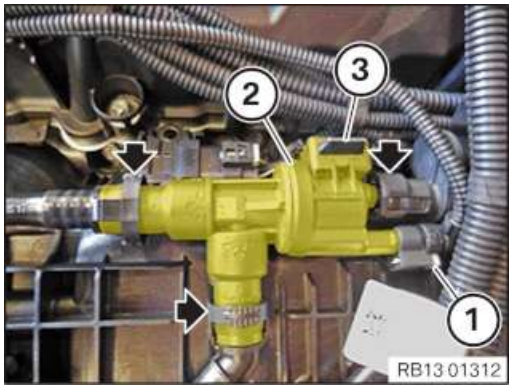
**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

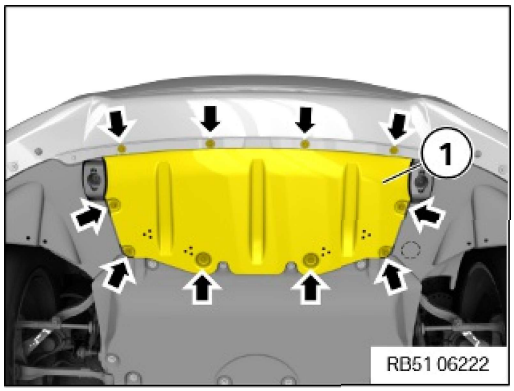
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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- Unlock and disconnect the tank ventilation lines (arrows).
- Unlock and loosen connector (1).
- Remove the tank vent valve (2) from the holder (3).

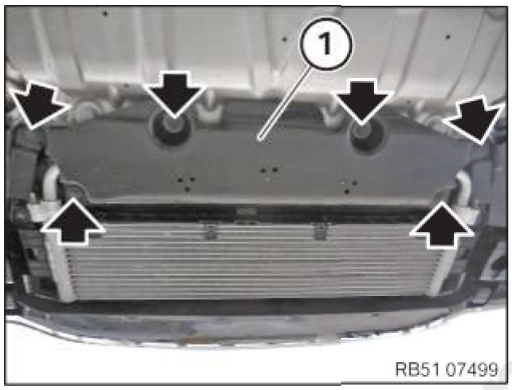
**9 – Removing the front underbody protection**




- **Version 1:**

  Remove screws (arrows).

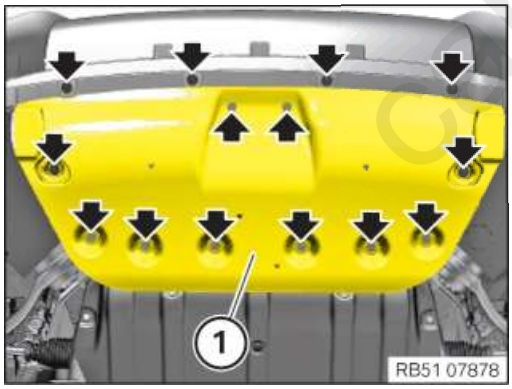
  Feed front underbody protection (1) backwards out of the bumper panel.




- **Version 2:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.

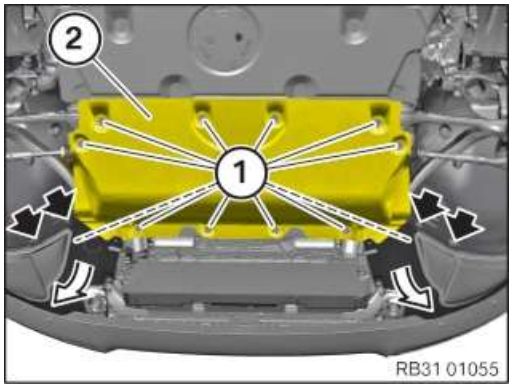



- **Version 3:**

  Remove screws (arrows).

  Guide out front underbody protection (1) and remove it.

**10 – Remove the underbody protection of the steering gear**




- **Version 1:**

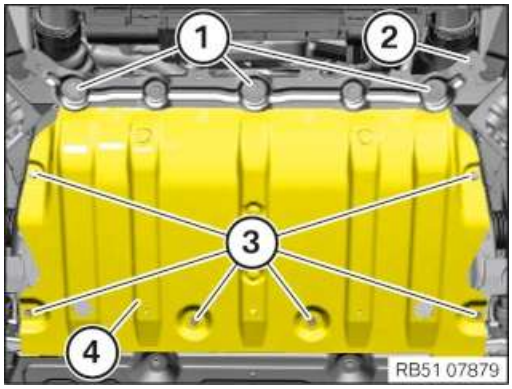
  Unscrew the screws (arrows) of the wheel arch cover on wheel arch cover.

  Fold the bottom wheel arch cover to the side.

  Loosen screws (1).

  Remove underbody protection of the steering gear (2).

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- **Version 2:**

  Loosen screws (1).

  Remove the holder of the underride protection (2).

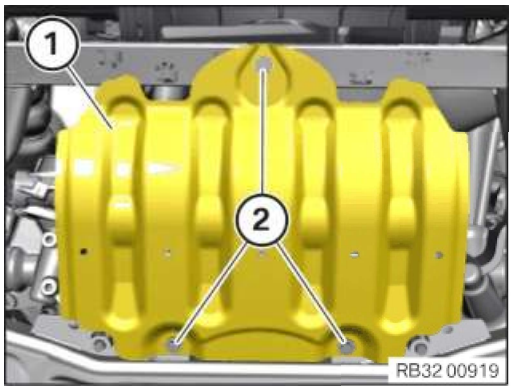
  Loosen screws (3).

  Slide the steering gear underbody protection (4) out and remove.

**11 – If installed: Removing the steering start protection**

**Prerequisite**

The front underbody protection is removed.




- Loosen screws (2).
- Remove guard (1).

**12 – Draining the coolant from the low-temperature cooling system**

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

**TECHNICAL INFORMATION**

**Life-long fill of coolant!**

Do not reuse used coolant.

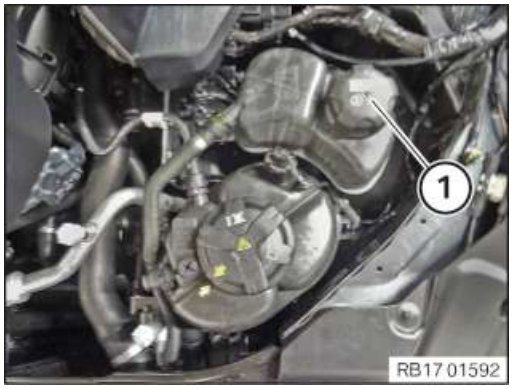
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

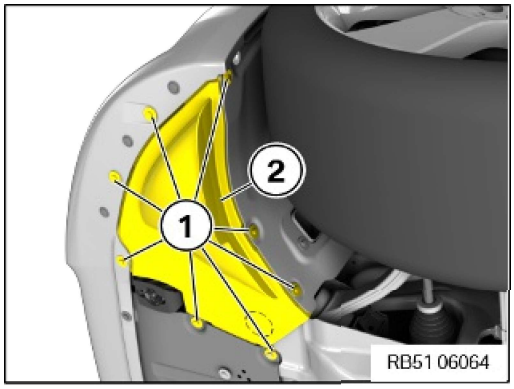
**TECHNICAL INFORMATION**

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

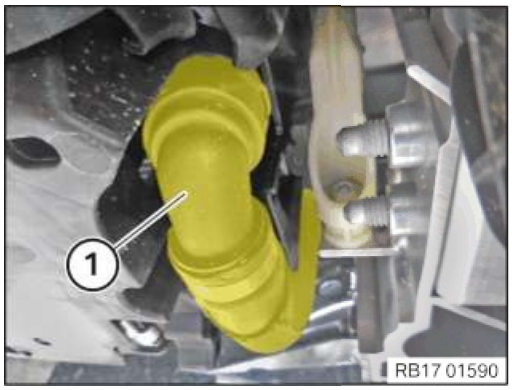
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- Loosen sealing cap (1).




- Loosen screws (1).
- Guide out and remove bottom left cover (2) to the front.

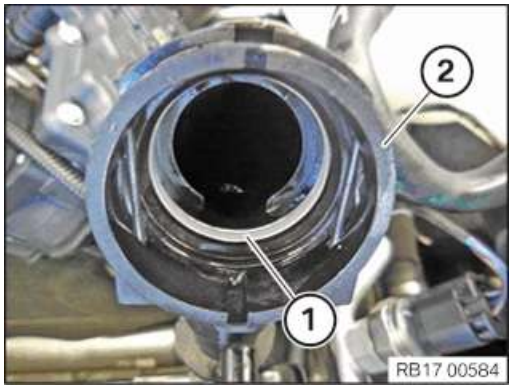



- Unlock and disconnect the coolant line (1).
- Catch and dispose of escaping coolant.

**13 – Connecting the coolant lines for the low-temperature coolant circuit**

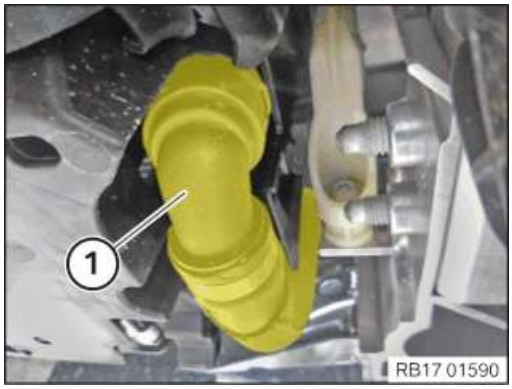
**TECHNICAL INFORMATION**

Make sure that the connections are locked correctly. The locks must engage audibly.



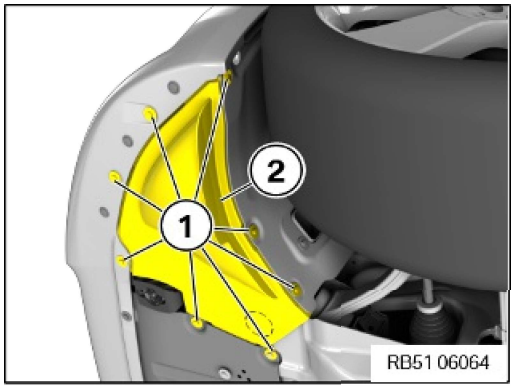

- Check the sealing rings (1) of the coolant lines (2) for damage and renew if necessary.

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- Connect and lock the coolant line (1).

  The coolant line (1) must audibly engage.




- Feed in and install cover (2) at the bottom front left.
- Tighten the screws (1).

**Cover, front bottom on side**

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 3 Nm |

### 14 – Removing the intake plenum

**RISK OF DAMAGE**

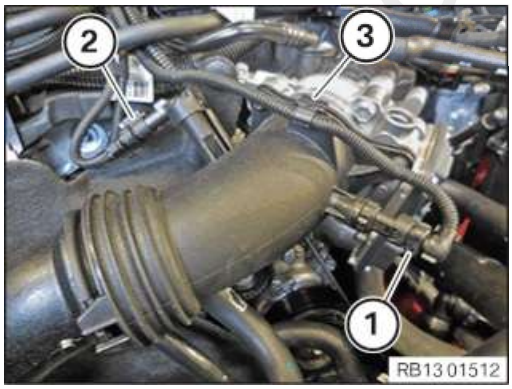
**Damage to wires when disconnecting connectors and plug connections.**

**Sheared wires can cause a short circuit.**

- Do not pull on the wires when disconnecting connectors and plug connections.

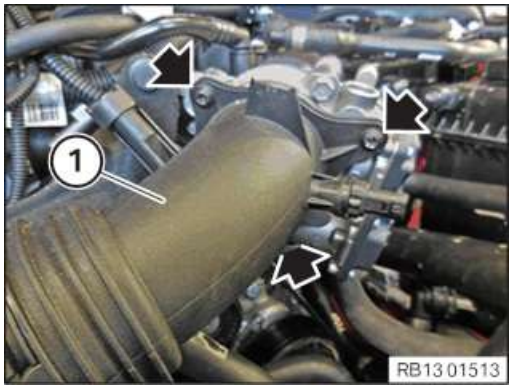
**TECHNICAL INFORMATION**

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

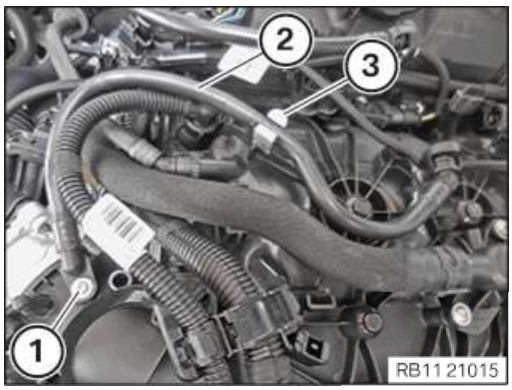



- Unlock plug connection (1) and disconnect.
- Unlock plug connection (2) and disconnect.
- Unlock and loosen clamp (3).

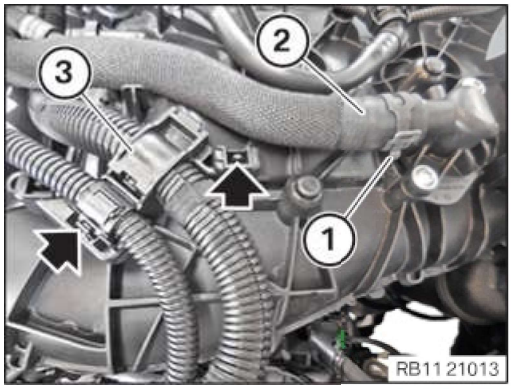
cardiagn.com



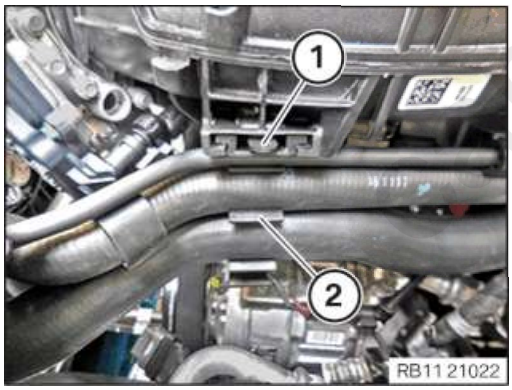

- Remove screws (arrows).
- Feed out charge air line (1) and place to one side.




- Loosen screw (1).
- Guide tank ventilation line (2) out of clamp (3) and remove it.




- Release the clamping collar (1) with the special tool 0 495 794 (17 2 050).
- Guide the coolant hose (2) out and remove.
- Catch and dispose of escaping coolant.
- Unlock the locks (arrows).
- Guide out the wiring harness section (3) for sensor system 2 and place to one side.

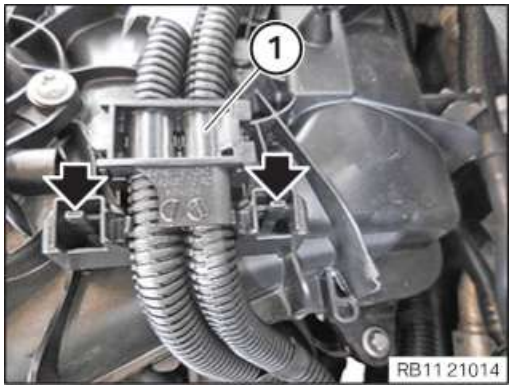



- Unlock the lock (1).
- Thread out holder (2) and set aside.

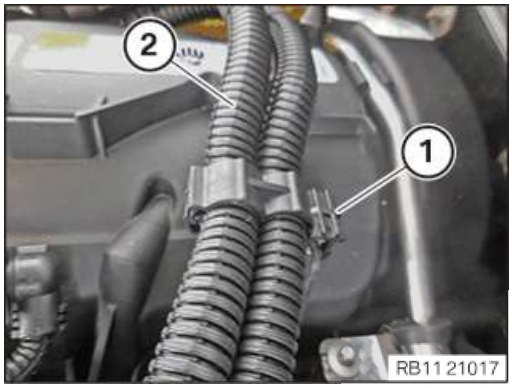



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).

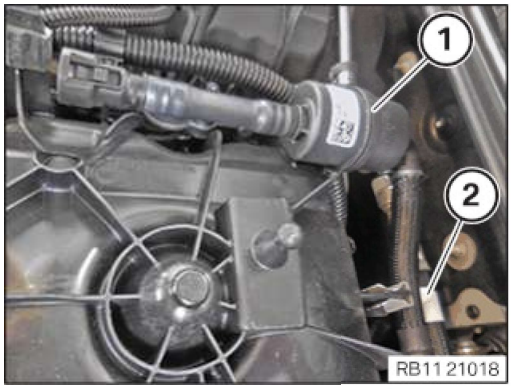
obdiagn.com



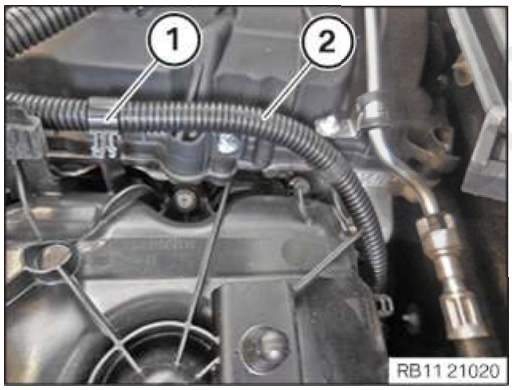

- Unlock the locks (arrows).
- Thread out the wiring harness section (1) for the injectors and ignition coils and set it aside.




- Loosen clamp (1).
- Thread out the wiring harness section (2) for the injectors and ignition coils and set it aside.




- Guide tank ventilation line (1) out of clamp (2) and place it aside.

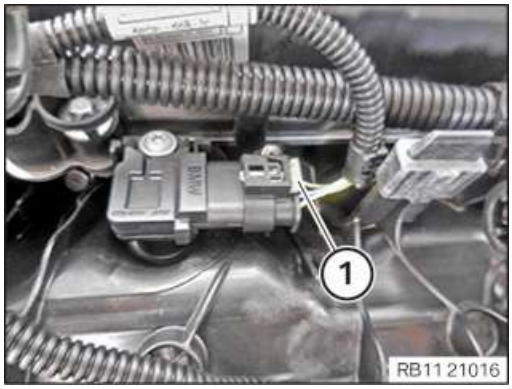



- Loosen clamp (1).
- Guide out the wiring harness section (2) for the sensor system 1 and place to one side.

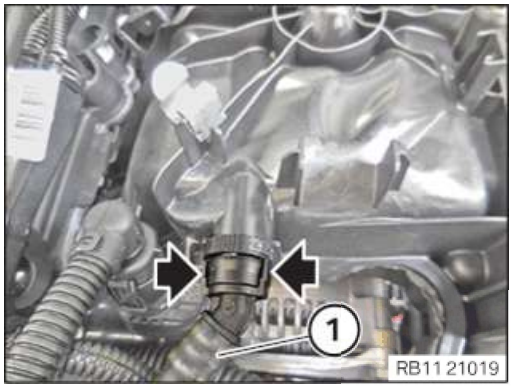



- Loosen screw (1).

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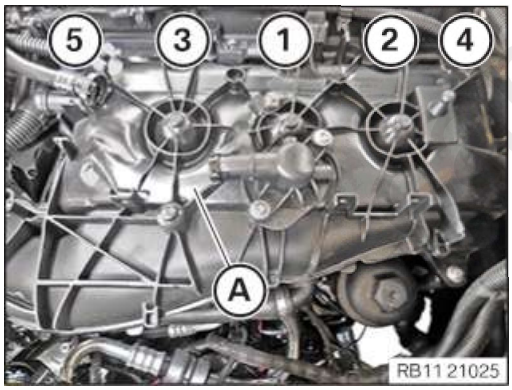

- Unlock plug connection (1) and disconnect.




- Unlock the locks (arrows).
- Feed the tank ventilation line (1) out and set it aside.




- Unlock and release coolant feed line (1).
- Catch and dispose of escaping coolant.




**TECHNICAL INFORMATION**

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Loosen screws in the order (5) to (1).
- Thread out intake plenum (A) and remove.

**MAIN WORK**

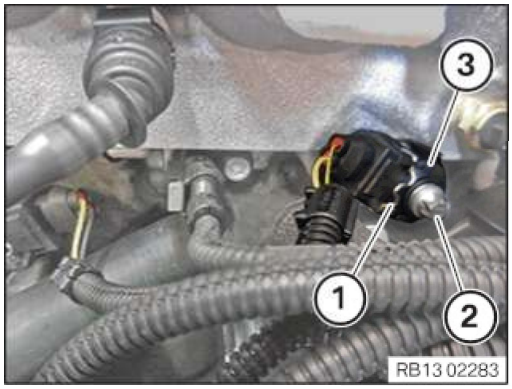
**15 – Remove the knock sensors for cylinders 3 to 4**

**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

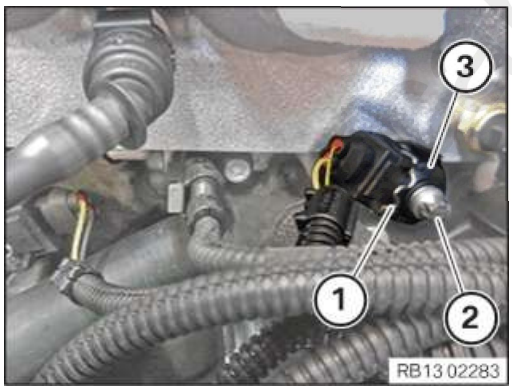



- Unlock and loosen connector (1).
- Loosen screw (2).
- Remove the knock sensor (3).

**16 – Install the knock sensors for cylinders 3 to 4**

**TECHNICAL INFORMATION**

When installing the knock sensors, the tightening torque must be observed.
Non-compliance with the tightening torque can lead to malfunction.




- Clean the contact surface of the knock sensor at the crankcase.
- Install knock sensor (3).
- Tighten down screw (2).

**Knock sensor to crankcase**

| | | | |
|---|---|---|---|
| M8x30 | Observe tightening torque without fail! | Tightening torque | 21,5 Nm |

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

## POSTPROCESSES

**17 – Installing the intake plenum**

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**RISK OF DAMAGE**

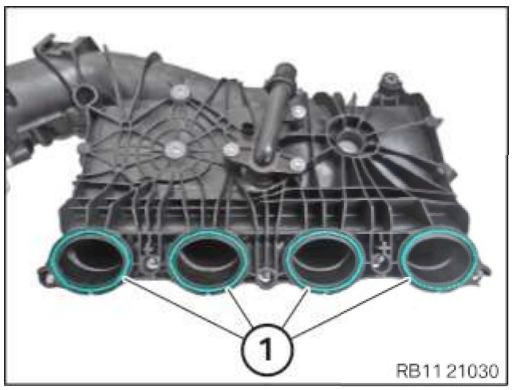
**Improper routing of cables and wiring harnesses.**

**Trapped, crushed or damaged cables may cause short circuits and malfunctions.**

- Route all cables without abrasions, do not trap and crush.

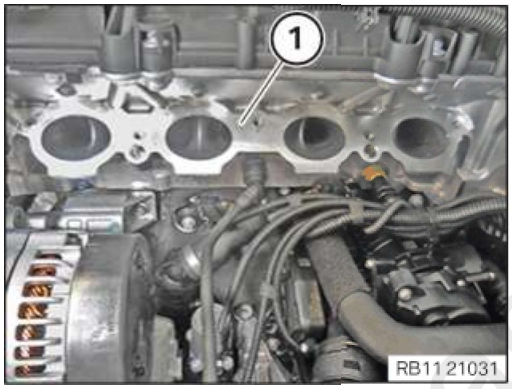
**TECHNICAL INFORMATION**

Make sure that the connections are locked correctly. The locks must engage audibly.

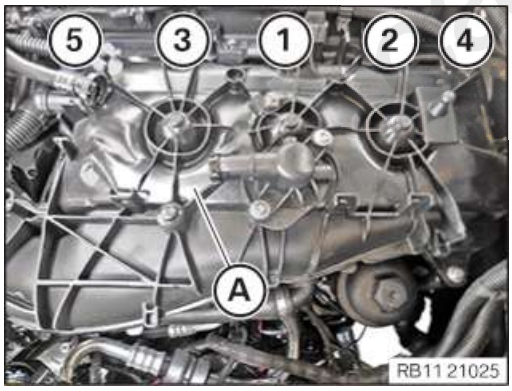



- Renew gaskets (1).

  **Parts:** Seals




- Clean contact surface (1).




**TECHNICAL INFORMATION**

Additional coolant can escape. Make sure that no coolant enters the intake port of the cylinder head.

- Guide in and position intake plenum (A) on the cylinder head.
- Tighten screws in the order (1) to (5).

**Note:** Tighten the bolts in 360 degree steps.

**Intake plenum to cylinder head**

| | | | |
|---|---|---|---|
| M6 | | Tightening torque | 10 Nm |

autodiag.com



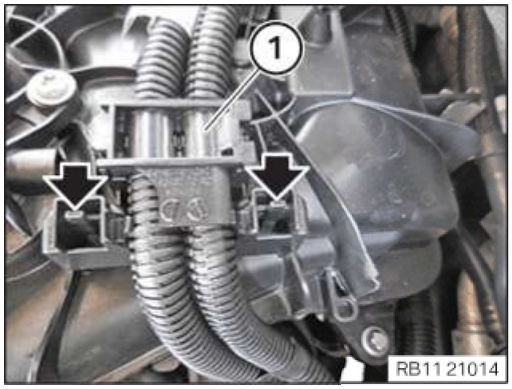

- Connect and lock coolant feed line (1).
- Make sure that coolant feed line (1) engages audibly.




- Tighten down screw (1).

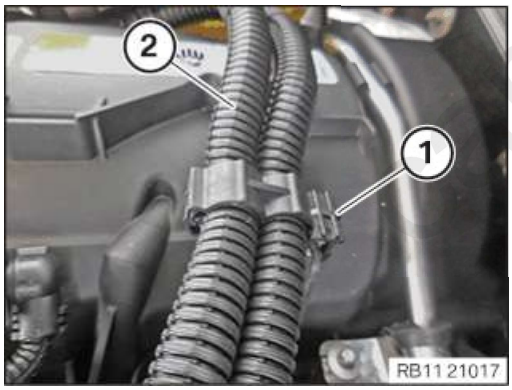
**Intake plenum to support**

| | | | |
|---|---|---|---|
| M6X25 | | Tightening torque | 8 Nm |

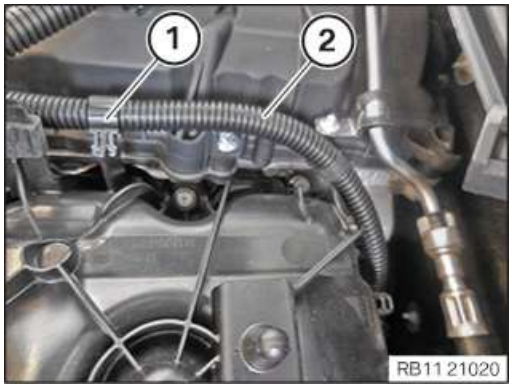



- Insert and install the wiring harness section (1) for the injectors and ignition coils.

  The locks (arrows) must engage audibly.




- Insert and install the wiring harness section (2) for the injectors and ignition coils.
- Secure clamps (1).




- Guide in and install wiring harness section (2) for sensor system 1.
- Secure clamps (1).

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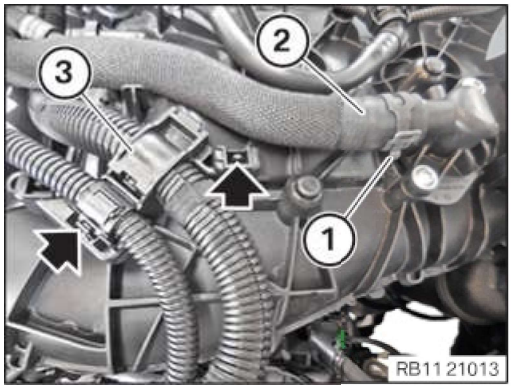

- Insert and install the tank ventilation line (1).
- Secure the tank ventilation line (1) to the clamp (2).



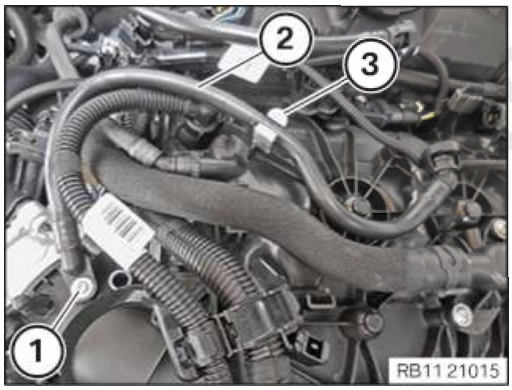

- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.
- Tighten down screw (2).

**Throttle body to holder**

| | | | |
|---|---|---|---|
| M6X25 | | Tightening torque | 8 Nm |



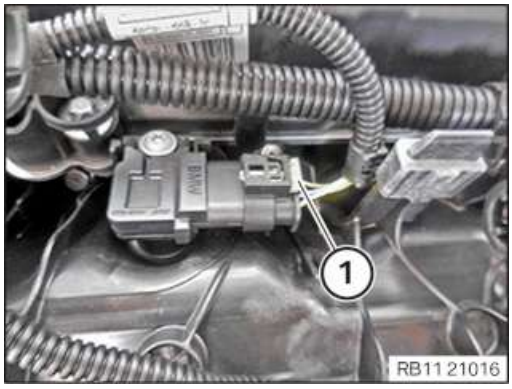

- Insert and install the coolant hose (2).
- Secure clamping collar (1) with the special tool 0 495 794 (17 2 050).
- Guide in and install wiring harness section (3) for sensor system 2.
- Make sure that you can hear the locks (arrows) engage.




- Insert and install the tank ventilation line (2).
- Secure the tank ventilation line (2) to the clamp (3).
- Tighten down screw (1).

**Tank ventilation line to intake plenum**

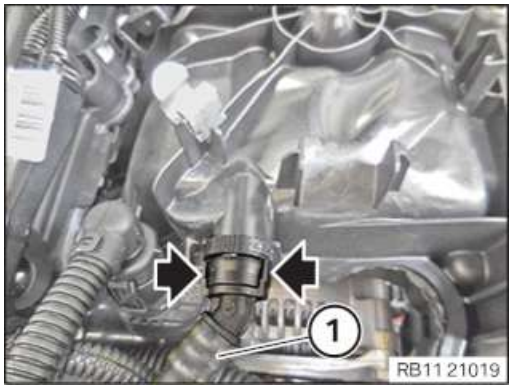
| | | | |
|---|---|---|---|
| Oval-head screw | | Tightening torque | 3 Nm |




- Connect connectors (1) and lock.

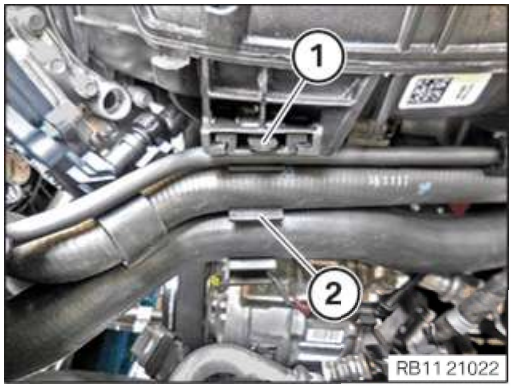
  The connector (1) must engage audibly.

obdiagn.com

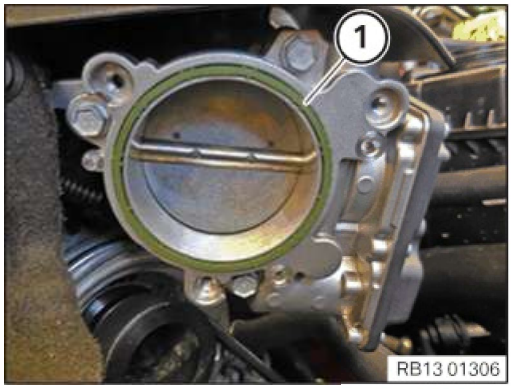



- Insert and install the tank ventilation line (1).

  The locks (arrows) must engage audibly.

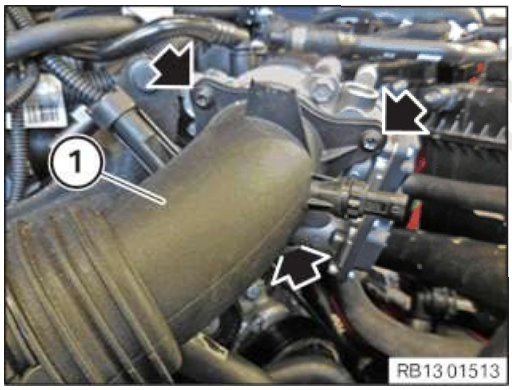



- Insert and install the holder (2).
- Ensure that the lock (1)engages audibly.




- Renew the gasket (1).

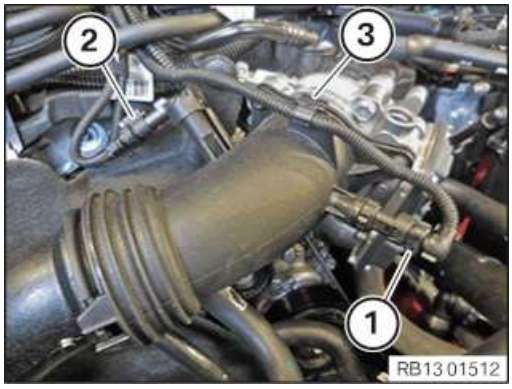
  **Parts:** Gasket




- Insert and install charge air line (1).
- Tighten screws (arrows).

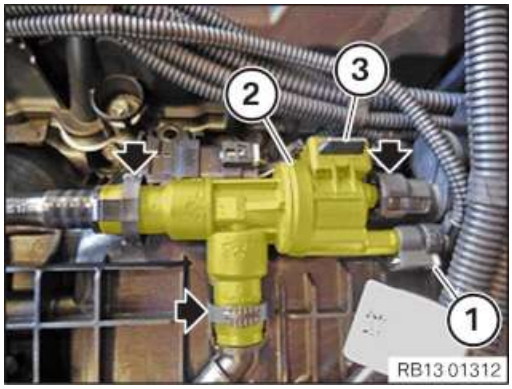
**Charge air line to throttle body**

| | | | |
|---|---|---|---|
| M6 | | Tightening torque | 8 Nm |




- Connect connectors (1) and lock.
- Connect connectors (2) and lock.
- Make sure you can hear the connectors (1) and (2) engage.
- Secure clamps (3).

**18 – Installing the tank vent valve**

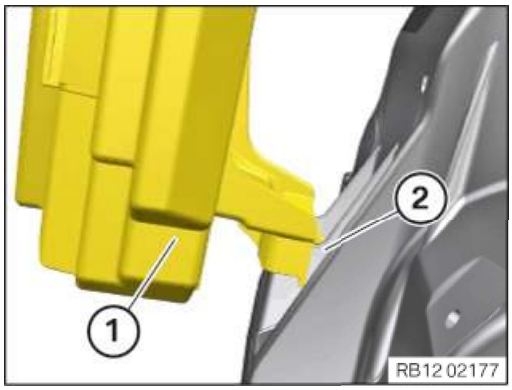



- Secure the tank vent valve (2) to the holder (3).
- Connect and lock the tank ventilation lines (arrows).

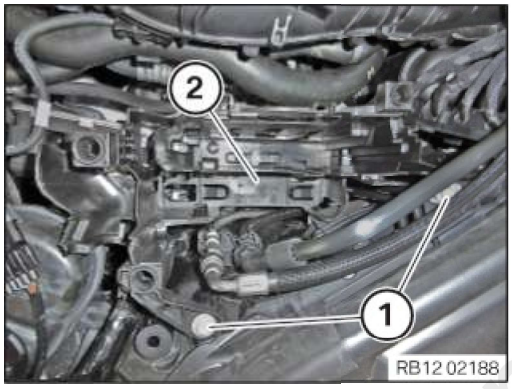
  The tank ventilation lines (arrows) must audibly engage.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

**19 – Installing the control unit holder**



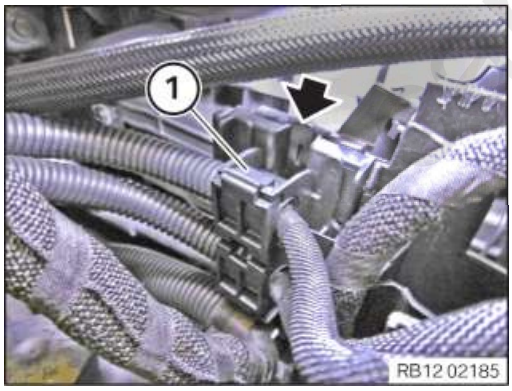

- Make sure the bottom control unit holder (1) is inserted correctly into the fixture (2).




- Guide in and install control unit holder (2).
- Tighten the screws (1).

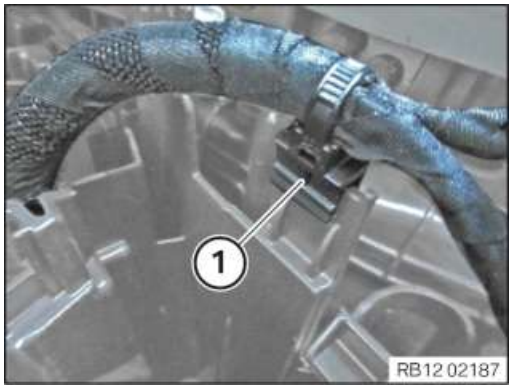
**Control unit holder on spring strut dome**

| | | |
|---|---|---|
| Hexagon screw | Tightening torque | 8 Nm |



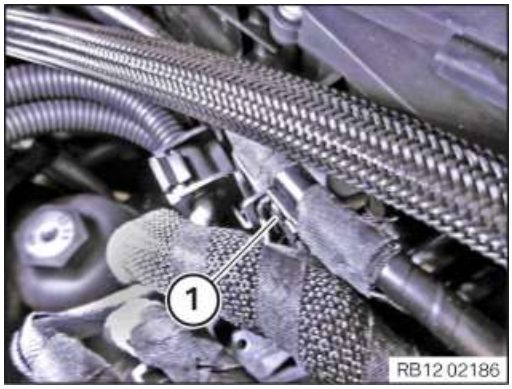

- Feed in and install the cable clip (1).

  Lock (arrow) must audibly engage.

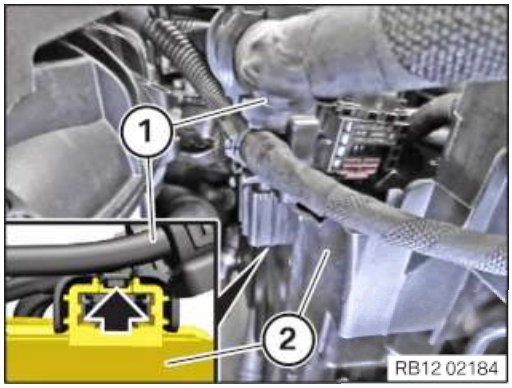



- Secure clamps (1).

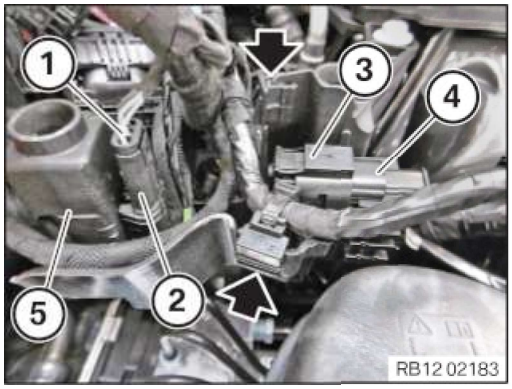
mydiagn.com




- Secure clamps (1).




- Connect the cable clip (1) with the control unit holder (2) and lock.
  Lock (arrow) must audibly engage.




- Connect and lock the connector (4) with the control unit holder (5).
  The connector (4) must engage audibly.
- Connect connectors (3) and lock.
  The connector (3) must engage audibly.
- Connect and lock the connector (2) with the control unit holder (5).
  The connector (2) must engage audibly.
- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure the clamps (arrows).

**20 – Installing the integrated supply module (PDM)**

**WARNING**

**Working on 12 V vehicle electrical system.**

**Risk of short circuits! Risk of fire!**

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

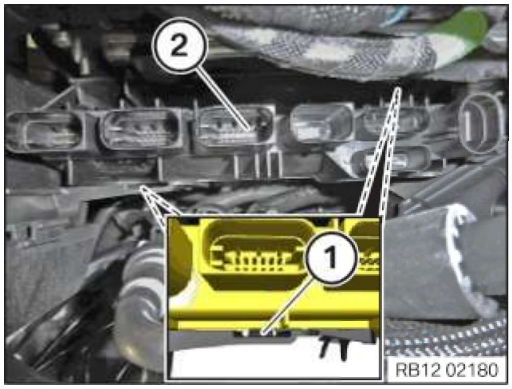
cardiagn.com

**RISK OF DAMAGE**

**Electrostatic discharge.**

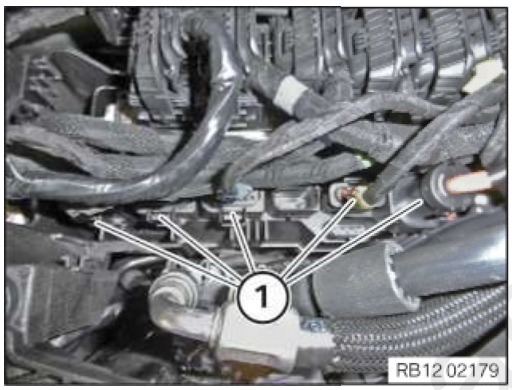
**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.




- Insert and install the integrated supply module (PDM) (2).

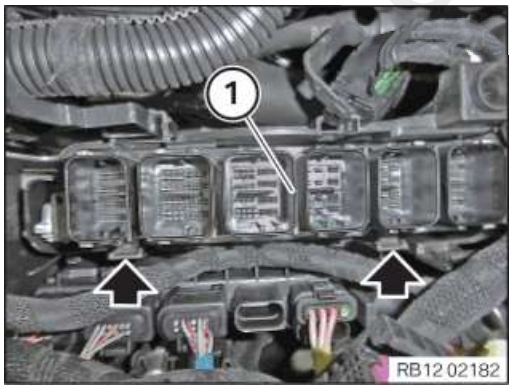
  The latch mechanisms (1) must engage audibly.
- Unlock the latch mechanisms (1).




- Connect connectors (1) and lock.

  The connectors (1) must engage audibly.

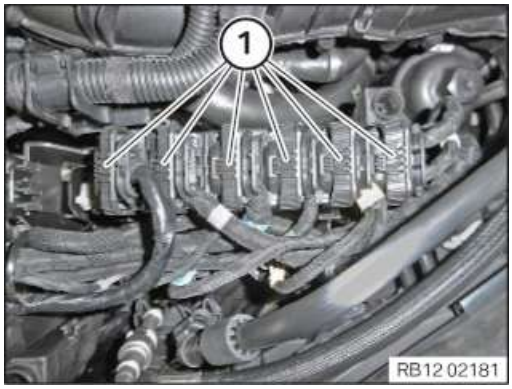
**21 – Installing the DME control unit**




- Feed in and install DME control unit (1).

  The locks (arrows) must engage audibly.

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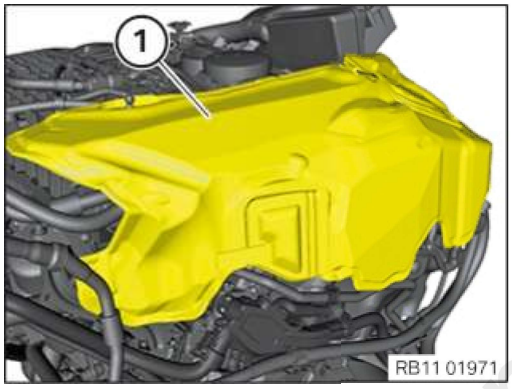

- Connect connectors (1) and lock.

  All connectors (1) must engage audibly.




- Insert and install cover (1) into guides.

**22 – Installing acoustic cover at rear**




- Make sure the acoustic cover (1) is correctly positioned on the rear side of the engine.




- Install the acoustic cover (1) from the top and clip it in into the marked areas.

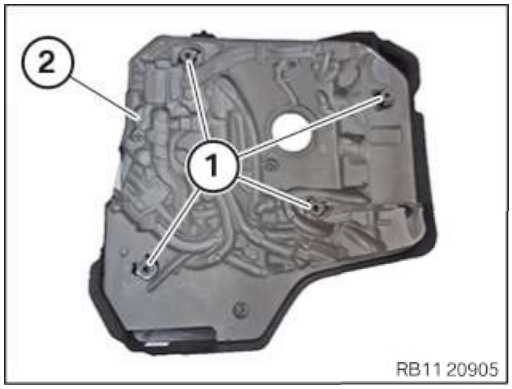
**23 – Install acoustic cover**

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.



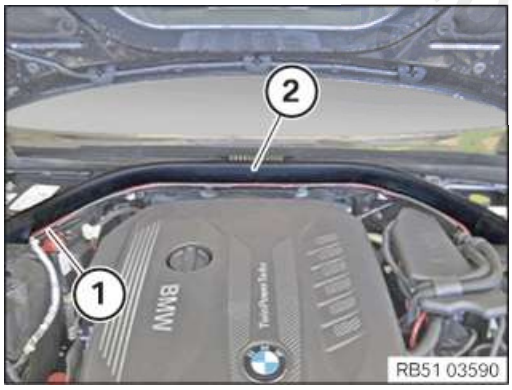

- Check all rubber mounts (1) of acoustic cover (2) for correct seating.




- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

**24 – Install the seal for the bonnet**




- Press the rear bonnet seal (2) into the guide.
- Feed in cable (1) into the brackets.
- Check that the rear bonnet seal (2) and the cable (1) are seated correctly.

**25 – Disconnecting all battery earth leads**

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- See additional information.

**26 – Filling and bleed the low-temperature coolant circuit**

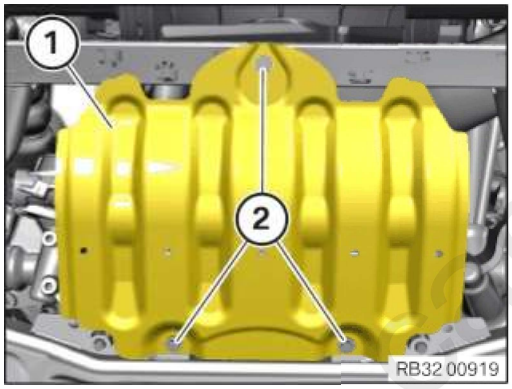



- See additional information.

**27 – If installed: Installing the steering guard**

**Prerequisite**

The front underbody protection is removed.

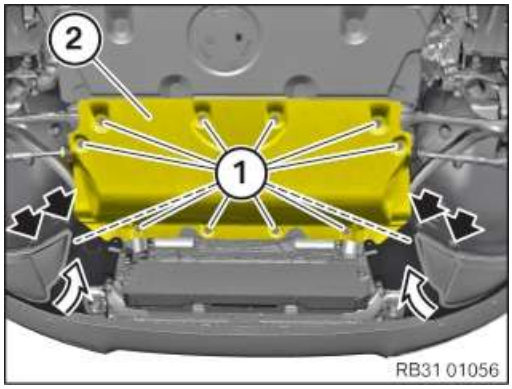



- Remove guard (1).
- Tighten the screws (2).

**Bumper buffer device steering on front axle support**

| | | | |
|---|---|---|---|
| M10 | | Tightening torque | 56 Nm |

**28 – Install the underbody protection of the steering gear**




- **Version 1:**
- Position the underbody protection of the steering gear (2).
- Tighten the screws (1).

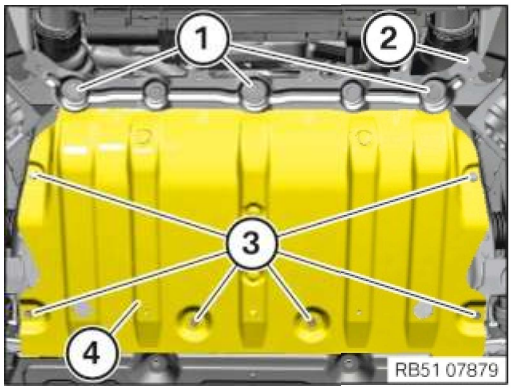
**Underbody protection of the steering gear**

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 3 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |

- Position the bottom wheel arch cover.
- Tighten the screws (arrows) of the bottom wheel arch cover on the wheel arch cover.

**Wheel arch cover (screws)**

| | | | |
|---|---|---|---|
| Thermoplastic hexagon screw | | Tightening torque | 3 Nm |




- **Version 2:**
- Guide in the steering gear underbody protection (4) and install.
- Tighten the screws (3).

**Underbody protection of the steering gear**

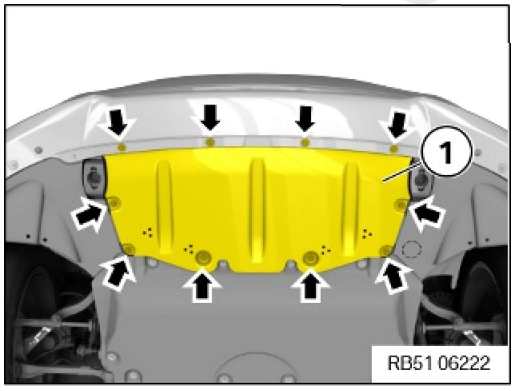
| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 3 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |

- Position holder of underride protection (2).
- Tighten the screws (1).

**Holder underride guard to front axle support**

| | | | |
|---|---|---|---|
| M10 | | Tightening torque | 56 Nm |

**29 – Installing the front underbody protection**




- **Version 1:**

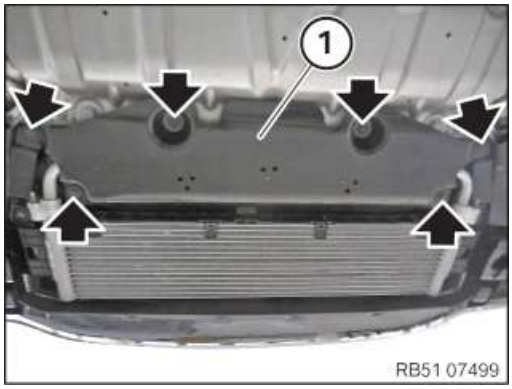
  Feed in the front underbody protection (1) towards the front under the bumper panel and position.

  Tighten screws (arrows).

**Underbody protection front**

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 2,6 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |

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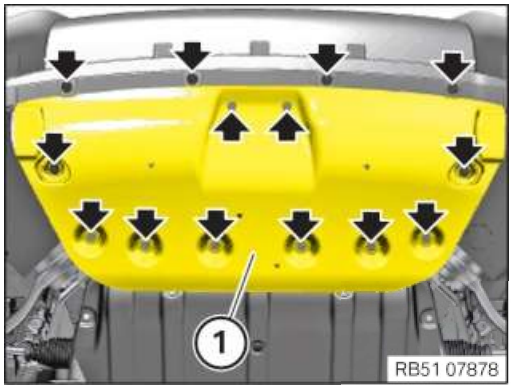

- **Version 2:**

  Feed in and position the front underbody protection (1).

  Tighten screws (arrows).

**Underbody protection front**

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 2,6 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |




- **Version 3:**

  Feed in and install front underbody protection (1).

  Tighten screws (arrows).

**Underbody protection front**

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 2,6 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |

## Additional Information

### Overview of Tightening Torques

**Cover, front bottom on side** — Used in step 13

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 3 Nm |

**Knock sensor to crankcase** — Used in step 16

| | | | |
|---|---|---|---|
| M8x30 | Observe tightening torque without fail! | Tightening torque | 21,5 Nm |

**Intake plenum to cylinder head** — Used in step 17

| | | | |
|---|---|---|---|
| M6 | | Tightening torque | 10 Nm |

**Intake plenum to support** — Used in step 17

| | | | |
|---|---|---|---|
| M6X25 | | Tightening torque | 8 Nm |

**Throttle body to holder** — Used in step 17

| | | | |
|---|---|---|---|
| M6X25 | | Tightening torque | 8 Nm |

**Tank ventilation line to intake plenum** — Used in step 17

| | | | |
|---|---|---|---|
| Oval-head screw | | Tightening torque | 3 Nm |

**Charge air line to throttle body** — Used in step 17

| | | | |
|---|---|---|---|
| M6 | | Tightening torque | 8 Nm |

**Control unit holder on spring strut dome** — Used in step 19

| | | | |
|---|---|---|---|
| Hexagon screw | | Tightening torque | 8 Nm |

**Bumper buffer device steering on front axle support** — Used in step 27

| | | | |
|---|---|---|---|
| M10 | | Tightening torque | 56 Nm |

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**Underbody protection of the steering gear** Used in step 28

| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 3 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |

**Wheel arch cover (screws)** Used in step 28

| | | | |
|---|---|---|---|
| Thermoplastic hexagon screw | | Tightening torque | 3 Nm |

**Holder underride guard to front axle support** Used in step 28

| | | | |
|---|---|---|---|
| M10 | | Tightening torque | 56 Nm |

**Underbody protection front** Used in step 29

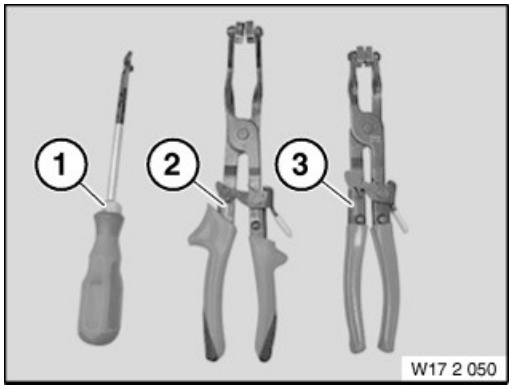
| | | | |
|---|---|---|---|
| Hexagon screw for thermoplastic | | Tightening torque | 2,6 Nm |
| Hexagon screw M6x20 | | Tightening torque | 8 Nm |

## Overview of Special Tools

**0 495 794 (17 2 050) Pliers**

Used in step 1417

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**Common**

| | |
|---|---|
| Usage | (Set of pliers) For assembling and disassembling the spring band clamps (Coolant hoses) |
| Included in the tool or work | |
| Storage location | B85 |
| Replaced by | |
| In connection with | |
| SI-Number | 01 26 06 (321) |

**Consisting of**

| Pos | BMW Order number | Replaced by | Designation | In Connection with |
|---|---|---|---|---|
| 1 | 0 495 795 (17 2 051) | | **Release tool** Remaining inventories will be sold off and then no longer available individually, but as part of complete tool set 17 2 050 = 0495794 only. | |
| 2 | 0 495 796 (17 2 052) | | **Pliers** (Pliers (curved version) Remaining inventories will be sold off and then no longer available as individual parts, but as part of complete tool set 17 2 050 = 0495794 only. | |
| 3 | 0 495 797 (17 2 053) | | **Pliers** (Pliers (straight version) Remaining inventories will be sold off and then no longer available as individual parts, but as part of complete tool set 17 2 050 = 0495794 only. | |

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## Links

| General repair instructions | Used in step |
|---|---|
| 12 00 ... Instructions for removal and replacement of control units | 521 |

| Repair instructions | Used in step |
|---|---|
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |

| | |
|---|---|
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 125 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 125 |
| 61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
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| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 20 900 Disconnecting and connecting battery earth lead | 125 |
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 5681520 |
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 8 |
| 61 00 730 Encode/program control unit(s) (after vehicle test) | 21 |
| 17 11 103 Removing and installing/replacing coolant expansion tank for the low-temperature coolant circuit | 26 |
| 17 11 103 Removing and installing/replacing coolant expansion tank for the low-temperature coolant circuit | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Venting cooling system and checking on watertightness | 26 |
| 17 00 040 Venting high temperature - cooling system and checking for water leaks (N20 hybrid drive) | 26 |
| 17 00 040 Venting high temperature - cooling system and checking for water leaks (N20 hybrid drive) | 26 |
| 17 00 040 Bleeding lower-temperature cooling system (B48) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |

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| | |
|---|---|
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 011 Draining and topping up coolant circuit for low temperature | 26 |
| 17 00 040 Bleed the low-temperature cooling system and check for watertightness (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleeding and filling low temperature cooling system using vacuum filler device (B48) | 26 |
| 17 00 011 Draining and topping up low-temperature coolant circuit | 26 |
| 17 00 011 Draining and topping up low-temperature coolant circuit | 26 |
| 17 00 040 Bleeding the low-temperature coolant circuit and checking it for watertightness | 26 |
| 17 00 040 Bleeding the low-temperature coolant circuit and checking it for watertightness | 26 |
| 17 00 015 Draining and topping up the coolant circuit for the drive \PREMIUM | 26 |
| 17 00 011 Draining and topping up low-temperature coolant circuit | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (low-temperature coolant circuit) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |
| 17 00 040 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) | 26 |


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# 12 14 524 Replacing the camshaft sensor of the exhaust camshaft

## PRELIMINARY WORK

### 1 – Removing the acoustic cover

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

## MAIN WORK

### 2 – Remove the camshaft sensor of the exhaust camshaft

**WARNING**

**Hot surfaces.**

**Risk of burning!**

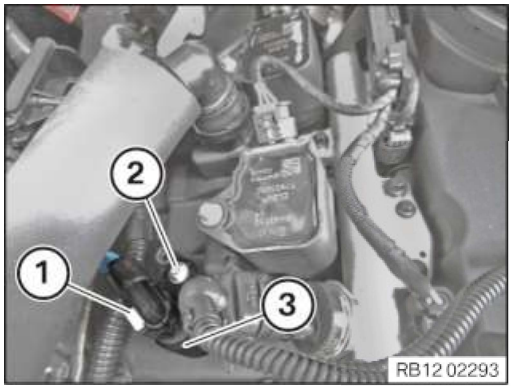
- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

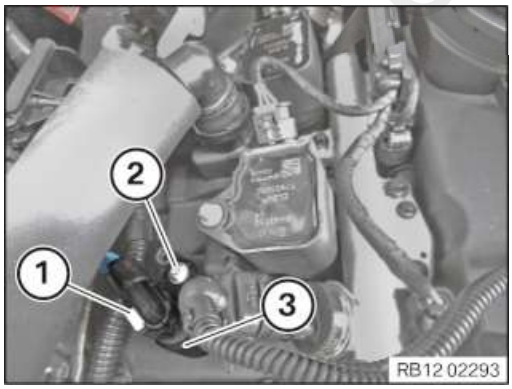



- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Feed out and remove the camshaft sensor (3).

**3 – Install the camshaft sensor of the exhaust camshaft**




- Check sealing ring (1) for damage, renew if necessary.




- Install the camshaft sensor (3).
- Tighten down screw (2).

**Camshaft sensor for exhaust camshaft on cylinder head cover**

| | | | |
|---|---|---|---|
| TS5x20 | | Tightening torque | 4 Nm |

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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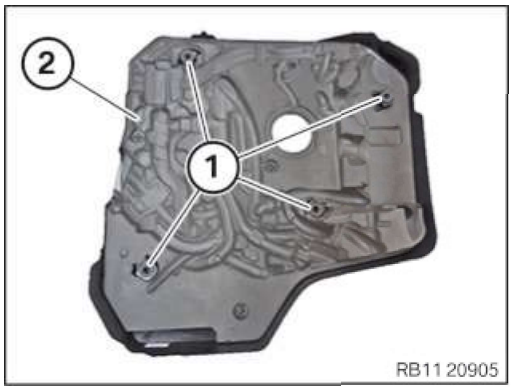
### 4 – Install acoustic cover

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Check all rubber mounts (1) of acoustic cover (2) for correct seating.




- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

## Additional Information

### Overview of Tightening Torques

**Camshaft sensor for exhaust camshaft on cylinder head cover** — Used in step 3

| | | | |
|---|---|---|---|
| TS5x20 | | Tightening torque | 4 Nm |

### Links

| Repair instructions | Used in step |
|---|---|
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 2 |

carsdiagn.com

# 12 14 523 Replacing the camshaft sensor of the intake camshaft

## PRELIMINARY WORK

### 1 – Removing the acoustic cover

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

## MAIN WORK

### 2 – Remove camshaft sensor of intake camshaft

**WARNING**

**Hot surfaces.**

**Risk of burning!**

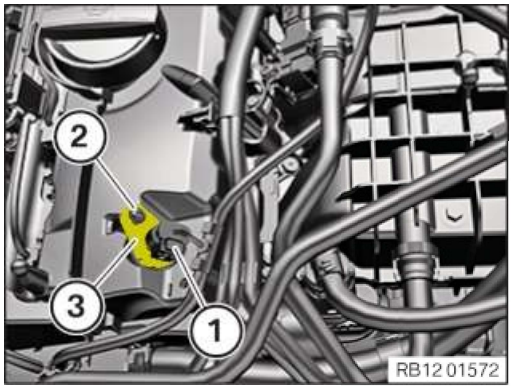
- Perform all work only on components that have cooled down.

**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



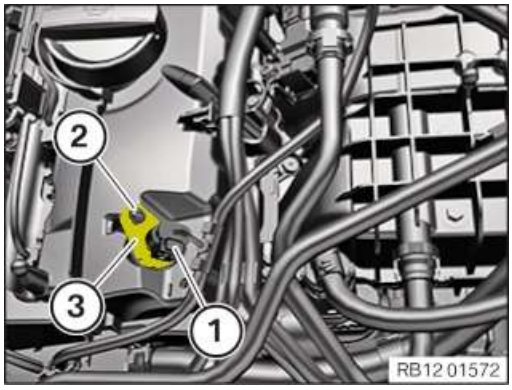

- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Feed out and remove the camshaft sensor (3).

**3 – Install camshaft sensor of intake camshaft**

▸ **Prepare the camshaft sensor**




- Check sealing ring (1) for damage, renew if necessary.




- Feed in and install the camshaft sensor (3).
- Tighten down screw (2).

**Camshaft sensor for intake camshaft on cylinder head cover**

| | | | |
|---|---|---|---|
| TS5x20 | | Tightening torque | 4 Nm |

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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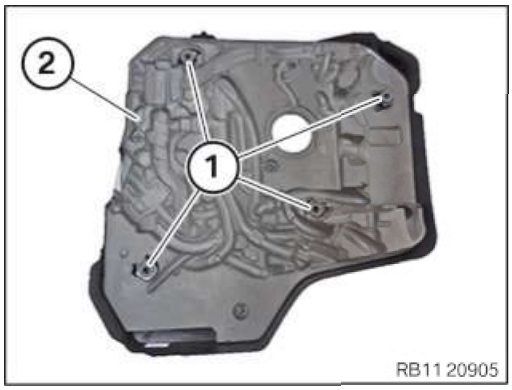
### 4 – Install acoustic cover

**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Check all rubber mounts (1) of acoustic cover (2) for correct seating.




- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

## Additional Information

### Overview of Tightening Torques

**Camshaft sensor for intake camshaft on cylinder head cover** — Used in step 3

| | | | |
|---|---|---|---|
| TS5x20 | | Tightening torque | 4 Nm |

### Links

| Repair instructions | Used in step |
|---|---|
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 2 |

carsdiagn.com

# 12 14 550 Replacing the control unit of the Digital Motor Electronics

**WARNING**

**Working on 12 V vehicle electrical system.**

**Risk of short circuits! Risk of fire!**

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

**RISK OF DAMAGE**

**Damage to battery terminal, the safety battery terminal or the intelligent battery sensor (IBS).**

**Damaged battery terminals can lead to malfunctions or vehicle electrical system faults.**

- Pull off battery terminal from battery pole by carefully moving to and fro. Do not pry off using a tool.

## PRELIMINARY WORK

### 1 – Disconnecting all battery earth leads




- See additional information.

### 2 – Removing the acoustic cover

**WARNING**

**Hot surfaces.**

**Risk of burning!**

- Perform all work only on components that have cooled down.

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**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.




- Unclip the acoustic cover (1) from the holders in the **marked** areas towards the top.

## MAIN WORK

### 3 – Removing the DME control unit

**RISK OF DAMAGE**

**Electrostatic discharge.**

**Damage to or destruction of electrical components.**

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

**TECHNICAL INFORMATION**

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

**TECHNICAL INFORMATION**

In a warranty case, you must always provide a fault memory printout with the defective part, even if the fault memory does not contain an entry.

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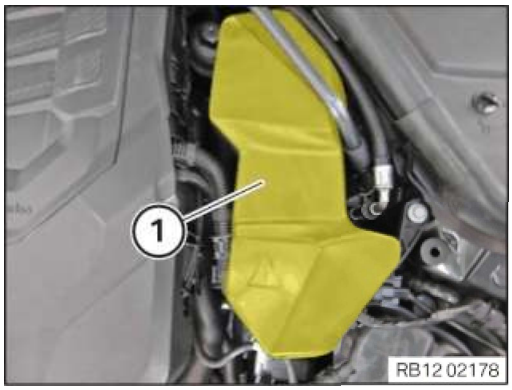
**TECHNICAL INFORMATION**

Control unit must be programmed after it is replaced.

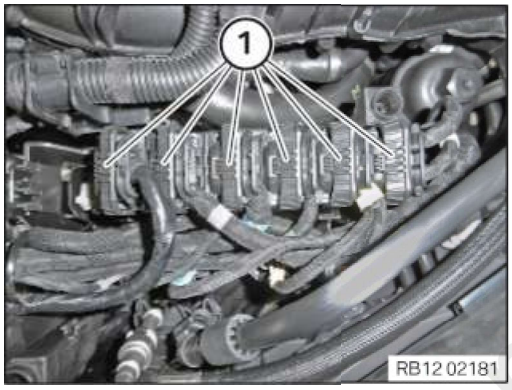
For additional information see: 61 00 ... Programming/encoding control unit(s)

**TECHNICAL INFORMATION**

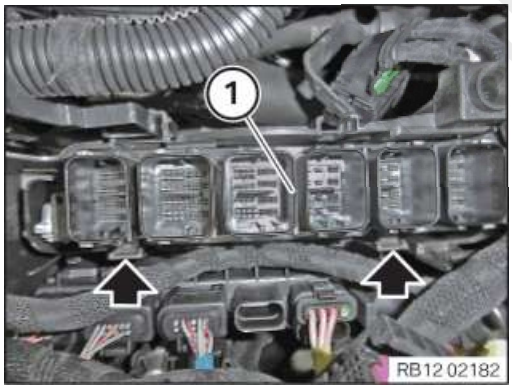
Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.




- Pull the cover (1) towards the top and feed out.



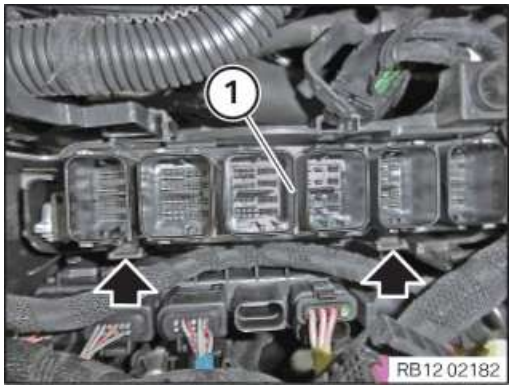

- Unlock and disconnect the plug connection (1).




- Unlock the locks (arrows).
- Guide out and remove DME control unit (1).

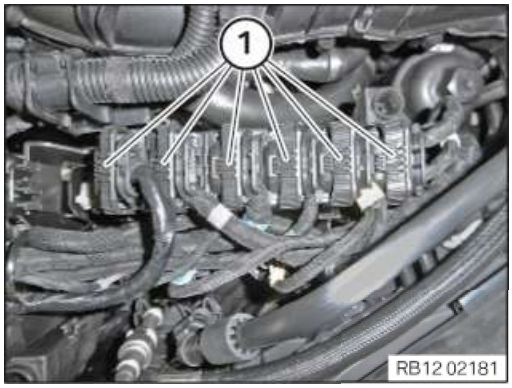
**4 – Installing the DME control unit**

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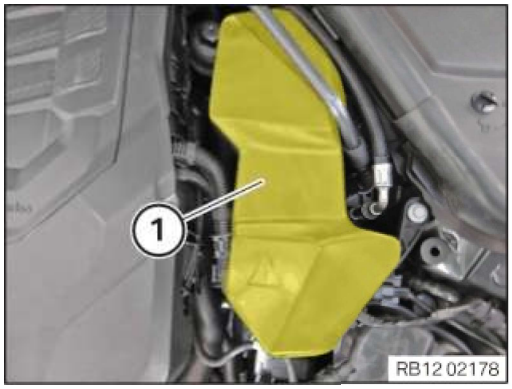

- Feed in and install DME control unit (1).

  The locks (arrows) must engage audibly.




- Connect connectors (1) and lock.

  All connectors (1) must engage audibly.




- Insert and install cover (1) into guides.

## POSTPROCESSES

### 5 – Install acoustic cover

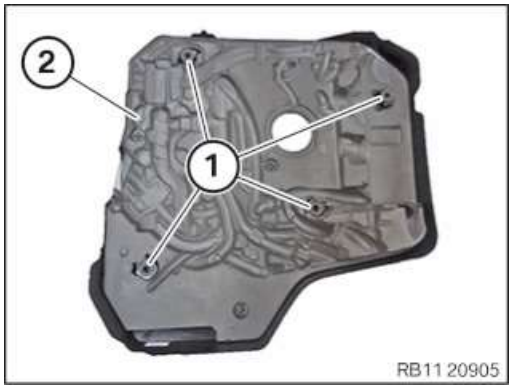
**RISK OF DAMAGE**

**Damage to the acoustic cover.**

**Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.**

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check all rubber mounts (1) of acoustic cover (2) for correct seating.




- Clip in the acoustic cover (1) into the holders in the **marked** areas.

  The acoustic cover (1) must audibly engage into place.

**6 – Disconnecting all battery earth leads**




- See additional information.

**7 – If the DME control unit is replaced: Program/encode the DME control unit**

▸ **Encode/program control unit(s)**

**Prerequisite**

Replacement of component.

**TECHNICAL INFORMATION**

Use the most recent software version to prevent faults during programming/encoding.
The battery voltage must not fall below 13.0 V during programming.
Use only chargers for a low volt-vehicle electrical system that are recommended by BMW.

**TECHNICAL INFORMATION**

**No high-voltage switch off is required** in electric vehicles or hybrid vehicles for programming/encoding.
The high-voltage system will be automatically switched off by the programming system.

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- Connect the battery charger to the vehicle.
- Connect the programming system with the vehicle.
- Determine the action plan.
- Accept and fully process the measures plan.
- If applicable, connect the workshop system to the vehicle, depending on the reworking list.
- Carry out vehicle test.
- Delete the fault memory.
- The information about programming the workshop system and the corresponding notes in the user documentation must be observed.
- Wait until programming/encoding has been completed.
- Disconnect the programming system from the vehicle.
- Disconnect the battery charger from the vehicle.

▸ **Reset ultra-small quantity adaptation**

**TECHNICAL INFORMATION**

If the DME control unit or an injector is renewed, minimum quantity adaptation must be reset. If an injector has been replaced on cylinder side, the minimum quantity adaptation must also be reset.



- Connect the diagnosis system to reset the minimum quantity adaptation:
  - Read out vehicle data
  - Identification without vehicle test
  - Start vehicle test
  - Vehicle handling
  - Service functions
  - Power train
  - Engine electronics
  - Adjustment functions
  - Delete adaptations
  - Reset adaptation values
  - Reset ultra-small quantity adaptation

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## Additional Information

### Links

| General repair instructions | Used in step |
|---|---|
| 12 00 ... Instructions for removal and replacement of control units | 34 |

| Repair instructions | Used in step |
|---|---|
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |

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|---|---|
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 16 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 16 |
| 61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle) | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
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| 61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads) | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 20 900 Disconnecting and connecting battery earth lead | 16 |
| 61 35 ... Notes on ESD protection (Electro Static Discharge) | 3 |
| 61 00 730 Encode/program control unit(s) (after vehicle test) | 4 |


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