

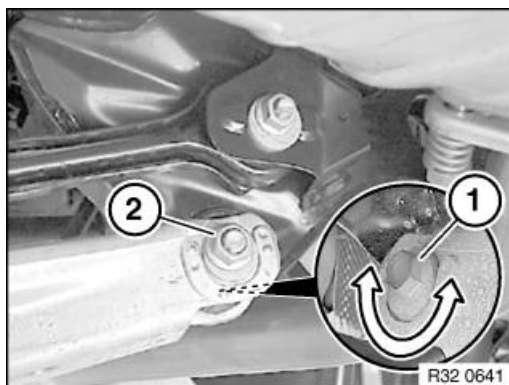
**Note:**

A camber change always means a toe change as well. The camber must therefore be adjusted first.

**Important!**

Only on cars with Active Cruise Control:

Because the axis of motion is the reference for ACC adjustment, it is necessary after an adjustment of the rear axle which alters the axis of motion also to check the [adjustment of the ACC sensor](#)!

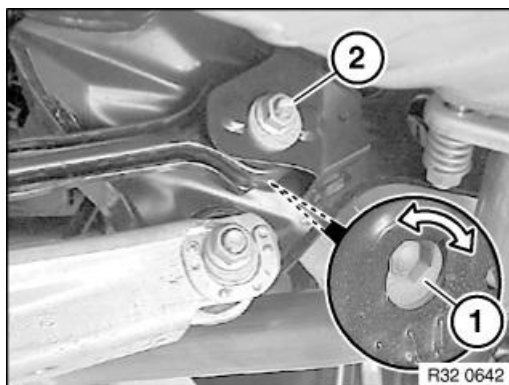
**Adjusting camber:**

Replace nut (2) and tighten to 5 Nm.

Turn eccentric bolt (1) to adjust camber to setpoint value.

Tighten nut (2).

Tightening torque [33 32 9AZ](#).

**Adjusting toe:**

Replace nut (2) and tighten to 5 Nm.

Turn eccentric bolt (1) to adjust toe to specified value.

Tighten nut (2).

Tightening torque [33 32 7AZ](#).

**Special tools required:**

- [32 3 140](#)
- [32 3 146](#)
- [32 3 147](#)

**Attention!**

Changes in axle geometry caused by accidents must under no circumstances be rectified by camber adjustment!

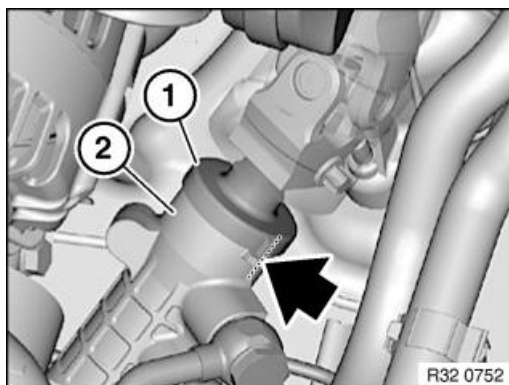
Note:

Camber and toe-in influence each other. Adjust the toe-in first in order to simplify the adjustment procedure.

The centring pin may only be driven out or unscrewed if the camber is outside the specified tolerance after toe adjustment.

Version with active front steering:

- Align steering wheel.
- Set the total steering angle via the service function "[Perform start-up/alignment for active steering](#)" to "zero".
- Secure using a steering wheel arrester, if required.

Version without active steering:

Move steering into straight-ahead driving position by means of markings on cap (1) and steering box (2).

Align steering wheel and secure with steering wheel arrester.

**Adjust toe-in:**

Clean thread on track rod.

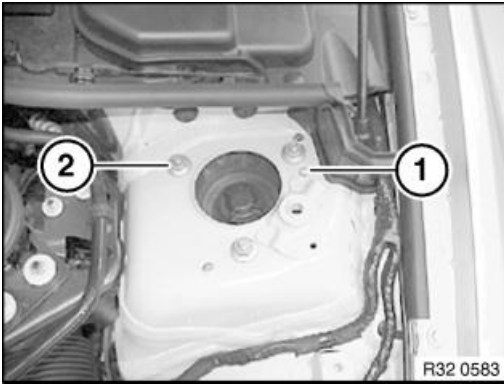
Loosen screw (2).

Turn track rod (3) to adjust toe-in to setpoint value, if necessary counterhold track rod end (1).

Tighten screw (2).

Tightening torque [32 21 2AZ](#).

If necessary, correct installation position of gaiter.



Adjusting camber:

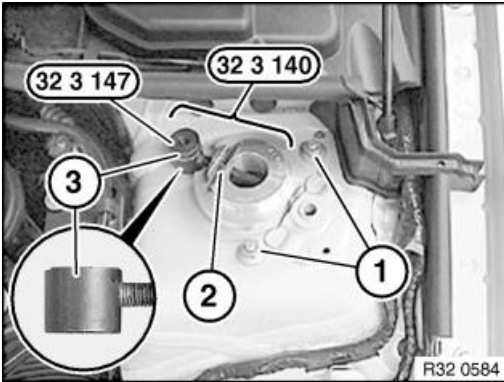
Remove the [tension strut for the spring strut dome](#).

Remove protective cap.

Screw out / drive out the centring pin (1).

Clean the wheel arch from the bottom in the area of the support bearing using compressed air.

Slacken nut (2).



Insert special tool [32 3 140](#) in the opening in the wheel arch.

Note:

While doing so, the spindle [32 3 146](#) (3) must be aligned such that the short end of the guide sleeve points to the top.

Screw the knurled nut [32 3 147](#) onto the stud bolt.

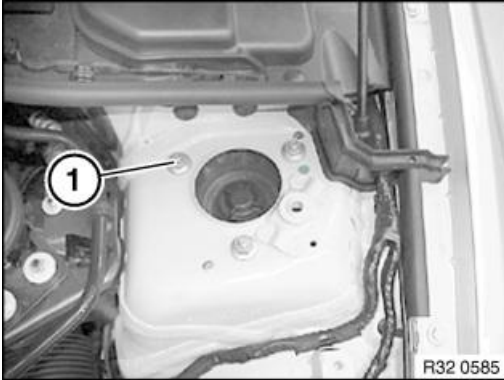
Renew nuts (1) and screw on up to the unit, do not tighten.

Twist the nut (2) of special tool [32 3 140](#) to adjust the camber to the setpoint value.

Tighten down nuts (1).

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

Remove special tool [32 3 140](#).



Renew nut (1) and tighten.

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



After Installation note:

- Check directional stability of car; if necessary, repeat toe-in adjustment

32 00 150 Carry out Kinematics Diagnosis System wheel alignment with vehicle load up to design position



Attention!

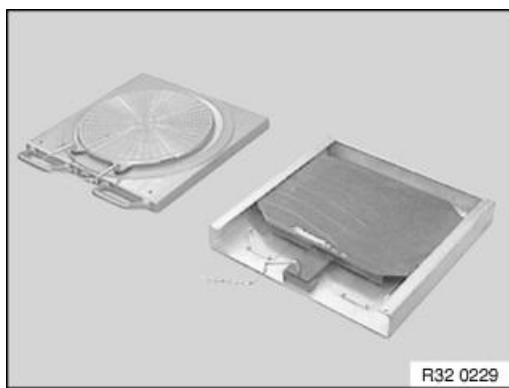
Carry out wheel alignment with DIN load only:

- If the technical prerequisites for alignment with ride height input are not fulfilled
- If the vehicle in question is a damaged vehicle



Note:

- Read and comply with [General information and definitions](#).
- Read and comply with [General chassis definition](#).
- Update [KDS data states](#)
- Check compliance with [test conditions](#), repair vehicle if necessary.



- If necessary, prepare vehicle hoist.
- Drive vehicle onto vehicle hoist.

Note: The front and rear wheels must be positioned centrally on the rotary and sliding plates.

NOTE: Rotary plates may vary from illustration depending on the manufacturer!



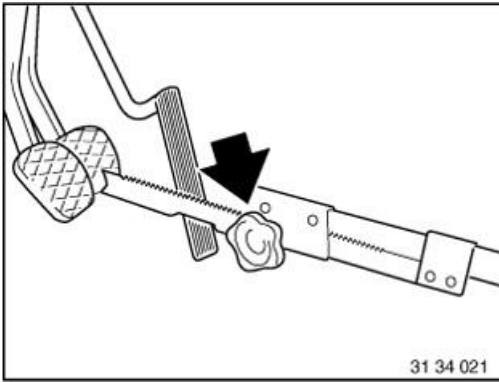
Note:

Vehicles with active steering:

Start up active steering prior to wheel alignment!



- Attach pickup/ride height marks to vehicle (observe specifications from the various equipment manufacturers).
- Enter customer and vehicle data
- Identify [chassis version](#) and select vehicle
- Enter tyre inflation pressure and tread depth
- Move [vehicle into design position](#)



- Install brake pedal tensioner



E81, E82, E84, E87, E88, E90, E91, E92, E93: Attention!

Risk of damage!

In order to avoid damaging the front side panel during the "Max. steering angle" drive-in routine, make sure the pickups are removed from the quick-clamping holders/quick-clamping units during output and input alignment. In the process do not detach the connecting cable from the pickups or the rotary plates.

Note:

After the drive-in routine, reconnect the pickups to the quick-clamping holders/quick-clamping units, align using the bubble levels and secure in place.



- Remove locking pins from both rotary and sliding plates.
- Perform input measurement in accordance with equipment manufacturer's instructions.
- If necessary, adjust [front axle and rear axle](#)
- Perform output measurement in accordance with equipment manufacturer's instructions.
- Save and print out test record.
- Insert locking pins into both rotary and sliding plates
- Remove chassis/wheel alignment system
- If necessary, carry out [alignment of ACC sensor](#)



Attention!

Only on vehicles with Active Cruise Control:

Because the driving axis is the reference for ACC alignment, it is necessary after an alignment of the rear axle, which alters the driving axis, to check the alignment of the ACC sensor as well!

It is not necessary to check the ACC sensor after only one adjustment of the front axle!



Only in event of customer complaint (e.g. poor driving performance):

Attention!

Do not remove screws/bolts (front axle support to engine support or body)!

Slacken all screws/bolts (front axle support to engine support or body) and then retighten to specified torque.

Refer to [Lowering front axle support](#).

**Important!**

In vehicles with active steering, steering angle sensor adjustment is integrated in the service function "[Initial operation/adjustment for active steering](#)" and must not be carried out separately!

*Note:*

Steering angle sensor adjustment must be carried out:

- Before adjustment work on the front axle/steering
- after all mechanical work on the steering system
- E36 Z3, E38: If Dynamic Stability Control (DSC) is installed
- E46 (All-wheel drive vehicle), E53, E83: After the battery has been disconnected
- After the following components have been replaced/encoded/programmed:
 - Fixture for switches of steering column / switch cluster / steering angle sensor
 - Dynamic Stability Control (DSC) control unit
 - Control unit active anti-roll stabilization (ARS)



Connect the vehicle to the diagnosis system or Software Service Station.

Select and carry out steering angle sensor adjustment under Service functions.

**Danger of poisoning!**

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

**Protective measures/rules of conduct:**

- Pour oil only into appropriately marked containers
- Do not pour oil into drinking vessels (drinks bottles, glasses, cups or mugs)
- Observe country-specific safety regulations

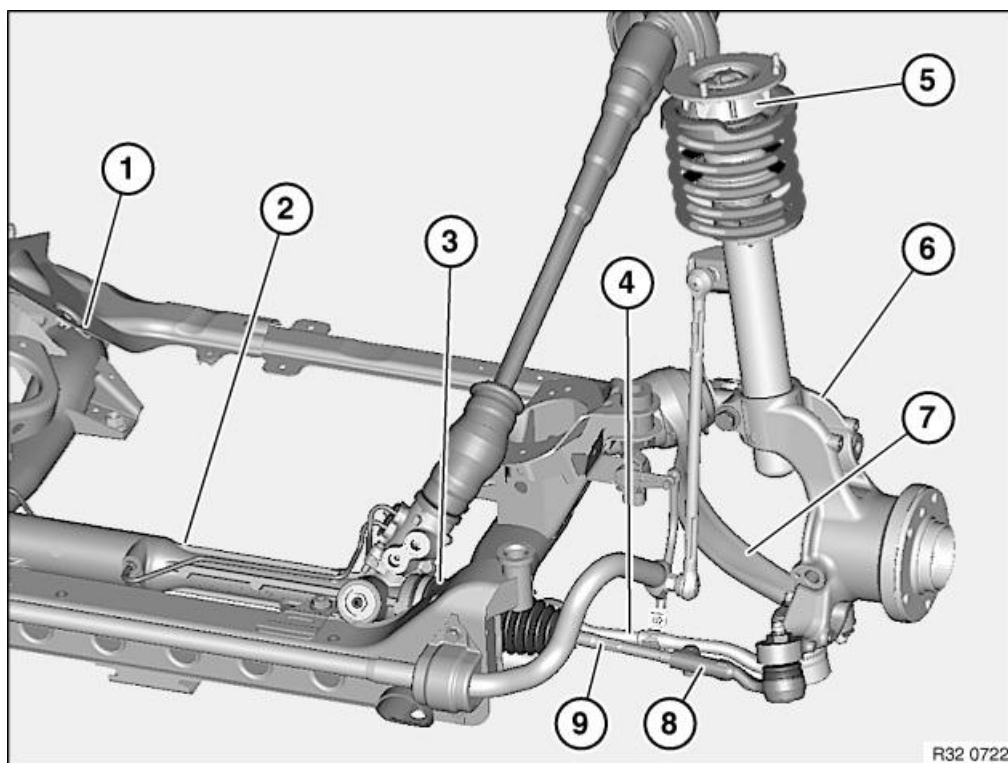
**First aid measures:**

- Do not induce vomiting.

If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

If the person affected is unconscious, do not administer anything by mouth, place the person in the recovery position and seek immediate medical attention.

31 00 ... Front axle + steering (AWD): wheel/chassis alignment check must be carried out after the following work

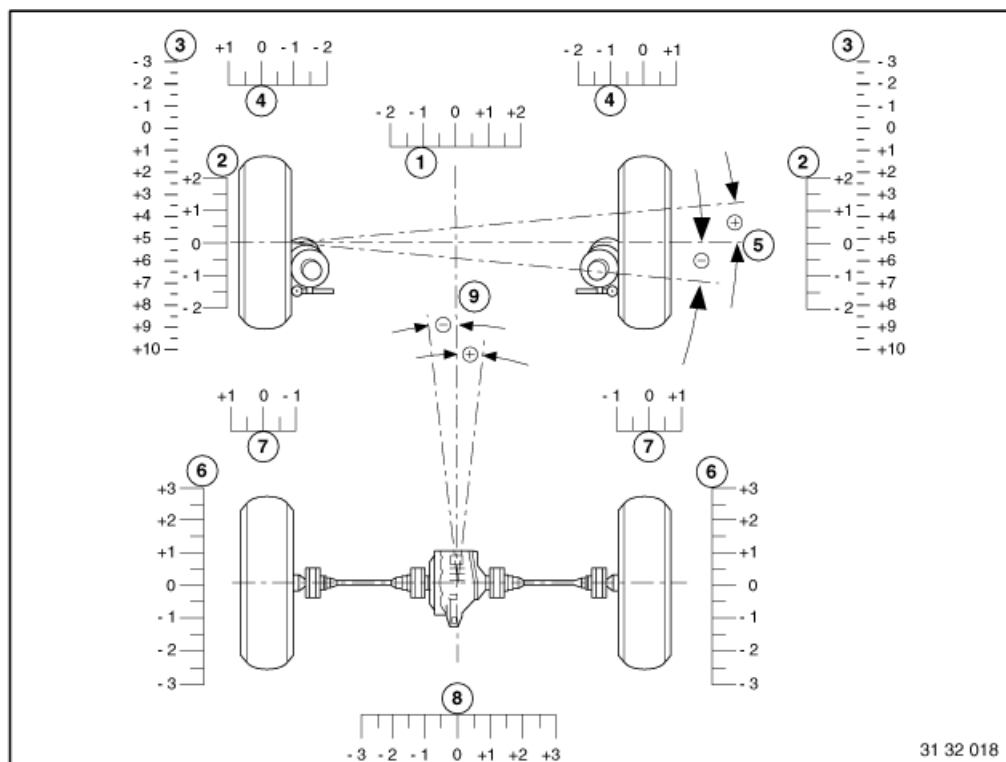


A [wheel/chassis alignment check](#) must be carried out after the following work:

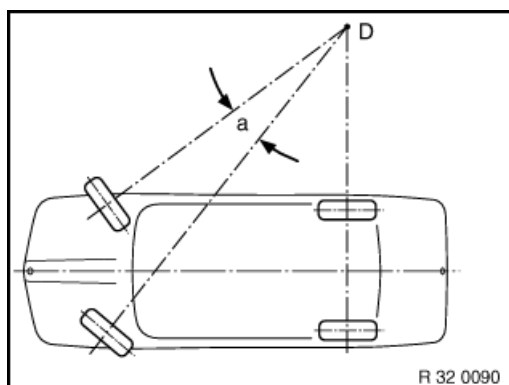
- Release of following screw/bolt connections:
 - Steering gear to front axle carrier
 - Control arm to front axle carrier
 - Compression strut to front axle carrier
 - Support bearing to body (if centering pin is missing)
 - Tie rod end to tie rod

- Replacement of following parts:
 1. Front axle carrier
 2. Steering gear
 3. Gaiter (if the tie rod end has to be screwed off)
 4. Control arm
 5. Support bearing (if centering pin is missing)
 6. Swivel bearing
 7. Compression strut or compression strut rubber mount
 8. Tie rod end
 9. Tie rod

32 00 ... General chassis and suspension definitions



- | | |
|---|-----------------------------|
| 1. Toe | 5. Wheel misalignment |
| 2. Camber | 6. Camber |
| 3. Caster (with 10° or 20° wheel lock) | 7. Rear-wheel position |
| 4. Toe angle difference (with 20° wheel lock) | 8. Toe |
| | 9. Geometrical driving axis |



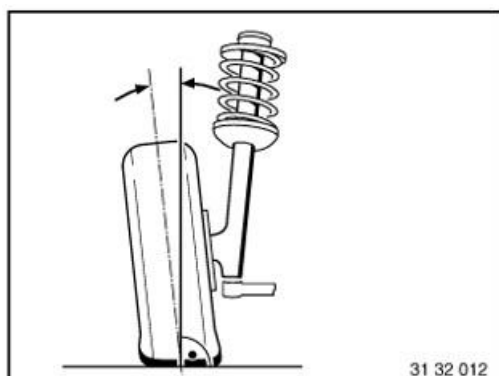
Toe angle difference

- a Toe difference angle
- D Centre point of operating circle

The toe angle difference is the angle adjustment of the inner cornering wheel relative to the outer cornering wheel when negotiating a curve. Steering is designed in such a way that angular position of wheels changes as steering lock progresses.

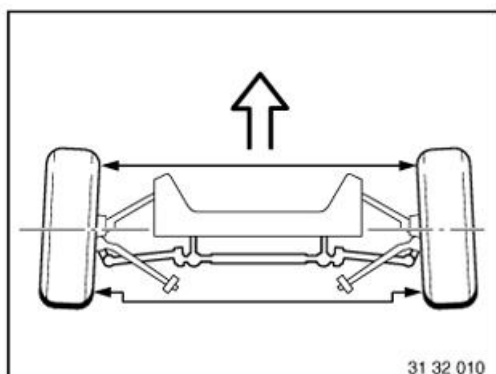
A correctly adjusted toe angle difference produces equal values for left and right lock with consideration of factory tolerances.

Toe angle difference provides information on corresponding operation of steering trapezoid for left or right steering lock from centre position.



Camber

Inclination of the wheel from the perpendicular.

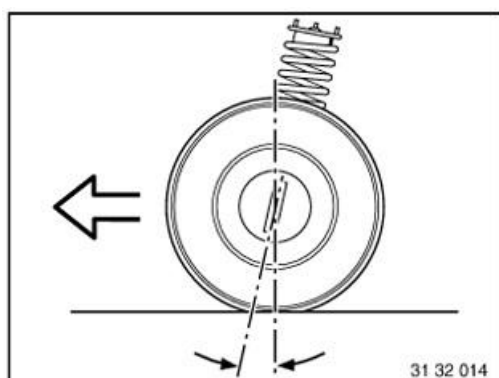


Toe

Reduction in distance of front of front wheels to rear of front wheels. The toe-in prevents the wheels from moving apart during driving and thus:

- the wheels from vibrating and grinding
- excessive tire wear
- excessive strain on the steering linkage and its links/joints
- heavy vehicle steering

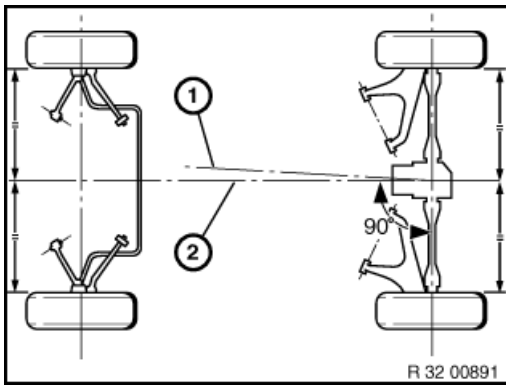
Measurement is performed in "straight-ahead mode".



Castor

Is the inclination of the kingpin in the direction of travel viewed from the side. The line through the centre point of the spring strut support bearing and the control arm ball joint corresponds to the "kingpin".

Thanks to caster, wheels are pulled and not pushed. In a similar manner to king pin inclination, when driving in curves or around corners, returning forces are reproduced to help return wheels to straight-ahead position.



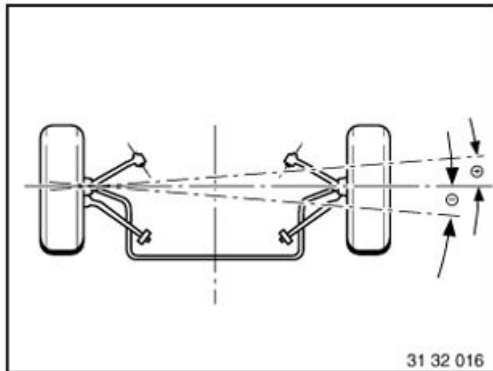
Geometrical driving axis 1

Is the angle bisector from the total rear-wheel toe.

Front-wheel measurements are taken in reference to this axis.

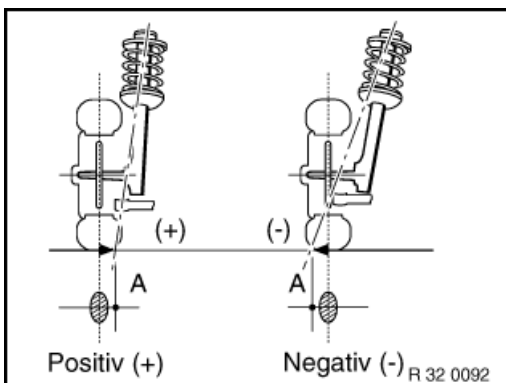
Symmetrical axis 2

Centre line running through front and rear axles.



Wheel misalignment

Angle by which one front wheel is displaced more towards front or rear than the other front wheel. The wheel offset angle is positive when the right wheel is displaced towards the front and negative when it is displaced towards the rear.



Kingpin offset/scrub radius

Is the distance from the centre of the wheel contact face to the intersection point of the kingpin extension. The line through the centre point of the spring strut support bearing and the control arm ball joint corresponds to the "kingpin".

The scrub radius is influenced by camber, kingpin angle and wheel offset of the wheel rim.

*Note:*

If the front spring strut does not have a label for suspension identification, the type of suspension can be identified from the part number in the Electronic Parts Catalogue.

32 00 ... KDS data statuses

Nominal values for wheel alignment are not published in ISTA.

The current setpoint values are made available in the workshop equipment portal.

See:

- www.bmwgroup-wep.com
 - Workshop Equipment catalogue:
 - Select Wheel alignment
 - Select KDS nominal values
 - E.g. Select Beissbarth KDS update, Copy data

Or:

- Aftersales Assistance Portal (ASAP)
 - Profile: Select Service/Technology
 - Select Workshop equipment
 - Select Start BMW
 - Select Workshop equipment catalogue
 - Select Wheel alignment
 - Select KDS nominal values
 - E.g. Select Beissbarth KDS update, Copy data

We recommend that the data records are updated on a regular basis.

Please contact your subsidiary if you do not have access to the portals listed.

32 00 155 Kinematics Diagnosis System wheel alignment with ride height measurement without loading the vehicle



Attention!

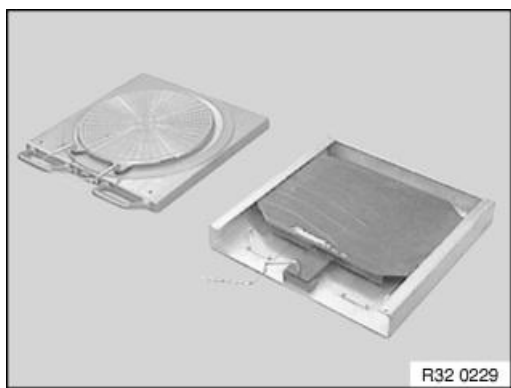
Do not perform wheel alignment without loading the vehicle:

- If the technical prerequisites for alignment with ride height input are not fulfilled
- If the vehicle in question is a damaged vehicle



Note:

- Read and comply with [General information and definitions](#).
- Read and comply with [General chassis definition](#).
- Update [KDS data states](#)
- Check compliance with [test conditions](#), repair vehicle if necessary.



- If necessary, prepare vehicle hoist.
- Drive vehicle onto vehicle hoist.

Note: The front and rear wheels must be positioned centrally on the rotary and sliding plates.

Note: Rotary plates may vary from illustration depending on the manufacturer!



Note:

Vehicles with active steering:

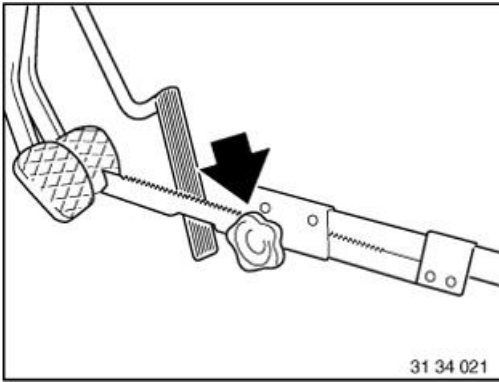
Start up active steering prior to wheel alignment!

On vehicles with rear axle slip angle control:

The service function "Moving HSR actuator to the centre position" is included in the active steering start-up.



- Attach pickup/ride-height marks to vehicle (observe regulation of the different device manufacturers).
 - If necessary, switch on chassis alignment system.
 - Enter customer and vehicle data
 - Identify [chassis version](#) and select vehicle
 - Enter tyre inflation pressure and tread depth
 - Measure [vehicle ride height](#) with tape measure (only Beissbarth KDS II wheel alignment equipment)
- If the ride height is outside the tolerance range (+40/-20 mm), load or unload vehicle accordingly to adjust the vehicle in this ride-height window



- Install brake pedal tensioner



E81, E82, E87, E88, E90, E91, E92, E93: Attention!

Risk of damage!

In order to avoid damaging the front side panel during the "Max. steering angle" drive-in routine, make sure the pickups are removed from the quick-clamping holders/quick-clamping units during output and input alignment. In the process do not detach the connecting cable from the pickups or the rotary plates.

Note:

After the drive-in routine, reconnect the pickups to the quick-clamping holders/quick-clamping units, align using the bubble levels and secure in place.



- Remove locking pins from both rotary and sliding plates.
- Perform input measurement in accordance with equipment manufacturer's instructions.
- If necessary, adjust [front axle and rear axle](#)
- Perform output measurement in accordance with equipment manufacturer's instructions.
- Save and print out test record.
- Insert locking pins into both rotary and sliding plates
- Remove chassis/wheel alignment system
- If necessary, carry out [alignment of ACC sensor](#)



Only in event of customer complaint (e.g. poor driving performance):

Attention!

Do not remove screws/bolts (front axle support to engine support or body)!

Slacken all screws/bolts (front axle support to engine support or body) and then retighten to specified torque.

Refer to [Lowering front axle support](#).

**Attention!**

For vehicles with ACC:

As the driving axis is the reference for ACC alignment, it is necessary to also check the alignment of the ACC sensor after a setting of the rear axle, which alters the driving axis.

It is not necessary to check the ACC sensor after only one adjustment of the front axle!

**Necessary preliminary tasks:**

- Move [vehicle into normal position](#)



- Version with air spring system:
 - Remove ignition key
 - If necessary, pull fuse for air supply system control unit
- Add/distribute weights in area of spring struts until the vehicle ride height is within the tolerance (refer to [Technical Data](#)).
Measure [vehicle ride height](#)

**Necessary preliminary tasks:**

- Check compliance with [test conditions](#), repair vehicle if necessary.



- Version with air spring system: Carry out [ride height adjustment](#)
- Check vehicle interior and luggage compartment (incl. spare wheel well) for load, unload vehicle if necessary
- Introduce DIN load (refer to [Technical Data](#)) into vehicle
- Determine [vehicle ride height](#)

Note: If the vehicle ride height is not inside the tolerance (refer to [technical data](#)), the vehicle must be repaired.

32 00 ... Notes and specifications for the replacement of the steering gear, steering column and the steering shaft following accident damage

Situation:

In the event of accidents or driving conditions similar to accidents, shock-like loads can cause different types of damage to steering boxes. When a steering box is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

Because of the disproportionate amount of effort involved, it is generally not sensible to check thoroughly all the individual components of the steering box and as an alternative it is necessary to take into account other components which can be checked more easily.

Procedure:

The steering box must be replaced if one or more of the following points apply:

- A. Visible or noticeable damage to the steering box
 - Version with electric steering box (EPS): Examine in particular the control unit with all plug connections for damage and hairline cracks.
- B. Unacceptable torque increase and jamming when the steering box is turned from lock to lock (without hydraulic/electrical assistance)
- C. Fire damage
- D. Damage, permanent deformation or fractures to:
 - Wheel rims in the event of a negative result from the wheel alignment check
 - Spring struts, steering stubs, wheel carriers
 - Wishbones
 - Struts or trailing links or anti-roll bar with this function
 - Body-side attachment points for wheel guide/control components
 - Front axle support
 - Pitman arms
 - Track rods
 - Steering box fixtures
 - Steering column

A lopsided steering wheel, significant deviations of camber/track values and noises when cranking the steering can be additional indications for the damage/deformations listed here.

This guideline is binding for all accident repairs to BMW and MINI vehicles.

Note:

If the steering box replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

For a corresponding example of the memorandum, [see Service Information \(bulletin\) 320188\(828\) Appendix 1](#).

Actual situation of the steering column and steering shaft:

In the event of accidents or driving conditions similar to accidents, shock-like loads can cause different types of damage to the steering shaft and steering column. In case no external damaged of the steering column and the steering shaft can be noticed, it is sometimes only possible to identify damage with great difficulty and with great effort.

Procedure for steering column and steering shaft:

The steering column and steering shaft must be replaced if one or more of the following points apply:

- Visible or noticeable damage, deformation or breakage of the steering column or steering shaft
- Damage, permanent deformation or breakage of the track rod
- Unacceptable torque increase and jamming when the steering column is cranked from limit position to limit

position (without hydraulic/electrical assistance)

- If the wheel alignment nominal data cannot be reached after all the damaged wheel components are changed (exceedance of the permissible wheel alignment tolerances). If required, attach the measurement protocol of the invoice/certificate
- Positive check for activated crash system of the steering column:
- If no damage is visible on the steering column, the mechanical steering column must be checked for an activated crash system:
 1. Open ELV
 2. Pull steering wheel out towards the driver (towards the body) until the physical limit position is reached, but do not use excessive force
 3. Push steering wheel towards engine compartment (approx. 20-30 mm away from body) into the comfort position and lock

If no end stop is present when pulling out the steering column or the gaiter of the steering column shroud has tension, the crash system has activated and the steering column is to be renewed.

Note:

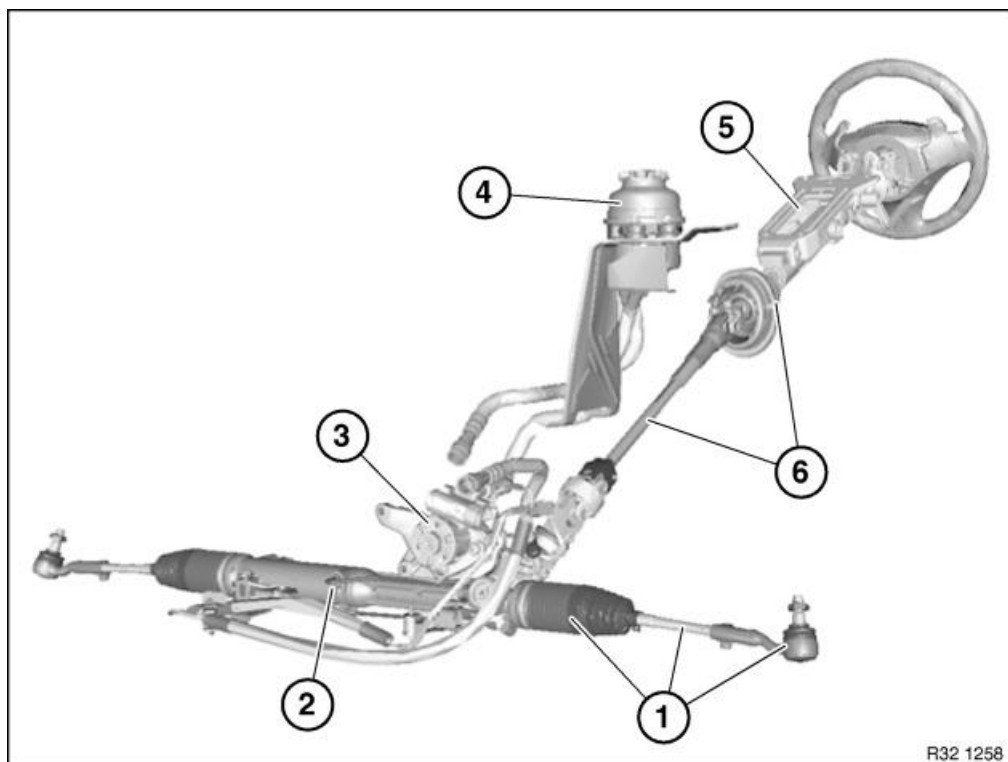
If the steering column/steering shaft replacement work which is required for safety reasons is rejected by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

For corresponding specimen of the memorandum, [refer to Service Information 320188\(828\) Appendix 1](#)

Attention!

The vehicle's operating licence will be invalidated whenever the function of any of its safety components is compromised!

32 ... Overview of steering



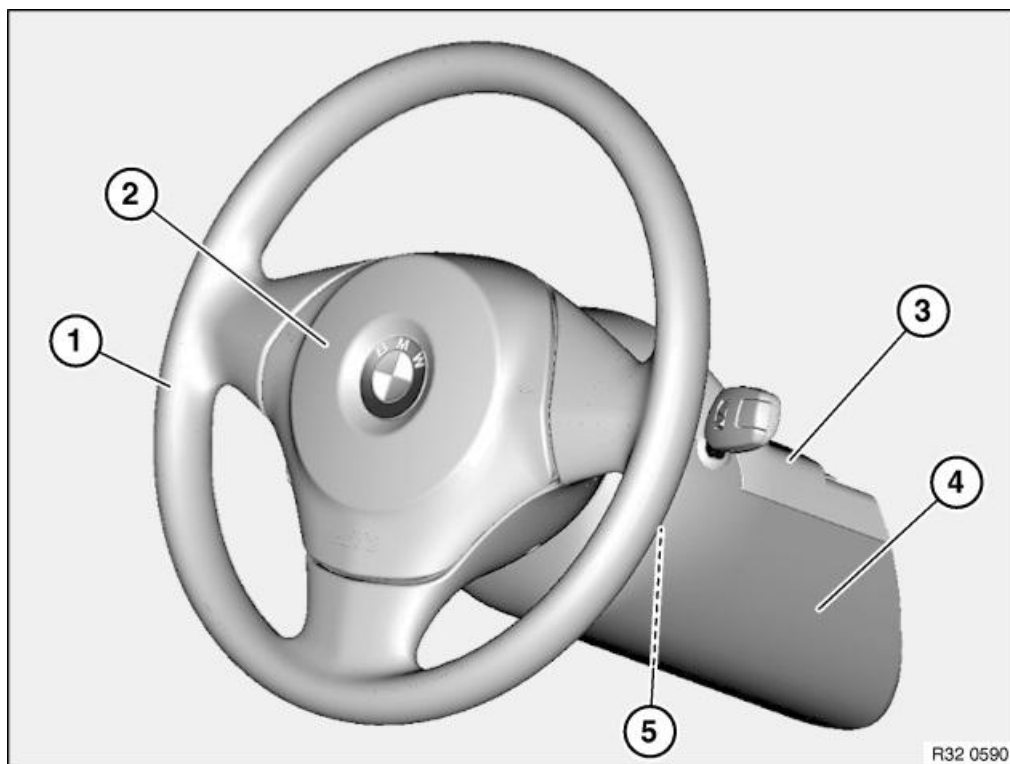
[Safety precautions and general information](#)

- 1 [Tie rod end / tie rod / gaiter](#)
- 2 [Hydraulic steering gear](#)
- 3 [Vane pump](#)
- 4 [Oil container](#)
- 5 [Steering column](#)
- 6 [Steering spindle lower section / sleeve](#)

[Adjustment work](#)

Troubleshooting

[Steering angle sensor adjustment](#)



- | | |
|---|---|
| 1 Steering wheel / decorative trims / cover | 5 Steering angle sensor/fixture for steering column stalk |
| 2 Airbag unit | Control lever |
| 3 Upper steering column casing | |
| 4 Lower steering column casing | Steering angle sensor adjustment/adjustment for active front steering |

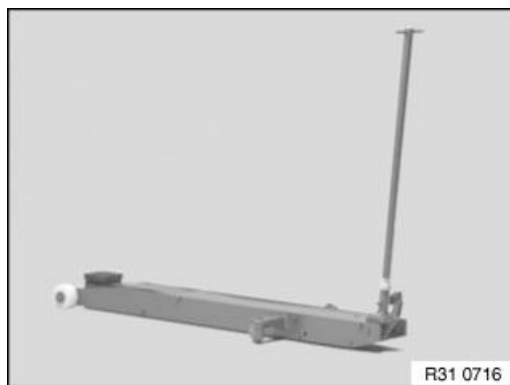
*Note:*

Rim runout compensation involves electronically recording the lateral runout of the rim and the possible clamping error of the quick-clamping unit for one wheel rotation and compensating the toe and camber for measurement/alignment.

Raise body.

Perform rim runout compensation in accordance with equipment manufacturer's instructions.

Compress/deflect car.



Observe the following trolley-jack-related notes:

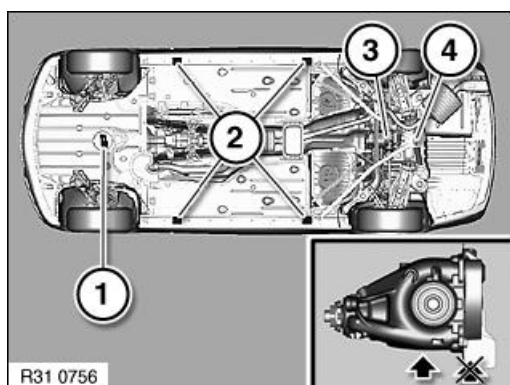
1. Only trolley jacks sold or approved by BMW, with a rubber plate on their mounting, may be used!
2. Trolley jacks must be regularly serviced and always checked for functional reliability before they are used!
3. Check the rubber plate on the trolley jack prior to each use, replacing if necessary.



Caution!

All-wheel drive vehicles may only be raised with the reinforcement plate fitted on the front axle!

Raising directly on the front axle support without reinforcement plate is not permissible!



Warning!

The vehicle may be raised with a trolley jack only at the following mounting point!

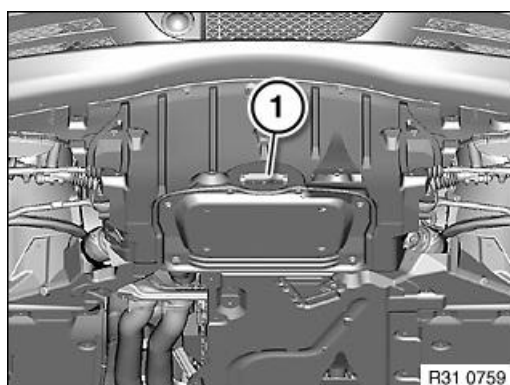
- 1 Jacking point on reinforcement strut (rear-wheel drive)

- 2 Side car jacking points

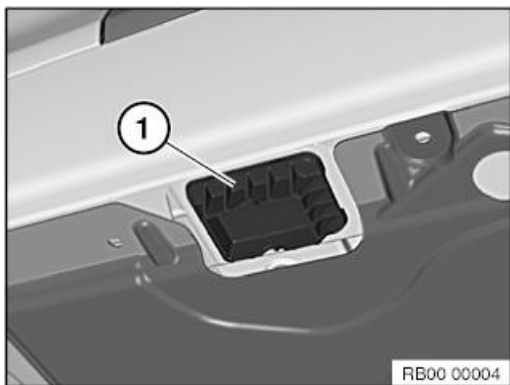
- 3 Rear axle final drive

Note: It is not permitted to raise the vehicle at the rear differential cover!

- 4 Bolting point for rear axle trailing links



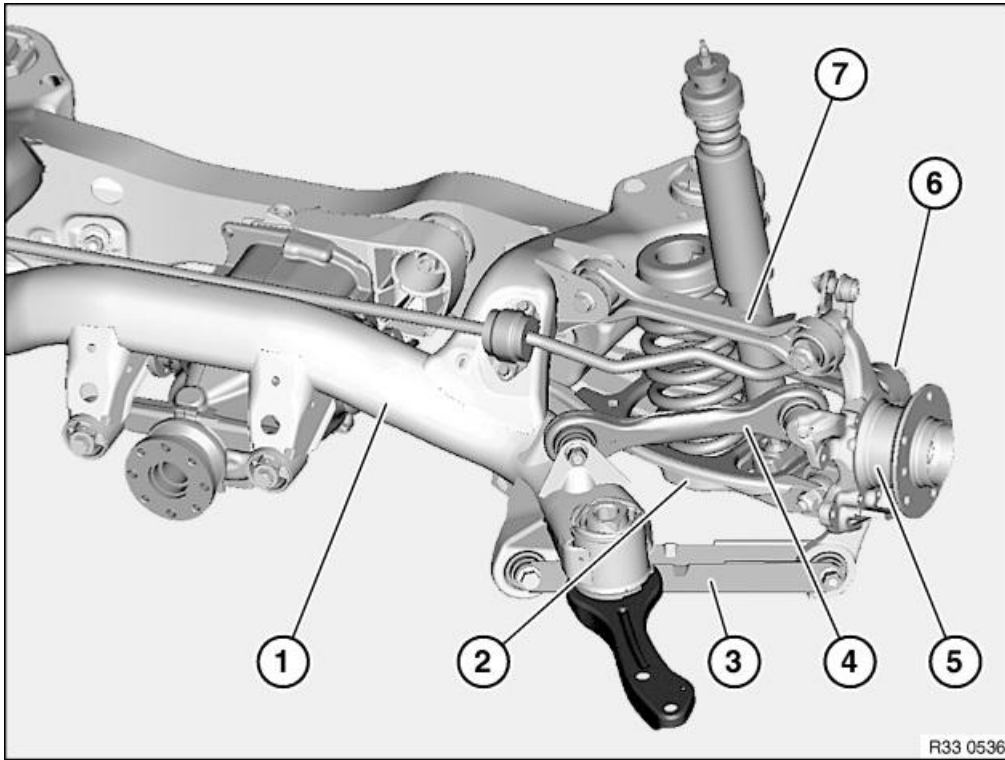
- 1 Jacking point on front axle support (four-wheel drive)

**Risk of damage!**

Jacking point (1) must be present!

Align the rubber plate on the trolley jack to the jacking point (1) in such a way that there is no contact to adjacent components and that they are therefore not damaged.

33 00 ... Rear axle: wheel/chassis alignment check must be carried out after the following work



A [wheel/chassis alignment check](#) must be carried out after the following work:

- Release of following screw/bolt connections:
 - Camber arm to rear axle carrier / wheel carrier
 - Trailing arm to rear axle carrier / wheel carrier
 - Guide arm to rear axle carrier
 - Toe arm to rear axle carrier / wheel carrier
 - Control arm to rear axle carrier

- Replacement of following parts:
 1. Rear axle carrier
 2. Camber arm / rubber mount / ball joint
 3. Trailing arm / rubber mount
 4. Guide arm
 5. Wheel carrier / rubber mount / ball joint
 6. Toe arm
 7. Control arm

00 Risk of injury if oil comes into contact with eyes and skin



Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin



Protective measures/rules of conduct:

- Wear protective goggles
- Wear oil-resistant protective gloves
- Observe country-specific safety regulations



First aid measures:

- Eye contact: Rinse eyes immediately with plenty of water for at least 15 minutes; if available, use an eye-rinsing bottle. If irritation of the eyes persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

Note: Do not use solvents/thinners.

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



Warning!

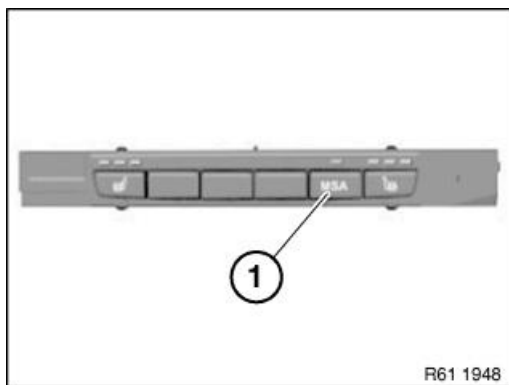
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

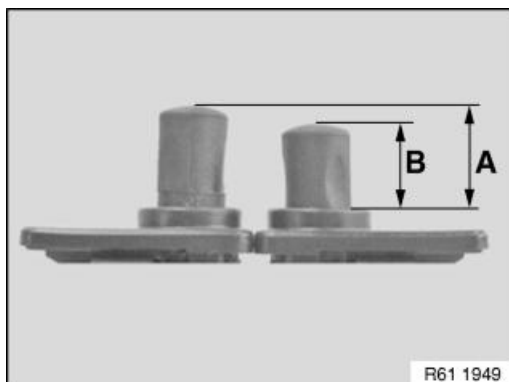
Observe safety precautions when working on MSA vehicles.

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
 $A = 10 \text{ mm}$
 - Basic setting (engine hood/bonnet open)
 $B = 7 \text{ mm}$

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](#)

00 Safety instructions for handling oil



Warning!

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!



Recycling:

Observe country-specific waste-disposal regulations.



Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

Note: Do not flush oil away with water or aqueous cleaning agents.

32 00 ... Test conditions for chassis/wheel alignment check

Observe the following test conditions prior to the chassis/wheel alignment check:

1. Only BMW approved wheel and tyre combinations are installed on the vehicle.
2. Correct tread depth. The tread depth for each axle may differ from left to right by max. 1-2 mm.
3. Correct tyre pressure (see label on vehicle).
4. All chassis and suspension components must be technically OK.
5. Condition of suspension and shock absorbers OK: Visually inspect for breakage, etc.
6. Vehicles with self-levelling suspension: Pull fuse of air supply system so that there is no controlling down or up.

32 00 ... Notes and specifications for the replacement of the steering gear, steering column and the steering shaft following accident damage

Situation:

In the event of accidents or driving conditions similar to accidents, shock-like loads can cause different types of damage to steering boxes. When a steering box is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

Because of the disproportionate amount of effort involved, it is generally not sensible to check thoroughly all the individual components of the steering box and as an alternative it is necessary to take into account other components which can be checked more easily.

Procedure:

The steering box must be replaced if one or more of the following points apply:

- A. Visible or noticeable damage to the steering box
 - Version with electric steering box (EPS): Examine in particular the control unit with all plug connections for damage and hairline cracks.
- B. Unacceptable torque increase and jamming when the steering box is turned from lock to lock (without hydraulic/electrical assistance)
- C. Fire damage
- D. Damage, permanent deformation or fractures to:
 - Wheel rims in the event of a negative result from the wheel alignment check
 - Spring struts, steering stubs, wheel carriers
 - Wishbones
 - Struts or trailing links or anti-roll bar with this function
 - Body-side attachment points for wheel guide/control components
 - Front axle support
 - Pitman arms
 - Track rods
 - Steering box fixtures
 - Steering column

A lopsided steering wheel, significant deviations of camber/track values and noises when cranking the steering can be additional indications for the damage/deformations listed here.

This guideline is binding for all accident repairs to BMW and MINI vehicles.

Note:

If the steering box replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

For a corresponding example of the memorandum, [see Service Information \(bulletin\) 320188\(828\) Appendix 1](#).

Actual situation of the steering column and steering shaft:

In the event of accidents or driving conditions similar to accidents, shock-like loads can cause different types of damage to the steering shaft and steering column. In case no external damaged of the steering column and the steering shaft can be noticed, it is sometimes only possible to identify damage with great difficulty and with great effort.

Procedure for steering column and steering shaft:

The steering column and steering shaft must be replaced if one or more of the following points apply:

- Visible or noticeable damage, deformation or breakage of the steering column or steering shaft
- Damage, permanent deformation or breakage of the track rod
- Unacceptable torque increase and jamming when the steering column is cranked from limit position to limit

position (without hydraulic/electrical assistance)

- If the wheel alignment nominal data cannot be reached after all the damaged wheel components are changed (exceedance of the permissible wheel alignment tolerances). If required, attach the measurement protocol of the invoice/certificate
- Positive check for activated crash system of the steering column:
- If no damage is visible on the steering column, the mechanical steering column must be checked for an activated crash system:
 1. Open ELV
 2. Pull steering wheel out towards the driver (towards the body) until the physical limit position is reached, but do not use excessive force
 3. Push steering wheel towards engine compartment (approx. 20-30 mm away from body) into the comfort position and lock

If no end stop is present when pulling out the steering column or the gaiter of the steering column shroud has tension, the crash system has activated and the steering column is to be renewed.

Note:

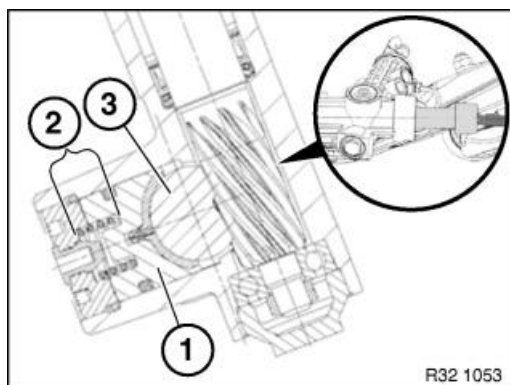
If the steering column/steering shaft replacement work which is required for safety reasons is rejected by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

For corresponding specimen of the memorandum, [refer to Service Information 320188\(828\) Appendix 1](#)

Attention!

The vehicle's operating licence will be invalidated whenever the function of any of its safety components is compromised!

32 11 ... Notes on checking steering backlash on vehicles with rack-and-pinion steering (with front axle raised)



Note:

When the front axle is raised, the applied force is distributed via the tie rod into horizontal and vertical forces. If there is now no electric or hydraulic assistance, the forces created cause the thrust member (1) to be unloaded against the spring (2). The play created in this way is incorrectly referred to as steering backlash.

3 = Rack



Important!

Target status: steering must be free from play in all the mechanical components (except for steering gear and tie rod)!



Note:

For checking purposes, the steering gear must be pressurised by means of electric or hydraulic assistance.

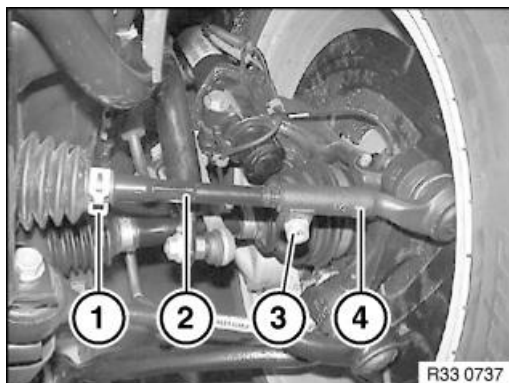
- Hydraulic steering assistance: Start engine
- Electro-hydraulic steering assistance: Switch ignition on
- Electric steering assistance: Turn on ignition and start engine

**Important!**

The hydraulic steering gear must be replaced if the polished surface of the rack is damaged (e.g. by corrosion)!

**Necessary preliminary work:**

- If necessary, remove diesel enclosure



Clean track rod.

Release band clamp (1).

Mark screw-in depth of track rod (2) or count thread turns.

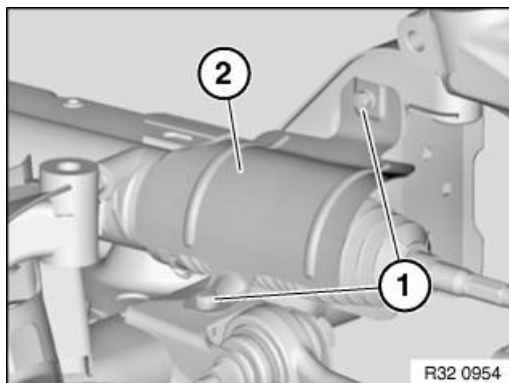
Release screw (3).

Twist track rod (2) out of track rod end (4).

Installation note:

Replace microencapsulated screw.

Tightening torque 32 21 2AZ.

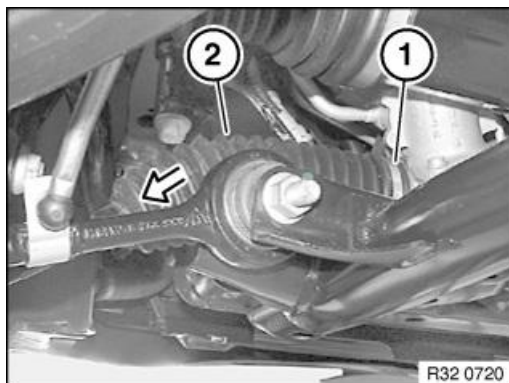
*Note:*

E9x only:

Heat shield is only fitted on the right side.

Release screws (1) and remove heat shield (2).

Tightening torque 32 21 4AZ.



Release ear clamp (1).

Detach gaiter (2) from track rod.

Installation note:

Clean rack and check surface for damage (e.g. by corrosion).

Grease rack (refer to BMW Service Operating Fluids).

Clean track rod and apply grease to taper.

Note:

This ensures that the gaiter is not rotated when the track rod is rotated.



After installation:

- Perform chassis / wheel alignment check
- Carry out steering angle sensor adjustment



Warning!

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!



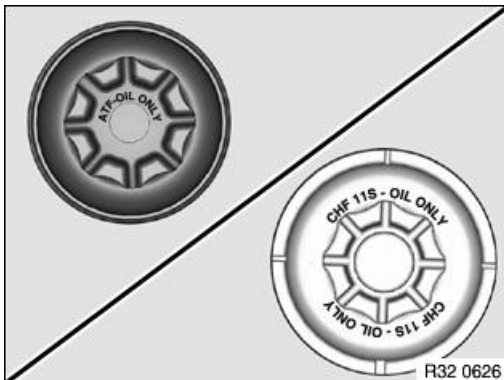
Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20 °C here.

Ensure that the cap is fully screwed in prior to the fill level check.



Note:

To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF	Automatic transmission fluid
CHF	Pentosin CHF11S



1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

Note: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20 °C. With the engine at normal operating temperature (approx. 50-60 °C fluid temperature) adjust a fill height 10 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

Hydraulic fluid: [BMW Service Operating Fluids](#)

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

32 00 ... Notes and specifications for the replacement of the steering gear, steering column and the steering shaft following accident damage

Situation:

In the event of accidents or driving conditions similar to accidents, shock-like loads can cause different types of damage to steering boxes. When a steering box is externally undamaged, it is sometimes only possible to identify damage with great difficulty and with great effort. However, damage of this nature poses an unacceptable risk to the vehicle because it can result in failure of the steering system.

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Procedure:

The steering box must be replaced if one or more of the following points apply:

- A. Visible or noticeable damage to the steering box
 - Version with electric steering box (EPS): Examine in particular the control unit with all plug connections for damage and hairline cracks.
- B. Unacceptable torque increase and jamming when the steering box is turned from lock to lock (without hydraulic/electrical assistance)
- C. Fire damage
- D. Damage, permanent deformation or fractures to:
 - Wheel rims in the event of a negative result from the wheel alignment check
 - Spring struts, steering stubs, wheel carriers
 - Wishbones
 - Struts or trailing links or anti-roll bar with this function
 - Body-side attachment points for wheel guide/control components
 - Front axle support
 - Pitman arms
 - Track rods
 - Steering box fixtures
 - Steering column

A lopsided steering wheel, significant deviations of camber/track values and noises when cranking the steering can be additional indications for the damage/deformations listed here.

This guideline is binding for all accident repairs to BMW and MINI vehicles.

Note:

If the steering box replacement work which is required for safety reasons is refused by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

For a corresponding example of the memorandum, [see Service Information \(bulletin\) 320188\(828\) Appendix 1](#).

Actual situation of the steering column and steering shaft:

In the event of accidents or driving conditions similar to accidents, shock-like loads can cause different types of damage to the steering shaft and steering column. In case no external damaged of the steering column and the steering shaft can be noticed, it is sometimes only possible to identify damage with great difficulty and with great effort.

Procedure for steering column and steering shaft:

The steering column and steering shaft must be replaced if one or more of the following points apply:

- Visible or noticeable damage, deformation or breakage of the steering column or steering shaft
- Damage, permanent deformation or breakage of the track rod
- Unacceptable torque increase and jamming when the steering column is cranked from limit position to limit

position (without hydraulic/electrical assistance)

- If the wheel alignment nominal data cannot be reached after all the damaged wheel components are changed (exceedance of the permissible wheel alignment tolerances). If required, attach the measurement protocol of the invoice/certificate
- Positive check for activated crash system of the steering column:
- If no damage is visible on the steering column, the mechanical steering column must be checked for an activated crash system:
 1. Open ELV
 2. Pull steering wheel out towards the driver (towards the body) until the physical limit position is reached, but do not use excessive force
 3. Push steering wheel towards engine compartment (approx. 20-30 mm away from body) into the comfort position and lock

If no end stop is present when pulling out the steering column or the gaiter of the steering column shroud has tension, the crash system has activated and the steering column is to be renewed.

Note:

If the steering column/steering shaft replacement work which is required for safety reasons is rejected by the customer or an insurance company for cost reasons, a memorandum to that effect must be drawn up and countersigned by the party bearing the costs of the accident repair.

For corresponding specimen of the memorandum, [refer to Service Information 320188\(828\) Appendix 1](#)

Attention!

The vehicle's operating licence will be invalidated whenever the function of any of its safety components is compromised!

**Warning!**

Danger to life!

[Secure engine in installation position](#) to prevent it from falling down.

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

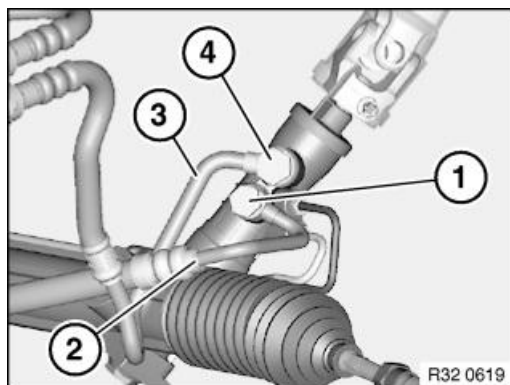
Seal off hydraulic lines with seal plugs.

**Important!**

If the lower section of the steering shaft is separated from the steering box/steering column, the steering column switch cluster may be damaged when the steering wheel is turned.

**Necessary preliminary tasks:**

- Draw off and dispose of hydraulic fluid from oil reservoir
- Secure [engine in installation position](#)
- Remove [track rod end on both sides from swivel bearing](#)
- Replacement only: Remove [track rod end at both ends of track rod](#)
- Lower [front axle support](#)



Release banjo bolts (1) and (4).

Disconnect pressure line (2) and return line (3) from hydraulic steering gear.

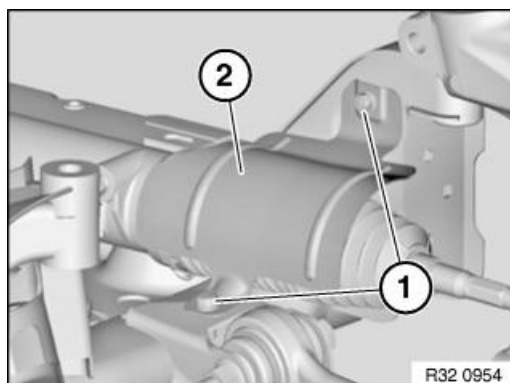
Installation note:

Replace sealing rings.

Make sure hydraulic lines are laid without tension and with sufficient distance to adjoining components.

Tightening torque [32 41 9AZ](#) (pressure line).

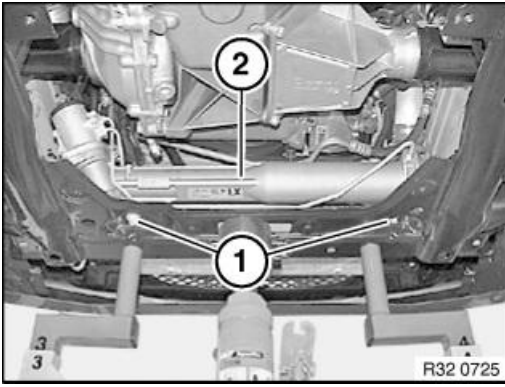
Tightening torque [32 41 10AZ](#) (return line).

*Note:*

Heat shield is only fitted on the right side.

If necessary, release screws (1) and remove heat shield (2).

Tightening torque [32 21 4AZ](#).



Release nuts and remove screws (1) towards bottom.

Remove hydraulic steering gear (2) to one side.

Installation note:

Replace screws and self-locking nuts.

Tightening torque [32 00 1AZ](#).



After installation:

- Turn steering wheel in both directions to the limit position. The airbag indicator lamp must not light up in the process.
- Fill and bleed [hydraulic system](#)
- Check line connections for leaks
- Perform [chassis / wheel alignment check](#)

32 41 ... Instructions for removing and installing ear clips



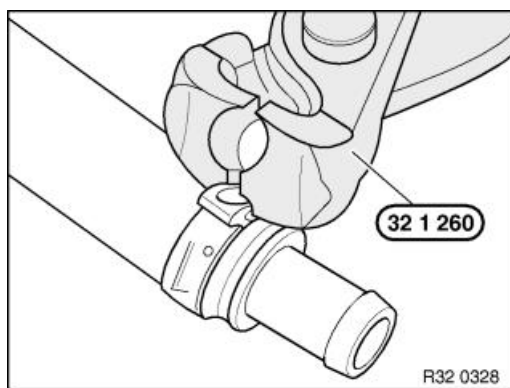
Special tools required:

- [32 1 260](#)

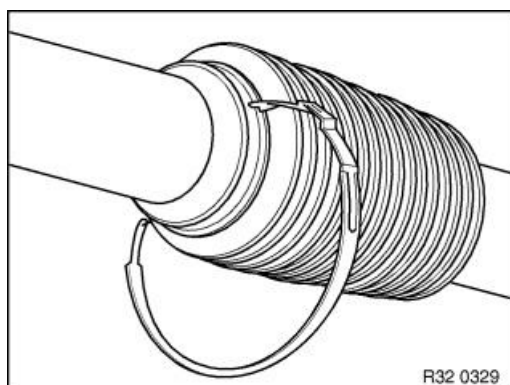
Note:

The work steps are show on assorted components.

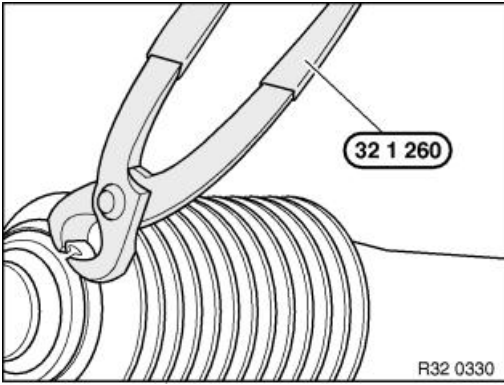
Ear clip must always be replaced.



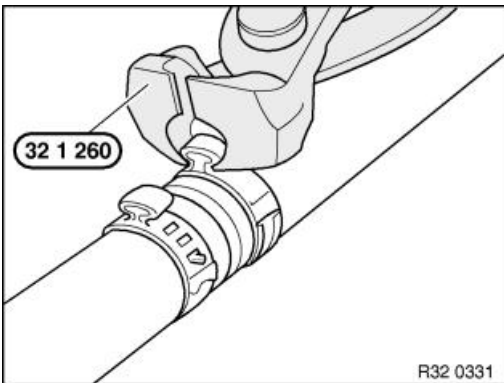
To remove an ear clip, place special tool [32 1 260](#) at right angles to ear and cut ear open.



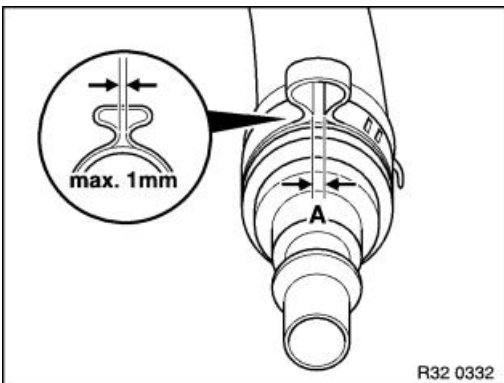
The ear clip can be fitted not only axially but also radially after the hook fastener has been opened.



Attach hook fastener and press ear together with special tool [32 1 260](#) .



The diagonal cutting pliers of special tool [32 1 260](#) can be used in areas which are difficult to access.



Important!
Gap (A) max. 1 mm!

**Special tools required:**

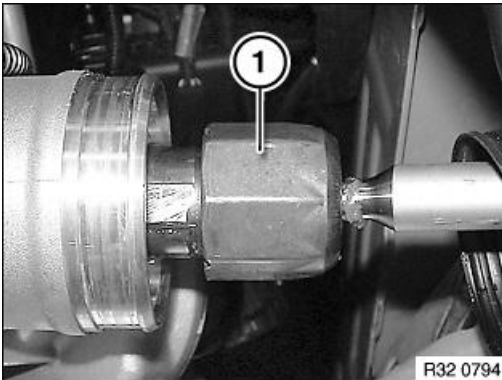
- [32 3 160](#)

**Important!**

The steering box must be replaced if the polished surface of the rack is damaged (e.g. by corrosion)!

**Necessary preliminary tasks:**

- Remove [track rod end from swivel bearing](#)
- Remove [gaiter from steering box](#) and slide back

**Important!**

To avoid damage to rack and to suspension mounting, move rack in as far as possible.

Undo the joint (1) using special tools [32 3 160](#) at the steering box rack.

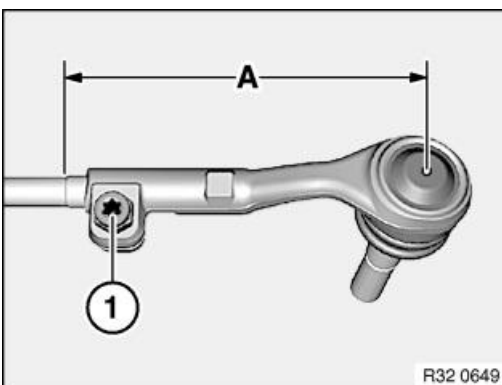
Tightening torque [32 21 1AZ](#).

Installation note:

Clean rack.

Check surface of rack for damage (e.g. corrosion).

For hydraulic steering gear only: Grease rack (refer to [BMW Service Operating Fluids](#)).

**On replacement, assemble new part with gaiter:**

- Determine dimension (A) to simplify following adjustment of front axle

Installation note:

Slacken clamping bolt (1) and screw off track rod end.

Slide gaiter with ear clip and band clamp on track rod.

Screw in track rod end to dimension (A).

Tightening torque [32 21 2AZ](#).

**After installation:**

- Only if replacing/removing track rod end: Perform [wheel alignment check](#)

**Special tools required:**

- [31 2 300](#)

**Note:**

If the tie rod end to tie rod screw/bolt connection is released, it is necessary after reinstallation to carry out a wheel/chassis alignment check.

**Necessary preliminary tasks:**

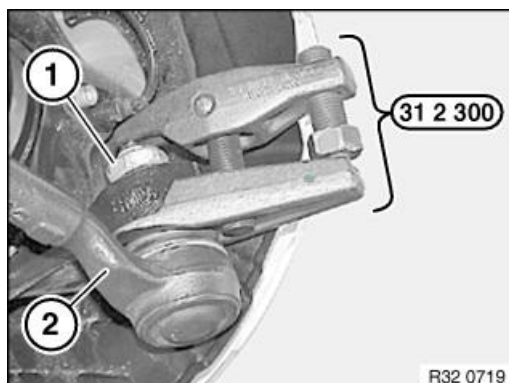
- Remove [front wheel](#)

**Important!**

Do not release tie rod end from swivel bearing with impact tool.

Rubber gaiter of tie rod end must not be damaged!

Do not pull stainless steel ring off journal.



Slacken nut (1); if necessary, grip at Torx socket.

Press tie rod end (2) with special tool [31 2 300](#) off swivel bearing.

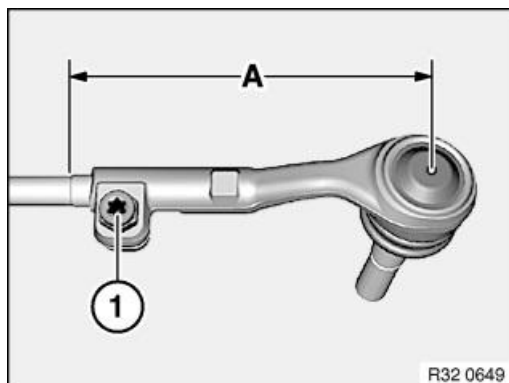
Unscrew nut (1).

Installation:

Keep tie rod end (2) to swivel bearing connection clean and free from oil and grease.

Replace self-locking nut.

Tightening torque [32 21 3AZ](#).



Determine measurement (A) to simplify following adjustment of front axle.

Release bolt (1).

Screw off tie rod end; if necessary, grip tie rod with open-end wrench.

Installation:

Check [gaiter](#) for damage, replace if necessary.

Screw tie rod end onto tie rod to measurement (A).

Tightening torque [32 21 2AZ](#).



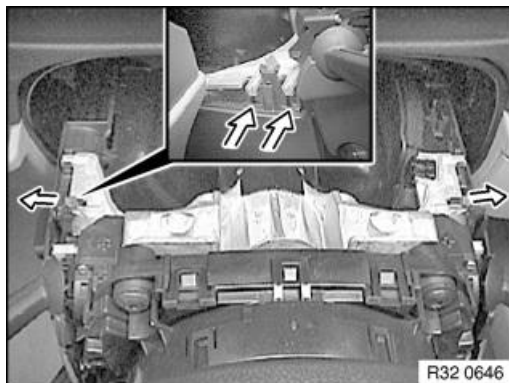
After installation:

- Perform [chassis alignment check](#)
- Carry out [steering angle sensor adjustment](#)



Necessary preliminary tasks:

- Remove [upper section of steering column trim](#)
- Move steering column into "top" and "extended" position and do not secure with adjusting lever



Press detent lugs outwards a little and unclip steering column trim downwards. *Installation:*

Align steering column trim by means of detent lugs to steering column and press up as far as it will go.

Press steering column trim on both sides together a little and then press upwards completely until detent lugs snap into place.

Check installation position, correct if necessary.

*Note:*

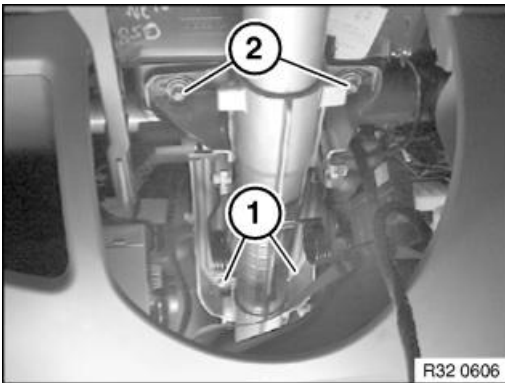
Steering angle sensor is integrated in the [steering column stalk fixture](#).

**After installation:**

- Replacement only: Carry out [programming/coding](#)
- Carry out [steering angle sensor adjustment/adjustment for active front steering](#)

**Necessary preliminary tasks:**

- Remove [steering spindle](#) in engine compartment
- Remove [panel for pedal assembly](#)
- Remove [steering column trims](#)
- Disconnect all plug connections at fixture for steering column stalk
- Disconnect plug connection on electric steering column lock
- Disconnect wiring harness from steering column and place to one side



Release screws (1).

Tightening torque [32 31 2AZ](#).

Secure steering column against falling out.

Unfasten screws (2).

Tightening torque [32 31 2AZ](#).

Remove steering column towards rear.

Installation:

Prior to installing, slide sleeve onto steering column.

**Replacement:**

- Modify [airbag unit](#)
- Modify [steering wheel](#)
- Modify [steering-column switch cluster](#)

**After installation:**

- Replacement: Lock and unlock electric steering column lock and clear fault memory in Car Access System (CAS).
- Replacement: Turn steering wheel in both directions to full lock. The airbag warning lamp must not light up in the process.
- Carry out [steering angle sensor adjustment](#) / adjustment for active front steering.
- Check directional stability of car.

32 31 070 Removing and installing/replacing steering spindle (in engine compartment)



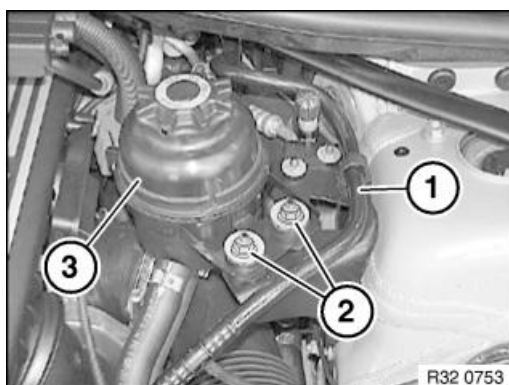
Important!

If the lower section of the steering spindle is separated from the double pivot/steering column, the steering-column switch cluster may be damaged when the steering wheel is turned.



Necessary preliminary tasks:

- Remove [microfilter housing](#) (N52K/N47T/N46 only)
- If necessary, remove left diesel encapsulation
- [Remove](#) trim panel for pedal mechanism
- Secure upper section of steering spindle (can be pushed into steering column) in footwell



N52K only:

Remove [intake filter housing](#) with air intake hose to intake pipe /system.

Remove vacuum line (1) from bracket.

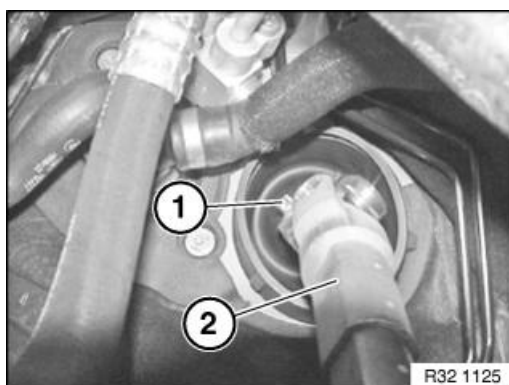
Release nuts (2) and remove washers.

Remove oil reservoir (3) with bracket from combination bracket, pass under vacuum line (1) and place to one side.

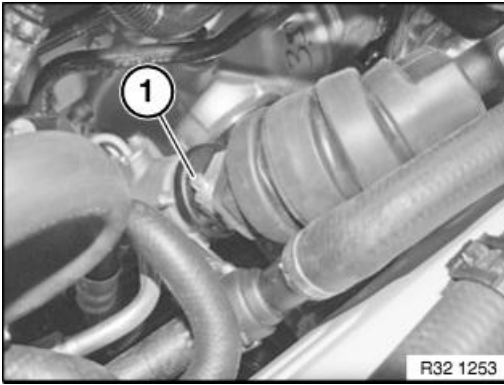
Installation note:

Replace self-locking nuts.

Tightening torque [32 41 2AZ](#).



Release clamping screw (1) on steering spindle (2) in engine compartment at top.



Release side clamping screw (1) from left wheel arch (4WD only).

Release clamping screw (1) in engine compartment (rear-wheel drive only).

Return steering to straight-ahead drive setting and remove ignition key.

Detach lower section of steering spindle from steering gear.

Detach steering spindle upper section from steering column.

Installation note:

Clean thread to remove all remnants of screw locking adhesive.

Replace clamping screws.

Clamping screw must rest in groove of steering spindle lower section.

No subsequent retorquing permitted!

Steering spindle can only be attached in one position on steering gear and steering column.

Tightening torque [32 31 4AZ](#).



After installation:

- Turn steering wheel in both directions to the limit position. The airbag indicator light must not light up in the process.

32 31 070 Removing and installing/replacing steering spindle (in engine compartment)



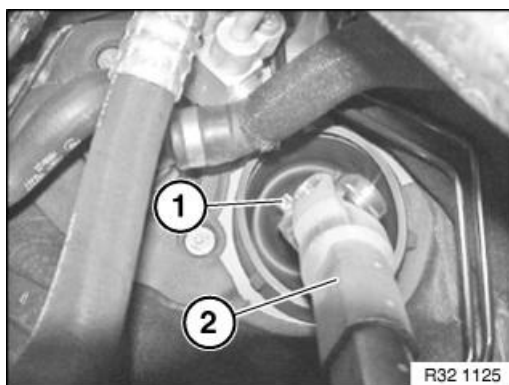
Important!

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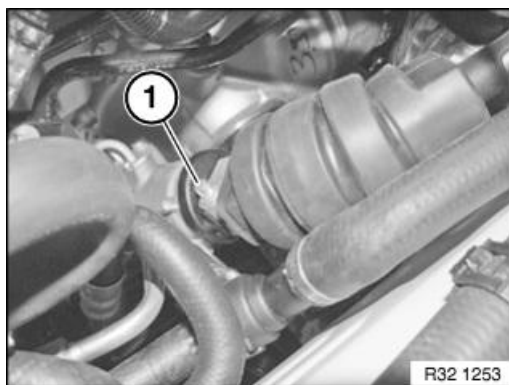


Necessary preliminary tasks:

- Remove [steering column](#)
- Remove [microfilter housing](#)
- [Remove](#) trim panel for pedal mechanism



Release clamping screw (1) on steering spindle (2) in engine compartment at top.



Release side clamping screw (1) from left wheel arch (4WD only).

Release clamping screw (1) in engine compartment (rear-wheel drive only).

Return steering to straight-ahead drive setting and remove ignition key.

Detach lower section of steering spindle from steering gear.

Detach upper section of steering shaft from steering column.

Installation note:

Clean thread to remove all remnants of screw locking adhesive.

Replace clamping screws.

Clamping screw must rest in groove of steering spindle lower section.

No subsequent retorquing permitted!

Steering spindle can only be attached in one position on steering gear and steering column.

Tightening torque [32 31 4AZ](#).



After installation:

- Turn steering wheel in both directions to the limit position. The airbag indicator light must not light up in the process.



Special tools required:

- [00 9 323](#)



Important!

Disconnecting the plug connection for the hands-free microphone or emergency SOS call button results in fault memory entries in the telephone control unit (limitation in the emergency SOS call system).

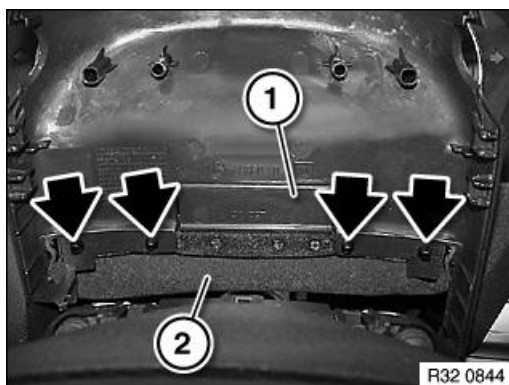
After installation:

- Read out fault memory and delete entries



Move steering column in "bottom" and "extended" position. **Important!**
Risk of damage!

Unclip steering column trim (1) at side with special tool [00 9 323](#).



Tilt steering column trim (1) towards front.

Unclip steering column gap cover (2) from steering column trim.

Installation:

Tilt steering column trim towards rear, align by way of locks to lower section (of steering column trim) and press down.

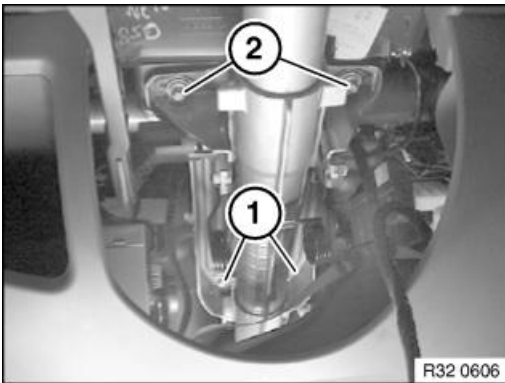


Replacement:

- E88, E93: Remove [hands-free microphone from steering column trim](#).

**Necessary preliminary tasks:**

- Remove [steering shaft](#) in engine compartment
- Remove [trim panel for pedal mechanism](#)
- Remove [steering column trims](#)
- Disconnect all plug connections at mounting for switch of steering column
- Disconnect plug connection on electric steering column lock
- Disconnect wiring harness from steering column and place to one side



Release screws (1).

Tightening torque: **21Nm**

Secure steering column against falling out.

Unfasten screws (2).

Tightening torque: **21Nm**

Remove steering column rearwards.

Installation note:

Prior to installing, slide sleeve onto steering column.

**Replacement:**

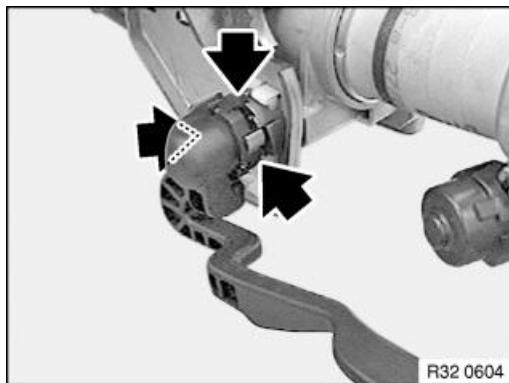
- Modify [airbag unit](#)
- Modify [steering wheel](#)
- Modify [steering-column switch cluster](#)

**After installation:**

- Replacement: Lock and unlock electric steering column lock and clear fault memory in Car Access System (CAS).
- Replacement: Turn steering wheel in both directions to the limit position. The airbag indicator lamp must not light up in the process.
- [Carry out steering angle sensor calibration](#)/adjustment for active steering
- Check directional stability of car.

**Necessary preliminary tasks:**

- Remove [steering column](#) (except on E84)



If necessary, remove cable duct from steering column.

Unclip adjusting lever.

Installation:

Align adjusting lever to steering column and attach straight to prevent the locks from being damaged.

Check locks after attachment, replace adjusting lever if necessary.

**Special tools required:**

- [00 9 321](#)

**Necessary preliminary tasks:**

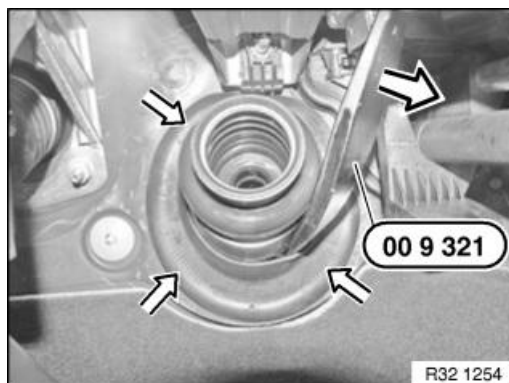
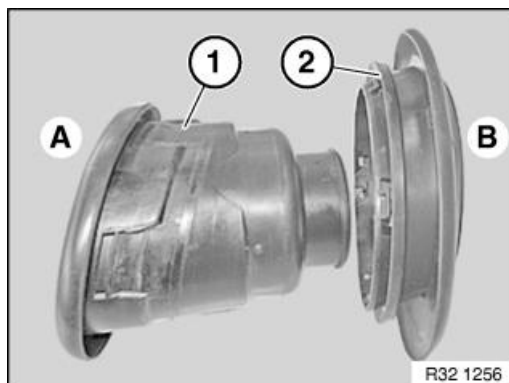
- Remove [lower section of steering spindle](#)

Important!

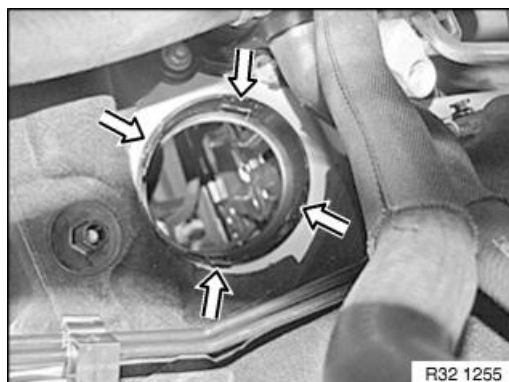
Two-piece sleeve!

Sleeve, part (1): Installed from engine compartment (A)

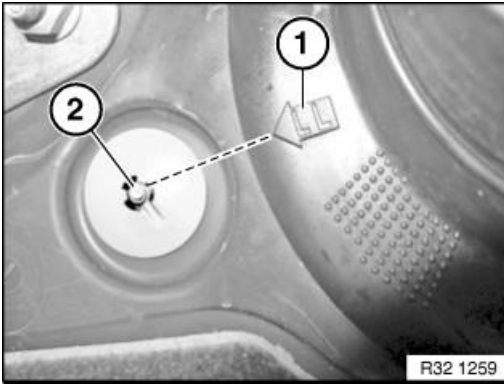
Sleeve, part (2): Installed from interior/footwell (B)



Use special tool [00 9 321](#) to lever out sleeve part (1) at the markings (see arrow) and press sleeve outwards (in direction of engine compartment).



Press down latches on sleeve part (2) (see arrows) from engine compartment and remove sleeve in direction of vehicle interior.



Installation:

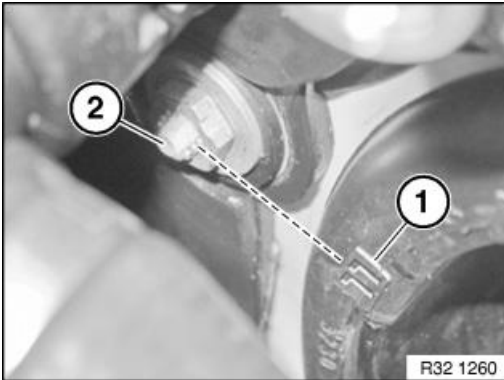
Observe installation sequence:

1st sleeve in vehicle interior:

Position mark (1) LL = left-hand drive and RL = right-hand drive so that arrow (1) points towards stud bolt (2).

Press sleeve into bulkhead.

Sleeve must snap audibly into place!



2nd sleeve in engine compartment:

Position mark (1) LL = left-hand drive and RL = right-hand drive so that arrow points towards stud bolt (2).

Sleeve must snap audibly into place. The sealing lip must rest on the bulkhead over its entire circumference!



After installation:

- Carry out [steering angle sensor adjustment](#) / adjustment for active front steering

*Note:*

Wheel/chassis alignment is not necessary after the steering wheel has been removed and installed or replaced.

**Necessary preliminary tasks:**

- Remove [airbag unit](#)



Move wheels/steering wheel into straight-ahead position.

Release screw and remove steering wheel.

Installation:

Align steering wheel using markings (1) to steering column and attach.

Make sure connecting lead(s) is/are correctly laid.

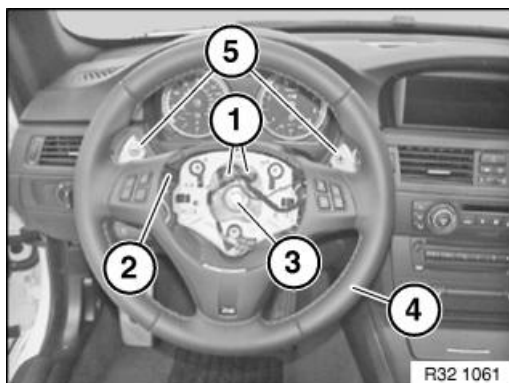
Tightening torque [32 33 1AZ](#).

**Note:**

Wheel/chassis alignment is not necessary after the steering wheel has been removed and installed or replaced.

**Necessary preliminary tasks:**

- Remove [airbag unit](#)



Set road wheels/steering wheel to straight-ahead position.

Disconnect plug connection (1).

If necessary, disconnect plug connection (2) for steering wheel heating.

Release screw (3) and remove steering wheel (4).

Installation:

Make sure connecting lead(s) is/are correctly laid.

Tightening torque [32 33 1AZ](#) .

Installation:

[If necessary, modify shift paddles \(5\)](#)

**Installation:**

Align sport steering wheel using markings (1) to steering column and attach.

Replacement:

- Modify [sport steering wheel cover/switches](#) .



Note:

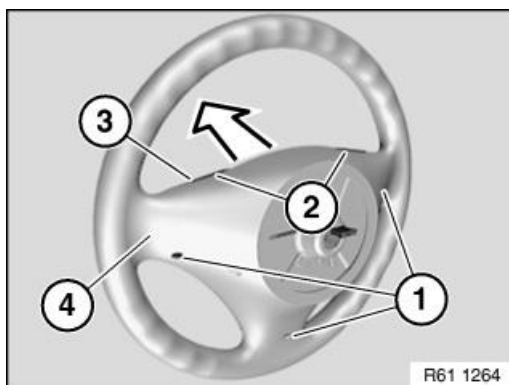
Version with multifunction:

The procedure is described in the document "[... both sport steering wheel switches](#)".



Necessary preliminary tasks:

- Remove [airbag unit](#)



Note:

Sport steering wheel (4) was only removed to generated the picture.

Release screws (1).

Release cover (3) from holders (2).

Installation:

Replace damaged cover.

72 12 ... Procedure after airbag deployment as result of an accident

Replace all components that were affected by the accident and check all others!

Check and/or replace following components after airbag deployment:

- Components
 - Sensor B-pillar (left/right)
 - Sensor front door (left/right)
 - Sensor seat, Driver-/passenger's side
 - Sensor, pedestrian protection
 - Front sensor (engine compartment)
 - Airbag control unit, vehicle interior
- Procedure
 - Inspect visually for mechanical damage (housing, plug connections). Replace damaged components.
 - Connect BMW diagnosis system
 - Read fault memory
 - Disconnect the vehicle battery and adhere to the waiting period (at least 30 seconds)
 - Rectify faults
 - Reconnect the vehicle battery and adhere to the waiting period (at least 10 seconds)
 - Delete fault memory
 - Switch off ignition and wait at least 2 minutes (no consumers may be switched on during this period such as interior light, radio, etc.)
 - Switch the ignition on (wait for at least 10 seconds)
 - Delete fault memory
 - If you cannot delete the fault memory: Replace the component that is causing the fault

Replace the airbag control unit in the following cases only:

- In the case of visible external damage
- In the case of a corresponding fault memory entry (airbag indicator light is illuminated)

Cables and connectors

- Components and procedure
 - Check cables and connectors for damage, replace if necessary.
(e.g. corrosion, correct engagement, bent pin)

Seat belt system

- Components
 - Automatic reel
 - Seat belt tensioner
 - Seat belt height adjustment
 - Anchor fitting tensioner
 - Seat belt buckle
- Procedure
 - Check components, replace if necessary
 - Additional door lock: Check for foreign body, remove it if necessary.

Seats

- Components
 - Seat
 - Airbag module
 - Active head restraint
- Procedure
 - Check seats (functional check of seat mechanism), replace if necessary
 - Check seat connection

- Replace gas generator of active head restraint

If the severity of the crash has not caused any other damage to the seat, only the triggered gas generator needs to be replaced.

External feature: The triggered head restraint is folded forwards and engaged.

The repair work can be carried out in the vehicle with the rear panel removed. The entire system can be pushed back into its original position and the new gas generator installed.

The gas generator can be replaced up to 5 times.

- Replace airbag module and, if necessary, seat cover with upholstery

Driver's airbag

- Components
 - Airbag module
 - Steering Wheel
 - Steering column (if damaged)
- Procedure
 - Replace faulty components
 - Replace steering wheel

Front-passenger airbag

- Components
 - Airbag module
 - Dashboard trim panel (must be replaced with vehicles without replaceable airbag cover!)
 - Supporting tube (if damaged)
- Procedure
 - Check components; replace if necessary

Side airbag, front/rear

- Components
 - Airbag module
 - Door trim panel
 - Door in white
 - Seat
- Procedure
 - Check components; replace if necessary

Head airbag

- Components
 - Airbag module
 - A-pillar trim panel
 - Roofliner
 - Cover, B-pillar (if damaged)
 - C-pillar trim panel (if damaged)
 - Connection/mount (on side frame)
- Procedure
 - Check components; replace if necessary

Knee airbag

- Components
 - Trim panel (driver's side)
 - Lower section of glove box
 - Knee protection (Driver- and passenger's side)
- Procedure
 - Replace faulty components

Passive knee protection

- Components
 - Trim panels (driver's side)
 - Glove box incl. knee protection (passenger's side)
- Procedure
 - Replace faulty components
 - Check retaining elements

**Warning!**

Observe the following instructions to avoid any risk of injury by the airbag unit.

- Comply with [safety regulations](#) for handling components with gas generators.
- Do not exert any force on the airbag unit.
- Use only specified tools for releasing the airbag unit.

Note: Incorrect handling may result in triggering of the airbag unit and thereby cause serious injury.

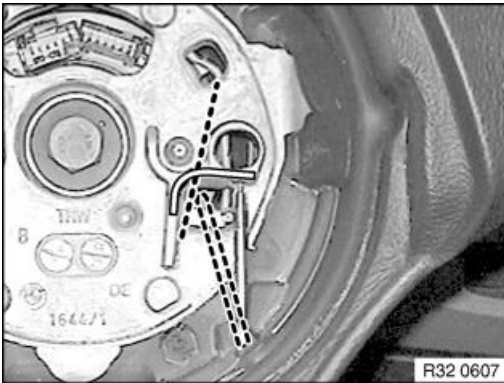
**Important!**

[Steering wheel](#) must be replaced if airbag unit has been triggered!

Follow [procedure after airbag triggering](#).

**Necessary preliminary tasks:**

- Disconnect [battery negative lead](#)



Insert Torx screwdriver (T20) roughly straight from below into opening on reverse side of steering wheel up to stop (approx. 5.5 cm).

Swing Torx screwdriver (T20) with handle sideways until airbag unit is unlocked.

Repeat procedure on other side.

Installation:

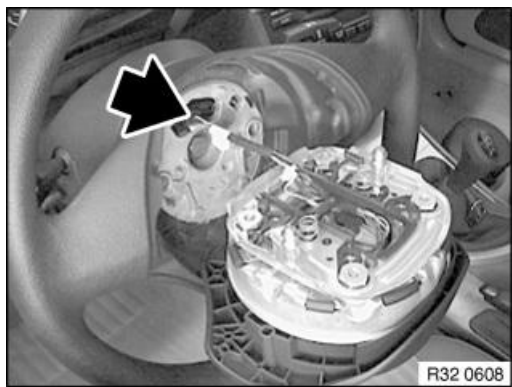
Make sure electrical lead is correctly positioned.

Snap airbag unit with uniform pressing force plane-parallel in direction of steering column shaft into steering wheel.

**Warning!**

Danger of injury!

Airbag unit may only be set down with the airbag itself facing upwards.



Tilt airbag unit towards rear.

Disconnect plug connection and remove airbag unit.



Warning!

Observe the following instructions to avoid any risk of injury by the airbag unit.

- Comply with [safety regulations](#) for handling components with gas generators.
- Do not exert any force on the airbag unit.
- Use only specified tools for releasing the airbag unit.

Note: Incorrect handling may result in triggering of the airbag unit and thereby cause serious injury.



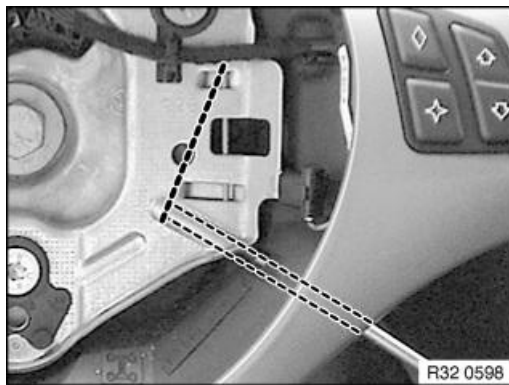
Important!

[Steering wheel](#) must be replaced if airbag unit has been triggered!
Follow [procedure after airbag triggering](#).



Necessary preliminary tasks:

- Disconnect [battery negative lead](#)
- Remove shift paddles for automatic transmission



Insert Torx screwdriver (T25) at an angle into concealed opening on reverse side of steering wheel until a spring resistance is felt (approx. 1.5 cm).

Increase pressure on spring leg (concealed) using Torx screwdriver (T25) until airbag unit is unlocked.

Repeat procedure on other side.

Installation:

Make sure electrical leads are correctly positioned.

Snap airbag unit with uniform pressing force plane-parallel in direction of steering column shaft into steering wheel.



Warning!

Risk of injury!

Airbag unit may only be set down with the airbag itself facing upwards.



Tilt airbag unit forwards.

Disconnect plug connections and remove airbag unit.

Installation:

Connect plugs to connections of same colour on airbag unit.

72 00 ... Safety regulations for handling components with gas generators

It is essential to comply with the regulations as specified in the law relating to the use of explosives when working on airbag units and seat belt tensioners.

Airbags, seat belt tensioners etc. are pyrotechnical objects. Pyrotechnical objects are assigned to different danger classes on the basis of the quantity of propellant that they contain. The assignment can be ascertained from the identification marking on the product:

Important!

Failure to comply with the warning notices and repair instructions for gas generator components can cause accidental deployment and result in injury and vehicle damage!

This applies in particular to the following components:

- Airbag modules (driver's/front passenger airbags, side airbags)
- Buckle/belt tensioner
- Head airbag
- Active knee protection
- Active head restraint
- Safety battery terminal

1. Regulations

The regulations quoted in the following refer to the Federal Republic of Germany.

In all other countries, the relevant legislation and regulations must be observed in each case. Country-specific legal regulations that go beyond this information or court decisions based thereon must be followed in each case or given precedence over these regulations.

The following components used by BMW:

- Pyrotechnical restraint systems are subject to danger class PT1
- Gas generators are pyrotechnical objects belonging to danger class T1

Handling, transporting and storing non-fired gas generators are subject to the "Explosive Materials Act" (law relating to the use of explosives dated 13/09/1976).

The relevant trade supervisory authority must be notified at least 2 weeks before pyrotechnical objects are handled for the first time. Here the relevant authority must be notified in writing of the person responsible (e.g. dealership owner, holder of general power of attorney or if necessary workshop supervisor). A certificate of qualification, i.e. specific training, is not required for the person responsible.

2. Dismantling and installation

- Inspection, testing and installation work may only be carried out by expert trained personnel in BMW Service.
- Work on components of the airbag system should only ever be carried out with the battery disconnected, the negative terminal post covered and the plug connection of the cable leading to the gas generator disconnected. If only the battery is disconnected, the following prescribed waiting period must be observed without fail:
 - 30 min. for vehicles up to 9/93
 - 1 min. for vehicles from 9/93 onward
- In the event of breaks in work, a component with a gas generator that has been removed must be secured against access by other persons.
- Individual components must never be repaired. Instead, always replace them.
- Do not treat airbag system components with cleaning agents or grease.
- Components of the airbag system must not be exposed to temperatures in excess of 75 °C.

- Airbag system components, including electronic diagnostic components, which have been dropped from heights in excess of 0.5 m must not be reinstalled in the vehicles.
- Do not remove components of the airbag system from the original packaging until immediately before they are to be installed in the vehicle.
- Before installing, subject components such as housing, connector pins ,etc. of the airbag system (including diagnosis electronics) to a visual inspection for damage and replace if necessary.
- Airbag system components may only be electrically tested while they are installed and only with the BMW ISTA.
- **Danger of injury:** The airbag module may only be set down with the airbag itself facing *upwards*. Otherwise the alternator will be thrown upwards if it is ignited.
- Do not point the ignition squib of a gas generator at other persons.
- Components with gas generators must not be fired while they are removed. They must be disposed of by special disposal companies or returned to BMW in the packaging of the new components.
- When carrying out straightening and welding work with an electric welder:
 - Disconnect battery
 - Cover negative terminal (post)
- Avoid all contact with the skin when removing a fired airbag module - wear gloves. Wash with water after contact with the skin.

3. Transport

- Components with gas generators must be sent off in the packaging of the new components.

4. Storage

- Observe the regulations of the relevant trade supervisory authority and the applicable national regulations.



Warning!

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!



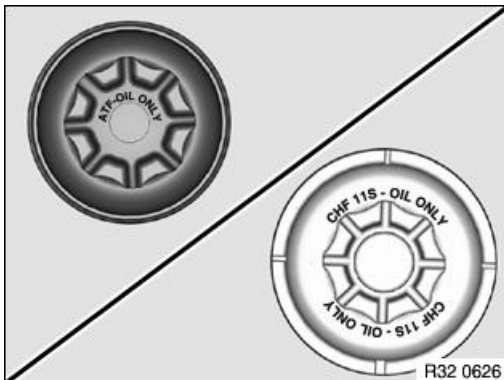
Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Using contaminated equipment to add fluid may introduce dirt particles into the fluid reservoir and significantly reduce the service life of the power steering system. Do not use any filler funnels or similar!

The fill level may only be checked or adjusted when the engine is stopped! The fluid temperature should be approx. 20 °C here.

Ensure that the cap is fully screwed in prior to the fill level check.



Note:

To avoid mix-ups when filling with hydraulic fluid, mark the fluid reservoirs or their caps with identification marks.

ATF	Automatic transmission fluid
CHF	Pentosin CHF11S



1. Thoroughly clean fluid reservoir and its immediate surroundings
2. Check and correct fill level

Note: The fill level can come to rest above the "MAX" mark when the engine is at normal operating temperature. This is dictated by the design in that the marking on the dipstick is referred to a fluid temperature of 20 °C. With the engine at normal operating temperature (approx. 50-60 °C fluid temperature) adjust a fill height 10 mm above the "MAX" mark. Do not under any circumstances draw off the fluid to the "MAX" mark when the engine is at normal operating temperature.

Hydraulic fluid: [BMW Service Operating Fluids](#)

3. Start engine
4. Turn steering wheel left and right twice in each case up to full lock; if necessary, top up hydraulic fluid (e.g. if hydraulic system is completely drained)
5. Move steering wheel to straight-ahead position and turn off engine
6. Check and correct fill level with engine stopped
7. Check hydraulic system for leaks

32 41 ... Instructions for removing and installing ear clips



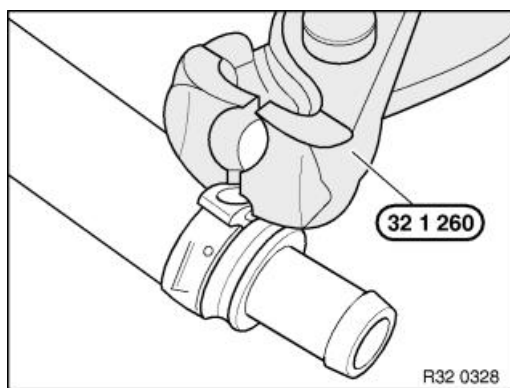
Special tools required:

- [32 1 260](#)

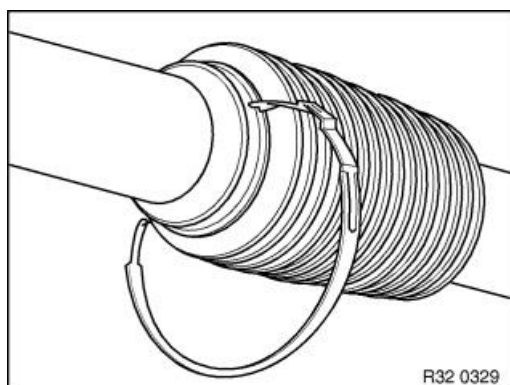
Note:

The work steps are show on assorted components.

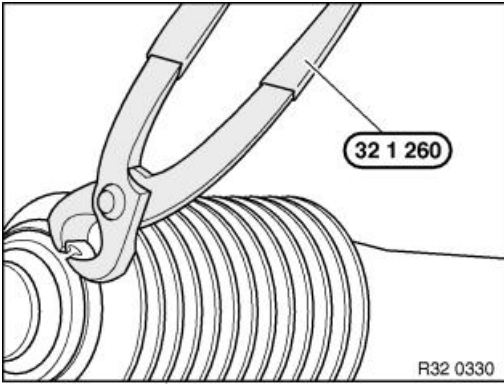
Ear clip must always be replaced.



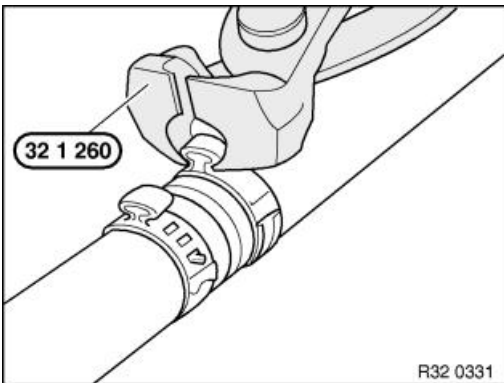
To remove an ear clip, place special tool [32 1 260](#) at right angles to ear and cut ear open.



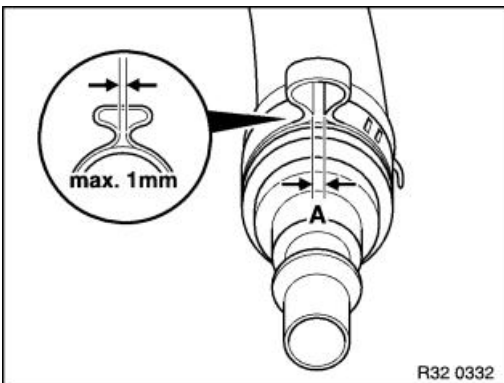
The ear clip can be fitted not only axially but also radially after the hook fastener has been opened.



Attach hook fastener and press ear together with special tool [32 1 260](#) .

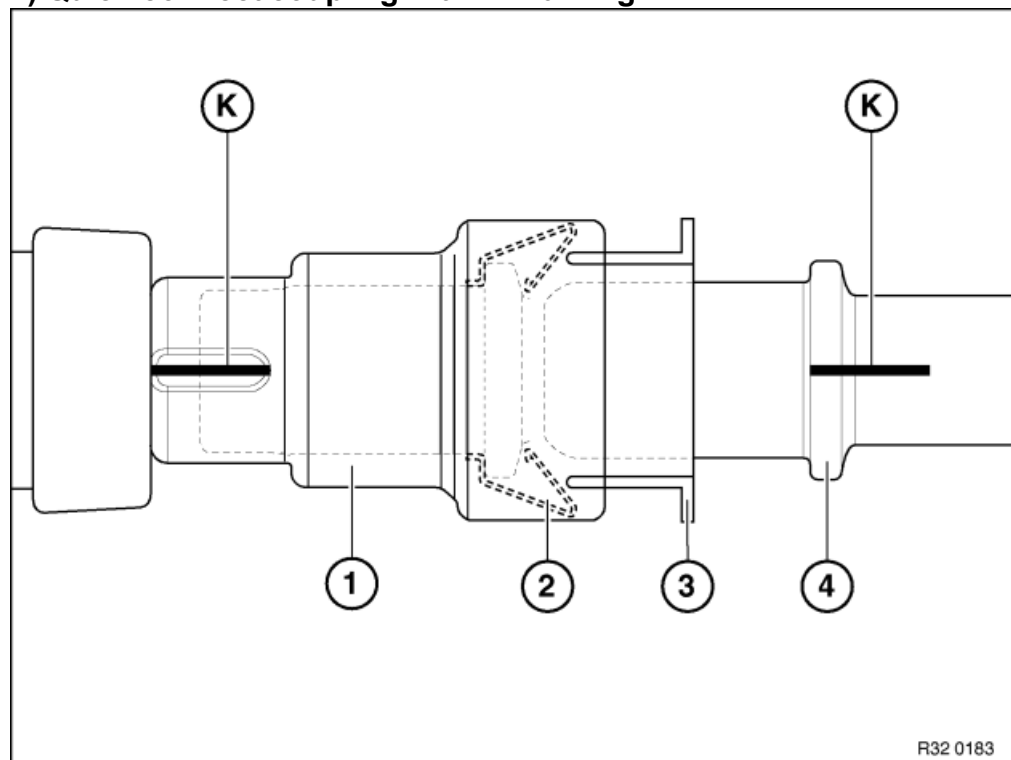


The diagonal cutting pliers of special tool [32 1 260](#) can be used in areas which are difficult to access.



Important!
Gap (A) max. 1 mm!

1) Quick-connect coupling with ID marking



Removing:

Push quick-connect coupling (1) against pipe (4) (thereby relieving strain on spring (2)).
Press plastic ring (3) into quick-connect coupling (1) and remove coupling (1).

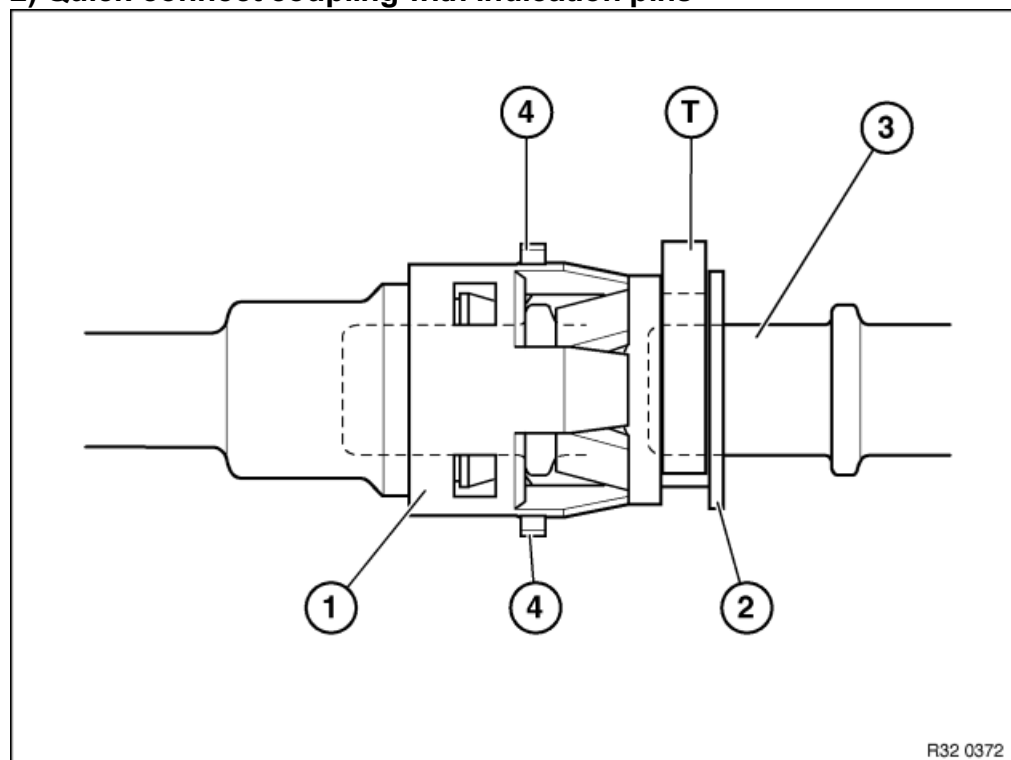
Assembly:

Markings (K) on coupling (1) and pipe (4) must be flush.

Push quick-connect coupling (1) onto pipe (4) until a "click" can clearly be heard.

To check that quick-connect coupling (1) has been installed correctly, pull it back forcefully.

2) Quick-connect coupling with indication pins



Removing:

Press plastic ring (2) into quick-connect coupling (1) and remove coupling (1).

Assembly:

When replacing hydraulic line: remove transportation lock (T).

Push quick-connect coupling (1) onto pipe (3) until both indication pins (4) can be seen and felt to point outwards at outside diameter of housing.

To check that quick-connect coupling (1) has been correctly fitted, feel indication pins (4) at outside diameter of housing. When correctly seated, indication pins (4) cannot be pressed into housing.

Important!

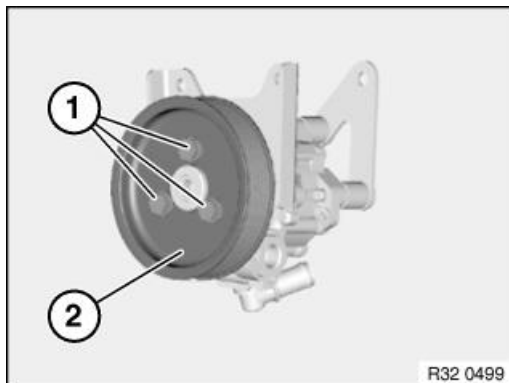
Coupling is not correctly engaged if both indication pins (4) fail to protrude from housing. Leakage is thus unavoidable.

32 41 100 Removing and installing/replacing belt pulley on vane pump for power steering



Note:

Carry out preliminary work as described in the document "[Replacing drive belt](#)".



Slacken screws (1)

Relieve tension on [drive belt](#) and remove from belt pulley (2).

Unscrew bolts (1) and remove belt pulley (2).

Installation note:

Lettering on belt pulley (2) must point forwards.

Tightening torque [32 41 3AZ](#).



Warning!

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Close off pipe connections with plugs.



Recycling:

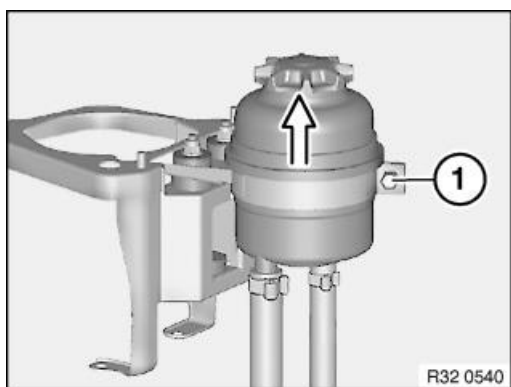
Catch and dispose of hydraulic fluid in a suitable container.

Observe country-specific waste-disposal regulations



Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir



Release screw (1).

Tightening torque [32 41 1AZ](#) .

Note:

If necessary, raise and/or turn fluid reservoir in order to gain better access to hose clamps.

Unfasten hose clips.

Disconnect suction line and radiator return line from fluid reservoir.

Lift out fluid reservoir.

Installation:

Make sure hydraulic lines are laid without tension and with sufficient spacing to adjoining components.



After installation:

- Fill and bleed [hydraulic system](#)
- Check pipe connections for leaks

32 41 060 Removing and installing/replacing vane pump for hydraulic steering (N47/N47T)



Warning!

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Close off pipe connections with seal plugs.



Recycling:

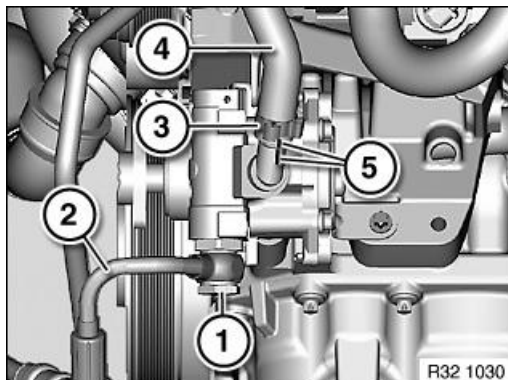
Catch and dispose of hydraulic fluid in a suitable collecting vessel.

Observe country-specific waste disposal regulations



Necessary preliminary tasks:

- Draw off and dispose of hydraulic fluid from fluid reservoir
- Remove lower [pedestrian protection](#) (E84)
- Remove [belt pulley](#)
- Remove [front underbody protection](#)
- Remove radiator seal



Release banjo bolt (1) and disconnect pressure line (2).

Installation note:

Replace all sealing rings.

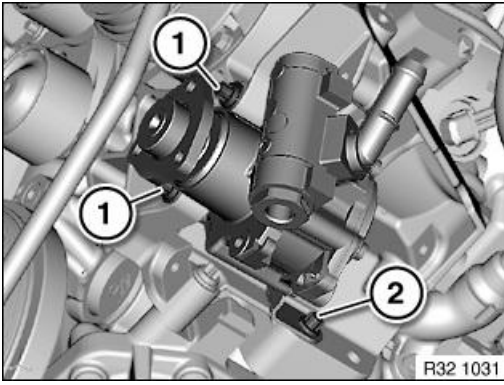
Make sure pressure line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque [32 41 8AZ](#).

Release hose clamp (3) and detach suction line (4) from vane pump.

Installation note:

Markings (5) on suction line and vane pump connection must match up.



Release screws (1, 2) and remove vane pump towards bottom. *Installation note:*

1. Insert screws (1, 2) (do not tighten down)
2. Tighten first screw (2) and then screws (1) to 2 Nm
3. Tighten down screws (1)
Tightening torque [32 41 6AZ](#).
4. Release screw (2) and check screw fastening point for gap freedom
5. Tighten down screw (2)
Tightening torque [32 41 6AZ](#).



After installation:

- Fill and bleed [hydraulic system](#)
- Check pipe connections for leaks

**Warning!**

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Close off line connections with seal plugs.

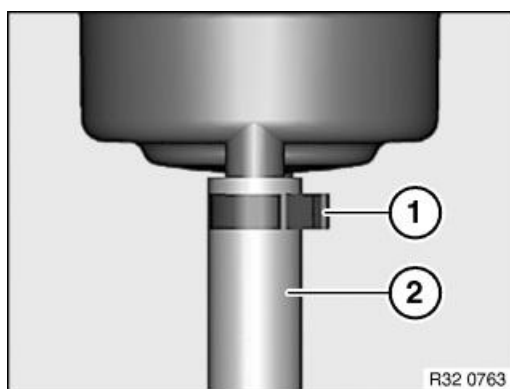
**Recycling:**

Catch and dispose of hydraulic fluid in a suitable collecting vessel.

Observe country-specific waste disposal regulations

**Necessary preliminary work:**

- Draw off and dispose of hydraulic fluid from oil reservoir
- N52K: Remove [intake silencer housing](#)
- If necessary, [remove intake port](#)



Remove [oil reservoir from bracket](#).

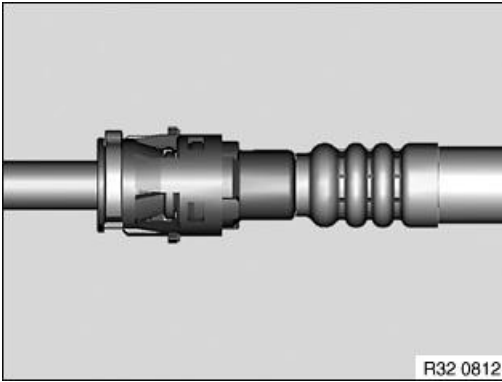
Release hose clamp (1) and detach cooler return line (2) from oil reservoir.

Installation note:

Make sure radiator return line is laid without tension and with sufficient spacing to adjoining components.



Expose cooler return line up to connection on hydraulic steering coil.



Release [quick-release coupling](#) and seal hydraulic steering coil connection with a suitable plug. *Installation note:* Make sure radiator return line is laid without tension and with sufficient spacing to adjoining components.



After installation:

- Fill and bleed [hydraulic system](#)
- Check line connections for leaks

**Warning!**

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Close off line connections with seal plugs.

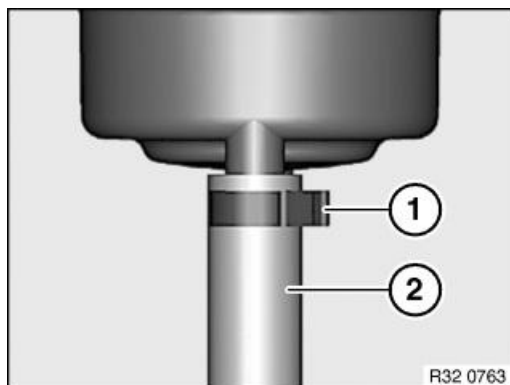
**Recycling:**

Catch and dispose of hydraulic fluid in a suitable collecting vessel.

Observe country-specific waste disposal regulations

**Necessary preliminary work:**

- Draw off and dispose of hydraulic fluid from oil reservoir
- Remove [pressure pipe](#)
- Remove [front underbody protection](#)
- Remove left steering assembly cover
- Remove lower [pedestrian protection, if applicable](#)
- [Release steering spindle on steering gear](#)



Remove [fluid reservoir from bracket](#).

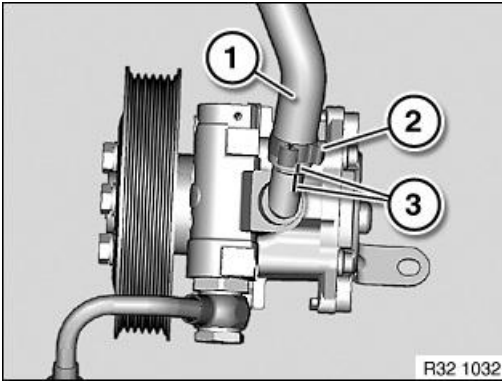
Release hose clamp (1) and detach intake pipe (2) from oil reservoir.

Installation note:

Make sure intake pipe is laid without tension and with sufficient spacing to adjoining components.



Expose intake pipe up to connection on vane pump.



Release hose clamp (2) and detach intake pipe (1) from vane pump. *Installation note:*
Marks (3) on intake pipe and vane pump connection must match up.



After installation:

- Fill and bleed [hydraulic system](#)
- Check line connections for leak tightness

**Warning!**

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Danger of injury](#) if oil comes into contact with eyes and skin!

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Close off pipe connections with seal plugs.

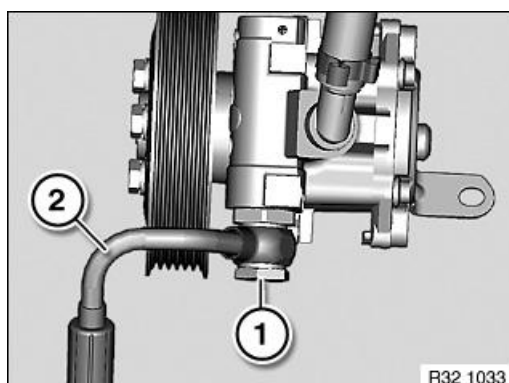
**Recycling:**

Catch and dispose of hydraulic fluid in a suitable collecting vessel.

Observe country-specific waste disposal regulations

**Necessary preliminary work:**

- Draw off and dispose of hydraulic fluid from oil reservoir
- Remove [front underbody protection](#)
- Remove [lower pedestrian protection](#) E84



Release banjo bolt (1) and detach pressure line (2) from vane pump. *Installation note:*

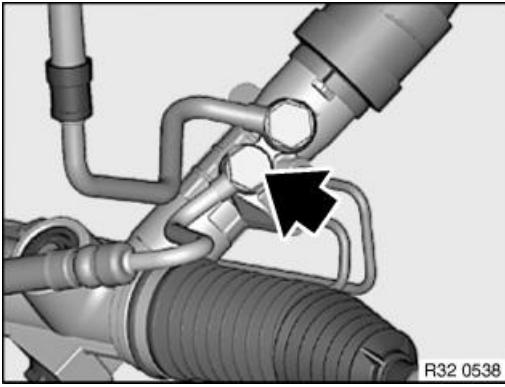
Replace all sealing rings.

Make sure pressure line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque [32 41 8AZ](#).



Expose pressure line up to connection on hydraulic steering gear.



Release banjo bolt and disconnect pressure line. *Installation note:*

Replace all sealing rings.

Make sure pressure line is laid without tension and with sufficient spacing to adjoining components.

Tightening torque [32 41 9AZ](#).



After installation:

- Fill and bleed [hydraulic system](#)
- Check pipe connections for leaks

**Warning!**

[Danger of poisoning](#) if oil is ingested/absorbed through the skin!

[Risk of injury](#) if oil comes into contact with eyes and skin!

Important!

Adhere to the utmost cleanliness. Do not allow any dirt to enter the hydraulic system.

Close off line connections with seal plugs.

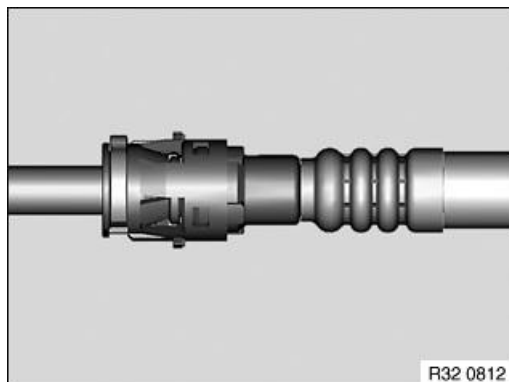
**Recycling:**

Catch and dispose of hydraulic fluid in a suitable collecting vessel.

Observe country-specific waste disposal regulations

**Necessary preliminary work:**

- Draw off and dispose of hydraulic fluid from oil reservoir
- Remove [front underbody protection](#)
- Remove lower [pedestrian protection, if applicable](#)
- Remove [reinforcement plate](#)

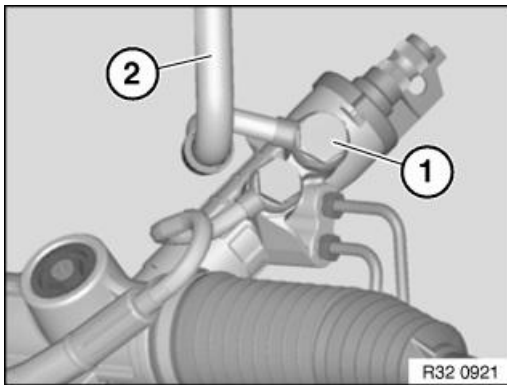


Release [quick-release coupling](#) and seal cooling loop connection with a suitable plug. *Installation note:*

Make sure hydraulic line is laid without tension and with sufficient distance to adjoining components.



Expose return line up to connection on hydraulic steering gear.



Release banjo bolt (1) and remove return line (2). *Installation note:*
Replace all sealing rings.

Make sure hydraulic line is laid without tension and with sufficient distance to adjoining components.

Tightening torque [32 41 10AZ](#).



After installation:

- Fill and bleed [hydraulic system](#)
- Check line connections for leak tightness



Screw securing adhesive is a means of preventing a screwed connection from being loosened by external influences.

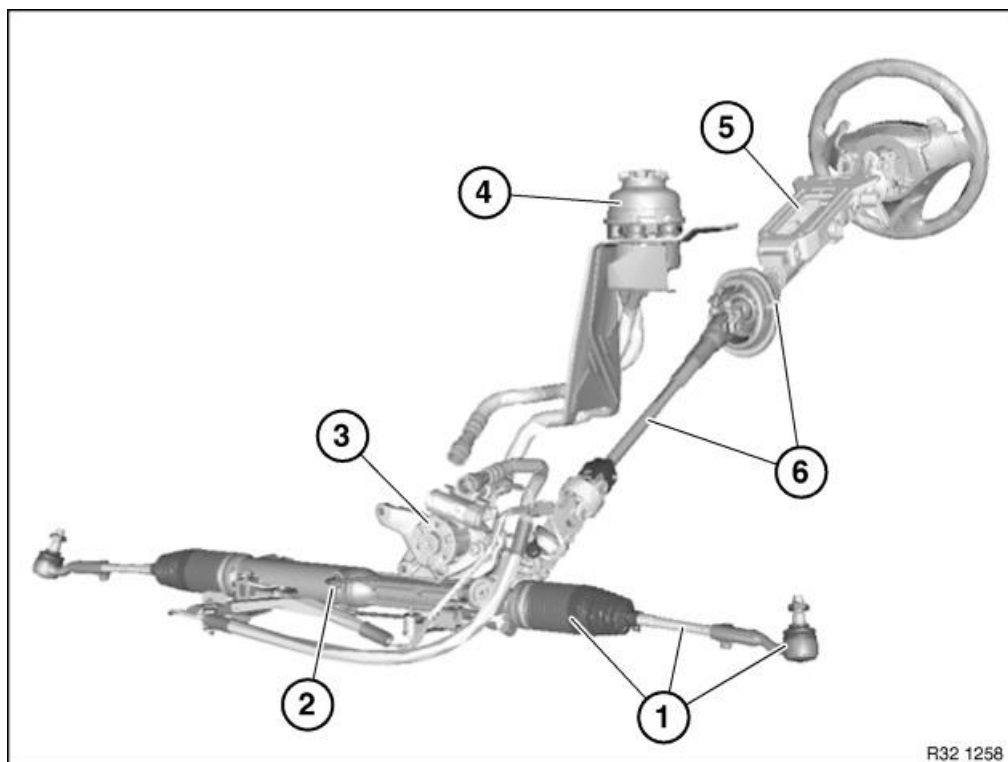
Once the screw has been coated with adhesive, the adhesive remains inactive until such time that it is activated by the encapsulation breaking when the screw is inserted and then cures (hardens) at room temperature.



Installation note:

- Screw connection must be completed within 20 mins. (start of curing)
- Microencapsulated screws must not be retightened
- Thread of nut must be cleaned beforehand in event of repeated use

32 ... Overview of steering



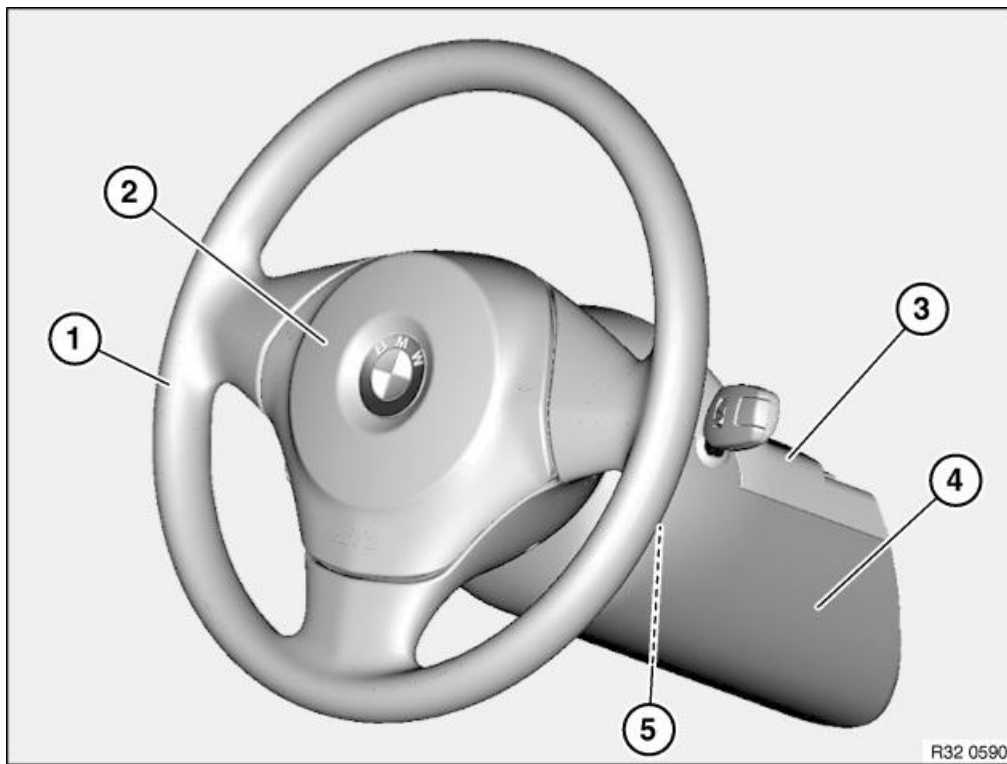
[Safety precautions and general information](#)

- 1 [Tie rod end / tie rod / gaiter](#)
- 2 [Hydraulic steering gear](#)
- 3 [Vane pump](#)
- 4 [Oil container](#)
- 5 [Steering column](#)
- 6 [Steering spindle lower section / sleeve](#)

[Adjustment work](#)

Troubleshooting

[Steering angle sensor adjustment](#)



- | | |
|---|---|
| 1 Steering wheel / decorative trims / cover | 5 Steering angle sensor/fixture for steering column stalk |
| 2 Airbag unit | Control lever |
| 3 Upper steering column casing | |
| 4 Lower steering column casing | Steering angle sensor adjustment/adjustment for active front steering |

32 00 ... **Test conditions for chassis/wheel alignment check**

Observe the following test conditions prior to the chassis/wheel alignment check:

1. Only BMW approved wheel and tyre combinations are installed on the vehicle.
2. Correct tread depth. The tread depth for each axle may differ from left to right by max. 1-2 mm.
3. Correct tyre pressure (see label on vehicle).
4. All chassis and suspension components must be technically OK.
5. Condition of suspension and shock absorbers OK: Visually inspect for breakage, etc.
6. Vehicles with self-levelling suspension: Pull fuse of air supply system so that there is no controlling down or up.