

## 61 20 ... Battery replacement information

A vehicle battery is constructed for the installation location and the individual power requirements of the particular vehicle. These individual power requirements depend on the motorisation and different types of equipment. The individually assigned vehicle battery is the ideal compromise between the power requirements of the vehicle electrical system and the weight and service life of the vehicle battery.

**If the vehicle electrical system of electric vehicles is not accessible due to a faulty 12 V battery, proceed as follows:**

### Battery exchange in electrified vehicles

Vehicles with the automatic engine start-stop function or particular engine types and optional equipment are equipped with a special vehicle battery (AGM battery), since only this battery type can provide elevated power requirements over the extended service life. Installing a different vehicle battery can cause problems with vehicle electronics, can reduce functions or can cause leakage of battery acid.

In the event of an accident where the airbags are deployed in vehicles with a vehicle battery in the luggage compartment, the electrical connection between the vehicle battery and the trigger is automatically disconnected through pyrotechnics. This prevents possible short-circuiting.

Proper operation of all of these safety and convenience functions requires a battery that conforms with specifications and that is properly registered in vehicles with energy management systems (IBS, power module).

### **Vehicles with energy management systems (IBS, power module): Register battery exchange**

The vehicle electrical system is informed about the vehicle battery characteristic data, such as type, size, age and current power capacity. Therefore, there will always be only one work scope provided that is permitted by the current status of information.

If the performance readiness drops below a defined minimum, a Check Control message will be generated to advise the driver that the battery must be replaced.

When installing a new vehicle battery, the battery must be registered and thus must also be registered with the vehicle electrical system.

*Note:*

Only this registration/logon will ensure that the corresponding Check Control message will go out again.

*Diagnosis system:*

Register battery exchange

- Service functions
- Body
- Voltage supply
- Register battery exchange

When retrofitting, a more powerful battery may be used. Standard batteries may always be replaced by AGM batteries with the same specifications.

When installing a battery of a different size or a different battery type, this change in vehicle data must be programmed into the vehicle data in accordance with specifications.

*Programming system:*

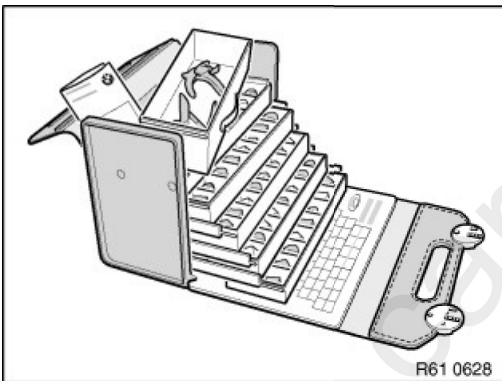
- Battery retrofitting

**Special tools required:**

- [61 0 300](#)
- [61 4 340](#)
- [61 0 240](#)

**Important!**

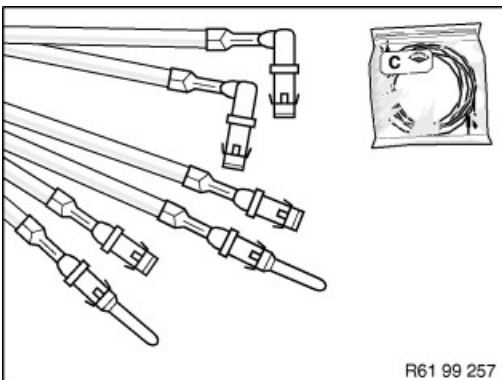
1. Identify cause of damage (e.g. sharp-edged body components, faulty electrical loads, jammed mechanisms, corrosion caused by ingress of water, etc.).
2. Read out fault memory
3. Eliminate cause of damage.
4. Disconnect battery negative terminal
5. Make sure that no safety-related system according to circuit diagram (e.g. antilock braking system, active rear-axle kinematics, airbags, etc.) are influenced. Otherwise replace faulty wiring harness or use repair cable (sourcing reference: BMW Parts Department)
6. Carry out function test and read out fault memories again
7. Eliminate new faults if applicable and clear fault memories

*Note:*

The repair range IV for vehicle electrical system contained the required special tools and individual parts for retrofitting and repair work with the aid of fan connectors.

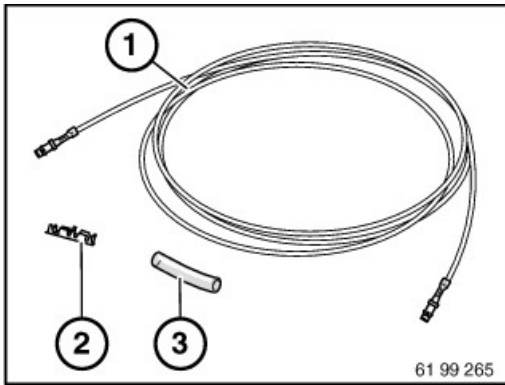
The case can no longer be ordered. Order individual parts for wiring harness repair through BMW Parts Department.

- Refer to Service Information:  
[SI02 04 07 341](#)



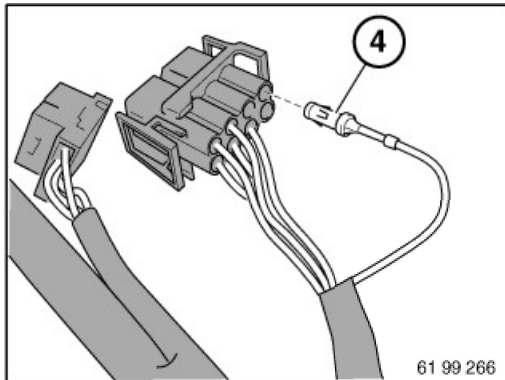
Choose repair kit.

Example: Repair kit, circular connector system D 2.5.



Remove following parts:

- (1) Pre-packaged end of cable with requisite wire cross-section
- (2) Crimp connector for selected wire cross-section
- (3) Shrink-fit hose

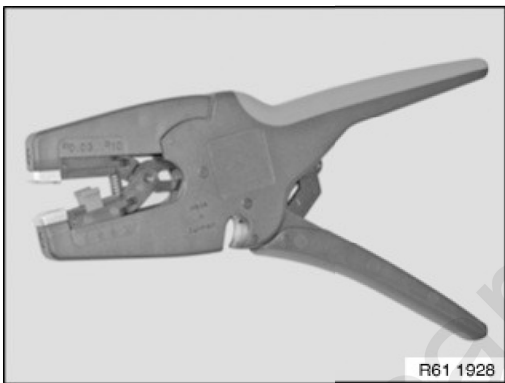


Open secondary lock on housing.

Mark damaged contact (4) with socket number of housing and press it out of housing using appropriate special tool contained in special tool set [61 0 300](#) ).

See repair instructions

[Notes for opening contacts and locks](#) of different plug contact systems.



### Important!

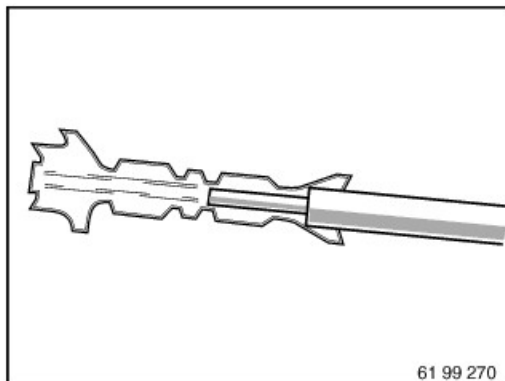
- Check maximum length of repair cable
- If more than one wire is to be repaired, the individual interfaces must be offset so that the wiring harness is not too thick at the repaired point.

Adhere to following procedure:

- Cut off wire with faulty contact at point which is easily accessible
- Strip insulation from end of wire at wiring harness end
- Cut preassembled wire end to length and strip insulation

Refer also to repair instruction:

[Cutting to length and stripping insulation from cables](#)



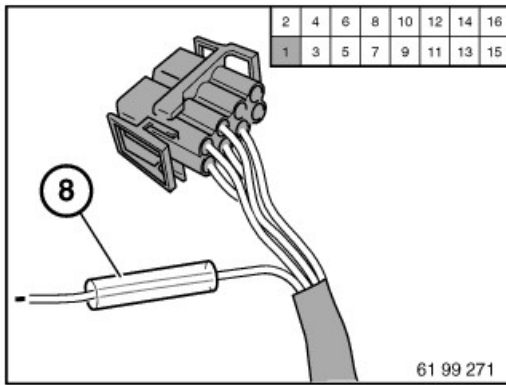
Crimp butt connector on preassembled wire end.

Special tools:

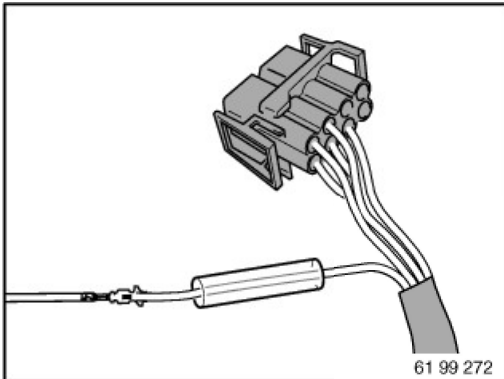
- [61 4 340](#) (0.35 - 2.5 sq mm)
- [61 0 240](#) (4.0 - 6.0 sq mm)

See repair instructions

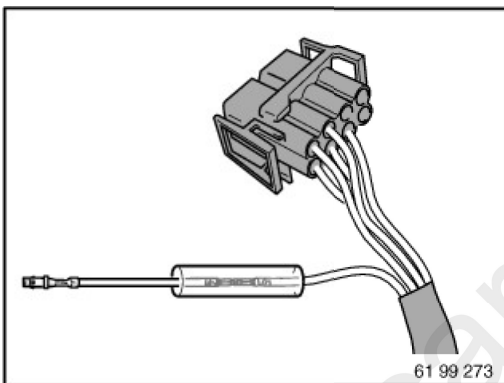
[Crimping on stop parts](#)



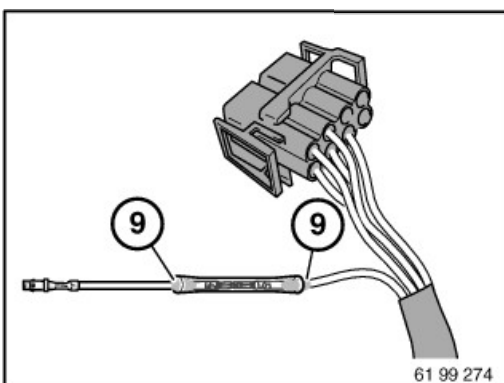
Push shrink-fit hose (8) onto free wire end.



Crimp unused wire end to butt connector.



Pull shrink-on sleeve over butt connector.



### Important!

Do not burn shrink-on sleeve.

With hot air blower, shrink the shrink-on sleeve on both sides (9) of shrink-fit hose until glue emerges uniformly all round.

Insert contact in housing.

Close secondary lock on housing.

## 11 00 ...      **Handling components after flood damage**

Flood damage can occur if the permissible fording depth of a vehicle is exceeded. Ingress of water can cause damage to the engine (water shock) or components.

Because dirt particles generally enter into the component with the water (e.g. starter motor, wiring harness), the components need to be thoroughly inspected.

Residual moisture in the components leads to corrosion (increased contact resistance in the component), which can lead to a component failure at a later time.

If water ingress into the electrical components cannot be ruled out, it is recommended to replace the component to ensure correct functioning through the vehicle lifetime.

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## 12 00 ... Instructions for removal and replacement of control units

### **Important!**

- Disconnecting the vehicle battery will cancel the fault memories of control units. Consequently, before disconnecting the car's battery, always interrogate the fault memories. Investigate stored faults and, once any faults have been remedied, cancel the fault memory.
- Control unit plugs should only ever be connected and disconnected while the ignition is turned off.
- The removal and installation of components, relays, fuses etc. can cause faults to be stored in fault memories capable of self diagnosis. Always interrogate the fault memories after completing work on the electrical system.
- Investigate stored faults and, once any faults have been remedied, cancel the fault memory.
- If necessary, initialise power window regulator [Initialise power window regulator](#)

On replacement of the DME/DDE control unit note the following:

- In every case use the diagnosis system to read out the hardware/software version of the corresponding control unit.  
Comply with the diagnosis system instructions for the encoding and programming work operations.  
On vehicles with an electronic immobiliser, comply with the diagnosis system instructions.
- In every control unit certain mean values are stored that are the basic values. The control unit receives different input values according to the engine condition. The teachable system compares the input values against the stored basic values and then forms the associated control commands. The control commands are forwarded to the corresponding actuators.
- When the DME control unit is de-energized for a long period (over one hour), the teachable system then loses the stored values. When a deleted control unit is returned to service or a new control unit is installed, the teachable system itself must read in and store the input value of the associated engine as new basic values.
- This process may cause uneven idle and faults in coasting mode after starting. Depending on the engine characteristics, it may take some time until all values have been compared with the engine condition.
- Therefore, comply with the following procedure before replacement or reinstallation of a DME/ DDE control unit is carried out:
  1. If possible, bring the engine up to its operating temperature prior to replacement of the control unit.
  2. Change control units and drive the vehicle with changing engine speeds.

## 61 00 ... Notes for disconnecting and connecting the vehicle battery

Observe [safety informations for handling vehicle battery](#).

### Before disconnecting vehicle battery:

Turn off the ignition and other electrical loads/consumers to prevent sparking when reconnecting.

#### Note:

If the ignition is not switched off when the vehicle battery is disconnected, fault memories may be set in some control units.

#### Attention!

- There is a danger of mixing up battery cables: if the positive battery cable and battery earth lead are the same colour and you are in doubt, follow the polarity to the vehicle battery, then mark and cover the leads
- The on-board computer and clock may lose your data.

### General notes on disconnecting the vehicle battery:

- Do not disconnect battery leads and leads from alternator and starter motor while engine is running.
- Disconnect terminal of [battery earth lead](#) from the battery. Cover battery negative terminal(s) and secure.
- Disconnect [both battery earth leads](#) in version with auxiliary battery. Cover battery negative terminal(s) and secure.
- When work is carried out on the electrical system, faults may be caused in the fault memories of some control units when the vehicle battery is connected.
- When installing battery terminal: Tightening torque [61 21 1AZ](#).

Only lead AGM battery:

- On vehicles with IBS at negative battery terminal:  
**Do not under any circumstances pull/lever off pole shoes by force.**  
**Do not under any circumstances release the hexagon socket screw of the IBS.**

### Note the following after having connected the vehicle battery:

#### Attention!

The scope of application of some systems may be restricted after an open circuit.

Personal Profiles may also be lost.

Settings or activations must be carried out, depending on the equipment specification.

For example:

- Activate [slide/tilt sunroof](#), if necessary
- Activate [power window](#), if necessary

Refer to the diagnosis system for further vehicle-specific information.

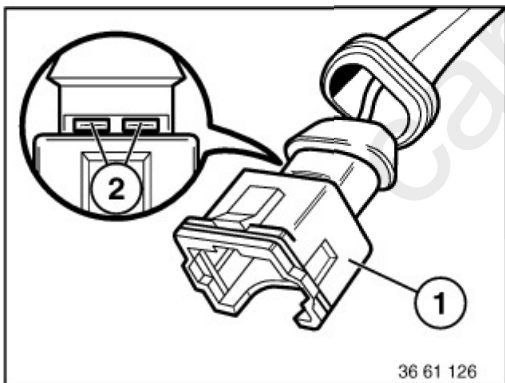


**Special tools required:**

- [61 0 300](#)
- [61 0 400](#)
- [61 1 100](#)

**Abbreviations of contacts and what they mean:**

| ELA               | Strand seal                                           |
|-------------------|-------------------------------------------------------|
| D 1.5 / 2.5 / 3.5 | Round contacts with 1.5 mm, 2.5 mm or 3.5 mm diameter |
| MDK               | Miniature double flat spring contact                  |
| JPT               | Junior Power timer                                    |
| DFK               | Double flat spring contacts                           |
| Elo               | Electronic contacts                                   |
| Elo Power         | Electronic contacts for heavy load                    |
| MQS               | Micro Quadlock system                                 |
| MPQ               | Micro Power Quadlock                                  |
| MLK               | Mini laminated contact                                |
| SLK               | Sensor laminated contact                              |
| LSK               | Load current contact                                  |
| MLK               | Mini laminated contact                                |
| Mcon              | Multi contact                                         |



**Important!**

The contacts can be changed on ultrasonically welded connectors (1).  
Ultrasonically welded connectors (1) must be replaced completely.  
Ultrasonic-welded connectors (1) can be identified by the welds (2) on their longitudinal side.



**Note:**

Special tools referred to in the repair instructions below are contained in the following special tool sets:

- Unlocking and pressing-off tool 61 1 150  
is replaced as of 09/2005 by [61 0 300](#) (BMW) and [61 0 400](#) (MINI)
- Release and pressing-off tool [61 1 100](#) (engine)

## **Repair instructions for opening connector housings and removing contacts of different connector systems:**

### **Connector system D 1.5/D 2.5:**

- [Circular connectors, 7- or 8-pin, system D 2.5](#)
- [Circular connectors, 13-pin, system D 2.5](#)
- [Circular connectors, 20-pin, system D 2.5](#)
- [Circular connectors, 4-, 7-, 10-, 12- or 25-pin, system D 1.5/D 2.5](#)
- [In-line connectors, 15-pin, system D 2.5](#)
- [In-line connectors, 8-, 12-pin, system D 2.5](#)
- [In-line connectors, 30-pin, system D 2.5](#)
- [In-line connectors, 20-pin, system D 2.5](#)

### **Connector system JPT/MDK/DFK:**

- [In-line connectors, 2-pin, System JPT ELA](#)
- [In-line plugs, 2-pin, System MDK 3 plus 2.8](#)
- [In-line plugs, 4-pin, System DFK ELA](#)

### **Connector system Elo/Elo Power:**

- [Inline plugs, 4-, 10-pin, System Elo](#)
- [In-line connectors, 6- to 50-pin, System Elo](#)
- [Inline plugs, 3-, 6-pin, System Elo-Power 2.8](#)

### **Connector system LSK:**

- [Connector housing LSK contact](#)

### **Connector system MQS/MPQ:**

- [Inline connectors, 6-, 8-pin, System MQS](#)
- [Inline plugs, 2-pin, System MPQ 2.8](#)
- [Control unit connectors, 25-, 35-, 55-, 83-, 88-pin](#)
- [In-line plugs, 24-pin, Hybrid System MQS/MPQ](#)
- [Socket housing 42-, 43-pin, Hybrid System MQS / MPQ](#)
- [Socket housings 2x21-, 2x27-pin, Hybrid System MQS/MPQ, Elo/Elo Power](#)
- [In-line connectors, 30-pin, Hybrid System MQS/MPQ](#)
- [Socket housings, 5-, 8-pin, System MQS/MPQ](#)
- [Socket housing \(radio connector\), Hybrid System MQS/MPQ](#)

**For connector contact systems not listed, refer to Service Information:**

[SI 2 05 05 217](#)

[SI 2 05 06 294](#)

[SI 2 03 08 440](#)

[SI 2 08 06 312](#)

[SI 2 02 08 439](#)

[SI 2 01 08 438](#)



**The following applies in general:**

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- To ensure professional repairs, perform repair work only with BMW-approved or recommended special tools and spare parts
- Make sure cables are laid without kinks or abrasions
- Ensure non-contacting routing at sharp-edged body parts; use edge protection if necessary
- Secure additionally laid cables/leads with cable ties

**The following additionally applies:**Shielded lines

Interference radiation and interference resistance can lead to neutral zones at contact points in the shielding. Consequently, distinctions have to be drawn between the following types:

Coaxial lines

- Shielded coaxial cables RTK031 may only be repaired with a special [crimping tool](#).
- For aerial lines only the bushing contact may be repaired.
- RG174 Lines and the bushing contact may not be repaired.

CVBS lines

- CVBS cables may not be repaired.
- CVBS cables must be replaced in their entirety.

HSD lines

- HSD cables may not be repaired.
- HSD cables must be replaced in their entirety.

Optical fibre cable:*Note:*

Fibre-optic cables are coloured differently as follows:

- Green = **MOST** (Media Oriented Systems Transport) optical fibres
- Yellow = **ISIS** (Intelligent Safety and Integration System) optical fibres
- Orange=repair fibre-optic cables

**Attention!**

- Optical fibres are permitted to show only one junction point (bridge). Replace optical fibres if necessary
- Smallest permissible bending radius is 25 mm
- Avoid effects of heat  $\geq 85^\circ$

[Treating cables and fibre-optic cables](#)FlexRay (twisted cables):

It is possible to repair the FlexRay. In the event of damage, the cables can be joined with conventional [butt connectors and heat-shrink tubing](#).

*Note:*

- FlexRay lines may only reveal one separation point (bride); renew complete line if necessary.
- If possible, maintain twisted cable after repair.
- After repairs, twist cables as close as possible to the connector/separation point.
- Twisting must be as symmetrical as possible.

Airbag lines:

[Repairing airbag cables](#)

Ribbon cables:

[Repairing ribbon cables](#)

## Replacing wiring harnesses

Repair wiring harnesses mainly cover the full equipment of the vehicle. If certain optional equipment is not installed in the vehicle, note the following:

- If necessary, secure the remaining connectors.
- If necessary, seal the remaining connectors outside the vehicle interior, for example, with butyl tape in such a way that moisture ingress can be eliminated permanently.
- [If necessary, repin the connector of the repair wiring harness.](#)

*Note:*

**Repair wiring harnesses** can be equipped with an **additional socket housing** (30-pin, for example), **which was not provided on the previous vehicle-side wiring harness**. This socket housing also cannot be found in the wiring diagram.

### Procedure

The separation point between the vehicle-side wiring harness and the repair wiring harness is located **in the vehicle interior** (in the footwell, for example):

- Cut the additional socket housing and connect the lines to the vehicle-side wiring harness using a butt connector.
- Alternatively, a suitable pin housing can be fitted on the vehicle-side wiring harness and connected to the additional socket housing.

However, this is permitted only if the following conditions are met:

- Carpets must not protrude visibly or become deformed due to the installation of the additional plug connection.
- It must be possible to install the adjacent components (for example, trims, trim panels, etc.) correctly after installing the additional plug connection.
- All the attachment points of the adjacent components (for example, trims, trim panels, etc.) must engage correctly.
- There must be no rattling noise due to the installation of the additional plug connection.
- The additional plug connection must not damage the adjacent components/wiring harnesses, etc..

The separation point between the vehicle-side wiring harness and the repair wiring harness is located **outside the vehicle interior** (in the wheel arch, for example):

- Cut the additional socket housing and connect the lines to the vehicle-

side wiring harness using a butt connector.

- **Using the additional socket housing is not permitted with a separation point outside the vehicle interior.**

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## 12 00 ... Notes/information on start assistance (jump starting)

Do not start the engine with help of starting sprays.

### Preparation:

Conform with the following when starting the engine with a jump starting cable.

- Ensure that the jump starting cable wires are of appropriate cross-section size.
- Only use fuse-protected jump starting cables.
- Check whether the current-supplying battery has 12 V voltage.
- If the engine is started from the battery of another vehicle, ensure that there is no contact between the bodies of both vehicles.

### Important!

Never touch electrically live ignition system components: high voltage - danger of injury!

If the battery in the vehicle supplying power is weak, start the engine of this vehicle and let it run at idling speed.

### Operation:

It is essential to conform to the procedures so as to avoid injury to persons or damage to parts.

- Automatic transmission: select drive position "P", apply parking brake.
- Manual transmission: move gear lever to neutral position, apply parking brake.
- Ensure that the jump leads cannot get caught in rotating parts, e.g. fan.
- First connect both positive poles of the batteries with one jump starting cable (red).
- Use the battery positive terminal in the engine compartment for vehicles with the battery in the luggage compartment.
- Then use the second jump starting cable (black) to connect the negative post of the current-supplying battery with the earth/ground point (not the negative pole or the body) of the vehicle to be started.

### Important!

Do not connect the second jump starting cable (black) with the negative pole of the battery in the vehicle to be started. Produced gas could be ignited by sparks.

### Risk of explosion!

After the engine of the vehicle to be started has fired, first disconnect the jump starting cable between the negative pole and the earth/ground point. Then remove the starting cable from the positive poles.

## 00 Safety information for working on vehicles with automatic engine start-stop function (MSA)



### Warning!

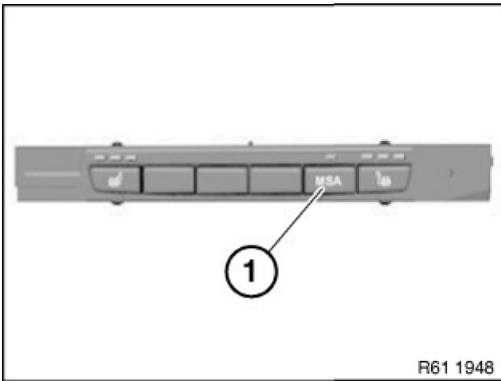
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

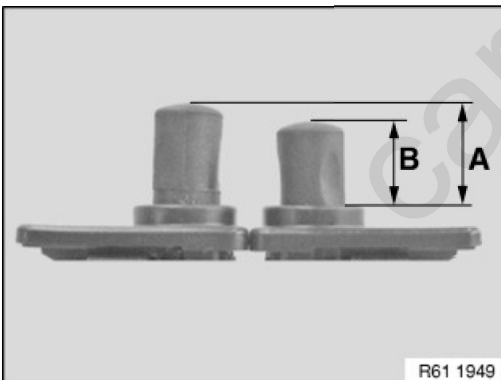
### Observe safety precautions when working on MSA vehicles.

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

### MSA function is deactivated by:



- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door



- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
  - Workshop mode  
A = 10 mm
  - Basic setting (engine hood/bonnet open)  
B = 7 mm

To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.



### When working with diagnosis tools:

- Observe instructions in diagnosis tool



*Note:*

For further information on automatic engine start-stop function (MSA):

- Refer to the Service Information (bulletin) (for manual transmissions) [Service Information \(bulletin\) 61 01 07 335](#)
- Refer to the Service Information (bulletin) (for automatic transmissions or twin-clutch gearboxes) [Service Information \(bulletin\) 61 01 10 629](#)

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## 61 00 ... Safety information on handling hybrid cars

### 1. Qualification:

All repair work on high-voltage components may **only be performed by specially trained personnel** (qualification: Work on high-voltage inherently safe vehicles) must be performed by qualified technicians. Each hybrid car requires additional vehicle specific training with training achievement controls. Required training is offered by the BMW Training Academy.

### 2. Identification:

Observe **warning notices** on high-voltage components. When replacing individual high-voltage components, check if warning stickers are present. Independently attaching warnings is only allowed on the locations provided for them. Use only approved and appropriately identified original new parts.

### 3. Rules of conduct/protective measures:

- Note operating instructions for handling high-voltage battery units.
- Do not under any circumstances touch open high-voltage cables and high-voltage components on damaged vehicle before shutting down the high-voltage electrical system.
- In the event of damage (mechanical, thermal) transition metal oxides, carbon, electrolyte solvents and their products of decomposition may be released.  
Suitable acid-resistant protective clothing/equipment must therefore be used when handling the vehicle!

- Hand protection: Gloves
- Eye protection: Safety goggles

Damaged high-voltage battery units must be stored in an acid-resistant pan in a location in the open that is protected against the weather (sun, rain) and secured against unauthorised access. Do not inhale escaping gasses.

- Prevent escaping substances from entering drains, pits and the sewer system.
- Collect any material that is discharged and have it disposed of according to the work instruction, wear acid-resistant protective clothing when doing so.
- Notify the fire brigade if fire breaks out, clear the area immediately and make accident scene safe. Attempt to extinguish the fire without putting persons in danger (suitable extinguishant: water and water foam).
- A cut 2nd emergency separation point must be repaired with a butt connector.

### 4. Measures before starting work:

- Each job on the vehicle must be assigned by appropriately trained personnel. Before work is started, this electrician must place the vehicle in the operating condition required to perform the relevant activity. The qualified personnel's instructions and directions absolutely must be followed. **No work may be carried out without this qualified personnel being consulted first.**
- It is **not** permitted to work on the high voltage system or on high voltage components while the engine is running.
- The readiness to drive must be ended before shutting off the voltage of the high-voltage system. The readiness to drive is ended when the driver is absent only under the following conditions:
  1. seat belt buckle unlocked **and**
  2. the driver's door is open **and**
  3. no brake activated **and**
  4. the accelerator pedal is not activated **and**
  5. speed < 3 km/h (2 mph)
- Work on live high-voltage components is expressly prohibited. Before each operation on the high-voltage system, the system must be isolated from the power supply by qualified personnel (high-voltage safety connector Off) and secured against unauthorised recommissioning (padlock).
- After each deactivation of the high-voltage system, it is essential to observe a **waiting period** of at least **10 seconds** prior to further work.
- Before beginning work, it is mandatory to check that the equipment is de-energised and is protected against being energised again.  
Work is only permitted to begin if:
  1. Corresponding display in the KOMBI **High-voltage system deactivated** or  
When a high-voltage warning is active (indicator light, Check Control, etc.), it is essential to determine and eliminate the cause of this warning via the diagnosis system before continuing with any other work. **If it cannot be definitively established that the equipment is de-energised**, work is not permitted to begin. **Danger to life!** Before work begins, a qualified electrician (1000 V AC) must verify that the system is de-energised using appropriate measuring devices and procedures.  
**=> In this case, Technical Support must be contacted!**
- Do not perform any work on the vehicle while it is charging. Before starting work, disconnect the charging

cable from the vehicle.

Battery charging may result in heating of the high-voltage battery unit. This heating may lead to sporadic launches of the electric fan (switch-on request from the electric fan). Therefore, work in the vicinity of the electric fan during the charging procedure is prohibited. Ensure freedom of movement of the battery charge lines in the vicinity of the electric fan.

5. *Measures during/after activities:*

- Identifiable mechanical damage to or tampering with high-voltage components must be reported immediately to the qualified personnel in charge.
- When carrying out any work on the high-voltage system, it is prohibited to drive externally all the drivetrain components (wheels, gearbox, drive shafts, etc.).
- *E72 only:* When the "Power Electronic Box Cover" is removed, the high-voltage system is not permitted to be activated. The high-voltage service disconnect must only be used when the "Power Electronics Box Cover" is completely installed.
- High-voltage cables (orange coating) and their connectors and stop parts **may not** be repaired. If damaged, a cable must always be replaced completely.
- When working in the vicinity of high-voltage components (identified accordingly with warning stickers and orange-coloured coating), protect these components against damage.
- The specified work steps in the repair instructions must be adhered to exactly.
- High-voltage components and their holders must be screwed/bolted to the defined tightening torque. Tightening torques and tightening specifications must be observed.
- Connecting high-voltage components to body ground is crucial to safety for reasons of equipotential bonding. For this reason, it is prohibited to operate any high-voltage components without them being correctly connected to body ground. The measurements (insulation/potential equalisation measurement) are performed automatically by the vehicle. Manual measurement is not therefore necessary. For a correct earthing connection, the retaining elements of high-voltage components must not be painted. Follow further [painting notes](#).
- Removed high-voltage battery units must be stored in a manner that protects them from misuse and damage.
- Damaged or warning stickers that are no longer legible on high-voltage components must always be replaced.

6. *Potential compensation:*

Equipotential bonding lines, high-voltage cables and the battery negative lead to the EME are fitted with safety screws.

- Clean contact faces and have then checked by a second person.
- Tighten down screws/bolts to specified torque.
- Have tightening torque checked by a second person.
- Both persons must document that the work has been carried out correctly in the vehicle records.

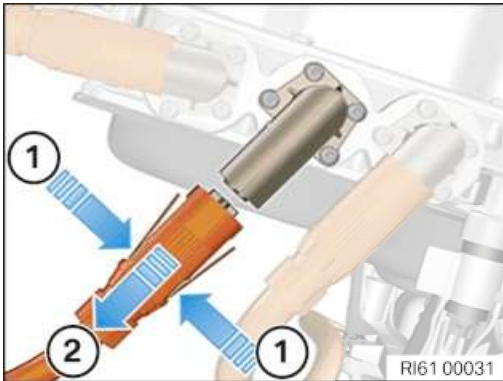
## 61 13 ... Unlocking and disconnecting various plug connections in electrical and hybrid vehicles



### Attention!

Observe the following instructions for handling high-voltage plug connections:

- Damaged high-voltage plug connections must be replaced completely. Repair is not permitted.
- Dirt contamination must be removed before opening the plug connection.



### Disconnect the Hirschmann high-voltage connector:

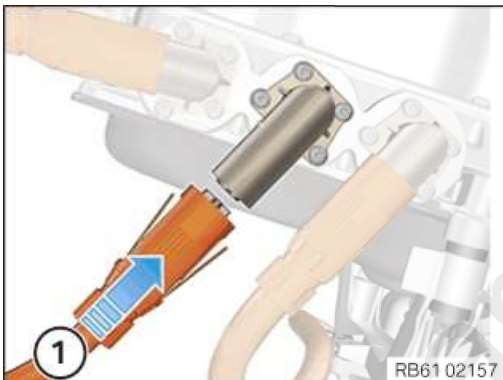
Press the lock (1) on the left and right on the connector in the direction of the arrow.

Pull off connector (2) in direction of arrow.

### Attention!

Connector (2) is difficult to pull off.

In the event of damage to high-voltage connector (2), the complete high-voltage cable must be replaced!

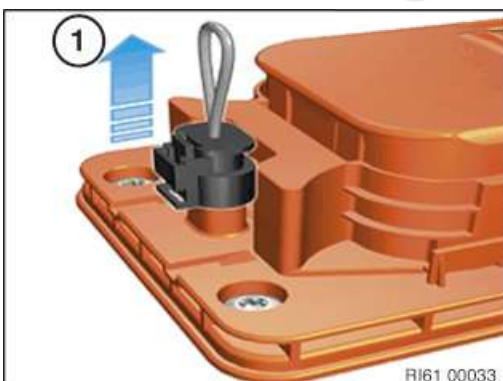


### Connect the Hirschmann high-voltage connectors:

Slide the connector (1) on in the direction of the arrow.

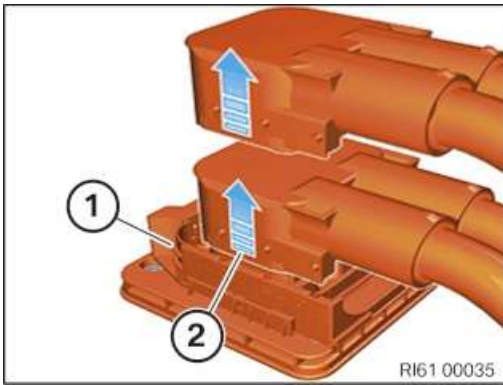
### Note:

Connector (2) must lock audibly.



### Disconnect the Kostal high-voltage connector:

Unlock and disconnect high-voltage interlock loop (1).



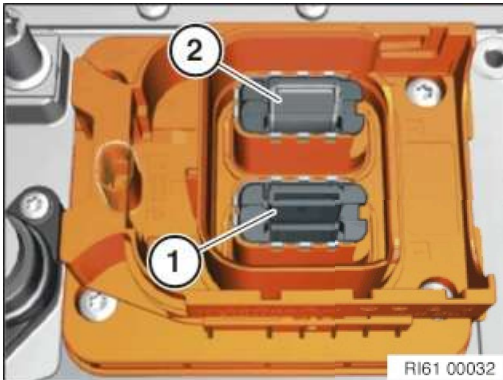
Push the lock (1) fully to the front.

Lift the connector (2) and remove it entirely.

**Attention!**

Plug connection (3) is difficult to pull off.

The connector (2) must be completely pulled off the opposite housing in one step. Damage may be caused to contact protection if connector is only partly pulled off and then closed again!



**Check the Kostal high-voltage connector and connection for damage:**

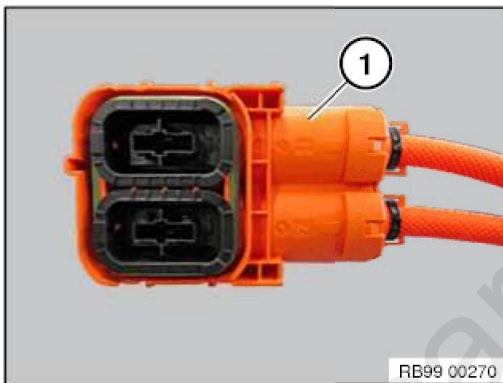
Check the touch protection for damage and correct positioning (1).

**Warning!**

Do not touch unprotected connector (2)!

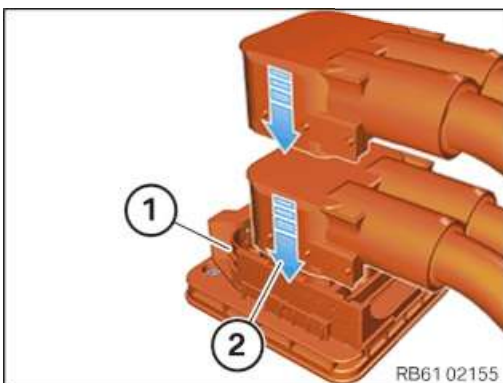
If the contact protection (1) has been pushed to the bottom (2), the high-voltage connector must be refitted.

If contact protection (1) remains in bottom position (2) after reinstallation, the contact protection is faulty and the component must be replaced!



Check the high-voltage connector (1) for damage. **Warning!**

In the event of damage to the high-voltage connector (1), the complete high-voltage cable must be replaced!



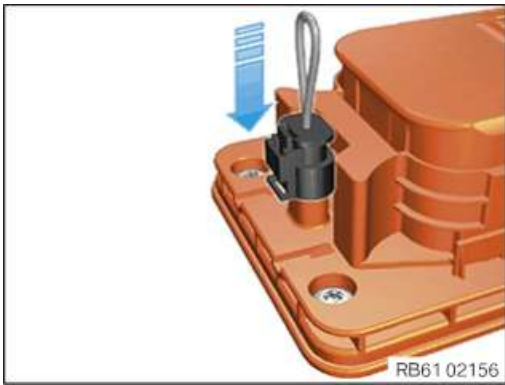
**Connect the Kostal high-voltage connector:**

Connect the connector (2) in one single movement to the counter-housing.

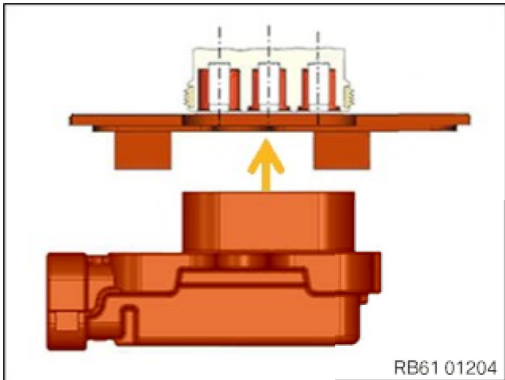
Push the lock (1) fully to the rear.

**Attention!**

Plug connection (3) must be correctly locked by lock (2), otherwise there is a risk of damage.

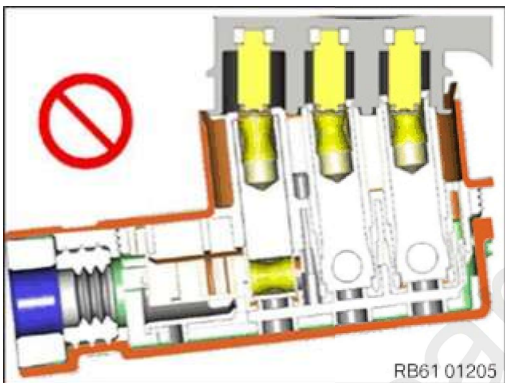


Connect the connector for the high-voltage interlock.



### Three-phase high-voltage connector:

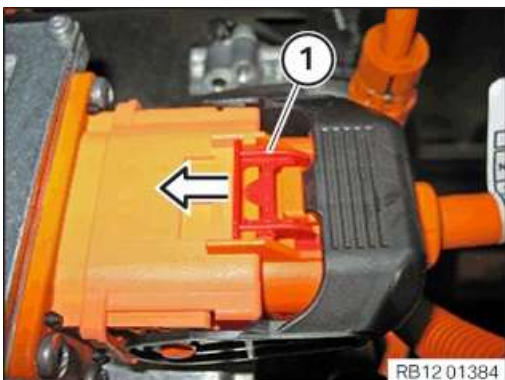
Connect and disconnect the connector straight.



### Attention!

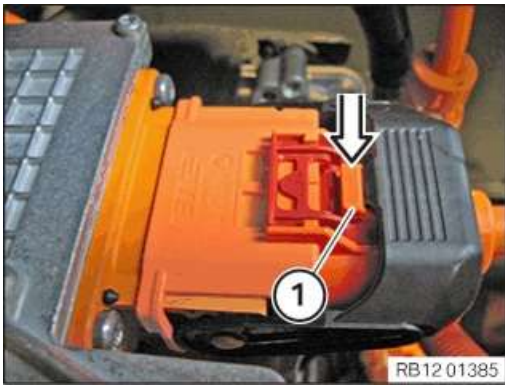
The system is designed to only offer limited protection against damage caused by connectors that are inserted at an angle.

Increased tilted connections will increase the connecting force and the risk of danger.

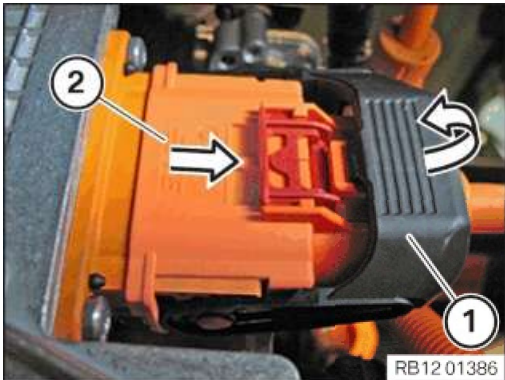


### Disconnect the high-voltage connector from the high-voltage connection of the KLE:

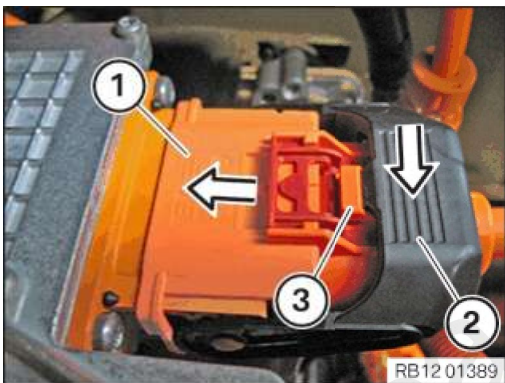
Slide lock (1) in direction of arrow up to stop.



Press lock (1).



Open the lock (1) completely and disconnect the connector (2).



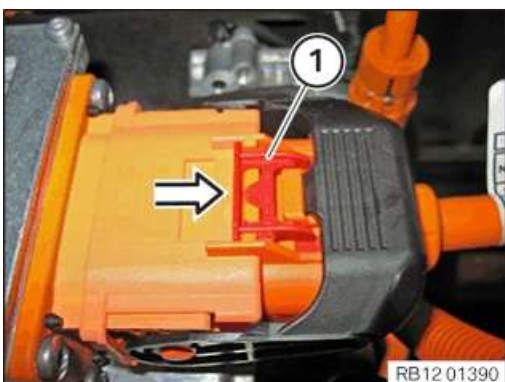
**Connect the high-voltage connector to the high-voltage connection of the KLE:**

Connect the connector (1) to the limit position and close the lock (2).

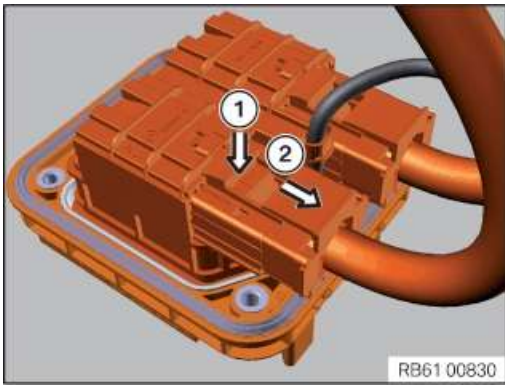
**Attention!**

Lock (2) must snap audibly into place.

The retaining lug of the lock (2) must be positioned completely under the lock (2).



Slide the lock (1) on to the stop in the direction of the arrow.



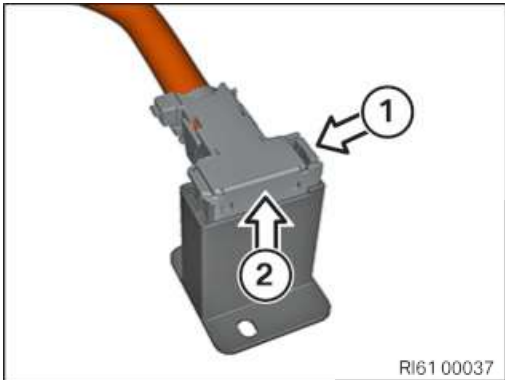
#### **High-voltage connector on the high-voltage connection of the high-voltage battery unit:**

Press down unlocking (1) in direction of arrow and pull off connector in direction of arrow (2).

#### **Attention!**

Contact protection is no longer provided in the event of a damaged connector housing.

In this case, contact technical support.



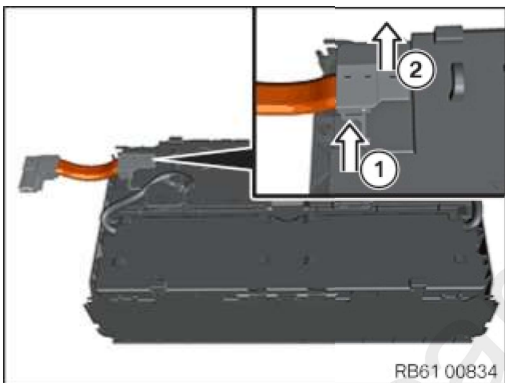
#### **High-voltage connector on the cell module I01:**

Press unlocking device (1) together and pull off connector upwards (2).

#### **Attention!**

Contact protection is no longer provided in the event of a damaged connector housing.

In this case, contact technical support.



#### **High-voltage connector on the cell module (cell module connecting line):**

Press unlocking (1) in direction of arrow and pull off connector in direction of arrow (2).

#### **Attention!**

Contact protection is no longer provided in the event of a damaged connector housing.

In this case, contact technical support.

Switch off ignition.



Connect diagnosis system.

Switch the ignition on.

Select "encoding" program.

Follow the instructions in the diagnosis system.

Adjust the following control units:

- EWS (electronic immobiliser)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

Follow Service Information "Diagnosis and Encoding" on the topic of encoding.

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Switch off ignition.



Connect diagnosis system.

Switch the ignition on.

Select "Programming".

Follow the instructions in the diagnosis system.

Adjust the following control units:

- EWS (electronic immobiliser)
- DME (Digital Motor Electronics) or
- DDE (Digital Diesel Electronics)

Follow Service Information "Diagnosis and Encoding" on the topic of programming.

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**Important!**

Read and comply with [notes](#) on protection against electrostatic damage (ESD protection).

*Necessary preliminary tasks:*

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- [Follow instructions for removing and installing control units.](#)

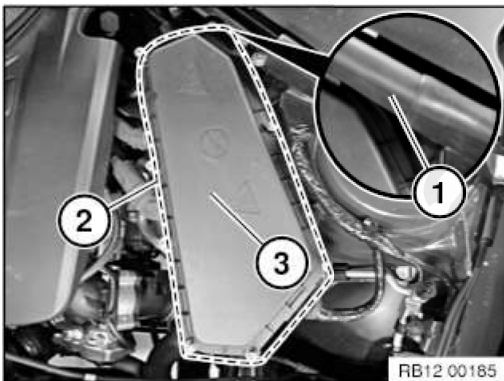
Replacement:

- Carry out programming/encoding.
- If no data can be read out from the previous control unit, carry out injection quantity compensation (description at end of instructions).

**Important!**

It is absolutely essential to read out the fault memory with the diagnosis system and produce a fault memory printout.

Switch off ignition.



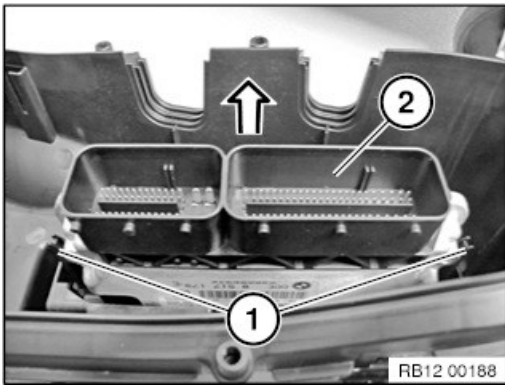
Partially loosen the rear gasket (1) for the engine compartment lid until the screw is accessible from the cover of the electronics box.

Release all screws along line (2).

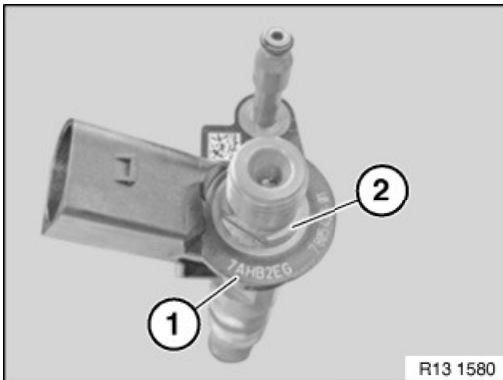
Remove the electronics box lid (3).



Unlock both connectors (1) in direction of arrow, disconnect connector from the control unit and set aside.



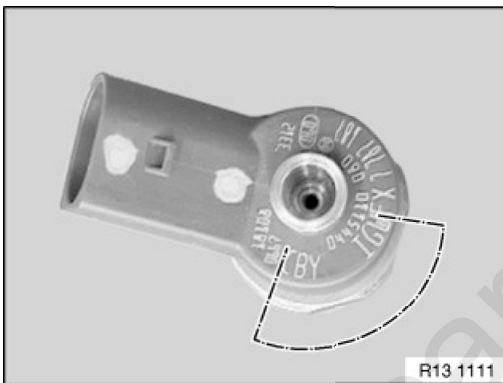
Release retainers (1) on control unit.  
Pull out control unit (2) towards top.



### Injection quantity compensation:

If the DDE control unit has been replaced, it will also be necessary to carry out adjustment of the injectors!

The adjustment value (1) (7-position letter code / number code) is engraved on each injector (2).



Enter the numbers/letters according to the installation location (cylinder) of the injectors.

- Select "DDE".
- Select "Adjustment, injection quantity compensation"
- Select "Test plan"

The adjustment must be entered for each injector.

It is necessary to adjust the injectors to ensure their full functional capability.



### Note:

Check stored fault messages.

Clear diagnostic fault entries from fault memory.

**Important!**

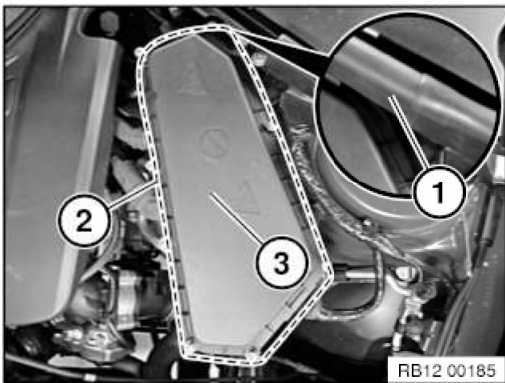
[Read](#) and comply with notes on protection against electrostatic damage (ESD protection)

*Necessary preliminary work:*

- Switch off ignition.

**Important!**

Follow [instructions](#) for removing and installing control units

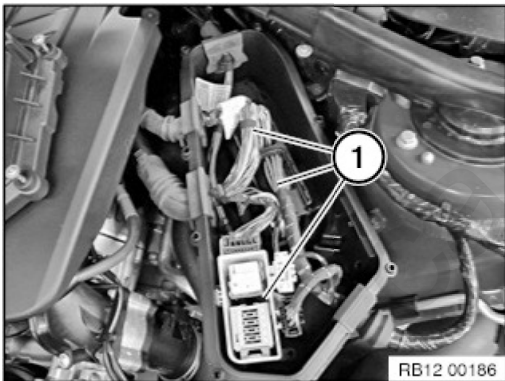


Partially loosen the rear gasket (1) for the engine compartment lid until the screw is accessible from the cover of the electronics box.

Release all screws along line (2).

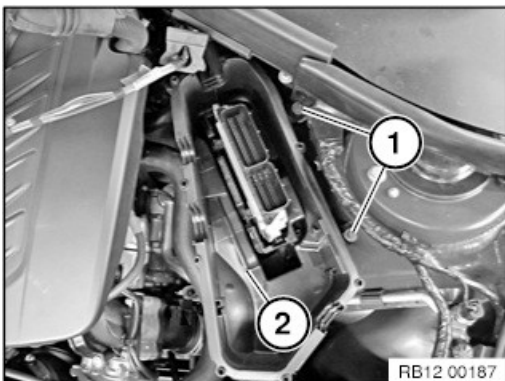
Tightening torque [12 90 1AZ](#).

Remove the electronics box lid (3).



Loosen all connectors and relay carriers (1) from the electronics box and set aside. *Installation note:*

Make sure rubber grommets are correctly fitted (watertightness).



Release screws (1).

Tightening torque [12 90 2AZ](#).

Pull the electronics box from the rubber grommet and remove through the top.



*Note:*

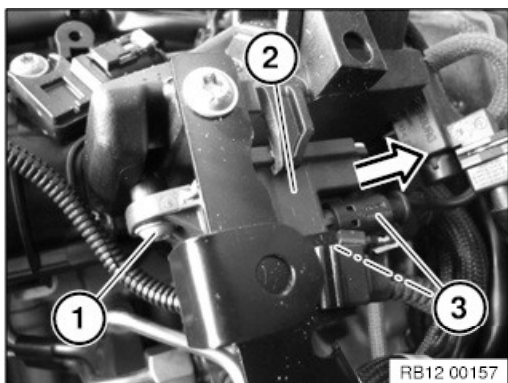
Check stored fault message.

Clear diagnostic fault entries from fault memory.

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**Necessary preliminary work:**

- Switch off ignition.
- Remove [acoustic cover](#) at rear.



Release screw (1).

Tightening torque [12 23 2AZ](#).

Push preheating control unit (2) back from the bracket.

Unlock and disconnect both connectors (3) from preheating control unit.

Thread out preheating control unit and remove.

**Note:**

If the preheating control unit is replaced, the preheating control service function must be performed using the diagnosis system after it is replaced.



**Installation note:**  
Assemble engine.

**Special tools required:**

- [11 6 050](#)
- [12 2 300](#)
- [11 1 480](#)

**Note:**

When one or more glow elements are replaced, the preheating control service function must be started with the BMW diagnosis system before replacement and the "Security data record in the preheating control must be activated".

**Note:**

If malfunctions have occurred at the glow elements, it is essential to check the safety fuse.

For further troubleshooting information refer to the BMW diagnosis system.

Switch off ignition.

**Note:**

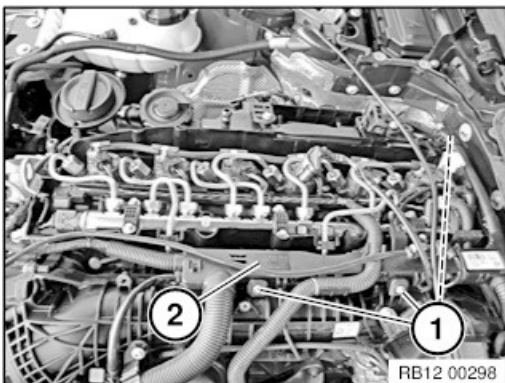
It is recommended to warm the engine up to operating temperature for easy removal of glow elements. In addition, spray glow element with [Disassembly agent 5.1](#) and let it take effect for approx. 2 minutes. Removing glow elements from a cold engine may cause damage to the thread in the cylinder head.

**Important!**

**Risk of burning! The use of gloves is mandatory!**

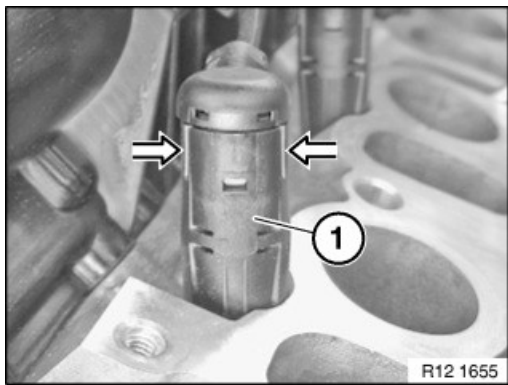
**Necessary preliminary work:**

- Remove [rear acoustic cover and sound insulation](#) on the injectors.



Release screws (1).

Unlock connector from cable channel and pull off. Slide cable channel (2) to one side.

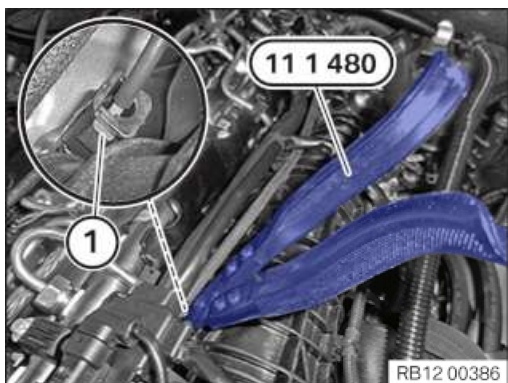


#### Version 1:

Compress connector fastener (1) with special tool [12 2 300](#) and pull from glow elements.

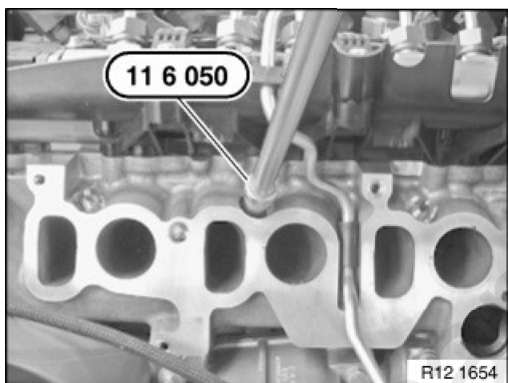
#### Note:

For purposes of clarity, the intake plenum is shown removed.



#### Version 2:

Pull connector (1) from glow element with special tool [11 1 480](#).



Unscrew glow elements with special tool [11 6 050](#).

Tightening torque [12 23 1AZ](#).

#### Note:

For purposes of clarity, the intake plenum is shown removed.



#### Note:

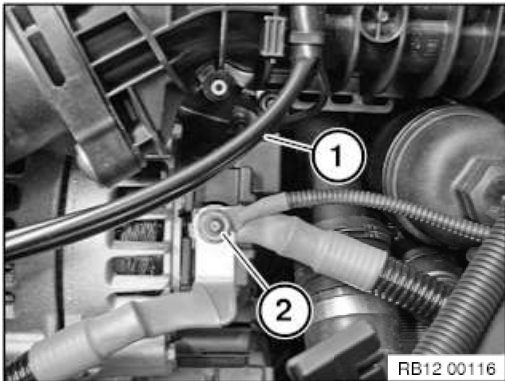
If one or more glow elements are renewed, the preheating control service function must be performed using the diagnosis system after they are replaced.



Read out fault code memory in DDE control unit. Check stored fault message. Rectify fault. Clear diagnostic fault entries from fault memory.

**Necessary preliminary work:**

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Disconnect [battery negative lead](#).
- Remove [intake plenum](#).
- Remove [drive belt for alternator](#).

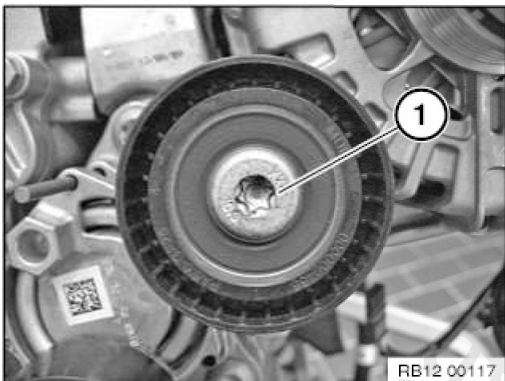


Release connector (1) and remove.

Slacken nut (2).

Tightening torque [12 52 2AZ](#)

Disconnect positive battery cable from alternator.

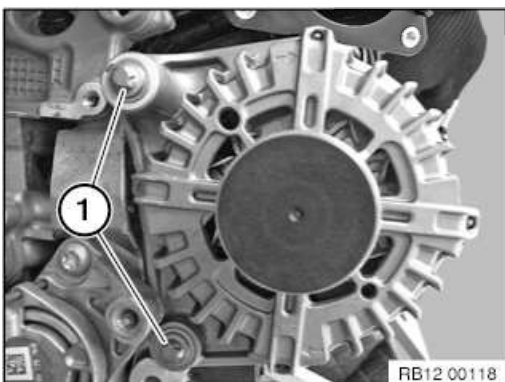


Slacken nut (1).

Remove cover from deflecting element and undo bolt (1) beneath it.

Tightening torque [12 31 2AZ](#)

Remove deflecting element.



Release screws (1).

Tightening torque [12 31 1AZ](#)

Feed out alternator upwards and remove.

**Note:**

Check stored fault messages.

Clear diagnostic fault entries from fault memory.

## 11 00 ...      **Handling components after flood damage**

Flood damage can occur if the permissible fording depth of a vehicle is exceeded. Ingress of water can cause damage to the engine (water shock) or components.

Because dirt particles generally enter into the component with the water (e.g. starter motor, wiring harness), the components need to be thoroughly inspected.

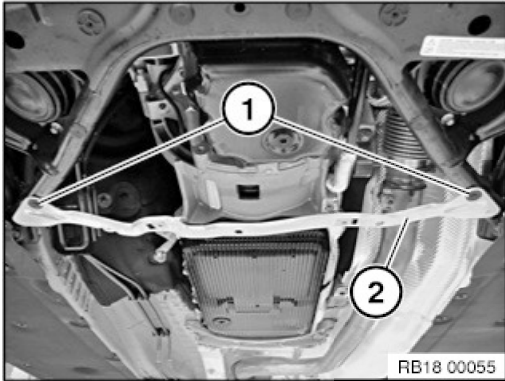
Residual moisture in the components leads to corrosion (increased contact resistance in the component), which can lead to a component failure at a later time.

If water ingress into the electrical components cannot be ruled out, it is recommended to replace the component to ensure correct functioning through the vehicle lifetime.

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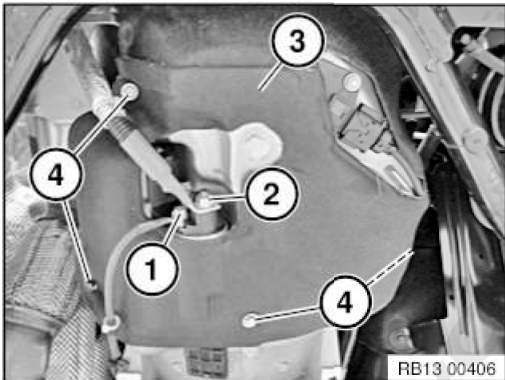
**Necessary preliminary tasks:**

- Switch off ignition.
- Disconnect [battery negative lead](#).
- Remove front [underbody protection](#).
- Remove rear [underbody protection](#).
- **All-wheel drive vehicles only:**  
Remove [reinforcement plate](#).



Release screws (1).

Remove connecting link (2).



Slacken nut (1).

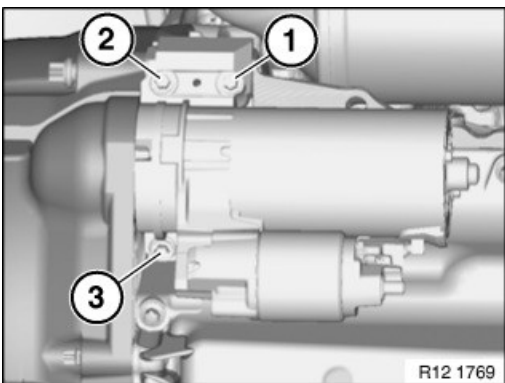
Tightening torque [12 52 1AZ](#).

Slacken nut (2).

Tightening torque [12 52 3AZ](#).

Release screws (4).

Remove bottom acoustic cover (3).



Release screws (1), (2) and (3).

Remove starter motor.

*Installation note:*

**Observe screwing sequence.**

Position and secure starter motor. Tighten down screws (1) and (2). Tighten down support screw (3).

Tightening torque [12 41 1AZ](#).



*Installation note:*

Check starter pinion and ring gear for damage.

Replace damaged starter motor.

Assemble engine.



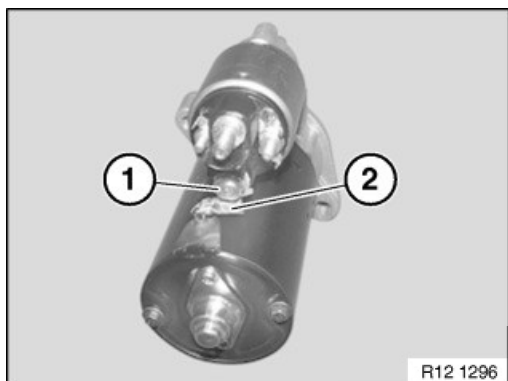
**Only during starter replacement and on vehicles with MSA (automatic engine start-stop function):**

- Use BMW diagnosis system to reset the starter counter.

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**Necessary preliminary work:**

- Switch off ignition.
- Remove [starter motor](#).



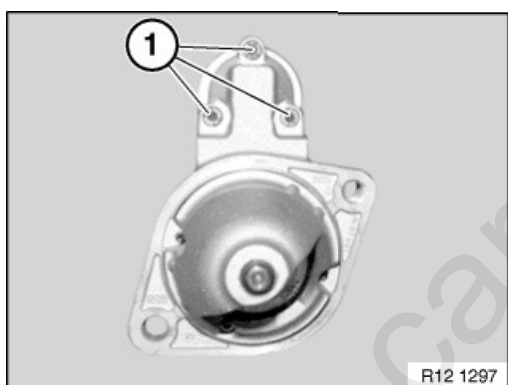
Slacken nut (1).

Remove the cable shoe (2).

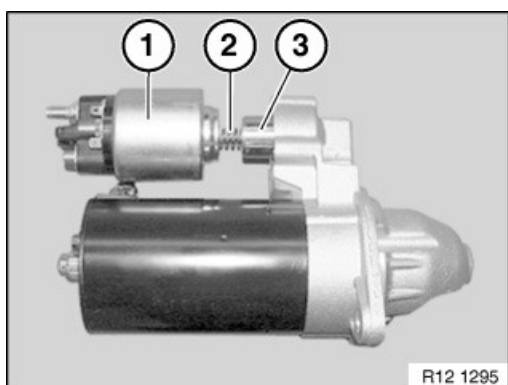
**Attention!**

Do not twist the cable shoe (2) when tightening, risk of shorting to starter motor housing.

Tightening torque [12 41 1AZ](#).



Release screws (1).



Remove the solenoid switch (1) and the spring (2).

Detach the bolt (3).

**Installation note:**

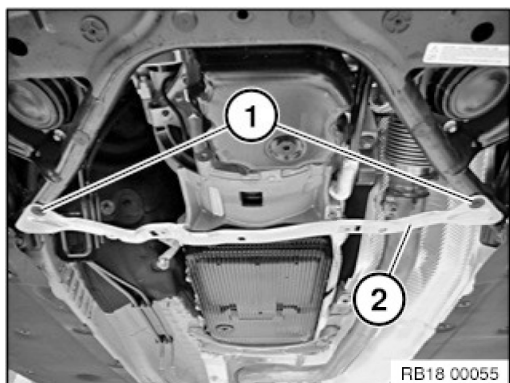
Check the bolt (3) for wear and grease the bolt.

## 12 42 500 Replacing positive battery cable between starter motor, alternator and positive battery connection point (N57 D30 O/T 1)



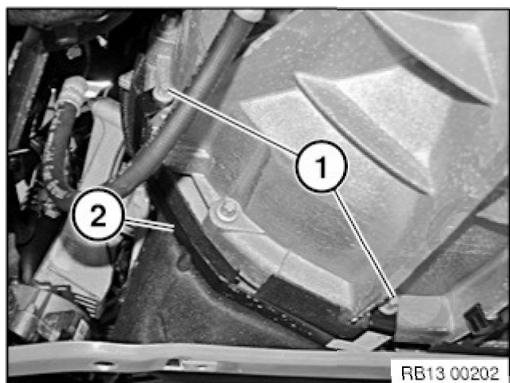
### Necessary preliminary tasks:

- Read out the fault memory of the DME control unit.
- Switch off ignition.
- Disconnect [battery earth lead](#).
- Remove [acoustic cover](#)
- Remove front [underbody protection](#).
- **Vehicles from 07/2014:**  
Remove [trailing link](#).



Release screws (1).

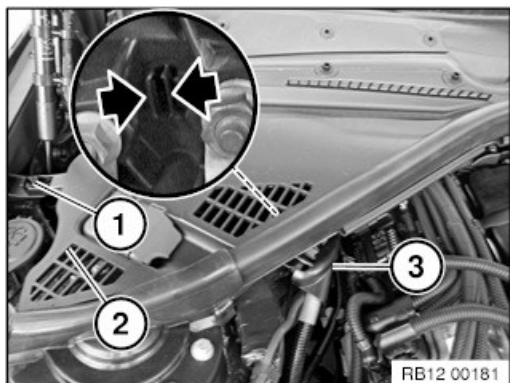
Remove connecting link (2).



Release screws (1).

Remove holder (2).

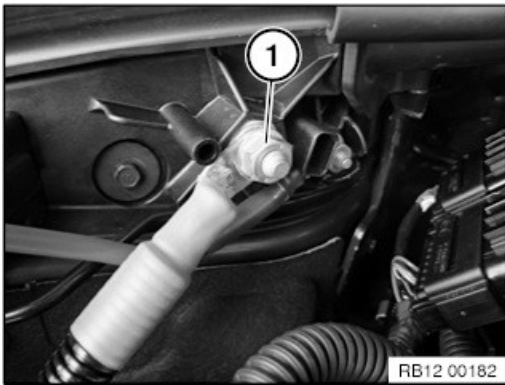
Partially detach sound insulation on the bottom.



### Vehicles up to 07/2014:

Unlock lock (1) and slightly raise service cover (2) until lock of cover (3) is accessible.

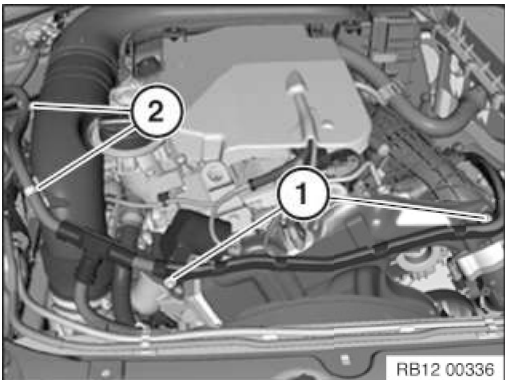
Unlock lock and remove cover (3).



Slacken nut (1).

Tightening torque [12 52 4AZ](#).

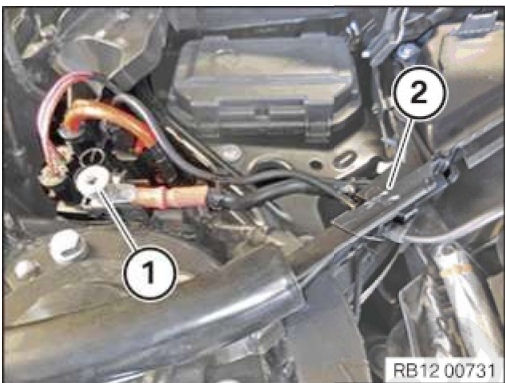
Remove positive battery cable from battery positive terminal.



**Vehicles up to 07/2014:**

Release screws (1).

Release positive battery cable from retainers (2).



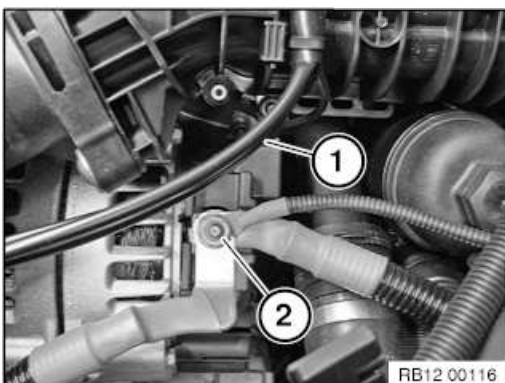
**Vehicles from 07/2014:**

Loosen positive battery cable (1).

Tightening torque [12 52 4AZ](#).

Release clamp (2).

Feed out positive battery cable.

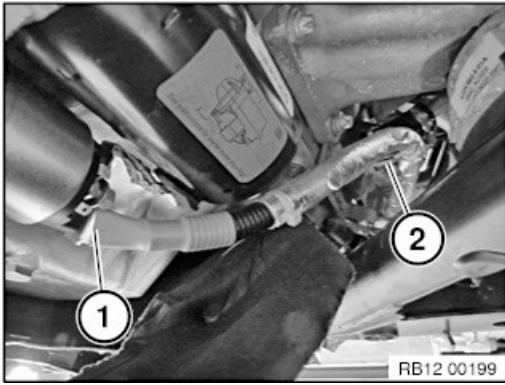


Slacken nut (2).

Tightening torque [12 52 2AZ](#).

Disconnect positive battery cable from alternator.

Do not disconnect the connector (1).



Release nut (1) on starter motor.

Tightening torque [12 52 3AZ](#).

Disconnect positive battery cable from starter motor.

Release positive battery cable from retainers (2).

Feed out positive battery cable and remove.



*Note:*

Reassemble the vehicle.

Check stored fault messages.

Clear diagnostic fault entries from fault memory.

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**Caution!**

Observe [safety regulations](#).

Investigate cause of triggering of safety battery terminal.

To do so, read out fault memory of airbag control unit. Note fault messages stored in memory. Rectify faults. Then clear fault memory.



Use of safety battery terminal:

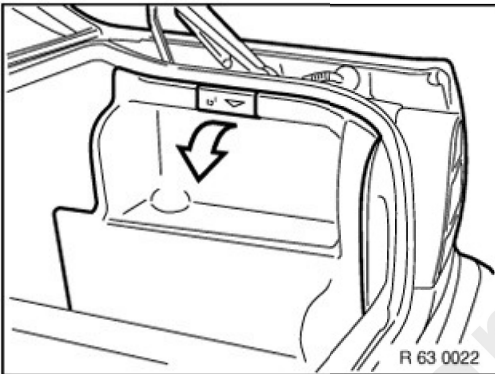
- From model year 1998 in Series E38, E39, E46
- From 4/99 in E36/Z3
- in each of following new Series

The different models have different installation locations:

**Battery in engine compartment**

Safety battery terminal is replaced with cable up to battery positive support point.

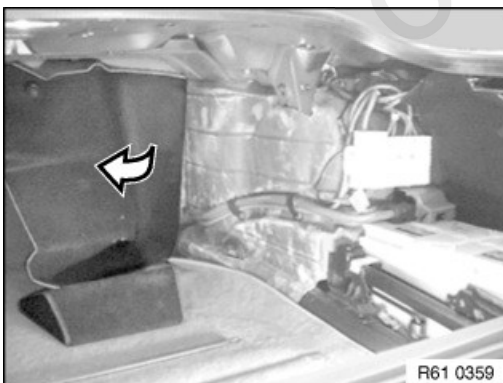
**Safety battery terminal is omitted as from 03/2002 from all E46 LHD models with 4-cylinder engines.**

**Battery in luggage compartment behind side trim panel**

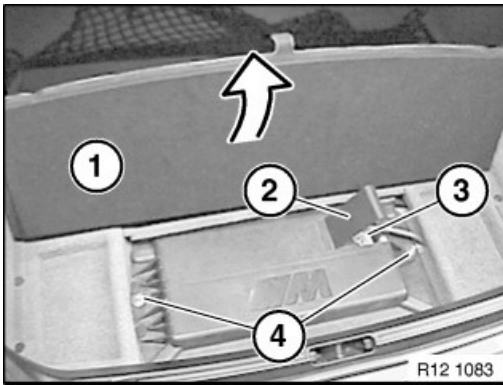
Remove side trim panel.

Follow instructions for [disconnecting and connecting battery](#).

Disconnect and cover battery negative lead.



Release front side trim panel partly and fold forward.



### Battery in luggage compartment under floor trim panel

Follow instructions for [disconnecting and connecting battery](#).

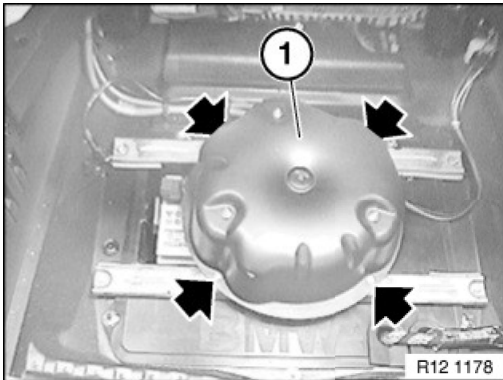
Fold back floor trim panel (1).

Lift cover (2) on battery negative lead.

Disconnect and cover battery negative lead (3).

Release nuts (4).

Remove battery cover.



### Battery in luggage compartment under spare wheel

Remove spare wheel.

Release screws.

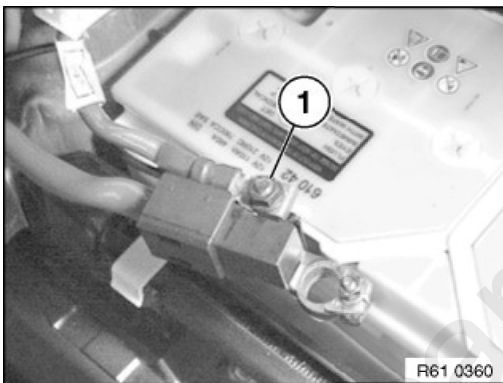
#### Caution!

Do not kink air pipes.

Set air supply system (1) to one side.

Follow instructions for [disconnecting and connecting battery](#).

Disconnect battery negative lead.



Disconnect supply cable (1) for vehicle electrical system. **Installation:**

Remove faulty fuses and carry out troubleshooting.



#### Caution!

Pay attention to interface.

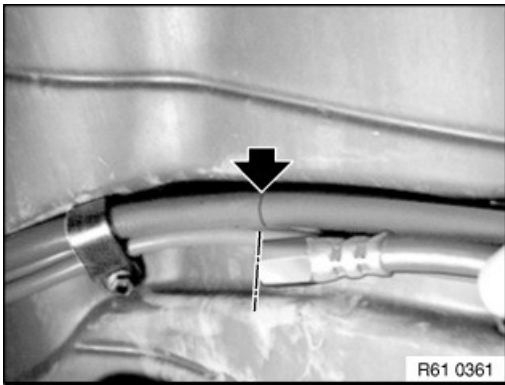
The repair cable is always a standard length.

The heavy-current connector of the repair cable has a larger diameter than the battery positive lead.

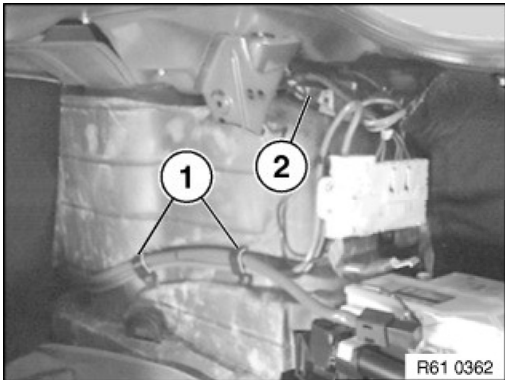
In some Series (e.g. E46 touring), the heavy-current connector of the repair cable can lead to installation problems.

This is the case when the interface is in the area of the close-fitting trim panels.

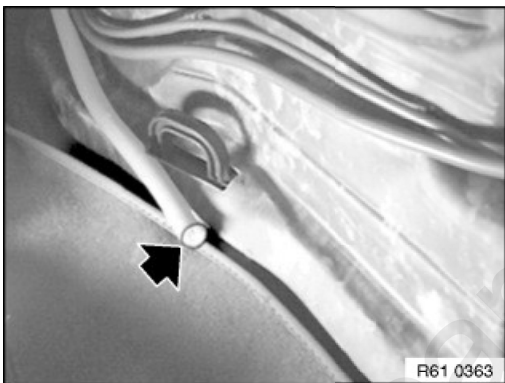
Find matching interface (e.g. approx. 10 cm behind rear seat backrest in E46 touring).



Lay repair cable parallel to battery positive lead.  
Mark interface of battery positive lead at end of repair cable.



Release cable ties (1).  
Disconnect plug connection (2).

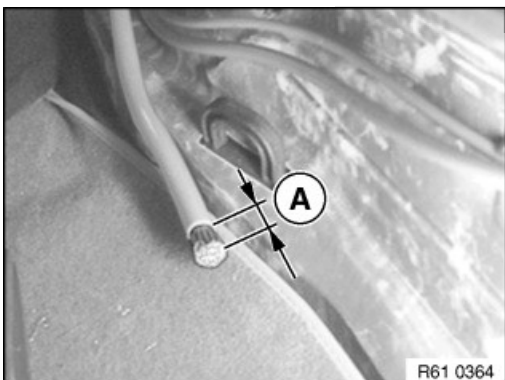


#### Caution!

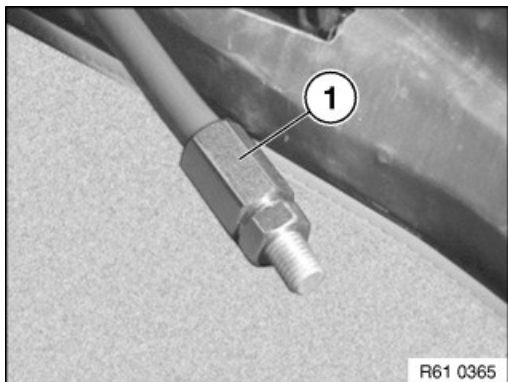
Do not use bolt cutters or similar tools to cut through the cable.

A cable end that has been squashed flat will no longer fit into the clamping sleeve.

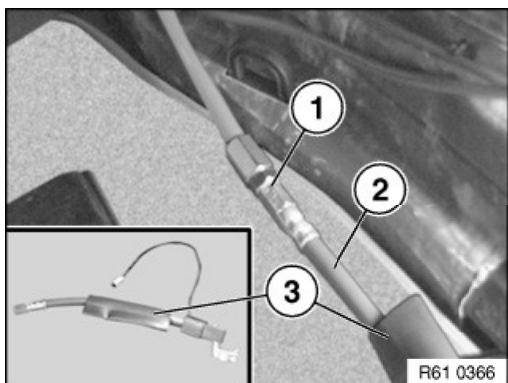
Saw through battery positive cable at marked point with an iron saw.



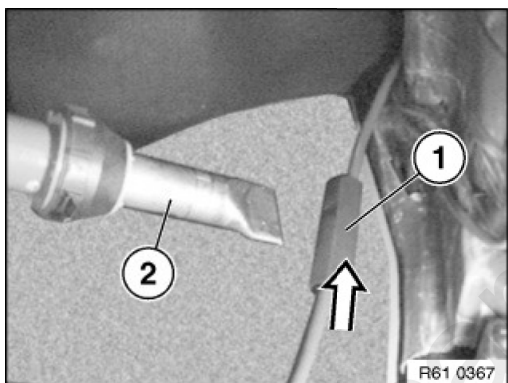
Strip insulation - length (A) - from cable end.  
Distance (A) = 15 mm.



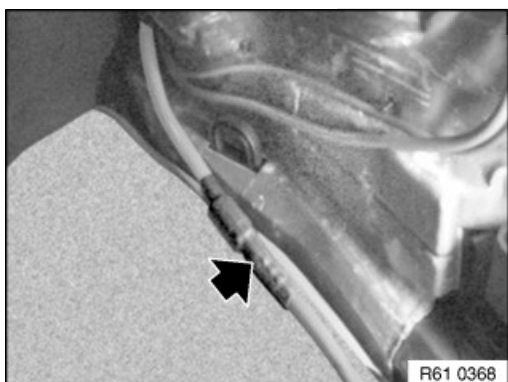
Push heavy-current connector (1) over stripped cable end and screw into position.



Push shrink-fit hose (3) over repair cable.  
Screw threaded sleeve (1) of repair cable (2) to heavy-current connector.



Push shrink-fit hose (1) over connecting point and shrink on with a hot-air blower (2).



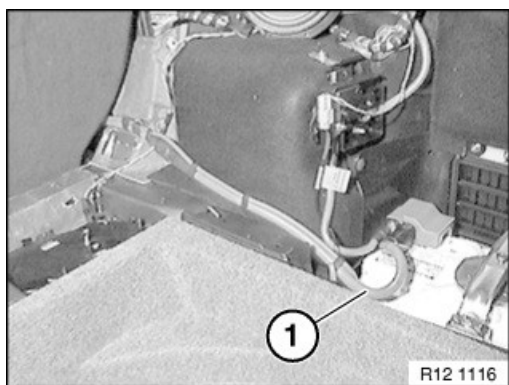
**Note:**

Heat up shrink-fit hose until it has settled completely around the connection point.



When laying the repaired battery positive cable, observe the following:

- The shrink-fit hose must not be scuffed during any movement.
- The repair cable must not cause any disturbing noises during driving operation.



**Note:**

Offsetting cutting line by approx. 10 cm produces excess length of battery positive lead (1).

Lay battery positive lead (1) without kinks or abrasions.

(Shown on E46 touring.)

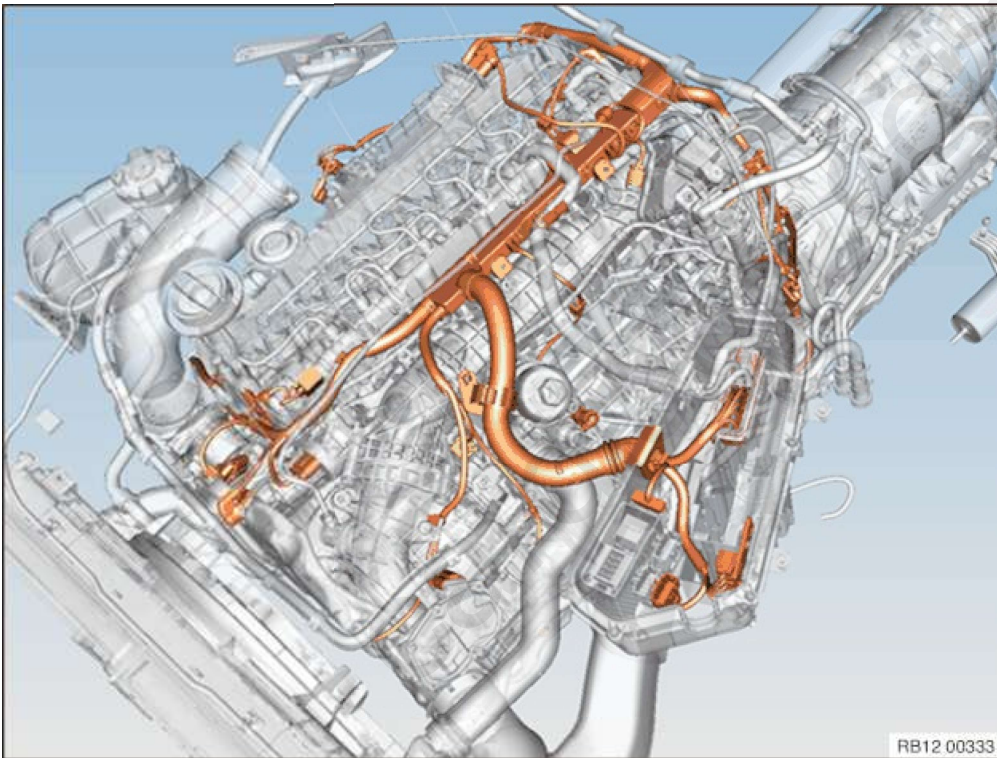
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**Attention!**

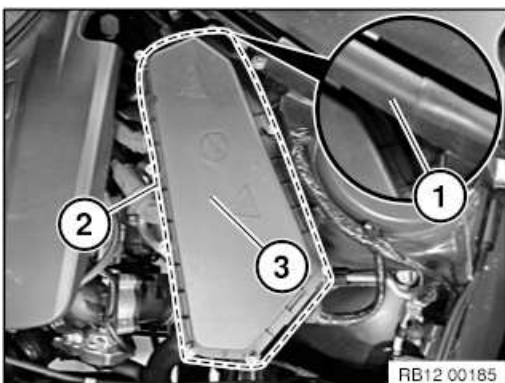
[Read and comply with notes on protection against electrostatic damage \(ESD protection\)!](#)

**Necessary preliminary tasks:**

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Disconnect [battery negative lead](#).
- Remove [intake silencer housing](#).
- Remove rear [acoustic cover](#) and sound insulation on injector.
- Remove front [underbody protection](#).



Overview of the wiring harness section for the engine.

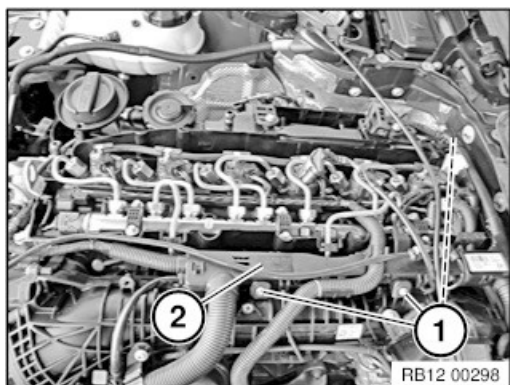


Partially loosen the rear gasket (1) for the engine compartment lid until the screw is accessible from the cover of the electronics box.

Release all screws along line (2).

Remove the electronics box lid (3).

Release wiring harness section for engine from electronics box.



Release screws (1).

Unlock connector from cable channel and pull off. Release cable channel (2).

| Unlock and disconnect following connectors and lines                                            | Note           |
|-------------------------------------------------------------------------------------------------|----------------|
| Unlock connector on hot film air mass meter and disconnect                                      |                |
| Unlock connector on exhaust turbocharger and disconnect                                         |                |
| Unlock connector from all electric changeover valves and pull off                               |                |
| Release and unplug connector from exhaust gas pressure sensor                                   |                |
| Unlock connector on exhaust-gas temperature sensor and disconnect                               |                |
| Unlock connector on oxygen sensor and disconnect                                                |                |
| Unlock connector on vacuum electric changeover valve (exhaust-gas recirculation) and disconnect |                |
| Unlock connector on exhaust-gas recirculation valve and disconnect                              |                |
| Unlock connector on coolant temperature sensor and disconnect                                   |                |
| Unlock connector on intake plenum intake adjuster and disconnect                                |                |
| Pull off and disconnect the connector from the pressure sensor on the intake plenum.            |                |
| Unlock connector on rail pressure sensor and disconnect                                         |                |
| Unlock connector on rail pressure regulating valve and disconnect                               |                |
| Unlock connector on camshaft sensor and disconnect                                              |                |
| Unlock connector on alternator and disconnect                                                   |                |
| Unlock connector on air conditioning compressor and disconnect                                  |                |
| Unlock connector on intake air temperature sensor and disconnect                                |                |
| Unlock connector on oil pressure sensor and disconnect                                          |                |
| Release nut on starter motor, detach cable (terminal 50)                                        |                |
| Unlock connector on transmission and disconnect                                                 | Automatic only |
| Unlock connector on crankshaft sensor and disconnect                                            |                |
| Unlock connector on throttle body and disconnect                                                |                |
| Unlock connector on exhaust-gas recirculation temperature sensor and disconnect                 |                |
| Unlock connector on high pressure pump and disconnect                                           |                |
| Unlock connector on fuel pressure/temperature sensor and disconnect                             |                |
| Release and unplug connector from preheating control unit                                       |                |



*Installation note:*

Check the wiring harness installation arrangement.

Check that the plug connections are correctly fitted.

Check stored fault messages.

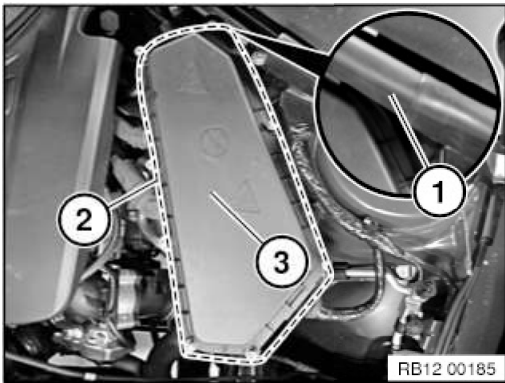
Delete the fault memory.

**Important!**

Read and comply with notes on [protection against electrostatic damage \(ESD protection\)](#).

**Necessary preliminary tasks:**

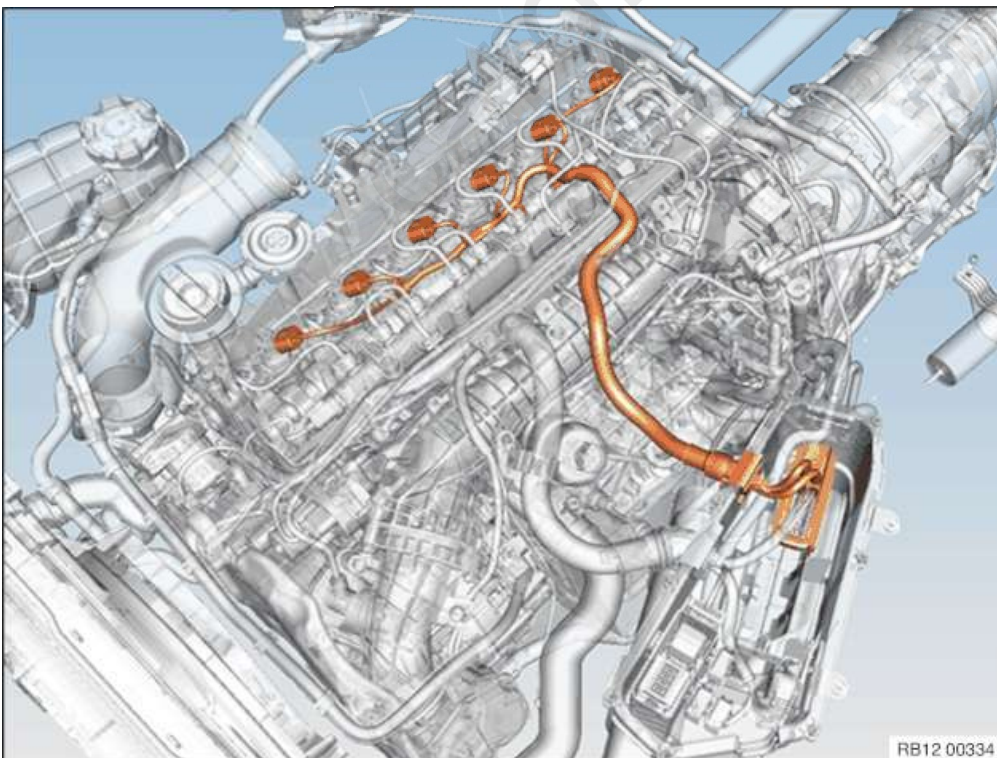
- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Disconnect [negative battery cable](#).
- Remove [intake silencer housing](#).
- Partially release [wiring loom](#) for engine.
- Remove [rear acoustic cover and sound insulation on injector](#).



Partially loosen the rear gasket (1) for the engine compartment lid until the screw is accessible from the cover of the electronics box.

Release all screws along line (2).

Remove the electronics box lid (3).



Unlock all plugs on injectors and disconnect.

Unlock and remove connector from control unit.

Detach wiring harness from clamp.

Feed out wiring harness for injectors under pressure lines and engine wiring harness and remove.

**Installation note:**

To ensure watertightness, make sure the wiring harness rubber grommet for injectors is correctly inserted.



*Note:*

Check wiring harness installation arrangement.

Check plug connections for correct fit.

Reassemble the vehicle.

Read out the fault memory of the DDE control unit.

Check and rectify stored fault messages.

Clear diagnostic fault entries from fault memory.

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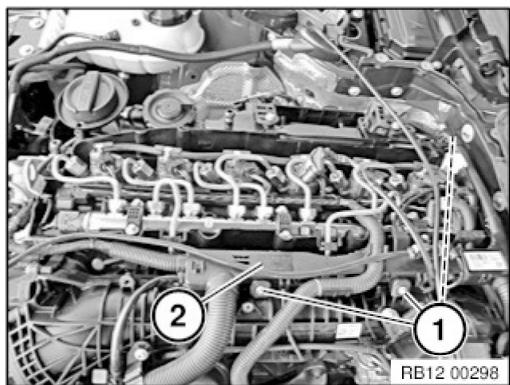
## Important!

[Read and comply with notes on protection against electrostatic damage \(ESD protection\)!](#)



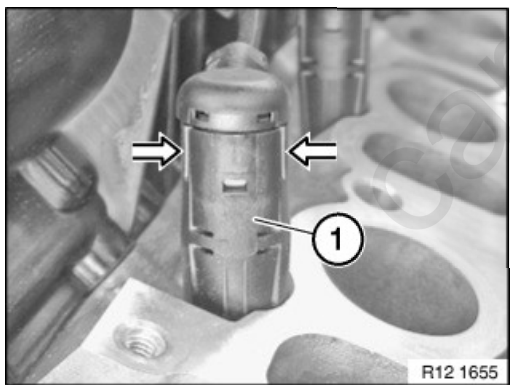
## Necessary preliminary tasks:

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Disconnect [battery negative lead](#).
- [Acoustic cover](#), rear.



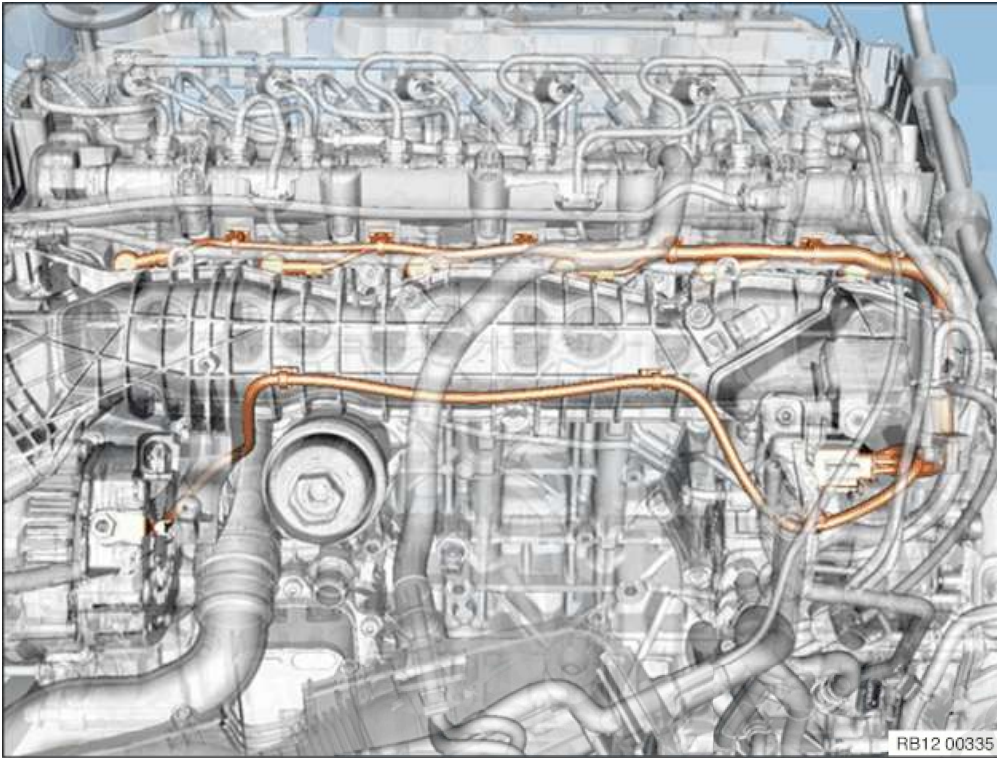
Release screws (1).

Unlock connector from cable channel and pull off. Slide cable channel (2) to one side.



Press together connector fastener (1) and detach plugs from glow elements. *Note:*

For purposes of clarity, the intake plenum is shown removed.



Overview of the wiring harness section for the preheating system.

Release nut on alternator.

Tightening torque [12 52 2AZ](#).

Disconnect positive battery cable from alternator.

Unlock connector on preheating control unit and remove.

Release wiring harness from clips and retainers.

Feed out wiring harness and remove.



*Installation note:*

Check wiring harness installation arrangement.

Check plug connections for correct fit.

Check stored fault message.

Clear diagnostic fault entries from fault memory.

## 61 00 ... Safety information on handling hybrid cars

### 1. Qualification:

All repair work on high-voltage components may **only be performed by specially trained personnel** (qualification: Work on high-voltage inherently safe vehicles) must be performed by qualified technicians. Each hybrid car requires additional vehicle specific training with training achievement controls. Required training is offered by the BMW Training Academy.

### 2. Identification:

Observe **warning notices** on high-voltage components. When replacing individual high-voltage components, check if warning stickers are present. Independently attaching warnings is only allowed on the locations provided for them. Use only approved and appropriately identified original new parts.

### 3. Rules of conduct/protective measures:

- Note operating instructions for handling high-voltage battery units.
- Do not under any circumstances touch open high-voltage cables and high-voltage components on damaged vehicle before shutting down the high-voltage electrical system.
- In the event of damage (mechanical, thermal) transition metal oxides, carbon, electrolyte solvents and their products of decomposition may be released.  
Suitable acid-resistant protective clothing/equipment must therefore be used when handling the vehicle!

- Hand protection: Gloves
- Eye protection: Safety goggles

Damaged high-voltage battery units must be stored in an acid-resistant pan in a location in the open that is protected against the weather (sun, rain) and secured against unauthorised access. Do not inhale escaping gasses.

- Prevent escaping substances from entering drains, pits and the sewer system.
- Collect any material that is discharged and have it disposed of according to the work instruction, wear acid-resistant protective clothing when doing so.
- Notify the fire brigade if fire breaks out, clear the area immediately and make accident scene safe. Attempt to extinguish the fire without putting persons in danger (suitable extinguishant: water and water foam).
- A cut 2nd emergency separation point must be repaired with a butt connector.

### 4. Measures before starting work:

- Each job on the vehicle must be assigned by appropriately trained personnel. Before work is started, this electrician must place the vehicle in the operating condition required to perform the relevant activity. The qualified personnel's instructions and directions absolutely must be followed. **No work may be carried out without this qualified personnel being consulted first.**
- It is **not** permitted to work on the high voltage system or on high voltage components while the engine is running.
- The readiness to drive must be ended before shutting off the voltage of the high-voltage system. The readiness to drive is ended when the driver is absent only under the following conditions:
  1. seat belt buckle unlocked **and**
  2. the driver's door is open **and**
  3. no brake activated **and**
  4. the accelerator pedal is not activated **and**
  5. speed < 3 km/h (2 mph)
- Work on live high-voltage components is expressly prohibited. Before each operation on the high-voltage system, the system must be isolated from the power supply by qualified personnel (high-voltage safety connector Off) and secured against unauthorised recommissioning (padlock).
- After each deactivation of the high-voltage system, it is essential to observe a **waiting period** of at least **10 seconds** prior to further work.
- Before beginning work, it is mandatory to check that the equipment is de-energised and is protected against being energised again.  
Work is only permitted to begin if:
  1. Corresponding display in the KOMBI **High-voltage system deactivated** or  
When a high-voltage warning is active (indicator light, Check Control, etc.), it is essential to determine and eliminate the cause of this warning via the diagnosis system before continuing with any other work. **If it cannot be definitively established that the equipment is de-energised**, work is not permitted to begin. **Danger to life!** Before work begins, a qualified electrician (1000 V AC) must verify that the system is de-energised using appropriate measuring devices and procedures.  
**=> In this case, Technical Support must be contacted!**
- Do not perform any work on the vehicle while it is charging. Before starting work, disconnect the charging

cable from the vehicle.

Battery charging may result in heating of the high-voltage battery unit. This heating may lead to sporadic launches of the electric fan (switch-on request from the electric fan). Therefore, work in the vicinity of the electric fan during the charging procedure is prohibited. Ensure freedom of movement of the battery charge lines in the vicinity of the electric fan.

5. *Measures during/after activities:*

- Identifiable mechanical damage to or tampering with high-voltage components must be reported immediately to the qualified personnel in charge.
- When carrying out any work on the high-voltage system, it is prohibited to drive externally all the drivetrain components (wheels, gearbox, drive shafts, etc.).
- *E72 only:* When the "Power Electronic Box Cover" is removed, the high-voltage system is not permitted to be activated. The high-voltage service disconnect must only be used when the "Power Electronics Box Cover" is completely installed.
- High-voltage cables (orange coating) and their connectors and stop parts **may not** be repaired. If damaged, a cable must always be replaced completely.
- When working in the vicinity of high-voltage components (identified accordingly with warning stickers and orange-coloured coating), protect these components against damage.
- The specified work steps in the repair instructions must be adhered to exactly.
- High-voltage components and their holders must be screwed/bolted to the defined tightening torque. Tightening torques and tightening specifications must be observed.
- Connecting high-voltage components to body ground is crucial to safety for reasons of equipotential bonding. For this reason, it is prohibited to operate any high-voltage components without them being correctly connected to body ground. The measurements (insulation/potential equalisation measurement) are performed automatically by the vehicle. Manual measurement is not therefore necessary. For a correct earthing connection, the retaining elements of high-voltage components must not be painted. Follow further [painting notes](#).
- Removed high-voltage battery units must be stored in a manner that protects them from misuse and damage.
- Damaged or warning stickers that are no longer legible on high-voltage components must always be replaced.

6. *Potential compensation:*

Equipotential bonding lines, high-voltage cables and the battery negative lead to the EME are fitted with safety screws.

- Clean contact faces and have then checked by a second person.
- Tighten down screws/bolts to specified torque.
- Have tightening torque checked by a second person.
- Both persons must document that the work has been carried out correctly in the vehicle records.

## 12 61 285 Removing and installing/replacing oil level sensor for engine oil (N57 D30 O/T 1)



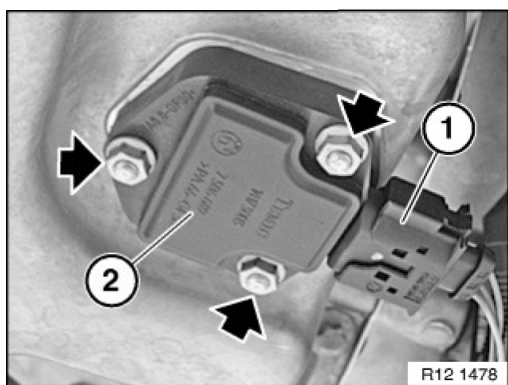
### Important!

Read and comply with notes on [protection against electrostatic discharge \(ESD protection\)](#).



### Necessary preliminary tasks:

- Switch off ignition
- Remove front [underbody protection](#).
- Drain [engine oil](#).
- Partially loosen the lower acoustic cover.



Unlock connector (1) and remove.

Unscrew nuts.

Tightening torque [12 61 2AZ](#).

Remove oil level sensor.

#### *Installation note:*

Clean sealing surface on oil sump.

Replace seal on oil level sensor.

An excessively low torque value will result in oil leaks.

An excessively high torque value will result in damage to the oil level sensor.

Top up engine oil.



#### *Note:*

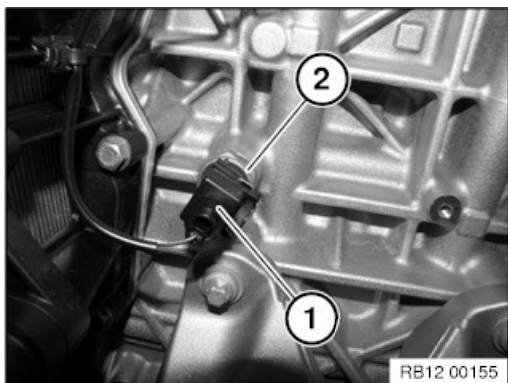
Check stored fault messages.

Delete fault memory.



**Necessary preliminary work:**

- Remove [intake silencer housing](#).



**Important!**

A small amount of engine oil emerges when oil pressure switch is removed.

Have a cleaning cloth ready.

Unlock connector (1) and remove.

Release oil pressure switch (2).

Tightening torque [12 61 1AZ](#).



Reassemble the vehicle.

Check engine oil level.

**Important!**

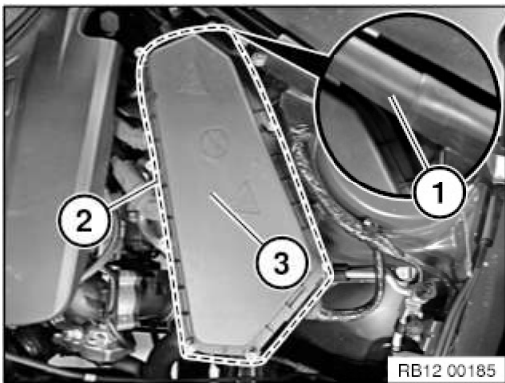
[Read](#) and comply with notes on protection against electrostatic damage (ESD protection)

*Necessary preliminary work:*

- Switch off ignition.

**Important!**

Follow [instructions](#) for removing and installing control units

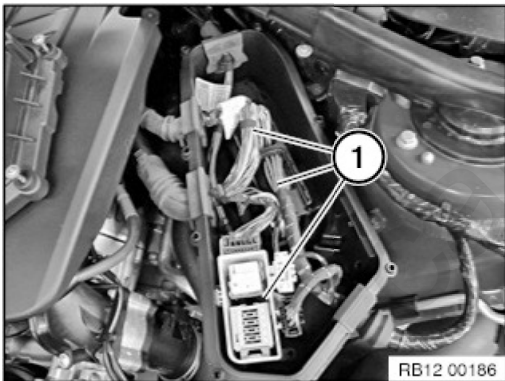


Partially loosen the rear gasket (1) for the engine compartment lid until the screw is accessible from the cover of the electronics box.

Release all screws along line (2).

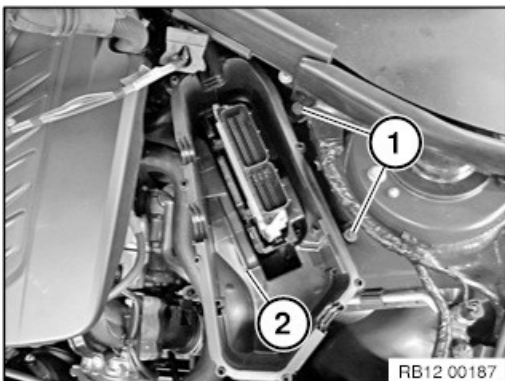
Tightening torque [12 90 1AZ](#).

Remove the electronics box lid (3).



Loosen all connectors and relay carriers (1) from the electronics box and set aside. *Installation note:*

Make sure rubber grommets are correctly fitted (watertightness).



Release screws (1).

Tightening torque [12 90 2AZ](#).

Pull the electronics box from the rubber grommet and remove through the top.



*Note:*

Check stored fault message.

Clear diagnostic fault entries from fault memory.

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