

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 optional 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.

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

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:

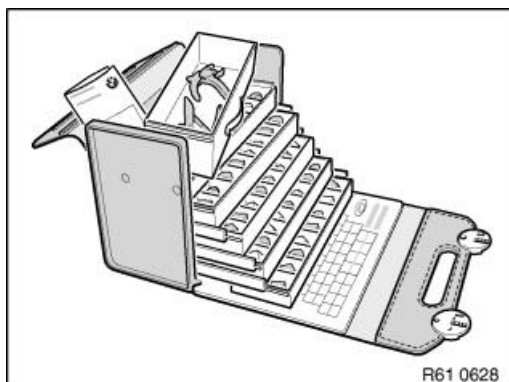
- Battery retrofitting

**Special tools required:**

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

**Important!**

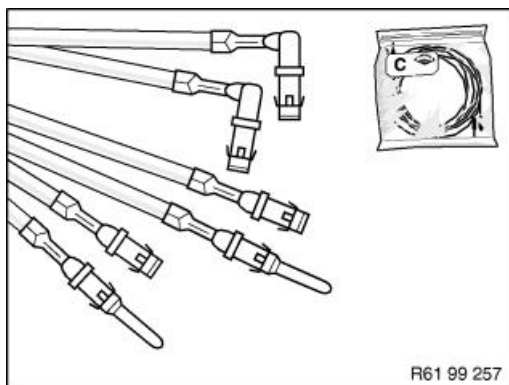
1. Identify cause of damage (e.g. sharp-edged body components, faulty electrical loads, jammed mechanisms, corrosion caused by ingress of water, etc.).
2. Read out fault memory
3. Eliminate cause of damage.
4. Disconnect battery negative terminal
5. Make sure that no safety-related system according to 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.

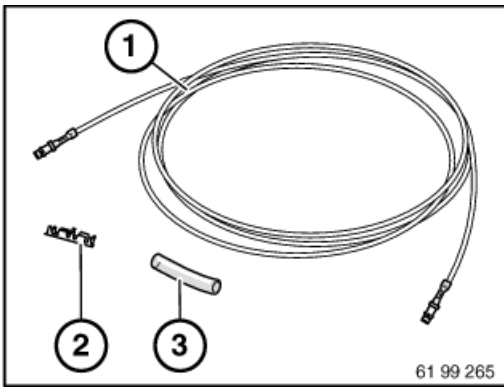
The case can no longer be ordered. Order individual parts for wiring harness repair through BMW Parts Department.

- Refer to Service Information:
[SI 02 04 07 341](#)



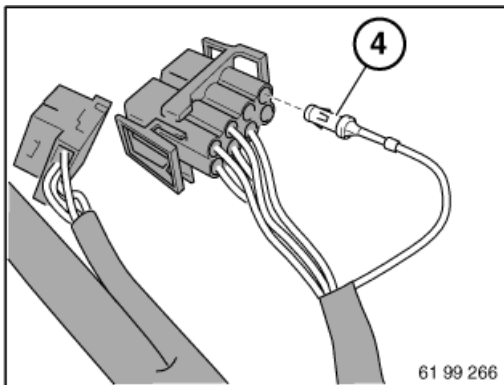
Choose repair kit.

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

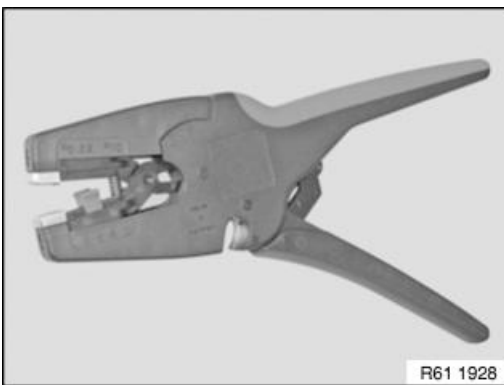


Open secondary lock on housing.

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!

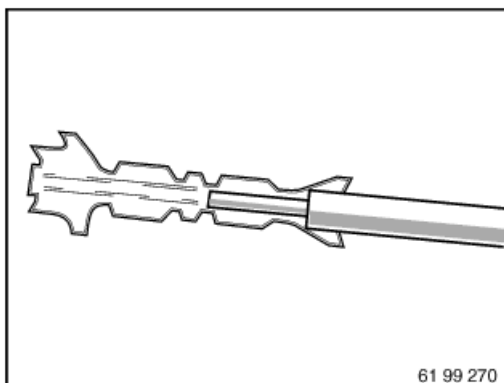
- Check maximum length of repair cable
- If more than one wire is to be repaired, the individual interfaces must be offset so that the wiring harness is not too thick at the repaired point.

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](#)



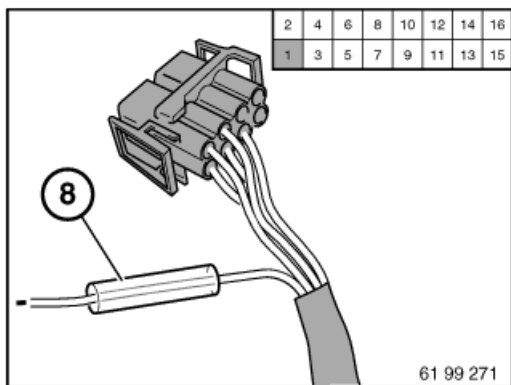
Crimp butt connector on preassembled wire end.

Special tools:

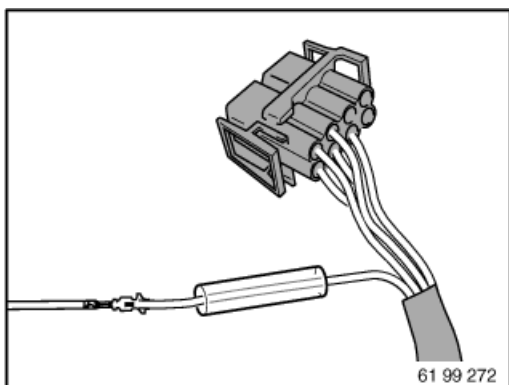
- [61 4 340](#) (0.35 - 2.5 sq mm)
- [61 0 240](#) (4.0 - 6.0 sq mm)

See *repair instructions*

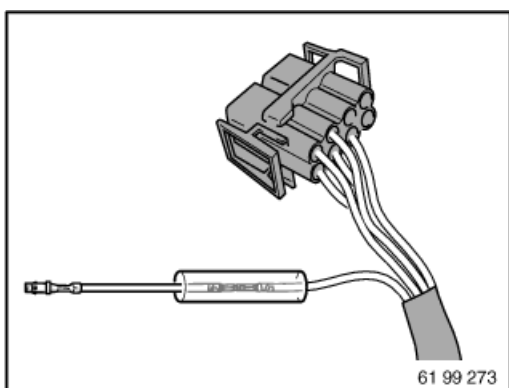
[Crimping on stop parts](#)



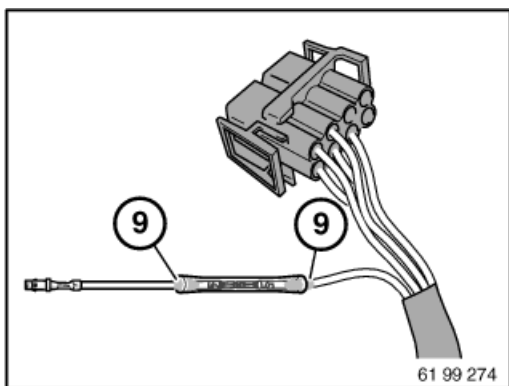
Push shrink-fit hose (8) onto free wire end.



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.

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

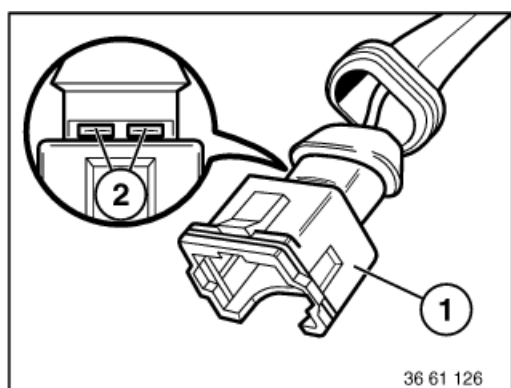
Refer to the diagnosis system for further vehicle-specific information.



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
- 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 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!

- Fibre-optic cables are permitted to show only one junction point (bridge), replace fibre-optic cables if necessary
- Smallest permissible bending radius is 25 mm
- Avoid effects of heat $\geq 85^\circ$

[Treating cables and optical fibres](#)

FlexRay (twisted cables)

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

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.

Note:

Repair wiring harnesses can be equipped with an **additional socket housing** (e.g. 30-pin), **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.

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!

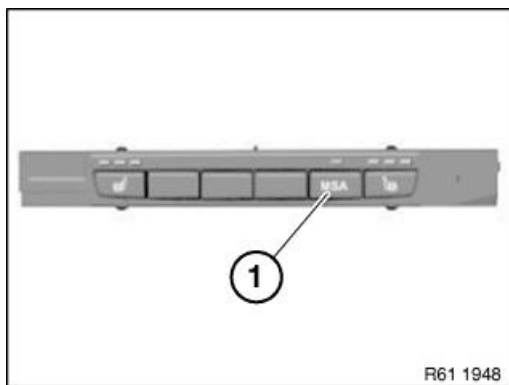
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

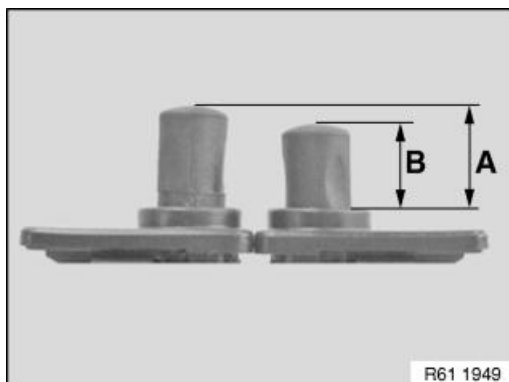
Observe safety precautions when working on MSA vehicles.

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](#)

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** orWhen 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.

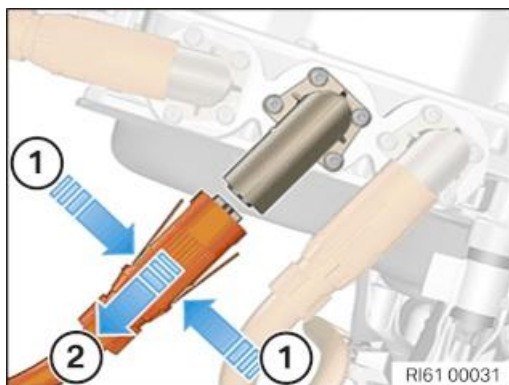
61 13 ... Unlocking and disconnecting various plug connections in electrical and hybrid vehicles



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:

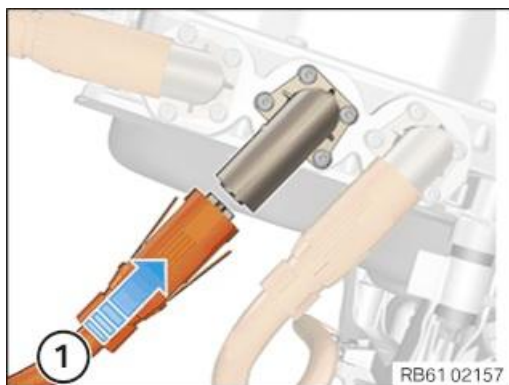
Press the lock (1) on the left and right on the connector in the direction of the arrow.

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!

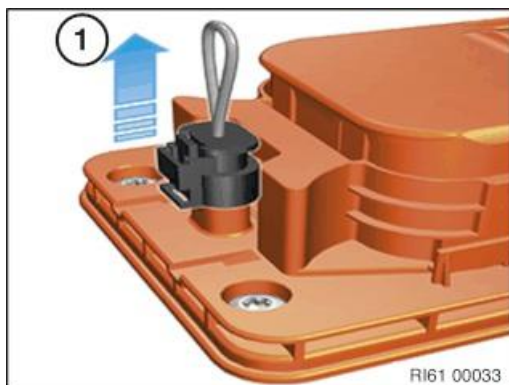


Connect the Hirschmann high-voltage connectors:

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

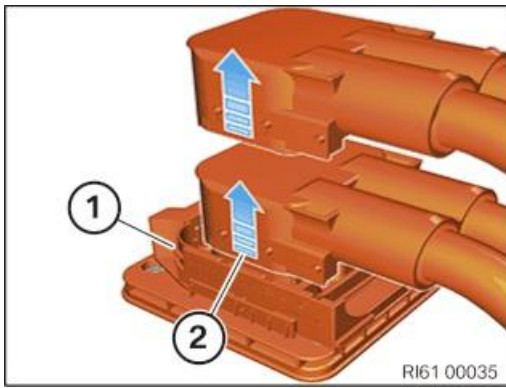
Note:

Connector (2) must lock audibly.



Disconnect the Kostal high-voltage connector:

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



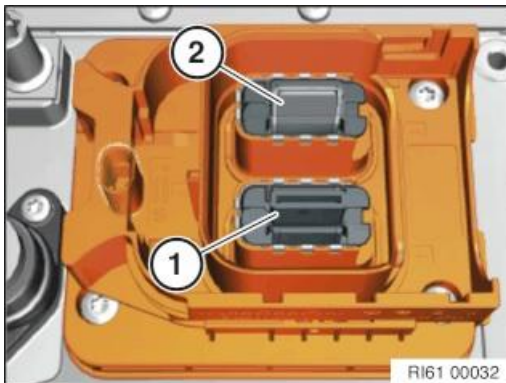
Push the lock (1) fully to the front.

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:

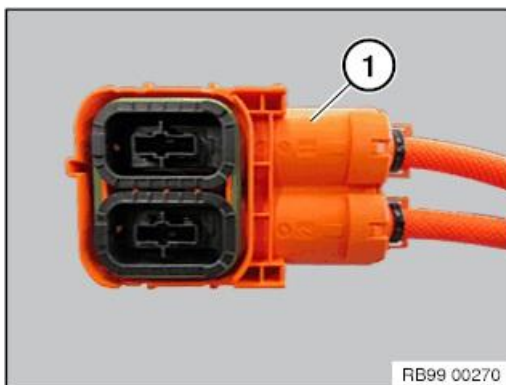
Check the touch protection for damage and correct positioning (1).

Warning!

Do not touch unprotected connector (2)!

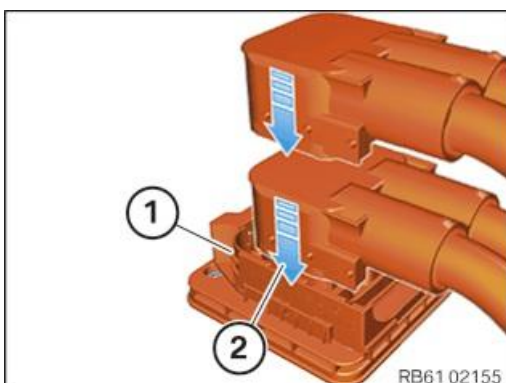
If the contact protection (1) has been pushed to the bottom (2), the high-voltage connector must be refitted.

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!



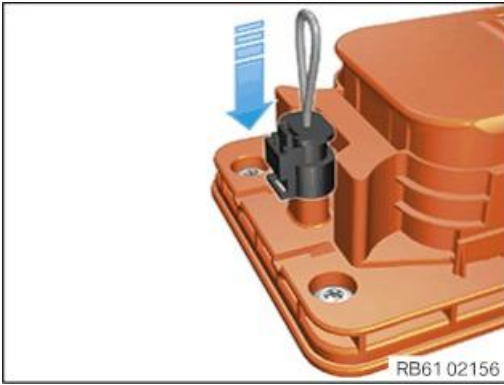
Connect the Kostal high-voltage connector:

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

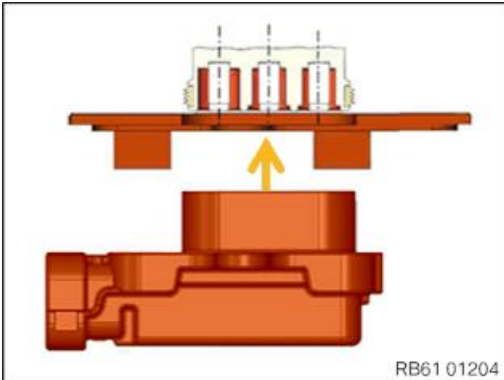
Push the lock (1) fully to the rear.

Attention!

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

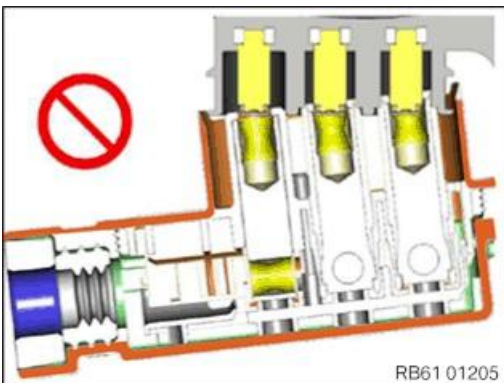


Connect the connector for the high-voltage interlock.



Three-phase high-voltage connector:

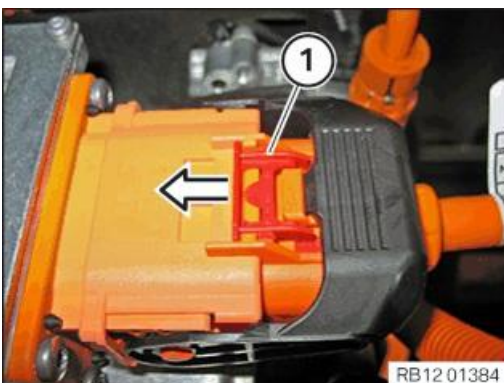
Connect and disconnect the connector straight.



Attention!

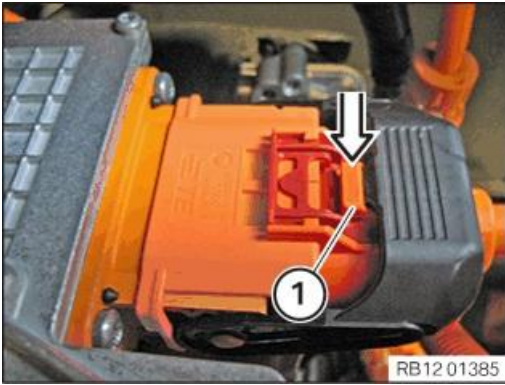
The system is designed to only offer limited protection against damage caused by connectors that are inserted at an angle.

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

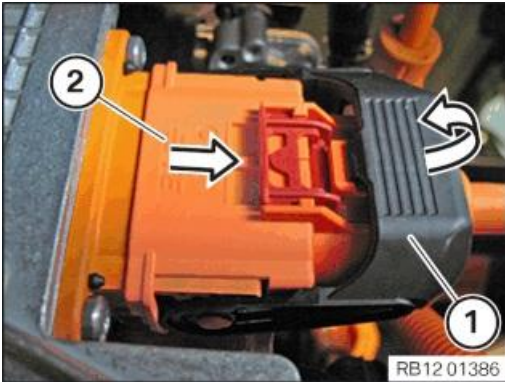


Disconnect the high-voltage connector from the high-voltage connection of the KLE:

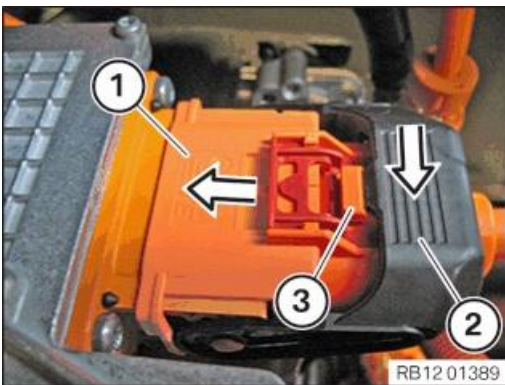
Slide lock (1) in direction of arrow up to stop.



Press lock (1).



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



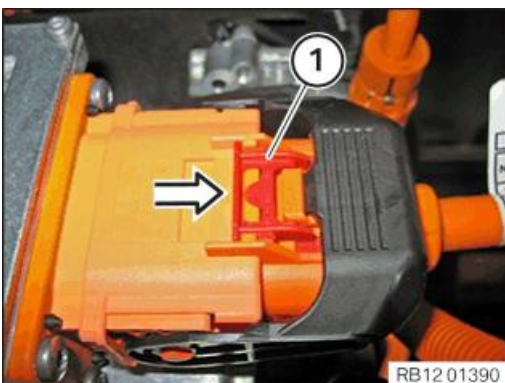
Connect the high-voltage connector to the high-voltage connection of the KLE:

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

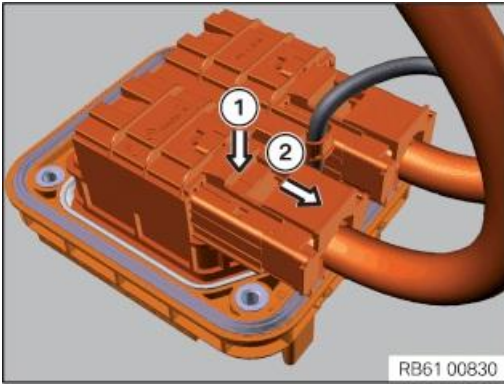
Attention!

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.



RB61 00830

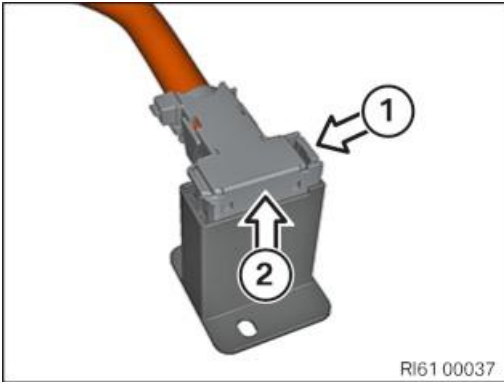
High-voltage connector on the high-voltage connection of the high-voltage battery unit:

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.



RI61 00037

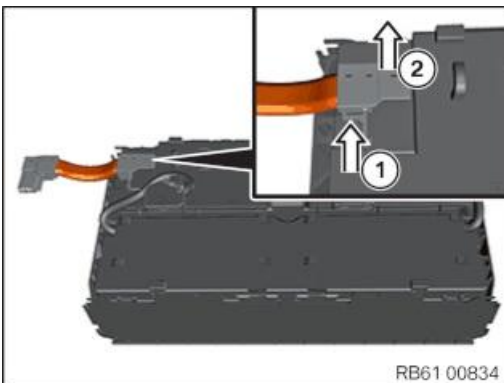
High-voltage connector on the cell module I01:

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.



RB61 00834

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.

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.

**Important!**

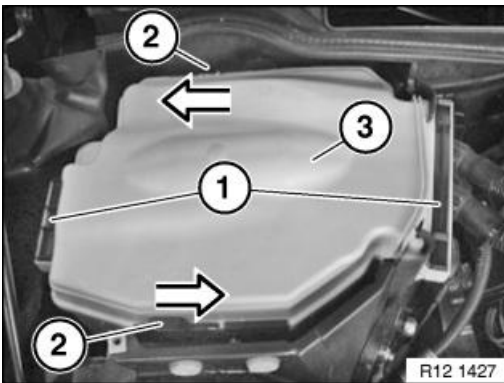
Read and comply with notes on [protection against electrostatic discharge \(ESD protection\)](#).

*Necessary preliminary tasks:*

- Read fault memory.
- Switch off ignition.
- Disconnect [negative battery cable](#).
- Remove [lower section of microfilter housing](#).
- [Follow instructions for removing and installing control units](#).

Replacement:

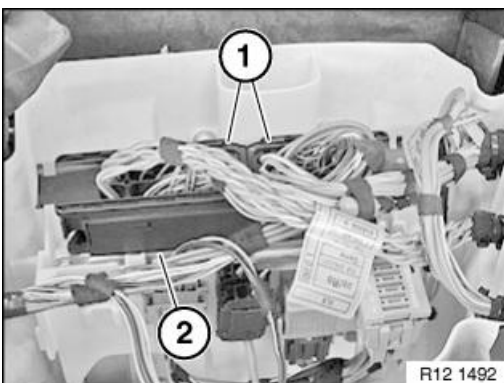
- Carry out programming/encoding.
- If no data can be read out from the previous control unit, carry out injection quantity compensation (description at end of instructions).



Unlock fasteners (1) from below and slide upwards approx. 10 mm.

Unlock locks (2) in direction of arrow.

Remove cover (3).

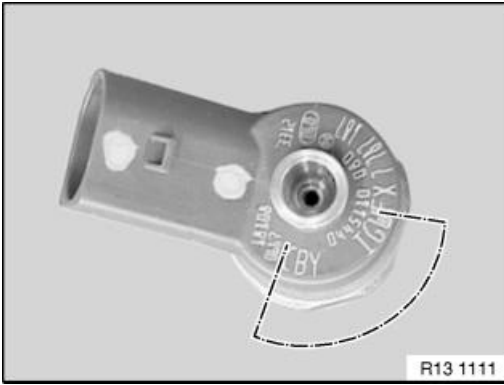


Unlock connector (1) and remove.

Unlock control unit (2) and remove towards top.

*Installation note:*Replacement:

Note the identification number and encoding.



Injection quantity compensation:

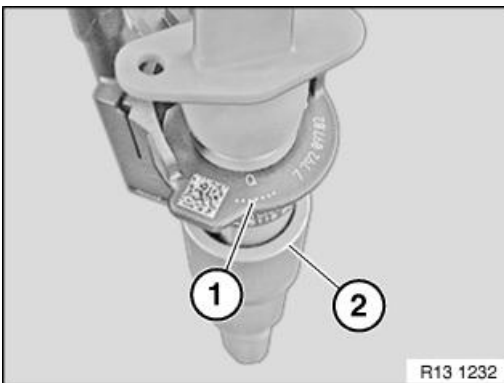
If the DDE control unit has been replaced, it will also be necessary to carry out adjustment of the injectors!

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

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 cylinder on which an injector has been replaced.

It is necessary to adjust the new injectors to ensure their full operability.



Position of the adjustment value (1) at the injector (2).



Note:

Check stored fault messages.

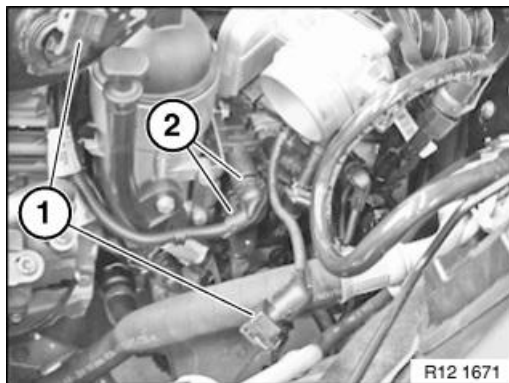
Delete fault memory.

**Necessary preliminary tasks:**

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

Note:

Installation location: on intake plenum, bottom.



Disconnect connector (1) from temperature sensor.

Disconnect pressure pipe from throttle valve.

Detach plug (2) from preheating control unit. Undo nuts on preheating control unit.

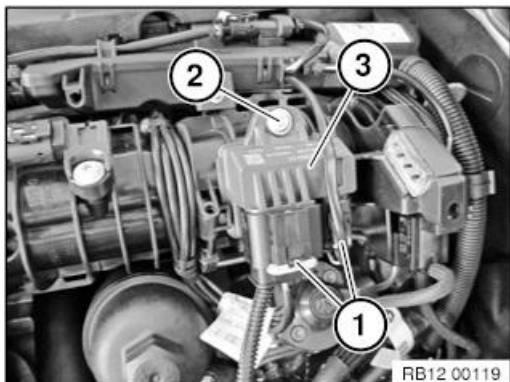
Remove preheating control unit.



Reassemble the vehicle.

**Necessary preliminary tasks:**

- Switch off ignition.
- Remove [acoustic cover](#)
- [Remove](#) microfilter housing lower section.
- [Remove](#) acoustic cover at rear.



Detach connector (1) from preheating control unit.

Release screw (2).

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

Remove preheating control unit (3).

**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.

**Necessary preliminary tasks:**

- Read fault memory of DDE control unit

**Warning!**

Do not operate glow plugs when removed! It is not possible to ensure that heat will dissipate correctly from glow elements! **Danger of injury and fire!**

**Important!**

Do not carry out any current measurements at the quick-start glow plugs (**risk of damage**).



Connect diagnosis system and carry out check on glow plugs.

Replace faulty [glow plugs](#).

Assemble engine.

Check function of DDE.

**Special tools required:**

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

**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.

**Note:**

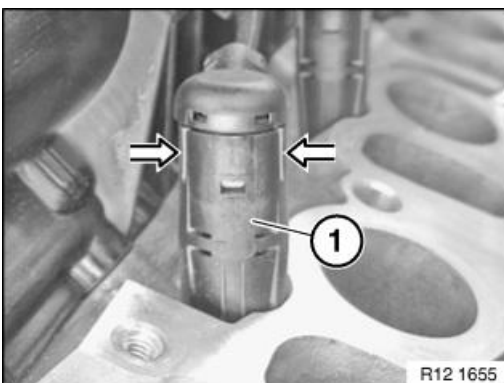
It is recommended to warm the engine up to operating temperature for easy removal of glow elements. In addition, apply the [Disassembly agent 5.1](#) to the glow elements and let it take effect for approximately 2 minutes. Removing glow elements from a cold engine may cause damage to the thread in the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

Important!

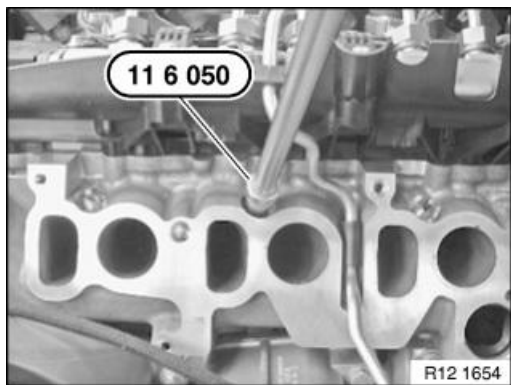
Risk of burning! The use of gloves is mandatory!

**Necessary preliminary tasks:**

- Switch off ignition.
- Disconnect [negative battery cable](#).
- Remove [acoustic cover](#)
- Remove rear acoustic cover.
- Remove [lower section of microfilter housing](#).
- Remove [trailing links](#) on spring strut dome.
- Partially detach engine wiring harness.



Press together connector fastener (1) with special tool [12 2 300](#) and detach connectors from glow elements.



Unscrew glow elements with special tool [11 6 050](#). **Note:**
If necessary, drill out special tool [11 6 050](#) with a 9.5 mm drill bit
approx. 20 mm deep.

Installation note:

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



Assemble engine.

Read out fault memory of DDE control unit, check stored fault messages,
rectify faults, clear fault memory.

**Special tools required:**

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

**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.

**Note:**

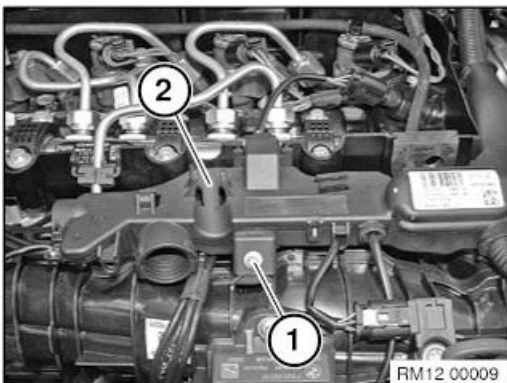
It is recommended to warm the engine up to operating temperature for easy removal of glow elements. In addition, spray glow element with [Disassembly agent 5.1](#) and let it take effect for approx. 2 minutes. Removing glow elements from a cold engine may cause damage to the thread in the cylinder head.

Important!

Risk of burning! The use of gloves is mandatory!

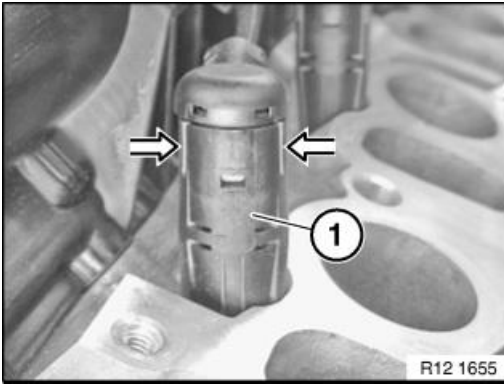
**Necessary preliminary tasks:**

- Switch off ignition.
- Disconnect [negative battery cable](#).
- Remove [acoustic cover](#)
- Remove [lower section of microfilter housing](#).
- Remove rear acoustic cover.
- Remove [trailing links](#) on spring strut dome.

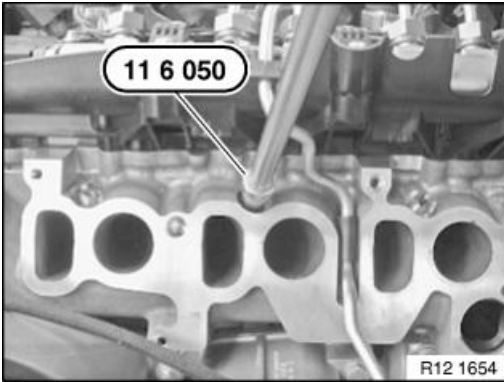


Release screw (1).

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



Press together connector fastener (1) with [12 2 300](#) and detach connectors from glow elements.



Unscrew glow elements with special tool [11 6 050](#). **Note:**
If necessary, drill out special tool [11 6 050](#) with a 9.5 mm drill bit approx. 20 mm deep.

Installation note:

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



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.

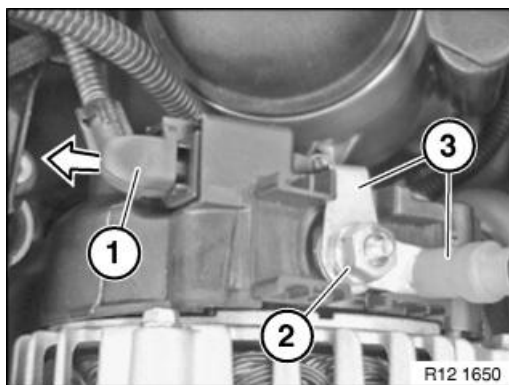


Assemble engine.

Read out fault memory of DDE control unit, check stored fault messages, rectify faults, clear fault memory.

**Necessary preliminary work:**

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Clamp off [battery earth lead](#).
- Remove [acoustic cover](#)
- Remove [alternator drive belt](#).

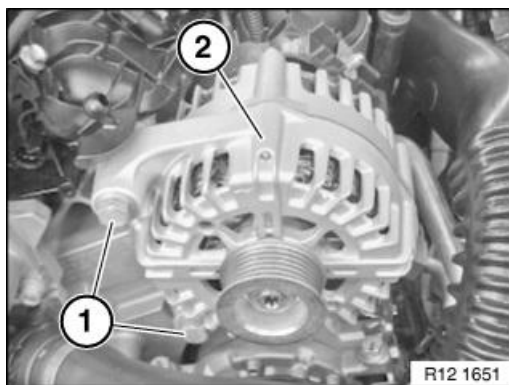


Unlock plug (1) and pull out in direction of arrow.

Release nut (2) and disconnect positive battery cables (3).

Installation note:

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



Release bolts (1) and remove alternator (2) in upward direction.

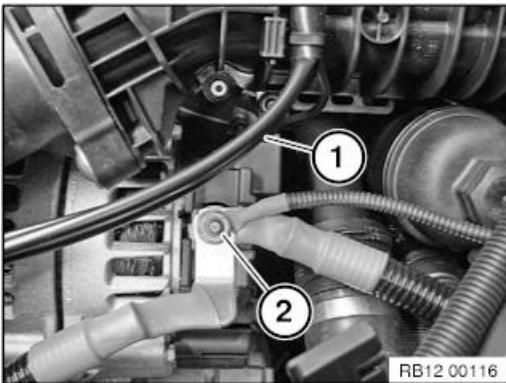
Tightening torque [12 31 1AZ](#).

**Note:**

- Check stored fault messages.
- Delete the fault memory.

**Necessary preliminary tasks:**

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

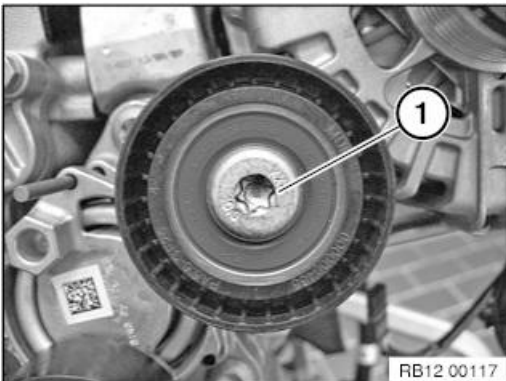


Release connector (1) and remove.

Slacken nut (2).

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

Disconnect positive battery cable from alternator.

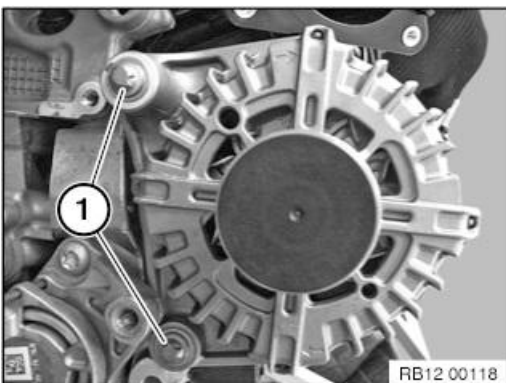


Slacken nut (1).

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 saved fault code memory entries.

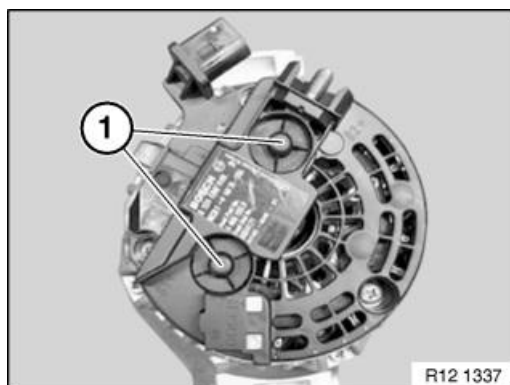
Delete the fault memory.

12 32 501 Replacing alternator regulator



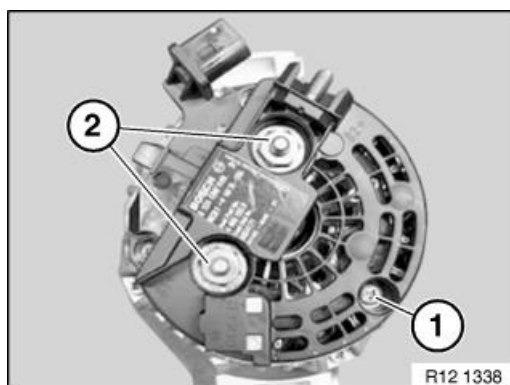
Necessary preliminary tasks:

- Switch off ignition
- Clamp off [battery negative lead](#)
- [Instructions](#) for removing and installing electronic components.
- Remove [alternator](#)



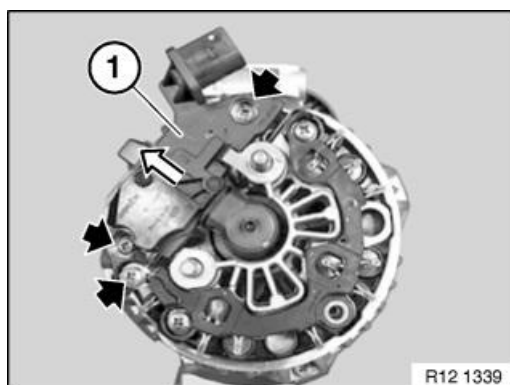
Bosch:

Release protective caps (1).



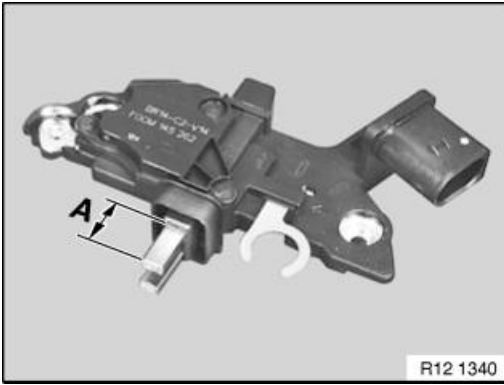
Bosch:

Release screw (1) and nuts (2), remove cover.



Bosch:

Release screws and remove regulator (1) in direction of arrow.



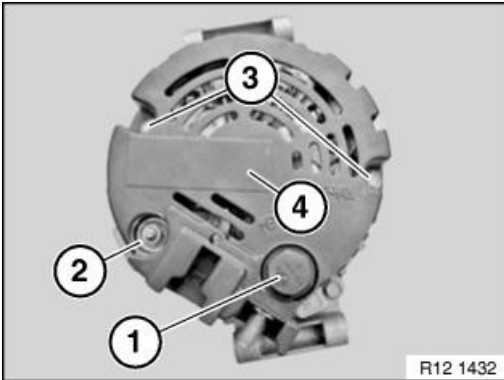
Bosch:

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.



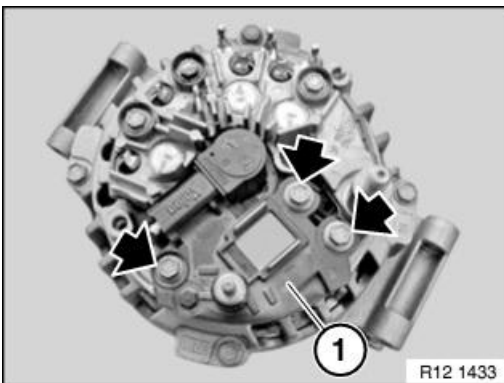
Valeo:

Slacken nut (1).

Slacken nut (2).

Release screws (3).

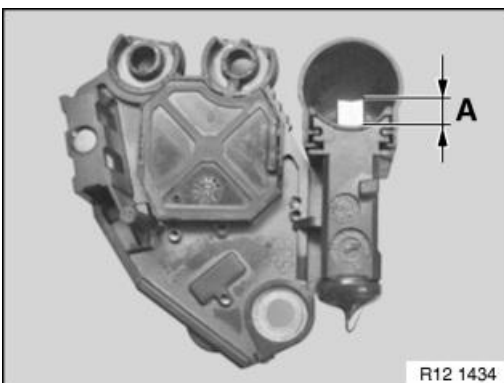
Release cover (4).



Valeo:

Release screws.

Remove regulator (1) towards top.



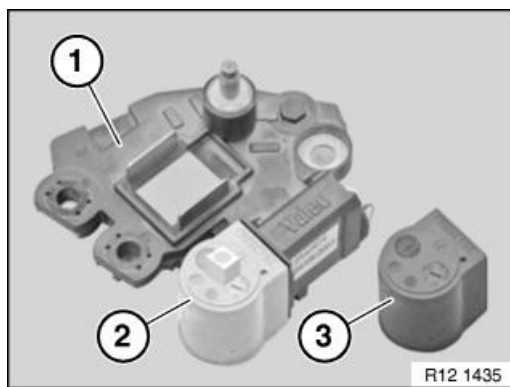
Valeo:

Installation:

Clean contact surfaces and check pretension of contact spring, replace regulator if necessary.

Measurement A = min. 5 mm.

Check collector ring for wear and recondition if necessary.



Installation:

Fit new regulator (1) with attached mounting sleeve (2) or locked carbon brush.

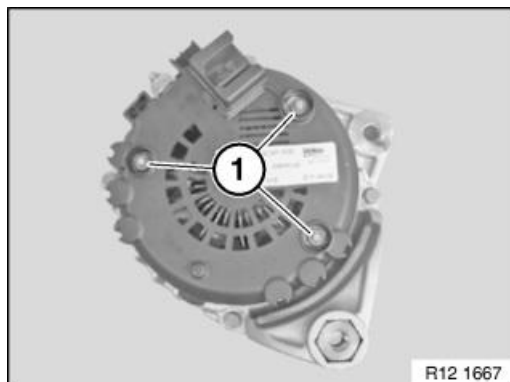
Pull off mounting sleeve (2) and replace with cover (3).

[Instructions for disconnecting and connecting battery.](#)

Disconnect battery negative lead on battery side and cover.

Alternator removed.

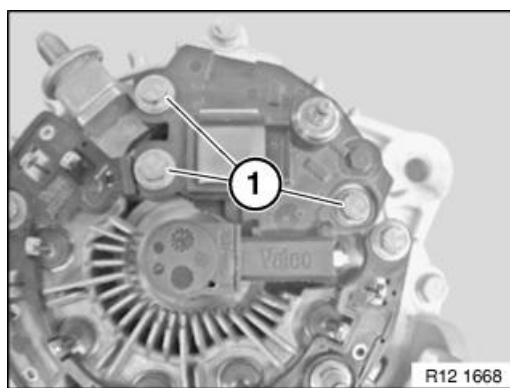
[Remove and install alternator.](#)



Valeo alternator:

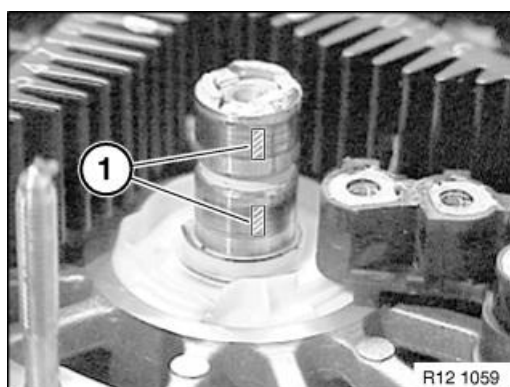
Release three nuts (1) for cover.

Lift out cover.

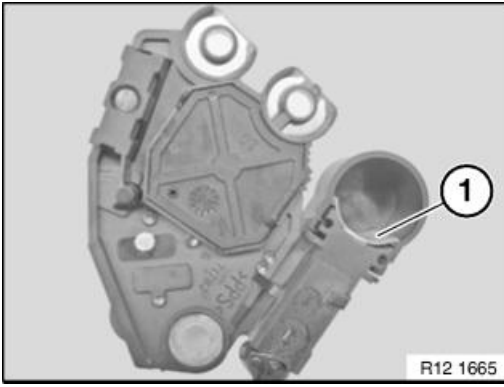


Release three bolts (1) of regulator switch.

Carefully remove regulator switch towards top.



Check contact faces (1) of slip rings for wear and recondition if necessary.



Installation:

Fit new regulator with pressed back and locked carbon brushes (1).

Tighten retaining screws.

[Tightening torque 12 32 1AZ.](#)

Carefully engage carbon brush cover in downward direction.

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.

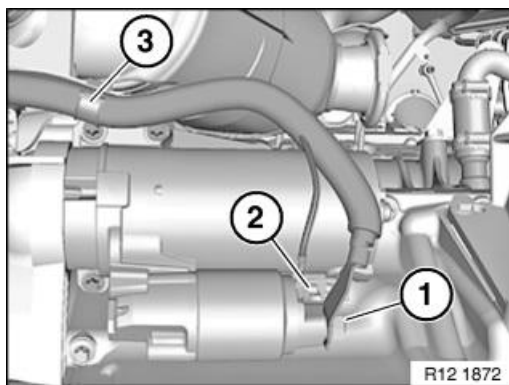
Because dirt particles generally enter into the component with the water (e.g. starter motor, wiring harness), the components need to be thoroughly inspected.

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.

**Necessary preliminary work:**

- Switching off the ignition
- Disconnect [battery earth lead](#)
- Remove front [underbody protection](#)
- **Four-wheel drive only:**
Remove [reinforcement plate](#)



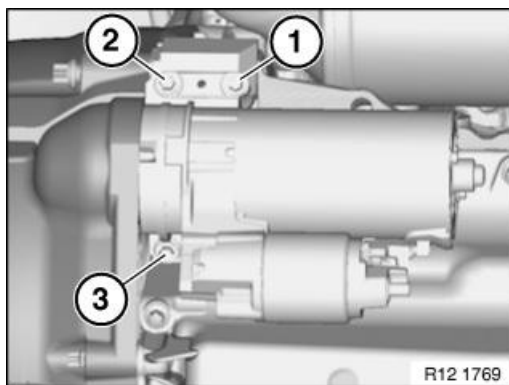
Release nut (1) and remove cable.

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

Release nut (2) and remove the positive battery cable.

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

Unclip positive battery cable from clamp (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.

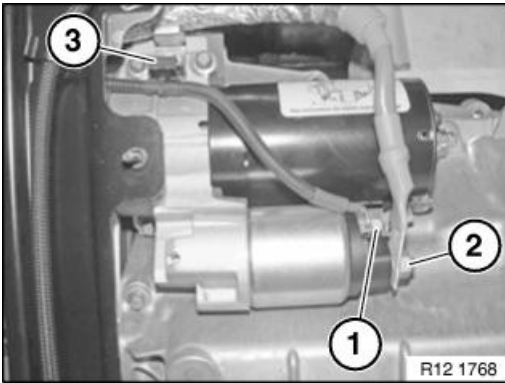
Replace damaged starter motor.

Assemble engine.



Necessary preliminary work:

- Switch off ignition.
- Clamp off [battery earth lead](#).
- **Rear-wheel drive only:**
Remove front [underbody protection](#).
- **Four-wheel drive only:**
Remove [reinforcement plate](#).



Release nut (1) and remove cable.

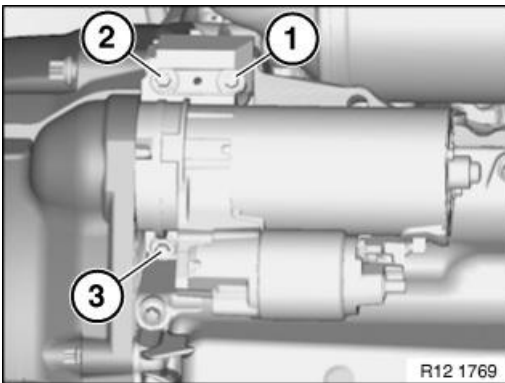
Tightening torque [12 52 1AZ](#).

Release nut (2) and remove the positive battery cable.

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

Release screw (3) on cable clip and lay cable to one side.

Tightening torque [12 52 5AZ](#).



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 screw (3).

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



Installation note:

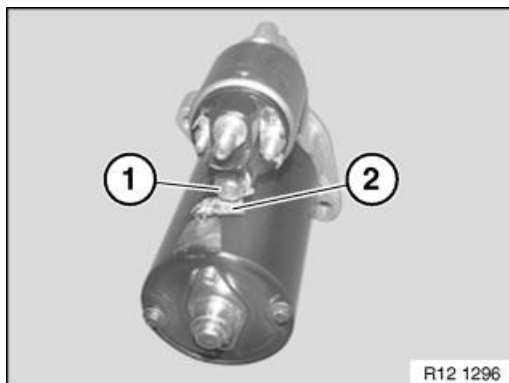
Check starter pinion and ring gear for damage.

If necessary, replace starter motor.

Assemble engine.

**Necessary preliminary work:**

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



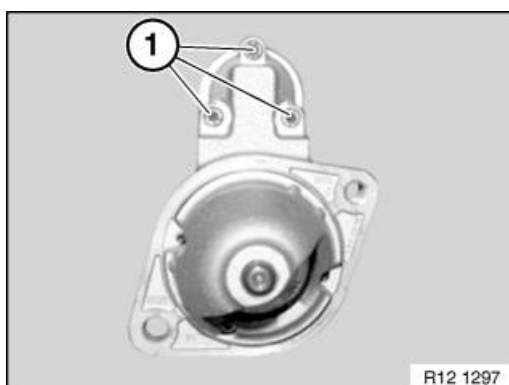
Slacken nut (1).

Remove the cable shoe (2).

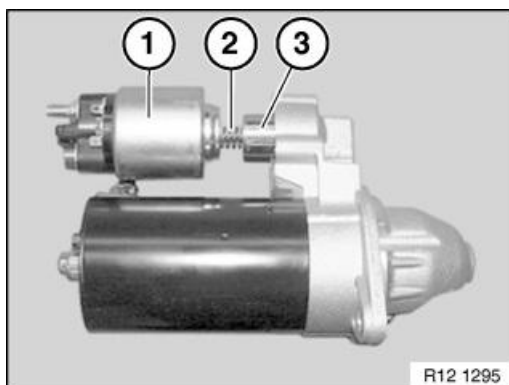
Attention!

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.

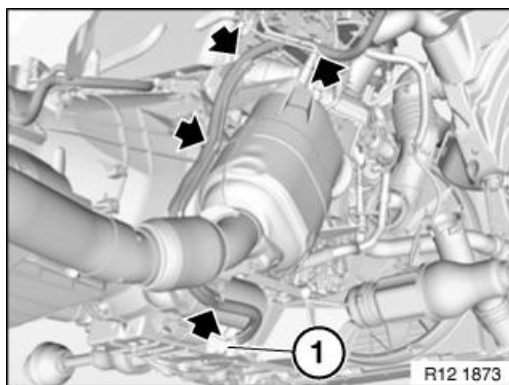
12 42 510
(N47, N47S)

Battery positive lead between starter and battery positive terminal

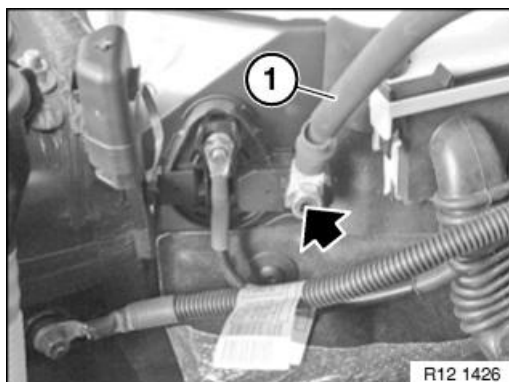


Necessary preliminary tasks:

- Read out fault memory
- Turn off ignition
- Disconnect [battery negative lead](#)
- Remove front [underbody protection](#)
- **Only for all-wheel drive:**
Remove [reinforcement plate](#)



Unclip battery positive leads from the clips.
Release battery positive lead (1) on starter.
Tightening torque [12 52 3AZ](#).



Remove cover on the battery positive terminal.
Unfasten nut.
Tightening torque, [12 52 4AZ](#).
Remove battery positive lead (1), feed out and remove.

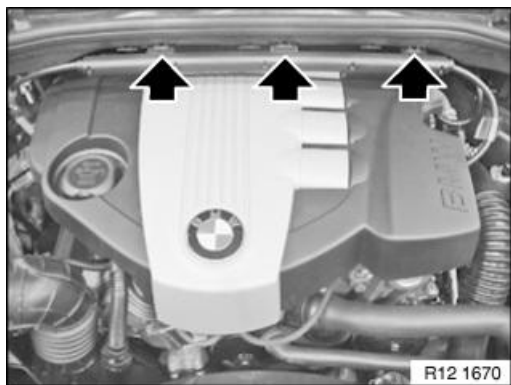


Note:

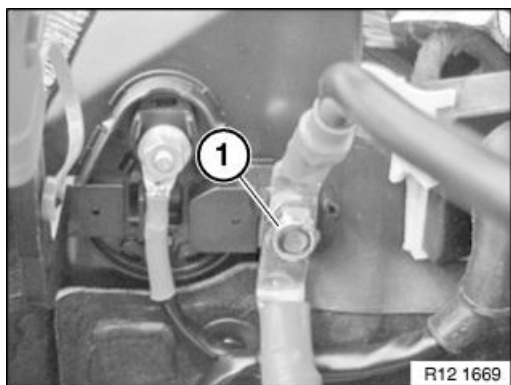
Assemble engine.
Read fault memory.
Check stored fault messages.
Correct fault and clear fault code memory.

**Necessary preliminary tasks:**

- Read fault memory.
- Switch off ignition.
- Remove [acoustic cover](#).
- Disconnect [negative battery cable](#).



Unhook cable duct from lower section of microfilter housing.

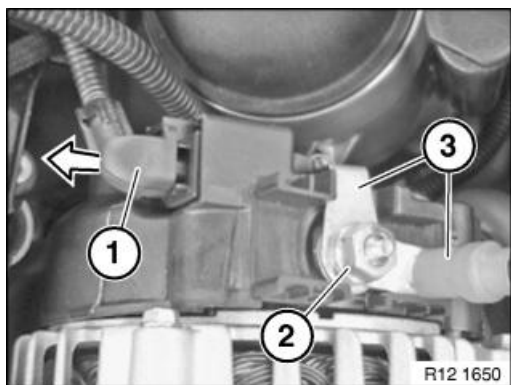


Remove protective cap.

Release nut (1) underneath.

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

Remove positive battery cable from battery positive terminal.



Release positive wire from alternator (2).

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

Feed out positive battery cable and remove.



Note:

Read out the fault memory of the DDE control unit.

Check stored fault messages.

Rectify fault.

Delete fault memory.

Reassemble the vehicle.

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:

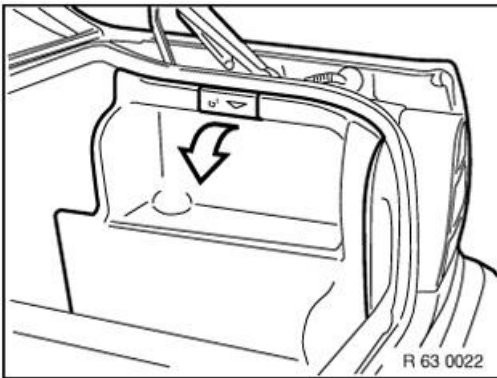
- From model year 1998 in Series E38, E39, E46
- From 4/99 in E36/Z3
- in each of following new Series

The different models have different installation locations:

**Battery in engine compartment**

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

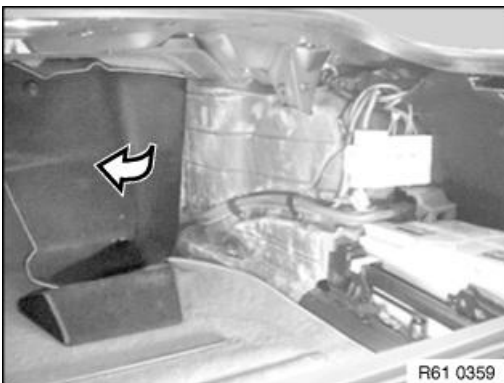
Safety battery terminal is omitted as from 03/2002 from all E46 LHD models with 4-cylinder engines.

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

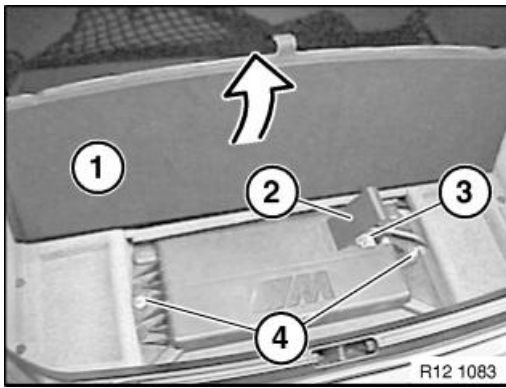
Remove side trim panel.

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](#).

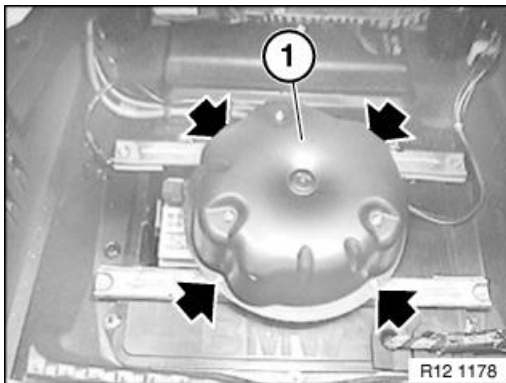
Fold back floor trim panel (1).

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.

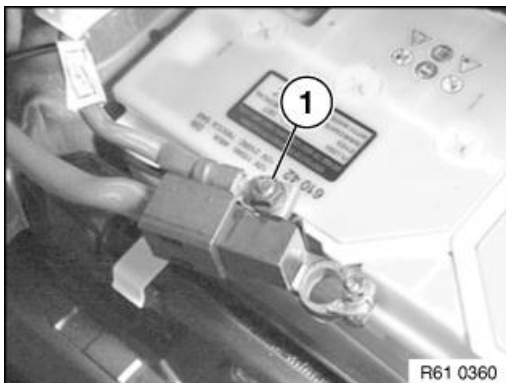
Caution!

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.

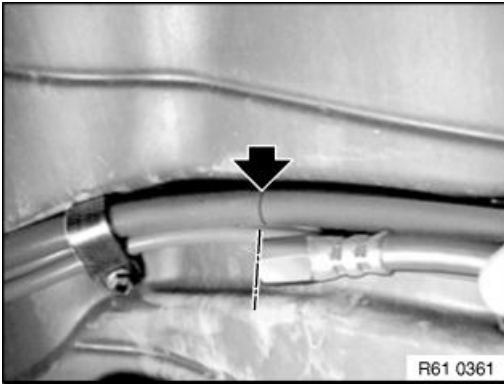
The repair cable is always a standard length.

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

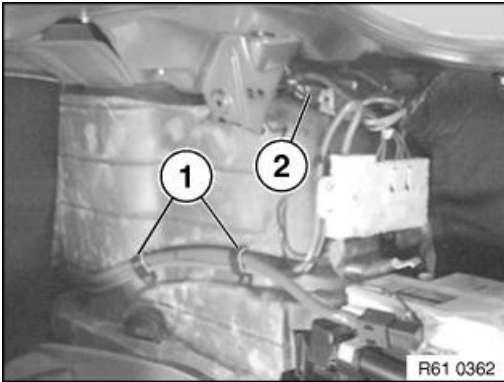
In some Series (e.g. E46 touring), the heavy-current connector of the repair cable can lead to installation problems.

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

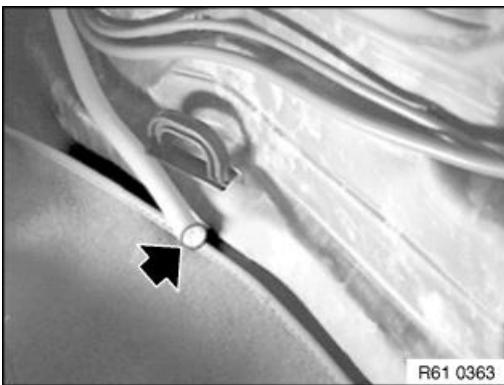
Find matching interface (e.g. approx. 10 cm behind rear seat backrest in E46 touring).



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



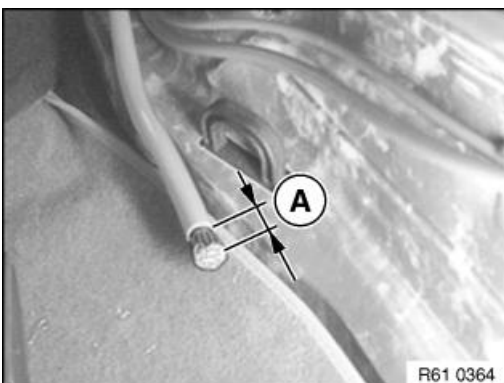
Release cable ties (1).
Disconnect plug connection (2).



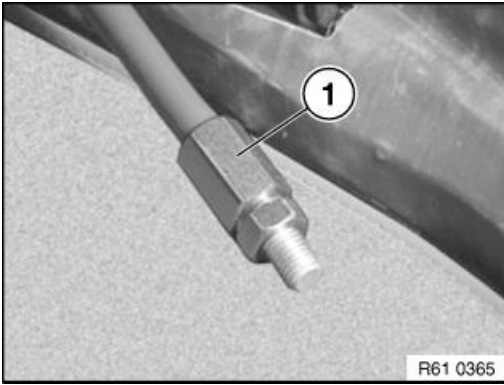
Caution!

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.

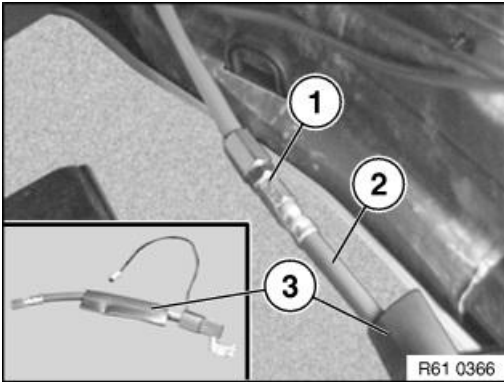
Saw through battery positive cable at marked point with an iron saw.



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

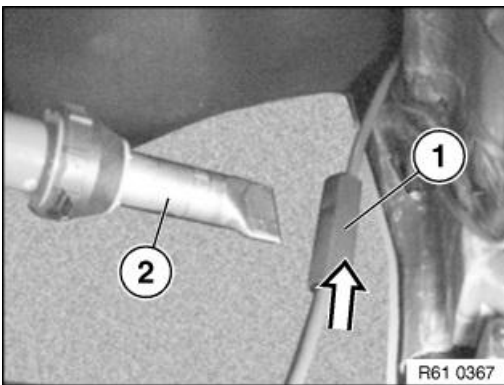


Push heavy-current connector (1) over stripped cable end and screw into position.

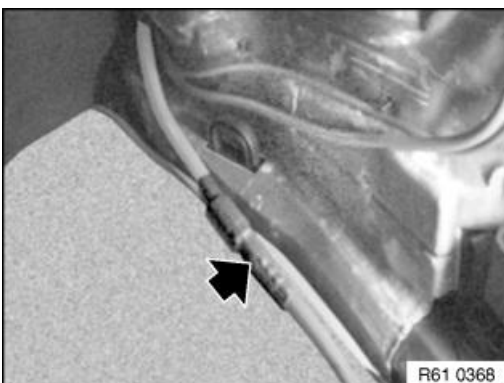


Push shrink-fit hose (3) over repair cable.

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).



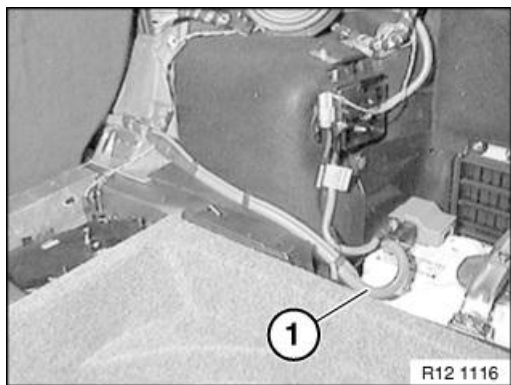
Note:

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:

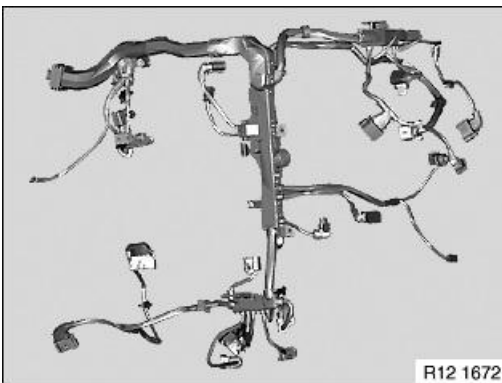
Offsetting cutting line by approx. 10 cm produces excess length of battery positive lead (1).

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

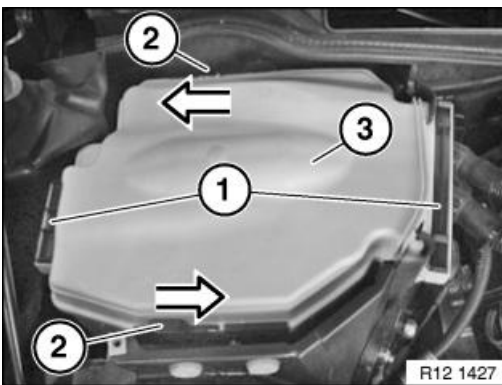
(Shown on E46 touring.)

**Necessary preliminary tasks:**

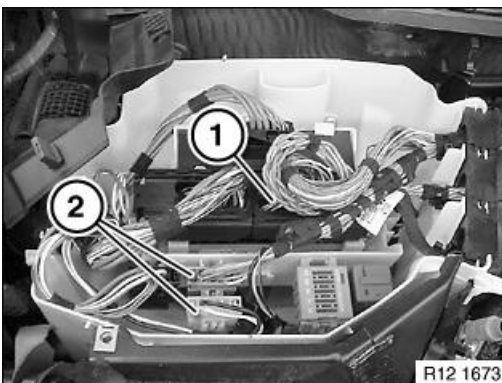
- Read fault memory.
- Switch off ignition.
- Disconnect [battery earth lead](#).
- Remove [acoustic cover](#)
- Remove [underbody protection](#)
- **only E81, E82, E84, E87, E88, E90, E91, E92, E93:**
Remove [lower section of microfilter housing](#).
- **E83 only:**
Electronics box connections, see under [Removing control unit](#).

**Overview, engine wiring harness**

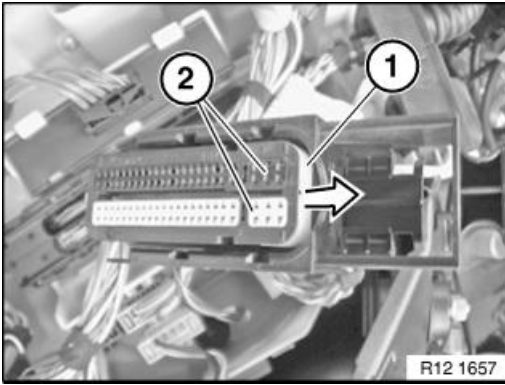
Note:
For a better overview, the plug-in contacts are shown on the removed engine in the repair instructions.



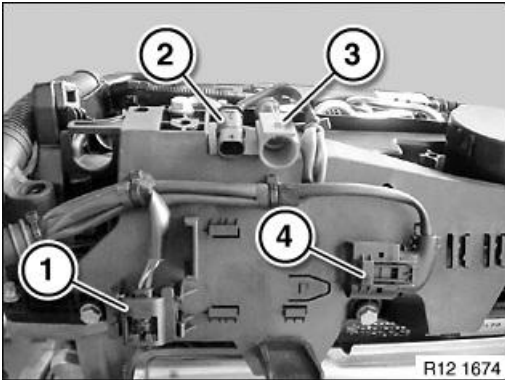
Unlock fasteners (1) from below and slide upwards approx. 10 mm. Unlock locks (2) in direction of arrow. Remove cover (3).



Unlock and release control unit module (1). Unlock and disconnect plugs (2).

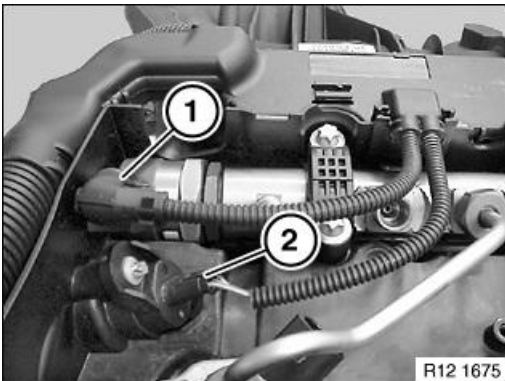


Unlock retaining clip (1) with a small screwdriver in direction of arrow. Pull out plugs (2) (injector wiring harness) towards rear.

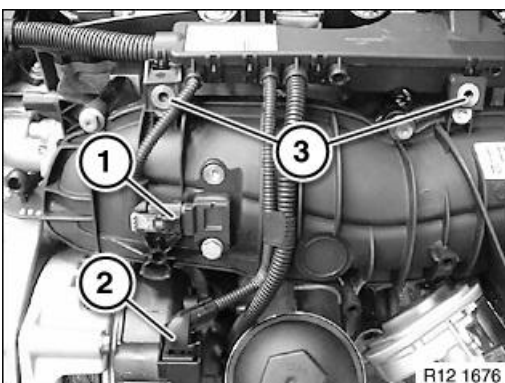


Holder for plug connector on cylinder head cover. Unlock and disconnect plug connections for oxygen sensor (1), exhaust-gas temperature sensor (2), terminal 50 (3) and exhaust backpressure sensor (4). Open cable straps.

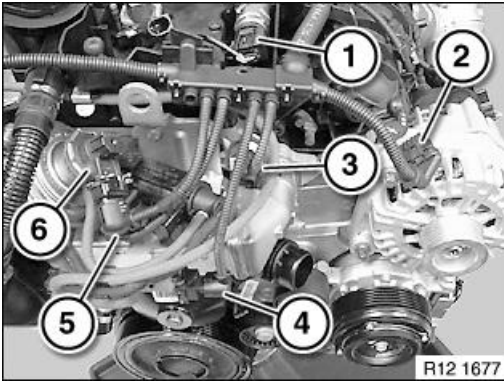
Release mounting bolt of cable duct in cylinder head cover.



Unlock and disconnect plugs for rail pressure regulator (1) and camshaft sensor (2).

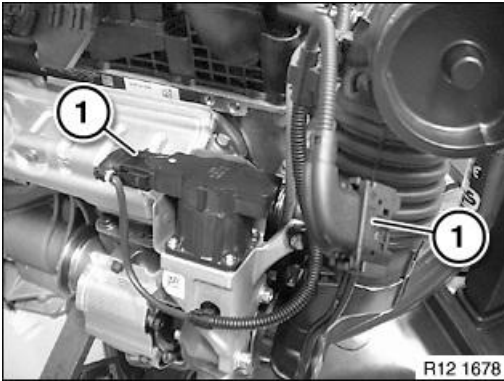


Unlock and disconnect plug connections for charging pressure sensor (1) and alternator (2). Release screws (3).

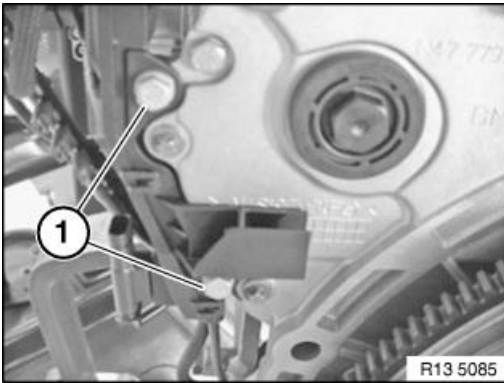


Disconnect plug connections at front of engine.

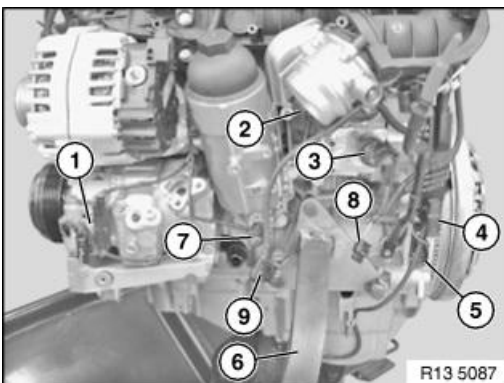
Rail pressure sensor (1), intake manifold changeover (2) (optional), coolant temperature sensor (3), EGR changeover valve (4) (optional), EGR shift valve (5), EGR actuator (6).



Disconnect plug connections for VTG actuator (1) (only N47) and hot film air mass meter.



Release bolts on cable duct (1).



Disconnect plug-in connection.

A/C compressor (1), throttle valve (2), metering unit (3), preheating system (4), crankshaft sensor (5), oil level sensor (6), oil pressure switch (7), fuel feed (8).

Feed out wiring harness and remove.

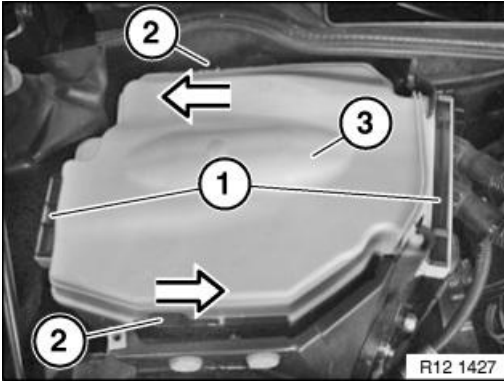


Reassemble the vehicle.

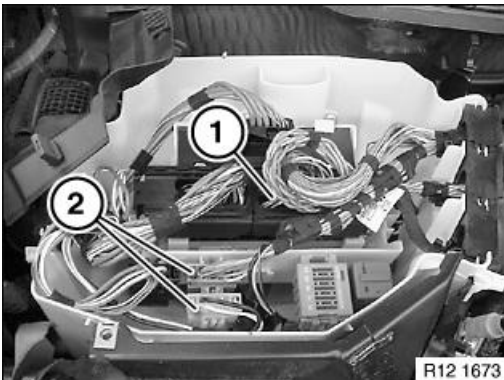
Read fault memory.

**Necessary preliminary work:**

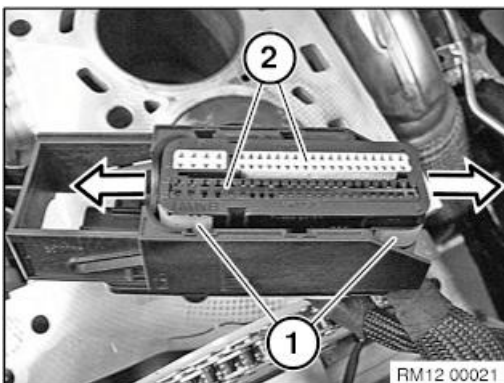
- Read out fault memory.
- Switch off ignition.
- Clamp off [battery earth lead](#).
- Remove [acoustic cover](#)
- Remove [underbody protection](#)
- Remove [lower section of microfilter housing](#).



Unlock fasteners (1) from below and slide upwards approx. 10 mm. Unlock locks (2) in direction of arrow. Remove cover (3).

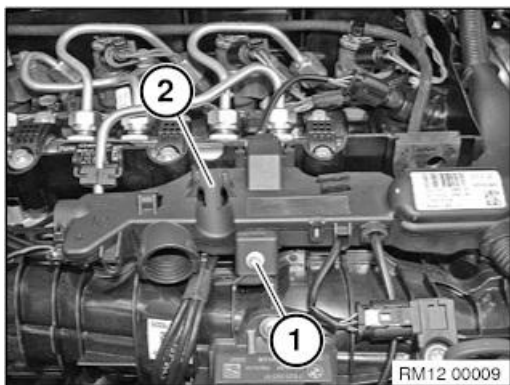


Unlock and release the connector (1) from the control unit. Unlock and disconnect plugs (2).



Pull out fasteners (1) in direction of arrow.

Push back sockets (2) and detach engine wiring harness from connector housing.



Release screw (1).

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 on all electric changeover valves on carrier plate and disconnect	
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 exhaust-gas recirculation valve and disconnect	
Unlock connector on coolant temperature sensor and disconnect	
Unlock connector on intake plenum intake adjuster and disconnect	
Unlock and pull off the connector from the pressure sensor (intake pressure)	
Unlock connector on rail pressure sensor and disconnect	
Unlock connector on rail pressure regulating valve and disconnect	If installed.
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 and pull off the connector from the exhaust temperature sensor (exhaust-gas recirculation cooler)	
Unlock connector on high pressure pump and disconnect	
Unlock and pull off the connector from the fuel pressure and temperature sensor	
Release and unplug connector from preheating control unit	



Release wiring harness from clips and retainers.

Feed out wiring harness and remove.



Installation note:

Check the wiring harness installation arrangement.

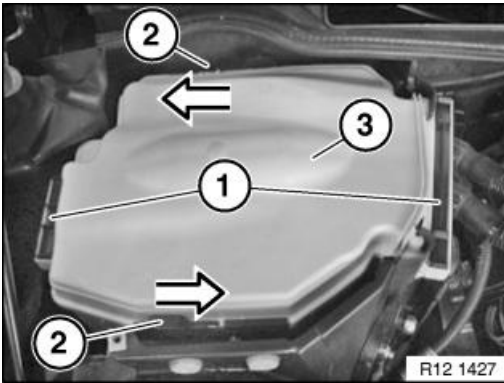
Check that the plug connections are correctly fitted.

Check stored error/fault messages.

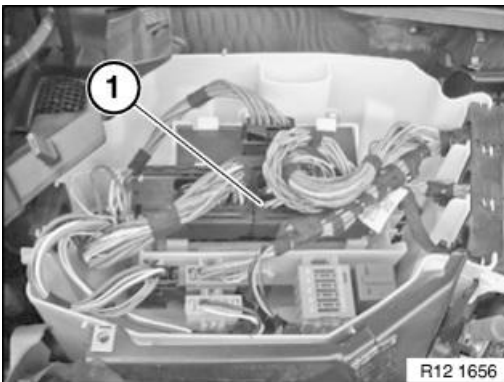
Delete the fault memory.

**Necessary preliminary tasks:**

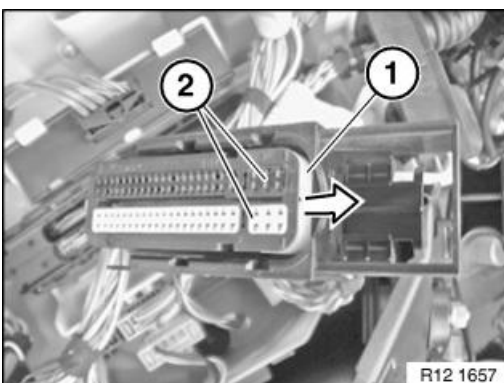
- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Disconnect [battery negative lead](#).
- Remove [acoustic cover](#)
- Remove [microfilter housing](#) lower section.



Unlock fasteners (1) from below and slide upwards approx. 10 mm.
Unlock locks (2) in direction of arrow.
Remove cover (3).



Unlock connector (1) from DDE control unit and detach in upward direction.



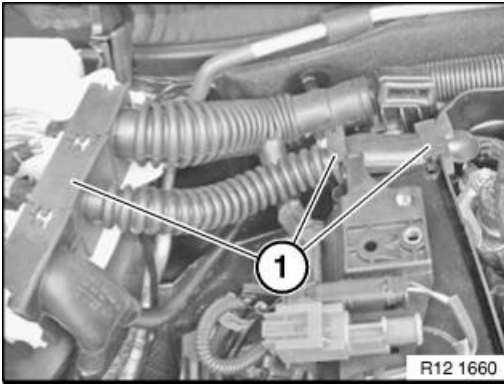
Press out retaining clip (1) with a small slotted screwdriver approx. 2 mm in direction of arrow.

Pull out plugs (2) towards rear.

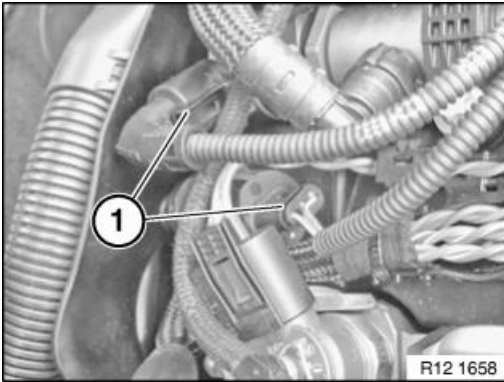
Installation note:

Insert plugs and slide retaining clamp back.

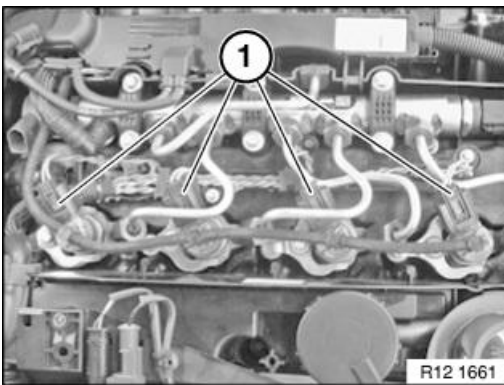
Check that connectors (2) are tightly fitting.



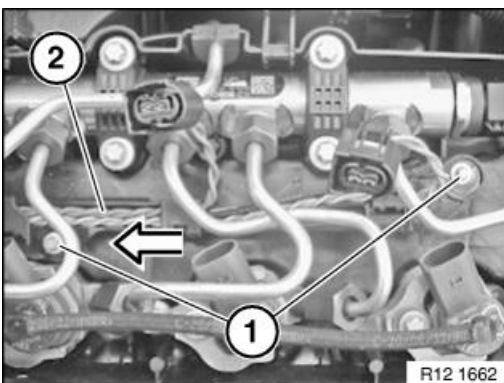
Pull out profile seals (1) in upward direction. *Installation note:*
To prevent leaks, you must install profile seals correctly.



Unlock connector (1) and remove.



Unlock plugs (1) on injectors and disconnect.



Release screws (1) and pull out injector wiring harness (2) under high pressure lines in direction of arrow.



Note:

Reassemble the vehicle.

Read out the fault memory of the DDE control unit.

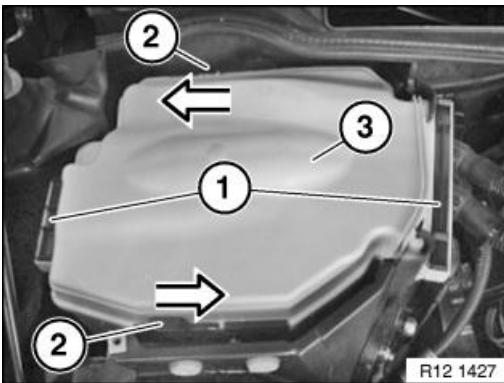
Check stored fault messages.

Rectify fault.

Delete fault memory.

**Necessary preliminary tasks:**

- Read out the fault memory of the DDE control unit.
- Switch off ignition.
- Disconnect [battery earth lead](#).
- Remove [acoustic cover](#)
- Remove microfilter housing.
- Unscrew [positive battery cable](#) from alternator and lay to one side.

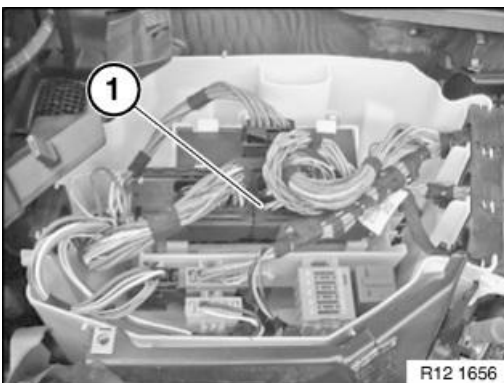


Electronics box information E83 under: [Remove control unit](#).

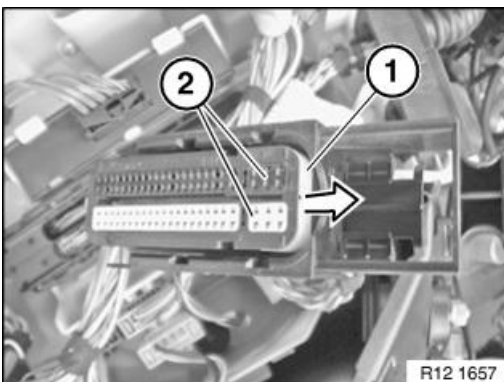
Unlock fasteners (1) from below and slide upwards approx. 10 mm.

Unlock locks (2) in direction of arrow.

Remove cover (3).



Unlock connector (1) from DDE control unit and detach in upward direction.



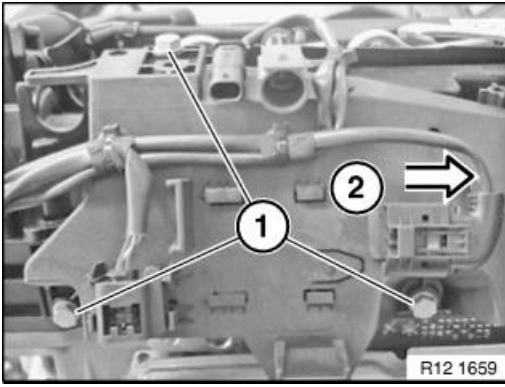
Press out retaining clip (1) with a small slotted screwdriver approx. 2 mm in direction of arrow.

Pull out plugs (2) towards rear.

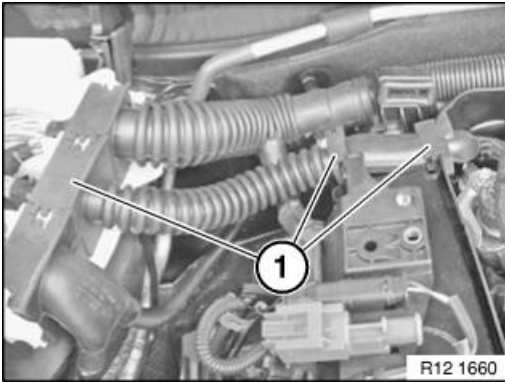
Installation note:

Insert plugs and slide retaining clamp back.

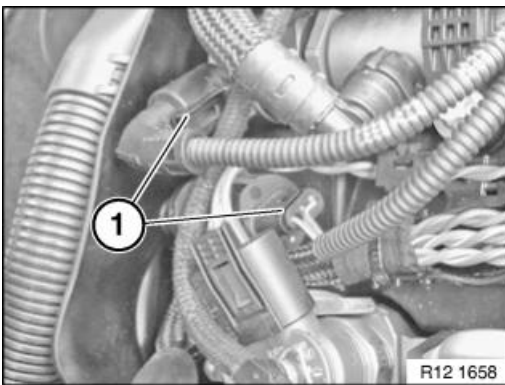
Check that connectors (2) are tightly fitting.



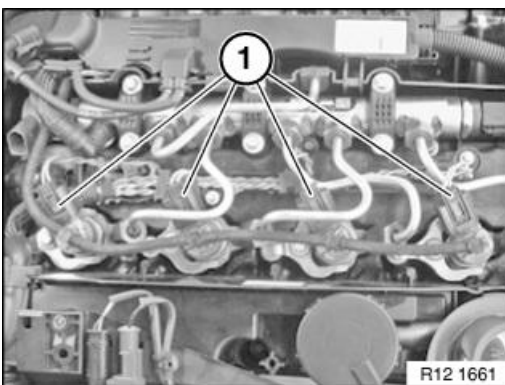
Release bolts (1) and slide carrier plate (2) approx. 20 mm in direction of arrow. *Note:*
For purposes of clarity, this operation is shown on the removed engine.



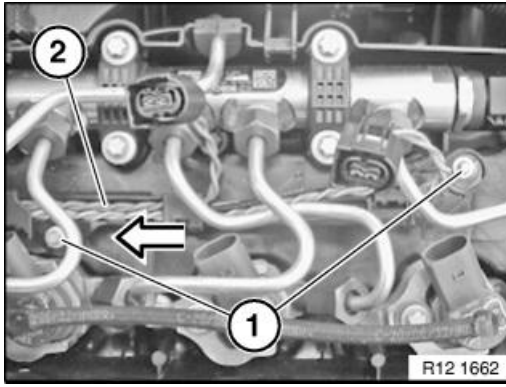
Pull out profile seals (1) in upward direction. *Installation note:*
To prevent leaks, you must install profile seals correctly.



Unlock connector (1) and remove.



Unlock plugs (1) on injectors and disconnect.



Release screws (1) and pull out injector wiring harness (2) under high pressure lines in direction of arrow.



Note:

Reassemble the vehicle.

Read out fault memory of DDE control unit (DDE = Digital Diesel Electronics).

Check stored fault messages.

Rectify fault.

Delete 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** orWhen 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.



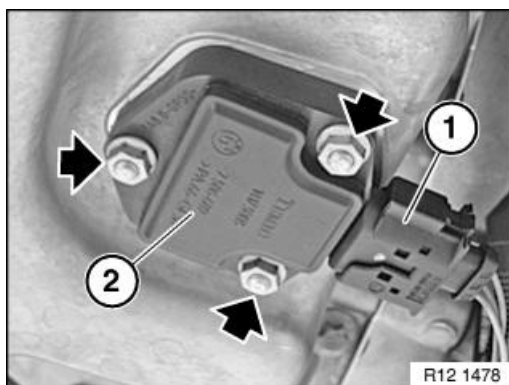
Important!

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



Necessary preliminary tasks:

- Switch off ignition
- Remove [underbody protection](#)
- Drain off [engine oil](#)



Unlock connector (1) and remove.

Unscrew nuts.

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

Remove oil level sensor (2).

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.

**Warning!****Danger of scalding!**

Only perform this work after engine has cooled down.

**Important!**

When working on the oil, coolant or fuel circuit, you must protect the alternator against contamination.

Cover alternator with suitable materials.

Failure to comply with this procedure may result in an alternator malfunction.

**Recycling:**

Catch and dispose of leaking engine oil in a suitable container.

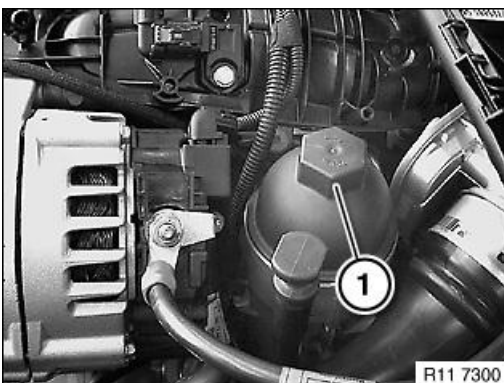
Observe country-specific waste-disposal regulations.

**Necessary preliminary tasks:**

- Remove [acoustic cover](#)

**Note:**

Drain the full flow oil filter to prevent excessive oil discharge when removing the oil pressure switch.

**Important!**

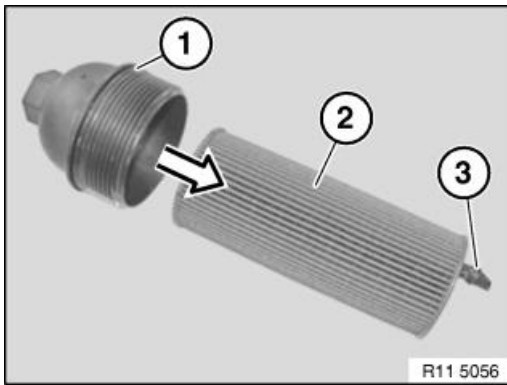
Do not damage oil-filter cover.

Release and tighten down with a socket only.

When the oil filter cap is released, the oil flows from the oil filter housing back into the sump.

Release oil-filter cover and remove towards top.

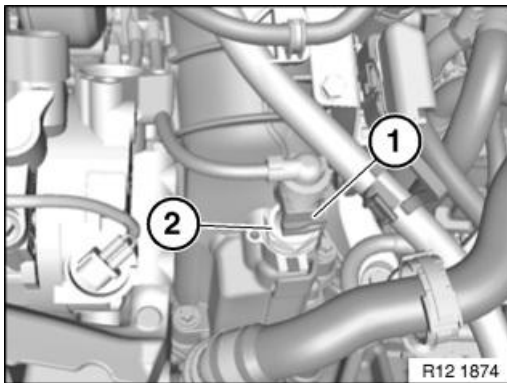
Tightening torque [11 42 1AZ](#).



Installation:

Replace sealing rings (1) and (3) and coat with oil.

Reinstall oil filter element (2).



Important!

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

Have a cleaning cloth ready.

Unlock plug (1) and remove.

Release oil pressure switch (2).

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

Replace sealing ring.



Add final details to vehicle

Check oil level. Top up engine oil if necessary.

12 61 285 Removing and installing/replacing the oil level sensor for engine oil (N47 D20 O/U/K/T 1)



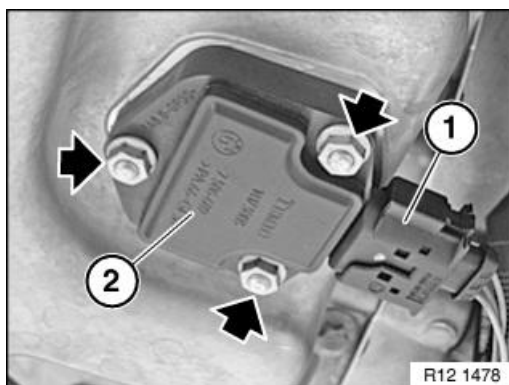
Important!

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



Necessary preliminary tasks:

- Switch off ignition.
- Remove [underbody protection](#)
- Drain [engine oil](#).



Unlock connector (1) and remove.

Unscrew nuts.

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

Remove oil level sensor (2).

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.

12 61 280 Removing and installing/replacing the oil pressure switch (N47 D20 U/K/O/T 1)



Warning!

Risk of scalding!

Only perform this repair work after engine has cooled down.



Recycling:

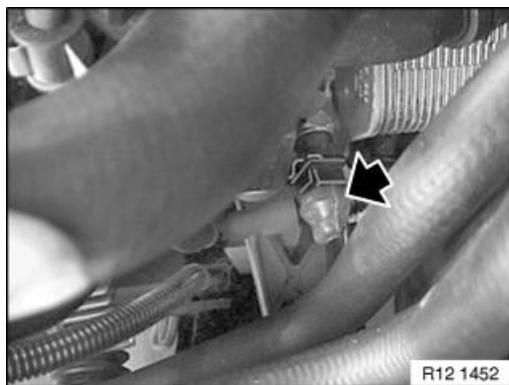
Catch and dispose of leaking engine oil in a suitable container.

Observe country-specific waste disposal regulations.



Necessary preliminary tasks:

- Remove [acoustic cover](#)



Note:

The oil pressure switch is located beneath the high pressure pump.

Important!

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

Have a cleaning cloth ready.

Unlock connector and remove.

Release oil pressure switch.

Installation note:

Replace sealing ring.

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



Reassemble the vehicle.

Check engine oil level. If necessary, top up engine oil.



The following applies in general:

To avoid damage, observe the following instructions:

- Avoid compressive and tensile loads
- 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 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!

- Fibre-optic cables are permitted to show only one junction point (bridge), replace fibre-optic cables if necessary
- Smallest permissible bending radius is 25 mm
- Avoid effects of heat $\geq 85^\circ$

[Treating cables and optical fibres](#)

FlexRay (twisted cables)

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

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.

Note:

Repair wiring harnesses can be equipped with an **additional socket housing** (e.g. 30-pin), **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.