Lenkung und Achsvermessung

Steering and wheel alignment
Direction et géométrie des essieux
Guida e controllo convergenza ruote
Dirección y alineación de las ruedas
Styrning
Stuurinrichting en assen opmeting

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32 Steering and Wheel Alignment

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Specifications

Steering and wheel alignment

Model		320/6 320/6 A	323 i 323 i A *)
3200 . . . Wheel alignment			
Normal-load position (for wheel alignment check) Load on front seats	kg (lb)	2 × 68 (2 × 150)	
Load on rear seats	kg (lb)	1 × 68 (1 × 150)	
Load in luggage compartment, on left[1])	kg (lb)	21 (46)	
Front axle Toe-in)	deg.	$0° 14' \begin{smallmatrix}+ 9' \\ 4'\end{smallmatrix}$	
	mm (in)	$1{,}5 \begin{smallmatrix}+ 1 \\ - 0.5\end{smallmatrix}$ $(0.059 \begin{smallmatrix}+ 0.039 \\ - 0.020\end{smallmatrix})$	
Camber[2])	deg.	0° ± 30′	
Toe-out on turns[2]) with inner wheel at 20° lock angle	deg.	0° 45′ ± 30′	
Kingpin inclination[2])	deg.	10° 54′ ± 30′	
Caster[2])	deg.	8° 20′ ± 30′	
Max. difference in caster angles of two front wheels	deg.	0° 30′	

*) Version for Sweden
1) with tank full
2) settings in normal-load position

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Specifications

Steering and wheel alignment

Model			320/6 320/6 A	323 i 323 i A*)
32 00 . . . Wheel alignment – (continued)				
Max. wheel lock angle	Inner wheel	deg.	41.2	
	Outer wheel	deg.	36.1	
Min. turning circle radius (wheels)	Left	m (ft, in)	9.40 (30 ft 10 in)	
	Right	m (ft, in)	9.60 (31 ft 6 in)	
Min. turning circle radius (overall)	Left	m (ft, in)	10.20 (33 ft 5 in)	
	Right	m (ft, in)	10.40 (34 ft 2 in)	
Rear axle Toe-in[1])		deg.	0° 10′ ± 10′	
		mm (in)	1 ± 1 (0.04 ± 0.4)	
Camber[1]) (negative)		deg.	− 2° ± 30′	
32 11 . . . Steering gear (ZF rack and pinion)				
ZF number	RHD cars		78 20 900 173	
	LHD cars		78 20 900 172	
Type of grease for steering gear			see approved list in Service Information	

*) Version for Sweden
[1]) Settings in normal-load position

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Specifications

Steering and wheel alignment

Model		320/6 320/6 A	323 i 323 i A*)
32 11 . . . Steering gear (ZF rack and pinion) – (continued)			
Quantity of grease	g (oz)	20 . . . 30 (0.7 . . . 1.1)	
Ratio Steering wheel turns ≙ movement of rack	mm (in)	1 ≙ 38 (1.5)	
Total number of steering wheel turns ≙ total movement of steering rack (without track rod)	mm (in)	4.05 ≙ 154 (6.1)	
(with track rod)	mm (in)	4.02 ≙ 153 (6.0)	
Overall steering ratio		21.1 : 1[1])	
Average turning moment value (steering gear removed) over 360° ≙ 0.5 turn of steering wheel in each direction from straight-ahead position (variations of max. ± 0.15 Ncm from average value are permissible)	Ncm	90 . . . 130	
	kpcm	9.0 . . . 13.0	

*) Version for Sweden

1) In straight-ahead position

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Specifications

Steering and wheel alignment

Model		320/6 320/6 A	323 i 323 i A *)
32 11 . . . Steering gear (ZF rack and pinion) – (continued)			
Beyond this range, up to at turning speed	Ncm kpcm 1/min	200 20 15	
Max. endplay at pressure pad after pressure adjustment and at specified turning moment	mm (in)	0.1 (0.004)	
Rack diameter	mm (in)	24 (0.94)	
Number of teeth on pinion		6	
Distance between axial pivot points with steering damper	mm (in)	593 (23.3)	
32 11 . . . Steering damper			
Make		Boge or Stabilus	
Stroke	mm (in)	156 (6.14)	

*) Version for Sweden

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Specifications

Steering and wheel alignment

Model			320/6 320/6 A	323 i 323 i A *)
32 11 . . . Steering damper – (continued)				
Steering damper test				
Test values for steering damper No. at running speed 100/min			New condition	
	Test stroke	mm (in)	10 (0.39)	25 (0.98)
	Traction/compression phase	N	300 ± 60	550 ± 80
		kp	30.6 ± 6.1	56.1 ± 8.2
		lb. f	67.4 ± 13.5	123.6 ± 18.0
			Tightening torques	
32 11 . . . Steering gear (ZF rack and pinion)				
Bearing shell at steering gear M 8		Nm kpm lb. ft	25 . . . 28 2.5 . . . 2.9 18.4 . . . 20.6	
Steering gear to front axle beam M 10		Nm kpm lb. ft	49 . . . 54 5.0 . . . 5.5 36.1 . . . 39.8	
Large setscrew, 2.4 mm across flats (8-sided) for steering gear pinion bearing		Nm kpm lb. ft	22 . . . 26 2.2 . . . 2.7 16.2 . . . 19.2	

*) Version for Sweden

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Steering and wheel alignment

Specifications

Model		320/6 320/6 A	323 i 323 i A *)
Tightening torques (continued)			
32 11 . . . Steering gear (ZF rack and pinion)			
Steering damper mounting (outer) M 8 × 1 mm	Nm kpm lb.ft	15 . . . 18 1.5 . . . 1.8 11.1 . . . 13.3	
Steering damper mounting (inner) M 8 × 1 mm	Nm kpm lb.ft	15 . . . 18 1.5 . . . 1.8 11.1 . . . 13.3	
32 21 . . . Steering arms, track rods			
Track rod to ball joint, M 14 × 1.5 mm locknut	Nm kpm lb. ft	55 . . . 65 5.6 . . . 6.6 40.6 . . . 47.9	
Track rod axial pivot to steering rack	Nm kpm lb.ft	70 . . . 78 7.1 . . . 8.0 51.6 . . . 57.5	
Track rod to steering knuckle, M 10 × 1 mm	Nm kpm lb. ft	35 . . . 40 3.6 . . . 4.1 25.8 . . . 29.4	

*) Version for Sweden

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Specifications

Steering and wheel alignment

Model		320/6 320/6 A	323 i 323 i A *)
Tightening torques (continued)			
3231 . . . Steering column			
Universal joint at joint disc or lower steering spindle	Nm kpm lb.ft	20 . . . 23 2.0 . . . 2.3 14.7 . . . 17.0	
Lower steering spindle to upper steering spindle (M 8 × 38 mm)	Nm kpm lb. ft	25. . .28 (20. . .23[1])) 2.5 . . . 2.9 (2.0 . . . 2.3[1])) 18.4 . . . 20.6 (14.7. . .17.0[1]))	
Lower steering spindle to rack and pinion steering gear (M 8 × 38 mm)	Nm kpm lb.ft	25. . .28 (20. . .23[1])) 2.5 . . . 2.8 (2.0 . . . 2.3[1])) 18.4 . . . 20.6 (14.7 . . . 17.0[1]))	
Hex bolt, M 8 × 45 mm at outer tube clip	Nm kpm lb.ft	17 . . . 19 1.7 . . . 1.9 12.5 . . . 14.0	
3233 . . . Steering wheel			
Steering wheel to steering spindle (M 14 × 1.5 mm)	Nm kpm lb.ft	85 . . . 95 8.7 . . . 9.7 62.7 . . . 70.0	

*) Version for Sweden
1) From introduction of aluminum pivots

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32 00 024 Front axle – optical wheel alignment



The following requirements must be met before checking wheel alignment:
1. Good, uniform tire treads
2. Specified tire pressures
3. Rims in good condition
4. Specified wheel bearing play
5. Move vehicle to normal load position:
2 × 68 kg (150 lb) on front seats,
1 × 68 kg (150 lb) on rear seat
21 kg (46 lb) in trunk, tank full.
Determine actual values with optical measuring equipment.
Draw up a data sheet.
Note nominal values[1]).

Trouble-shooting:

① Track incorrect
a) Track rod bent
b) Steering knuckle bent
c) Track rod ball joint worn

② Camber angle incorrect
a) Wishbone distorted
b) Spring strut distorted
c) Front axle beam distorted
d) Wheel arch distorted
e) Guide joint worn
f) Wheel bearing play
g) Spring deflection too high
h) Distortion in floor panel assembly

③ Caster angle incorrect
a) Wishbone distorted
b) Spring strut distorted
c) Wheel arch distorted
d) Distortion in floor panel assembly

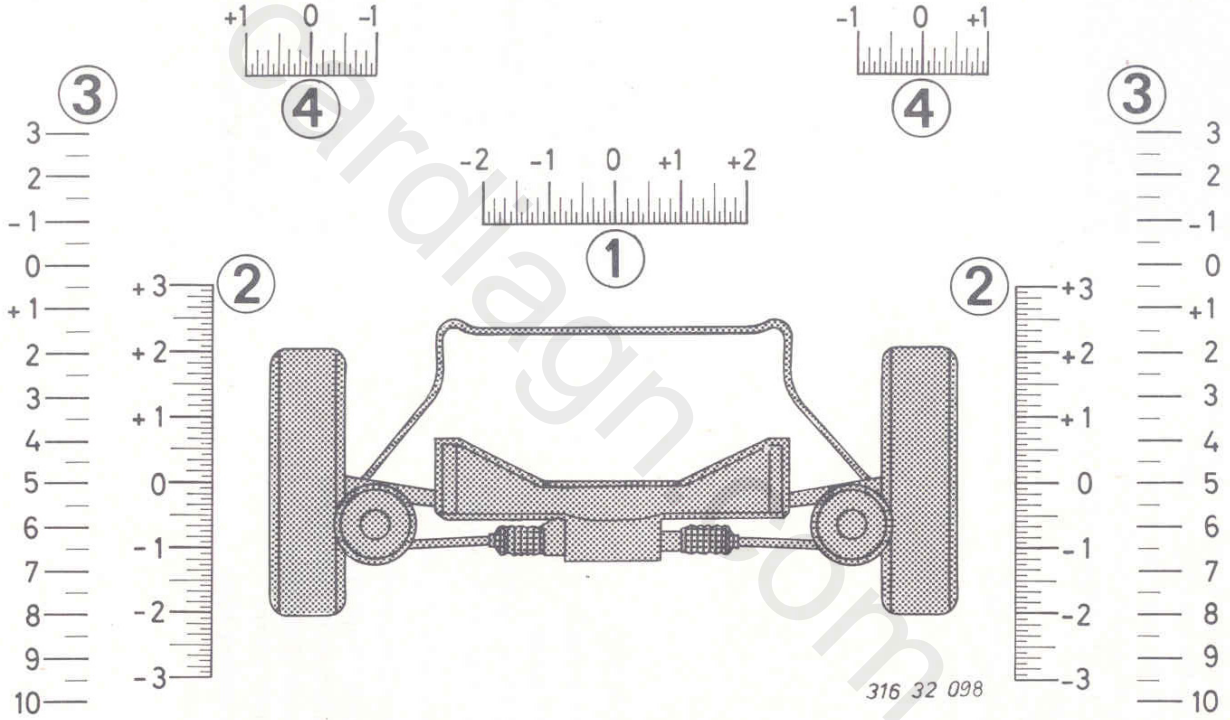
④ Toe-out turns incorrect
(assuming that camber and caster angles are correct)
a) Track rods non-uniformly adjusted
b) Steering knuckle bent

[1]) See specifications

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20° right-hand lock
measured at left wheel

20° left-hand lock
measured at right wheel

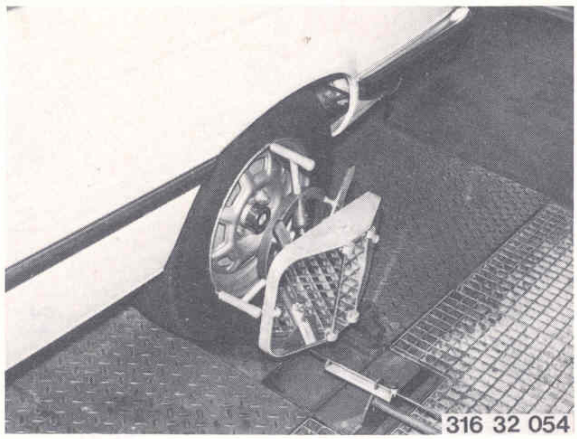


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32 00 054 Rear axle – optical wheel alignment

The following requirements must be met before checking wheel alignment:
1. Good, uniform tire treads
2. Specified tire pressures[1])
3. Rims in good condition
4. Specified wheel bearing play
5. Move vehicle to normal position:[1])

Determine actual values with optical measuring equipment.
Draw up data sheet.
Note nominal values[1]).


316 32 054

Trouble-shooting:

① Camber angle incorrect

a) Rubber mounting on rear axle beam defective
b) Rubber mounting on final drive defective
c) Silentbloc bushings in semi-trailing arm defective
d) Rear axle beam distorted
e) Semi-trailing arm distorted
f) Distortion in floor panel assembly

② Rear wheel position incorrect

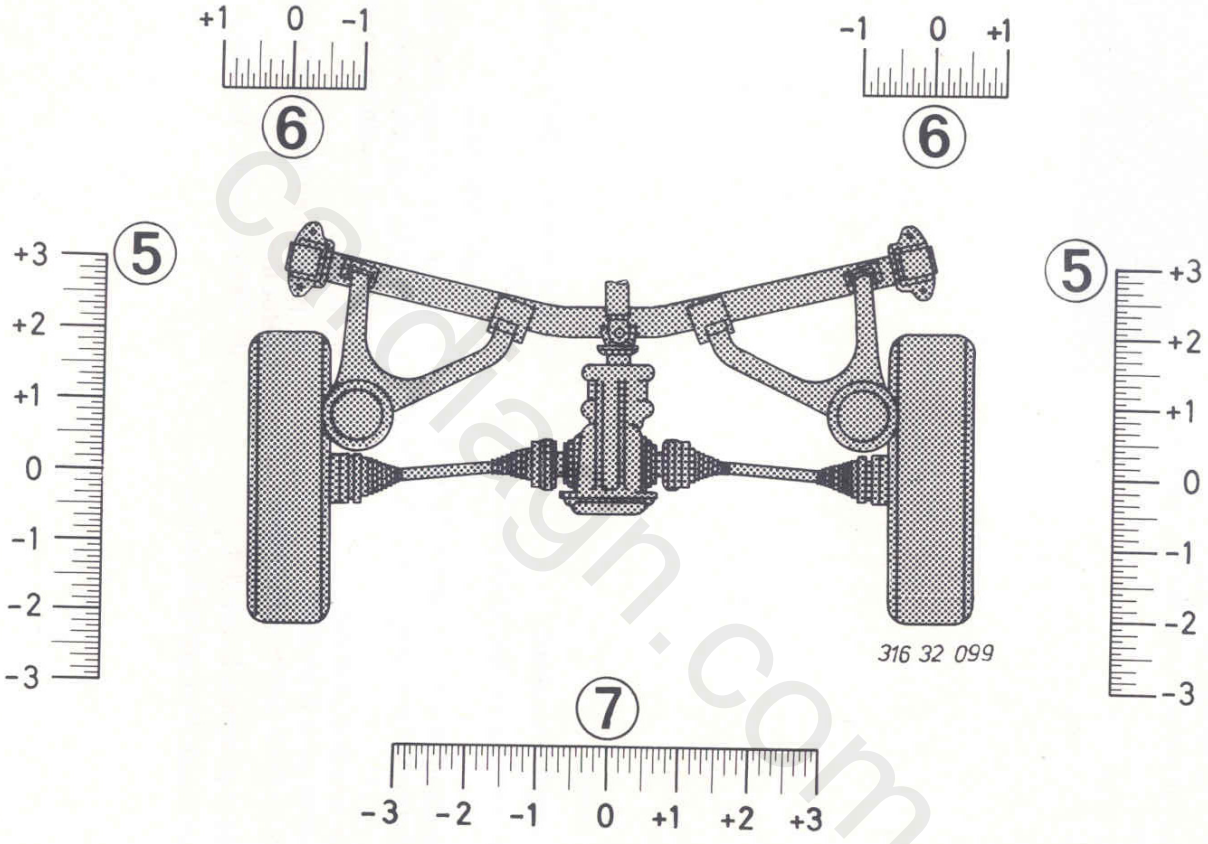
a) Rear axle beam has shifted laterally
b) Distortion in floor panel assembly assembly

③ Track incorrect

a) Rear axle beam distorted
b) Trailing arm distorted
c) Silentbloc bushing in semi-trailing arm defective
d) Rubber mounting on rear axle beam defective
e) Spring deflection too high.

[1]) See specifications

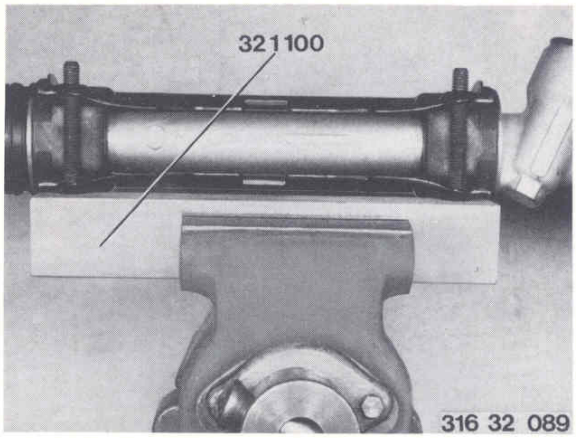
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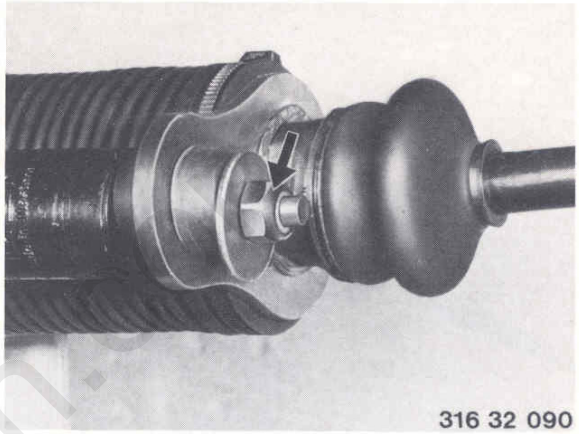
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32 10 004 Steering gear – adjusting

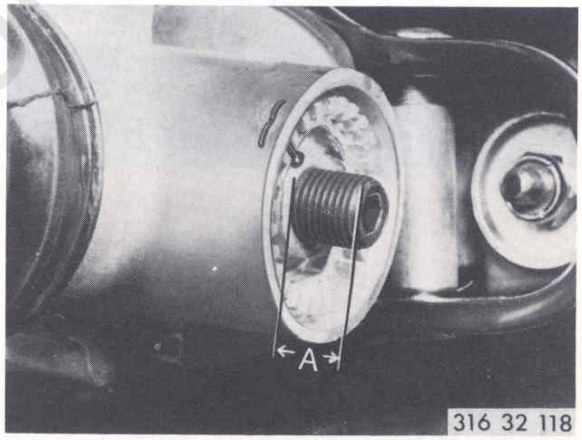
Remove and install steering gear – 32 11 000. Clamp mounting 32 1 100 into vise and insert steering gear.



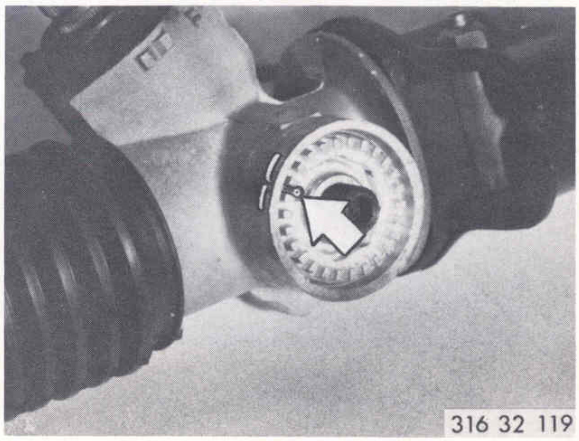
Unscrew nut at steering and push back the steering damper.
When installing: **Use a new self-locking nut. Note correct tightening torque[1]).**



Remove the end cap and slacken the Allen screw by approx. 12 mm (0.47 in) (A).

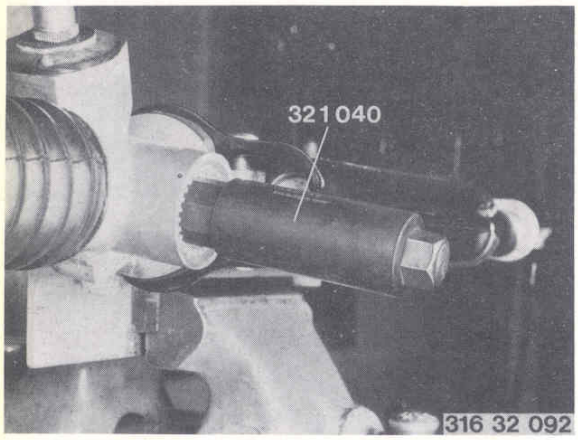


a) Adjusting pressure pad
Remove the cotter pin.

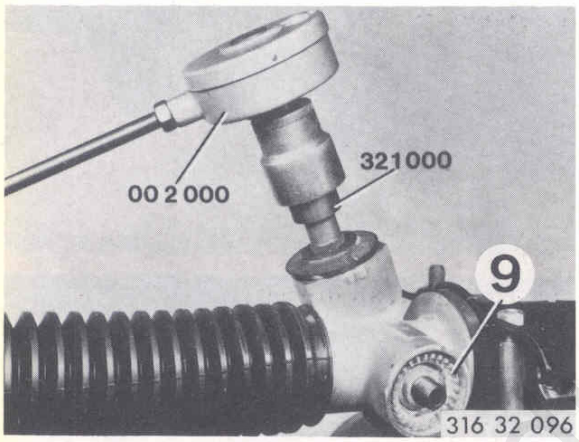


[1]) **See specifications**

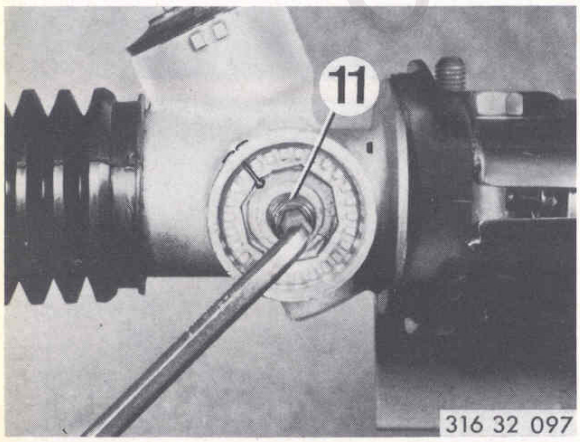
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Tighten the set screw with 32 1 040 socket wrench and torque wrench to 6 Nm (4.3 lb ft.).
Slacken the castellated nut by one slot.



Turn the steering rack from the full left to the full right position with socket adapter 32 1 000 and friction gauge 00 2 000, and check for local stiffness or jerky movement.
In this event, loosen the adjusting bolt (9) by one notch on the castellated end, and secure again with split pin.
Repeat the test. If stiffness or jerky movement is still noticed at any points, renew the rack, pinion or if necessary the entire steering mechanism.
Never loosen the adjuster by a further notch.

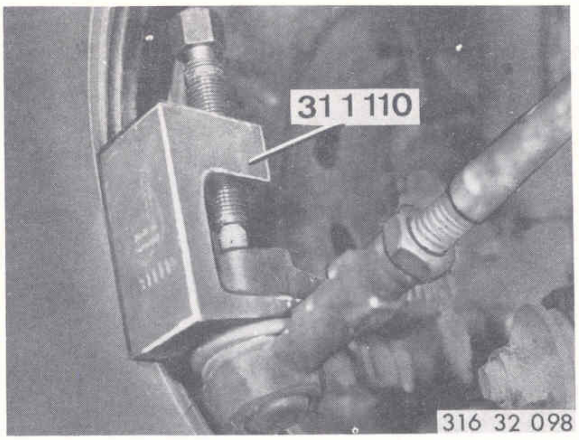


b) Adjusting turning moment:
Move the rack to the center position. Attach friction gauge 00 2 000 with socket adapter 32 1 000 to the pinion. Determine the turning moment[1]). If the specified friction is not attained, adjust at bolt (11).
Turning clockwise = increased friction
Turning anticlockwise = reduced friction
Install the dust cap.

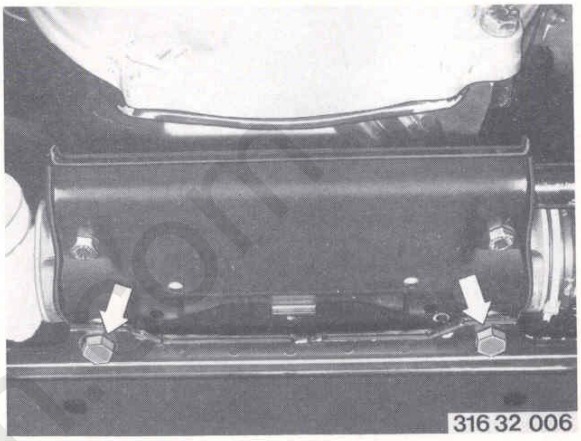
[1]) See specifications

32 11 000 Complete steering gear – removing and installing

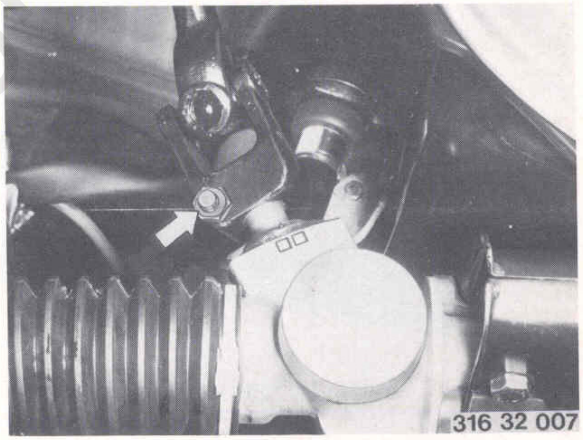
Remove split pin and unscrew castellated nut. Press off track rods at spring struts with extractor 31 1 110.
When installing: **Note correct tightening torque[1]).**
Check condition of joint seal and renew if necessary.



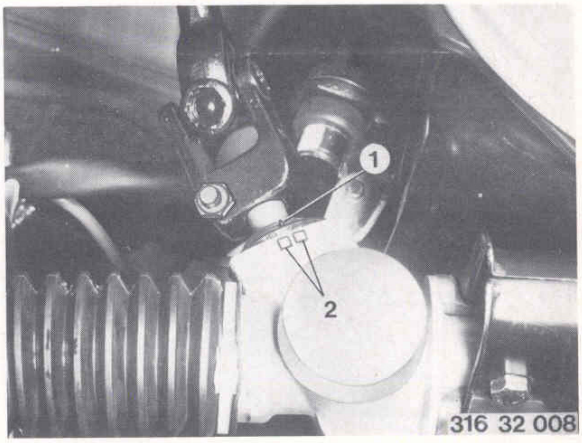
Detach steering gear from front axle beam.
When installing: **Use new self-locking nuts. Note correct tightening torque[1]).**



Unscrew nut and remove bolt.
Pull the steering gear away from the steering shaft.
When installing: **Make sure that the bolt is located in the retaining groove. Use a new self-locking nut. Note correct tightening torque[1]).**



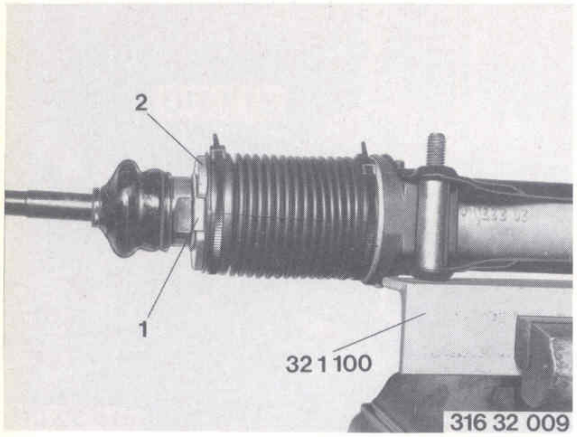
When installing: **Steering wheel should be in the straight-ahead position.**
The mark (1) on the dust seal must be between the marks (2) on the steering box.



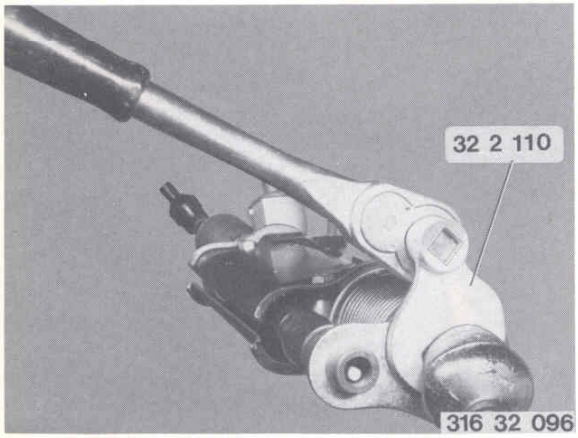
1) See specifications

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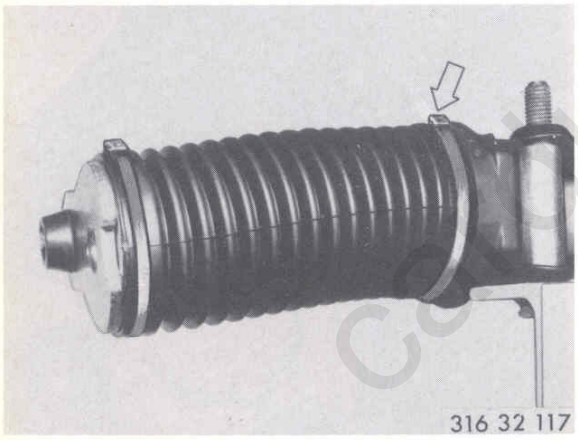
32 11 001 Steering gear – renewing



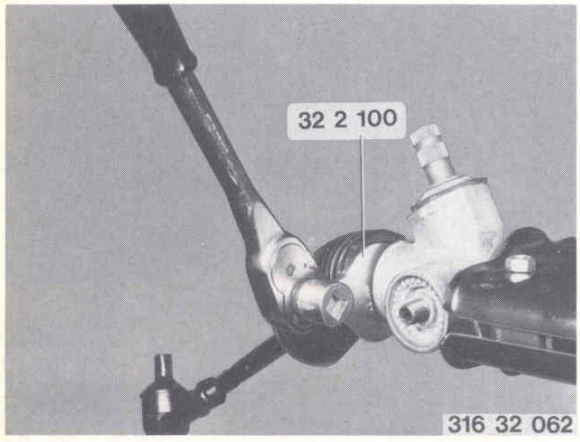
Remove and install the steering gear – 32 11 000. Clamp mounting 32 1 100 into the vise and attach the steering gear. Bend up the right keeper plate.
When installing: **Make sure that the step on the keeper plate (1) is located in the cutout on the retaining plate (2).**
Warning: **to prevent damage to rack and bearings, use water-pump pliers or similar tool to bend up keeper plate.**



Push rack fully in up to its stop.
Detach steering damper (if fitted) at retaining plate. Detach the right track rod from the steering gear with special open-end wrench 32 2 110 (32 mm).
When installing: **Note correct tightening torque[1]).**



Loosen hose clip and take off flexible gaiter.

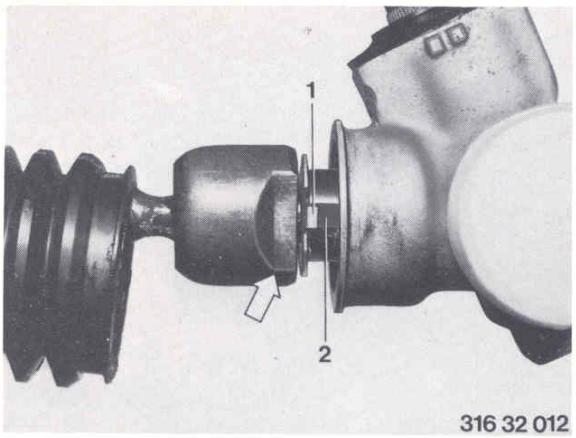


Loosen the left hose clip and push back the gaiter.
Push the rack far enough in at the left to allow the special wrench to be attached. Bend up the keeper plate. Detach the left track rod from the steering rack with special open-end wrench 32 2 100 (27 mm).
When installing: **Note correct tightening torque[1]).**

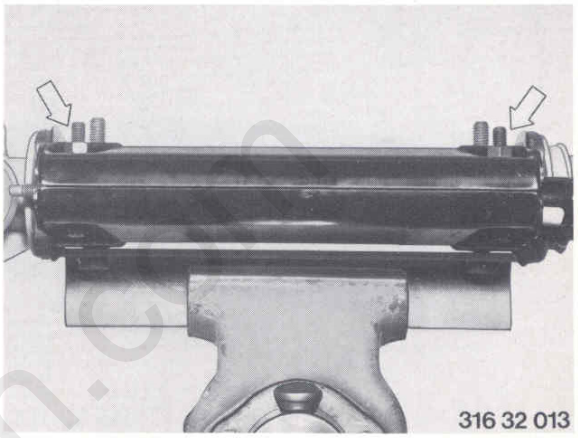
[1]) See specifications

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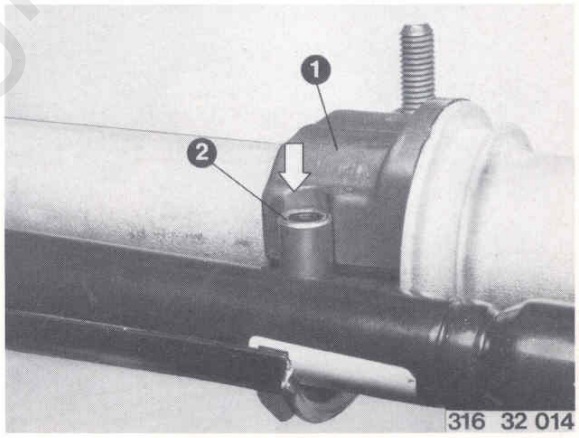
When installing: **Make sure that step (1) is in the cutout on steering rack (2).**



Unscrew nuts and take off bearing shell.
When installing: **Use new self-locking nuts. Note correct tightening torque[1]).**

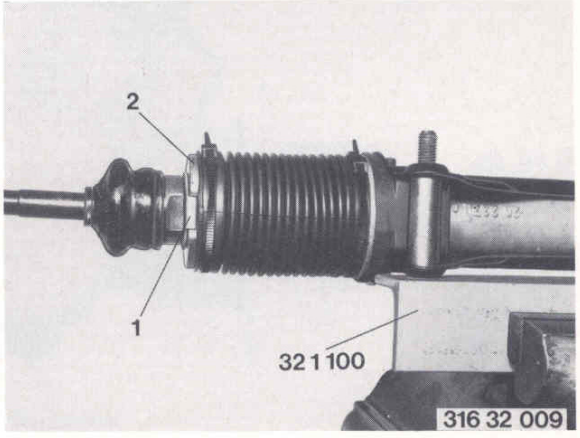


Detach steering damper, if fitted, from steering gear and remove. Take off rubber bushing (1) and spacing sleeve (2).
When installing: **Check condition of rubber bushing and renew if necessary. Insert rubber bushing (1) with the short spacing sleeves located at the cutouts provided.**
Check and adjust front wheel alignment – 32 00 024.



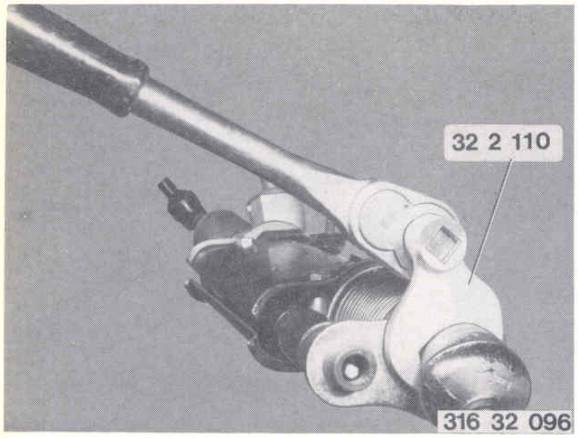
32 11 003 Steering gear – stripping and assembling

Note: **the steering gear can only be repaired in exceptional cases. It must normally be renewed.**
Remove (install) steering gear – 32 11 000.
a) Stripping down:
Clamp mounting 32 1 100 into vise and attach steering gear. Bend up right keeper plate.
When installing: **Make sure that step (1) on the keeper plate is located in the cutout on retaining plate (2). Check and adjust front wheel alignment – 32 00 024.**

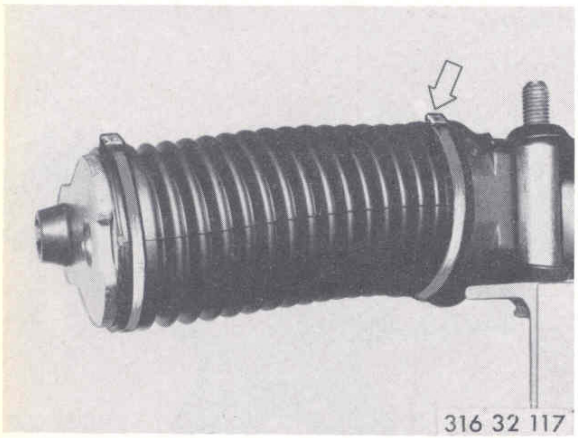


[1]) See specifications

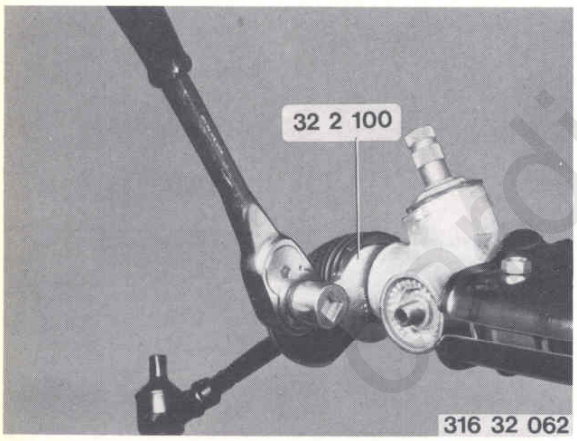
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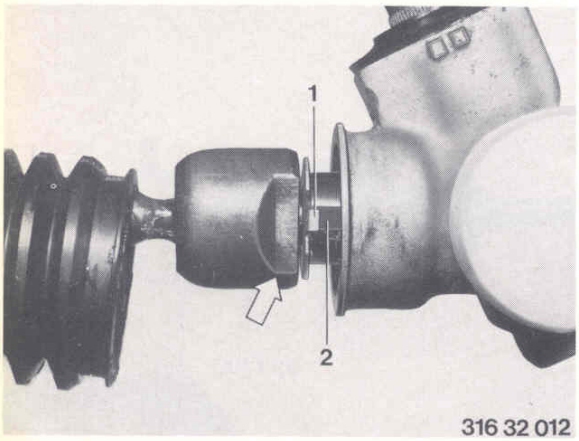
Push the rack fully in as far as the stop. If installed, detach steering damper at retaining plate. Detach the right track rod from the rack with special 32 mm open-ended wrench 32 2 110.
When installing: **Note correct tightening torque[1]).**



Detach the hose strap and take off the flexible gaiter.



Push the rack in far enough to permit the special tool to be attached.
Remove the hose strap and push back the flexible gaiter. Bend up the keeper plate. Detach the left track rod from the rack with 27 mm special open-ended wrench 32 2 100.
When installing: **Note correct tightening torque[1]).**

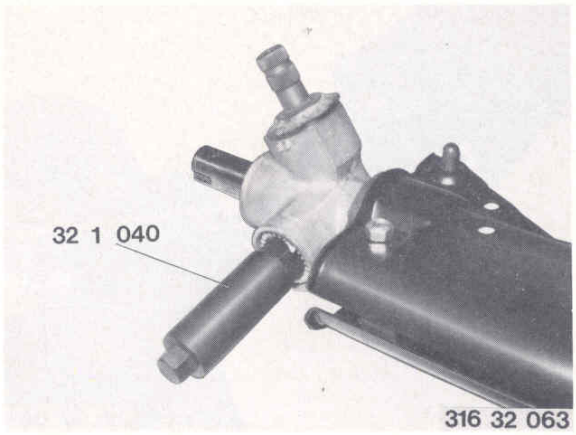


When installing: **Make sure that the peg (1) fits into the cutout on rack (2).**

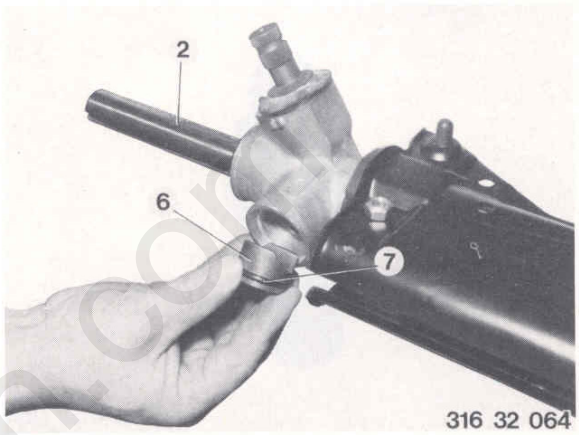
[1]) **See specifications**

ordiun.com

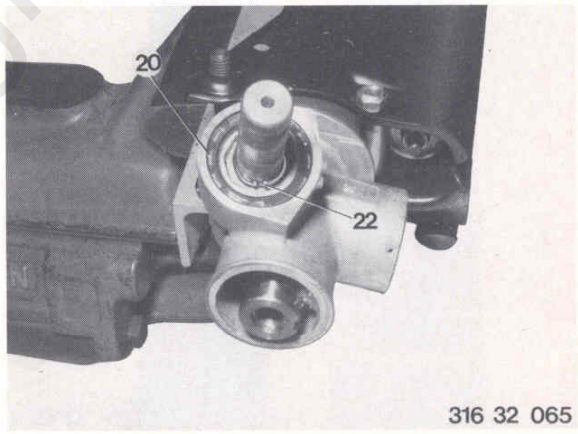
Remove dust cap (12). Take out cotter pin (10). Unscrew and remove adjusting bolt (9) with adjusting wrench 32 1 040.
Take off spring plate (8) and remove coil spring (5).
When installing: **For correct order, see stripped steering mechanism on page 32-11/11.**



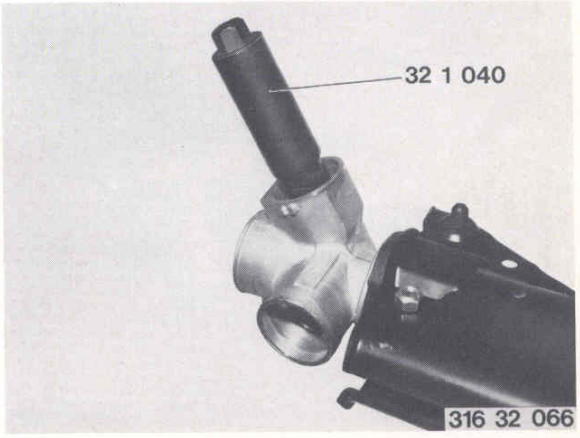
Raise rack (2) and force pressure pad (6) with O-ring seal (7) out of its location.



Extract the snap ring (22) and press out the notched ring (20).
When installing: **Check condition of snap ring and notched ring and renew if necessary.**

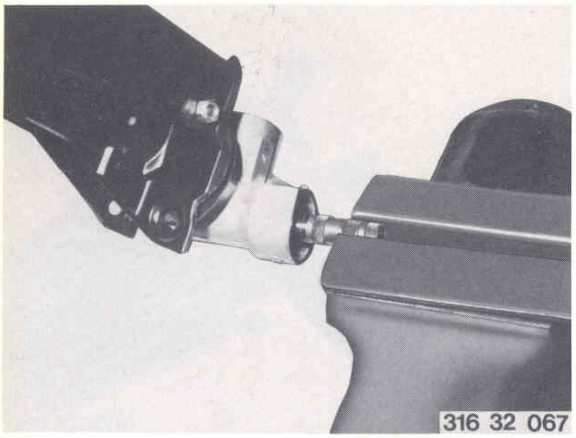


Unscrew and remove adjusting bolt (19) with adjusting wrench 32 1 040.
Remove O-ring seal (18) and washer (16).
When installing: **For installed order, see stripped steering mechanism on page 32-11/11.**
Note correct tightening torque[1]).

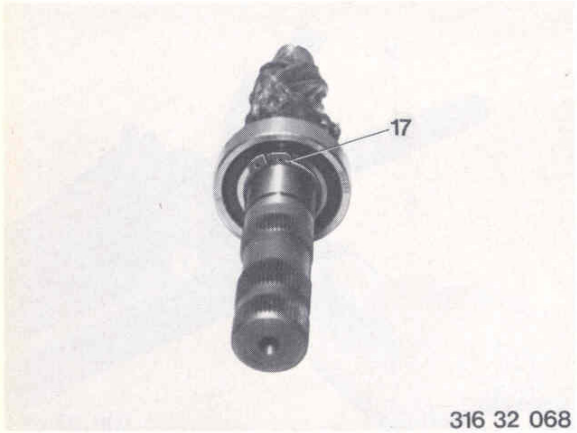


[1]) **See specifications**

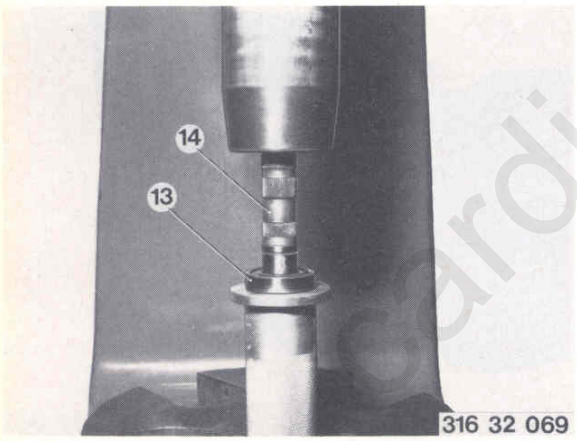
cardiagn.com



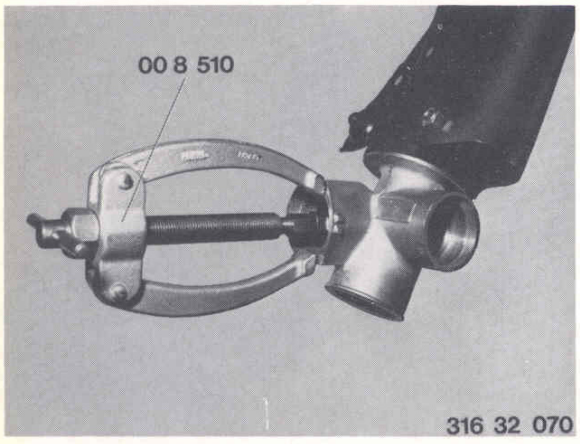
Clamp the pinion by its splines between soft jaws in the vise.
Using a plastic-headed hammer, strike the housing lightly to drive out the pinion.
Warning: **Make sure that the rack does not fall out.**



Extract the circlip (17).



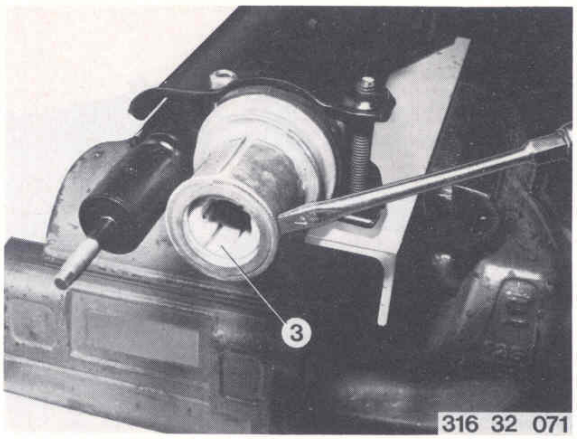
Force the ball bearing (13) away from the pinion (14).



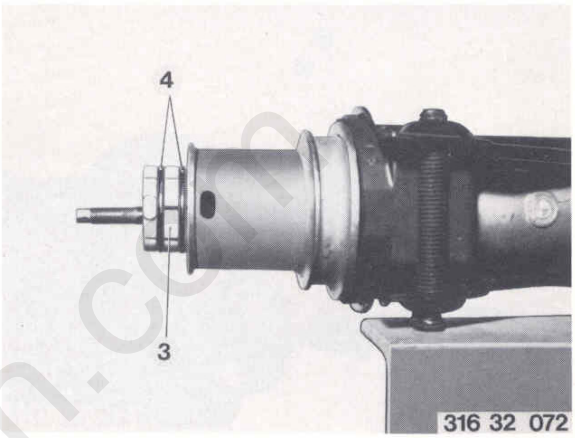
Extract needle roller race (15) from the housing with Kukko puller 00 8 510.

cardiagn.com

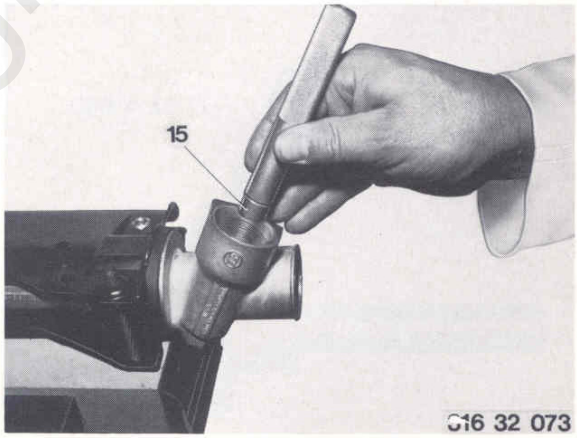
Press bearing bushing (3) out of its retaining catches with two screwdrivers, and remove.
Clean all parts thoroughly and inspect before assembling.
Always renew O-ring seals and keeper plates.



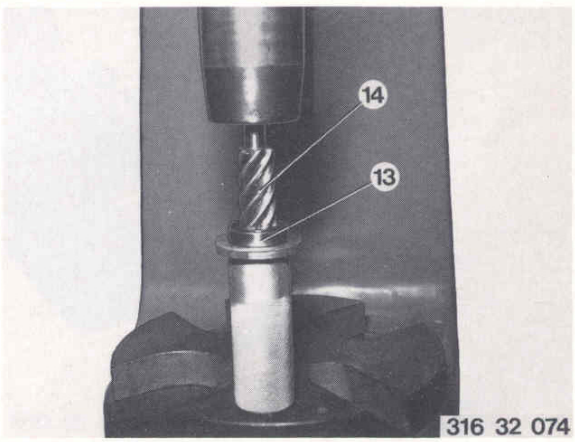
b) Assembling steering mechanism:
Insert new O-ring seals (4) into bearing bushing (3).
Insert the bearing bushing into the steering housing so that the projections locate in the locking slots.



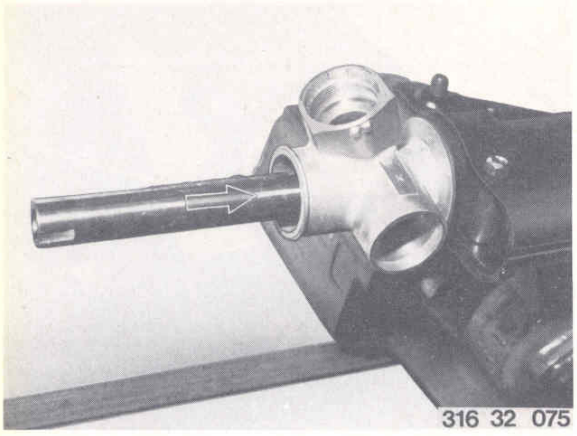
Drive the needle roller race (15) into the housing with a suitable drift so that the rounded end is facing down.



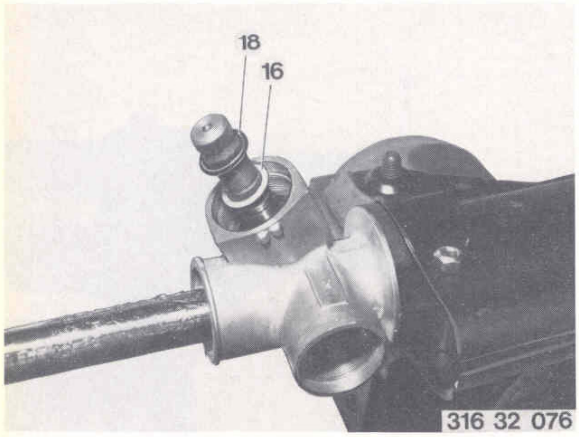
Press the ball bearing (13) onto the pinion (14) with the closed side towards the splines, and insert the circlip (17).



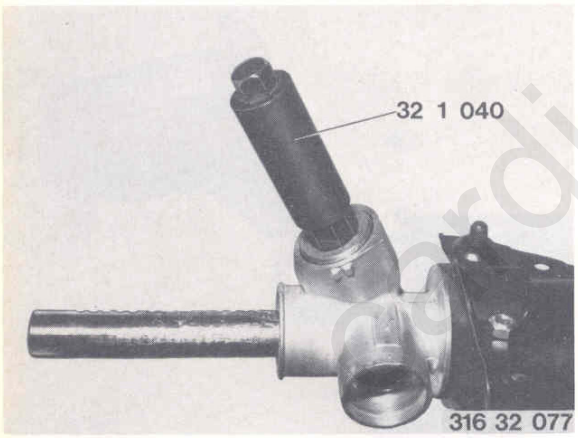
cardiagn.com



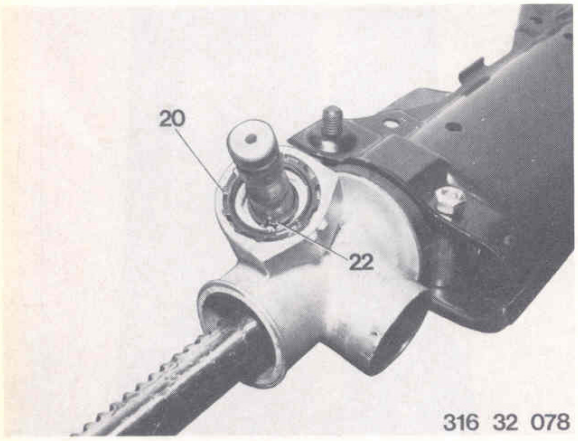
Coat the toothed area of the rack generously and the remaining area lightly with grease[1]). Insert the rack into the housing.
Dip the pinion (14) with pre-assembled ball bearing (13) into grease[1]) and insert into housing.



Push the plastic washer (16) and O-ring seal (18) onto pinion (14).



Tighten adjusting bolt (19) with adjusting wrench 32 1 040.
When installing: Note correct tightening torque[1]).

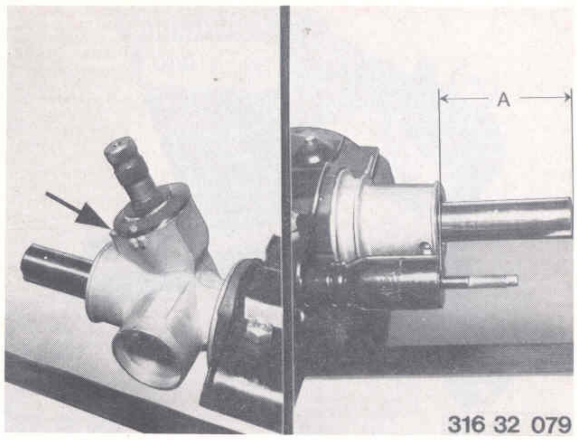


Insert snap ring (22) as far as the groove. Press the notched ring (20) on fully.

[1]) See specifications

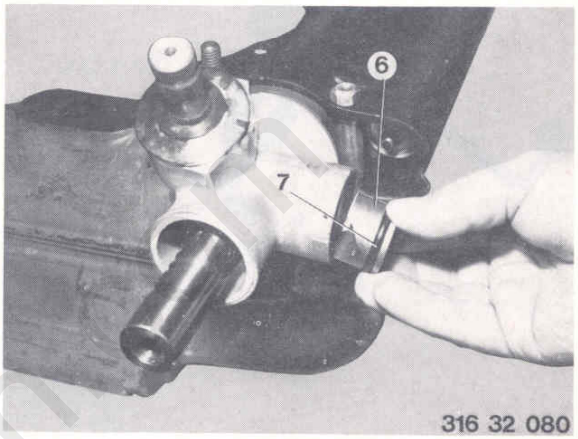
gardian.com

Move the rack to its center position.
Dimension A = 77 mm (3.03 in).
Pack the cavity between the dust seal (21) and the notched ring (20) with grease[1]).
Push on the dust seal so that the mark on the seal is located between the marks on the steering mechanism housing.



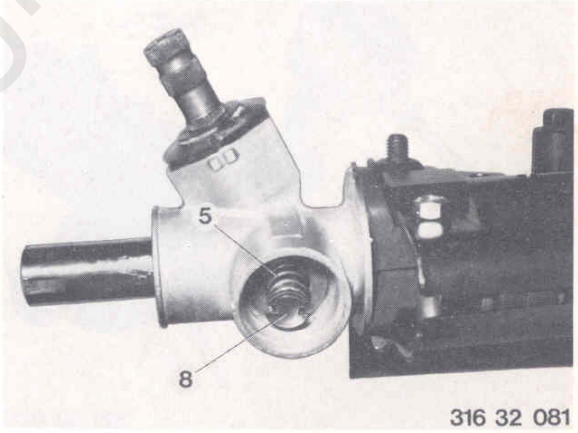
316 32 079

Insert 0-ring seal (7) into pressure pad (6) and push the pressure pad into the steering housing.



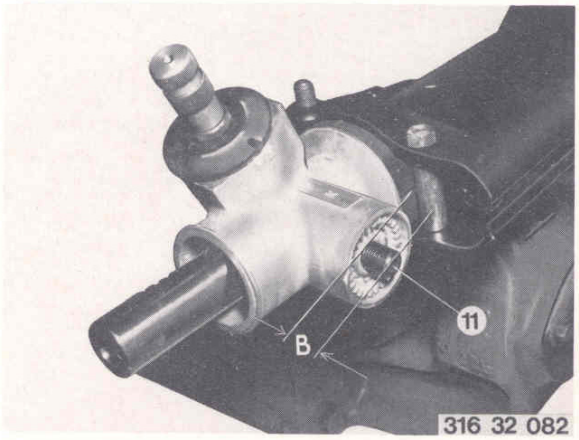
316 32 080

Mount coil spring (5) and spring plate (8) on the pressure pad.



316 32 081

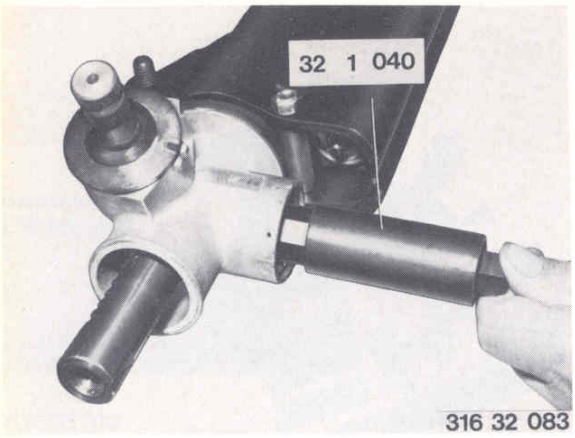
Tighten adjusting bolt (9) fully.
Unscrew adjusting bolt (11) until dimension B = approx. 12 mm (0.47 in.)



316 32 082

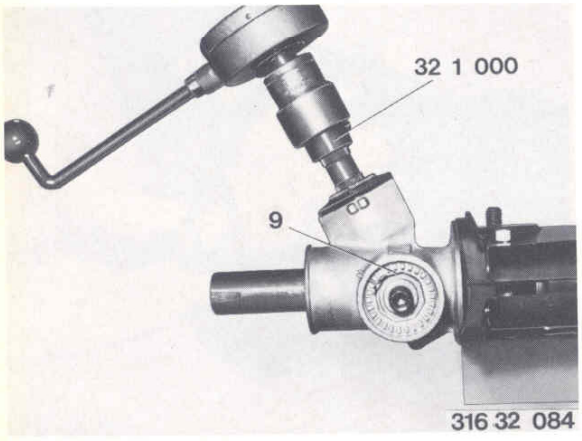
[1]) See specifications

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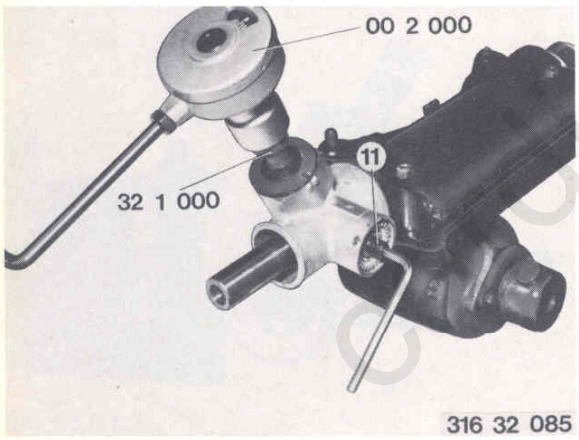
316 32 083

Using adjusting wrench 32 1 040, tighten adjusting bolt (9) to 6 Nm (4.3 lb/ft) and turn back the castellated slot to the next cotter pin hole.



316 32 084

Turn the rack from the full left to the full right lock position with socket adapter 32 1 000 and check for local stiffness or jerky movement. In this event, unscrew the adjusting bolt (9) by one further castellated slot, and insert the cotter pin. Repeat the test. If local stiffness or jerky movement is still detected, renew the rack or if necessary the complete steering mechanism. Never unscrew by a further slot.

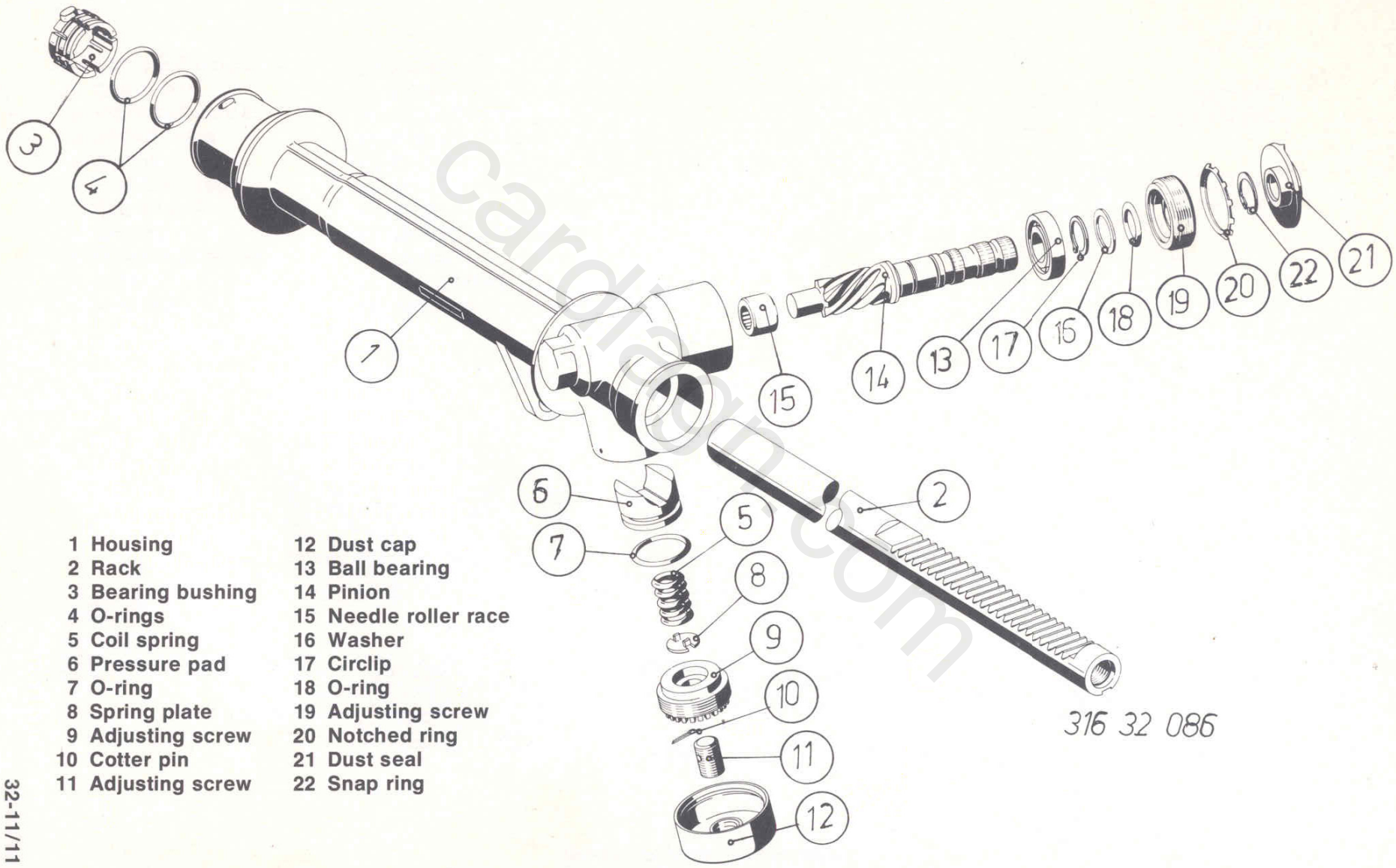


316 32 085

c) Adjusting turning moment:
Move the rack to the central position. Attach friction gauge 00 2 000 and socket adapter 32 1 000 to the input pinion.
Determine turning moment[1])! If the specified value[1]) is not obtained, adjust at bolt (11).
Turning clockwise = increased friction
Turning anticlockwise = reduced friction
Install the dust cap (12).
Note: Adjusting bolt (11) is self-locking. If the bolt turns too freely, it must be renewed.
Attach track rods to steering rack.

[1]) See specifications

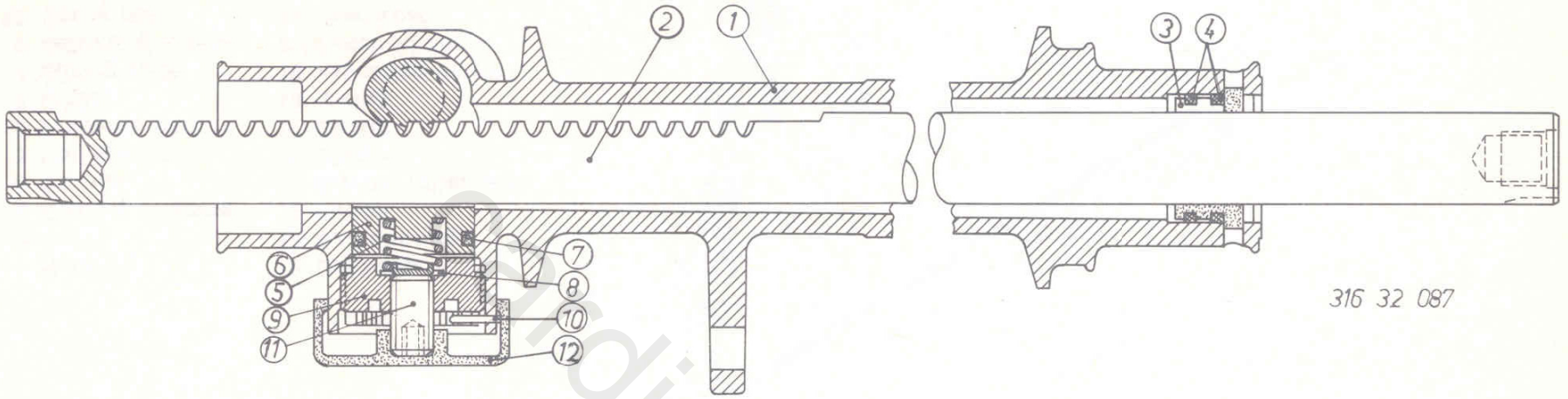
Steering gear components



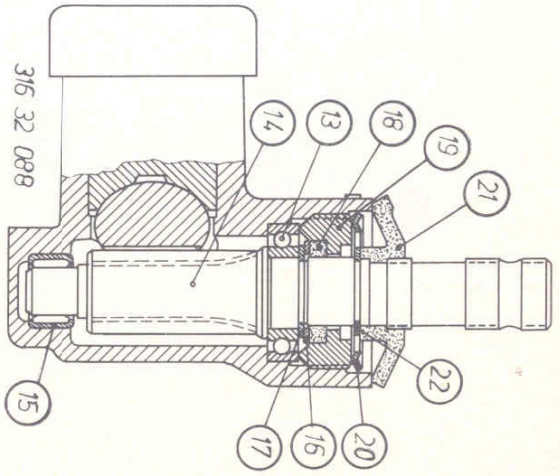
1	Housing	12	Dust cap
2	Rack	13	Ball bearing
3	Bearing bushing	14	Pinion
4	O-rings	15	Needle roller race
5	Coil spring	16	Washer
6	Pressure pad	17	Circlip
7	O-ring	18	O-ring
8	Spring plate	19	Adjusting screw
9	Adjusting screw	20	Notched ring
10	Cotter pin	21	Dust seal
11	Adjusting screw	22	Snap ring

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Steering gear – assembled



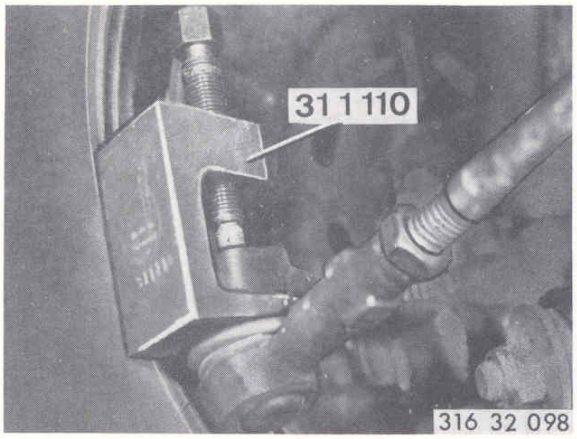
1 Housing
2 Rack
3 Bearing bushing
4 O-rings
5 Coil spring
6 Pressure pad
7 O-ring
8 Spring plate
9 Adjusting screw
10 Cotter pin
11 Adjusting screw
12 Dust cap
13 Ball bearing
14 Pinion
15 Needle roller race
16 Washer
17 Circlip
18 O-ring
19 Adjusting screw
20 Notched ring
21 Dust seal
22 Snap ring



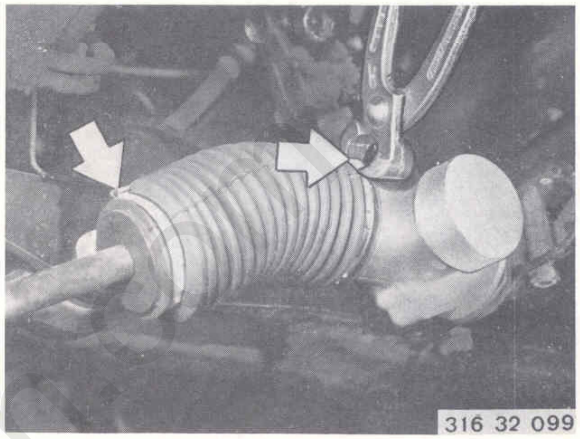
mediagn.com

32 21 231 Left track rod – renewing

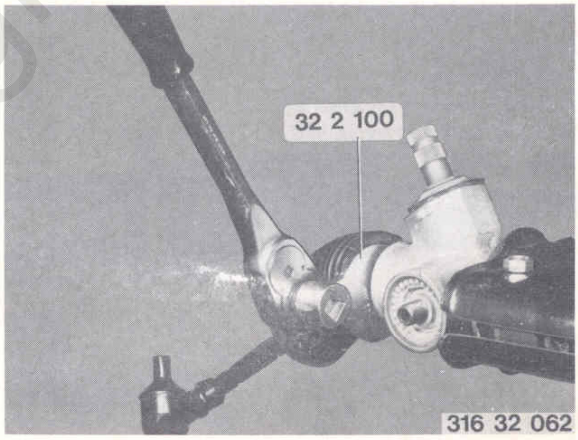
Remove split pin and unscrew castellated nut. Press track rod off spring-damper strut with special tool 31 1 110.
When installing: **taper and bore must be clean and free from grease. Check joint seal.**
Note correct tightening torque[1]).
Check front axle wheel alignment and adjust if necessary – 32 00 024.



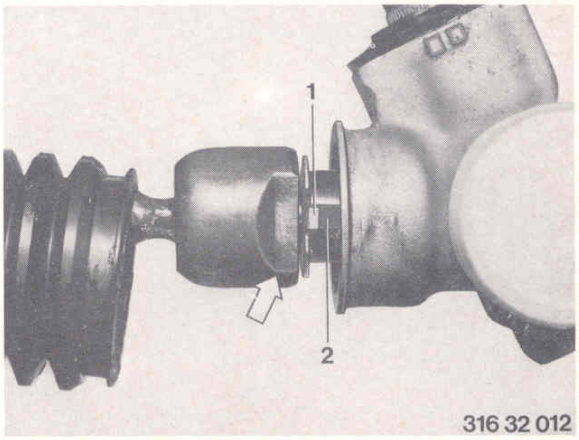
Unscrew the clips and push back the flexible gaiter.



Push the steering rack in until the special tool can just be attached.
Bend up the keeper plate.
Detach the track rod from the rack with special open-ended wrench (27 mm across flats) 32 2 100.



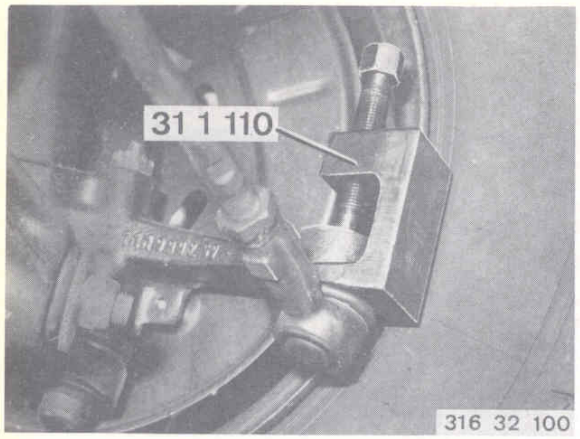
When installing: **make sure that projection (1) is located in the cutout in rack (2).**
Note correct tightening torque[1]).
Check condition of flexible gaiter and renew if necessary.
Warning: **to prevent damage to rack or bearings, bend up the keeper plate with water pump pliers or a similar tool.**



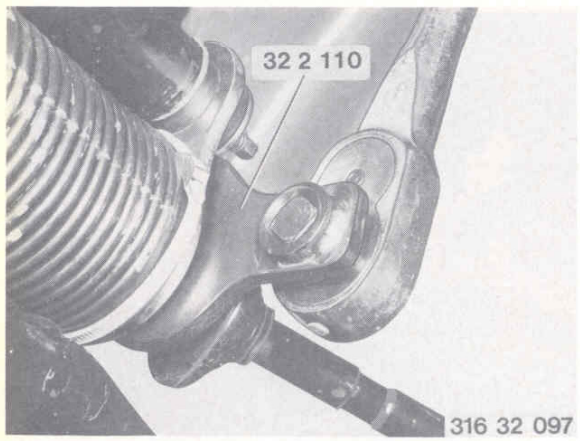
1) See specifications

cardiagn

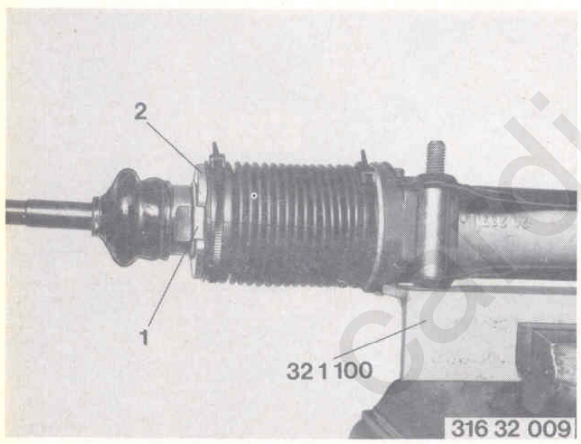
32 21 241 Right track rod – renewing



Remove split pin and unscrew castellated nut.
Press the track rod off the spring-damper strut with special tool 31 1 110.
When installing: **taper and bore must be clean and free from grease.**
Check the joint seal.
Note correct tightening torque[1]).
Check and adjust front wheel alignment – 32 00 024.



If necessary, unscrew nut and push back steering damper.
Push the steering rack fully in.
Bend up the keeper plate.
Detach the track rod from the rack with special open-ended wrench (32 mm across flats) 32 2 110.

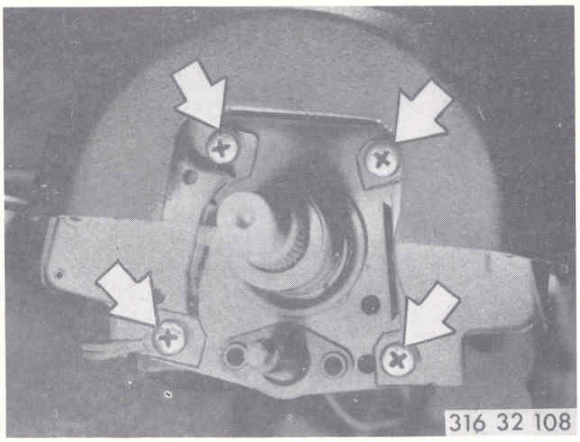


When installing: **make sure that the projection (1) on the keeper plate locates in the cutout on the retaining plate (2).**
Note correct tightening torque[1]).
Check front wheel alignment and adjust if necessary – 32 00 024.
Warning: **to prevent damage to the steering rack and bearings, use water pump pliers or a similar tool to bend up the keeper plate.**

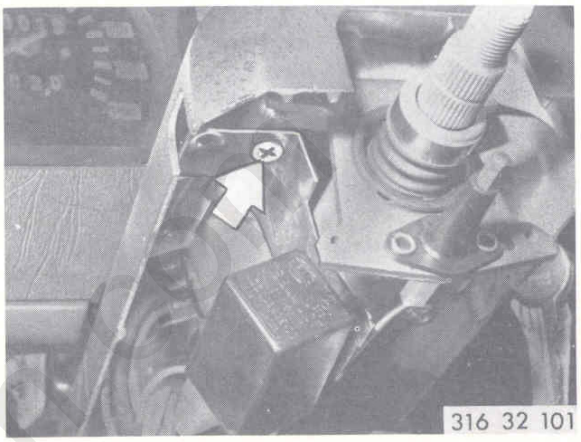
·) See specifications

32 31 000 Upper steering column surround – removing and installing

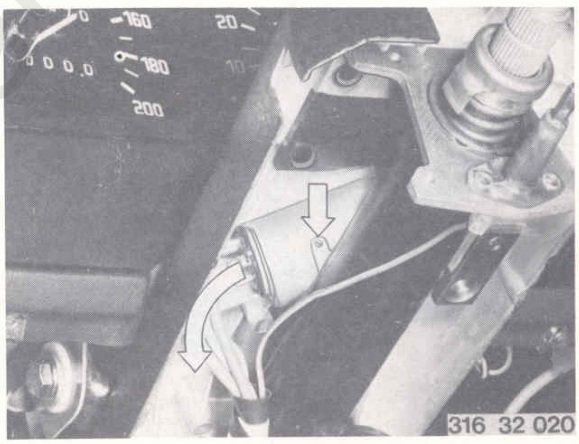
Disconnect the negative lead at the battery.
Remove and install the steering wheel – 32 33 000.
Remove and install the lower steering column surround – 32 31 020.
Remove the wiper and turn indicator switches from the switch panel.
When installing: **Attach earth (ground) lead at the same time.**


316 32 108

Unscrew and remove the hazard warning flasher relay.

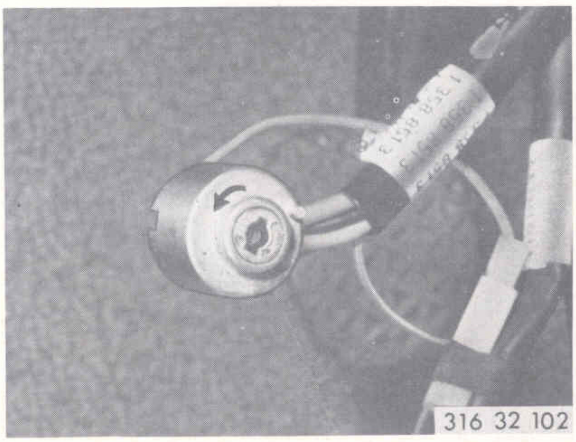

316 32 101

Remove the grub screw and pull out the ignition-starter switch.
Detach cable clips and place wiring harness to one side.

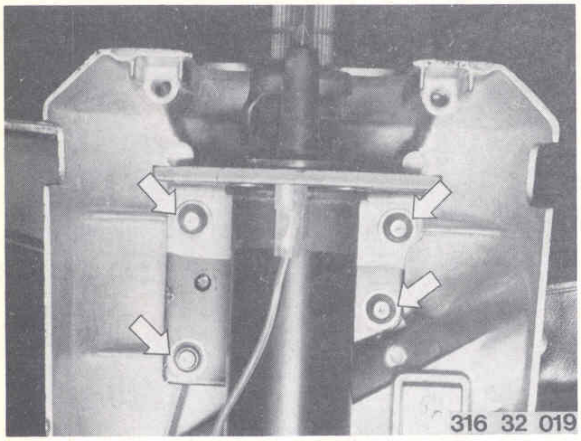


316 32 020

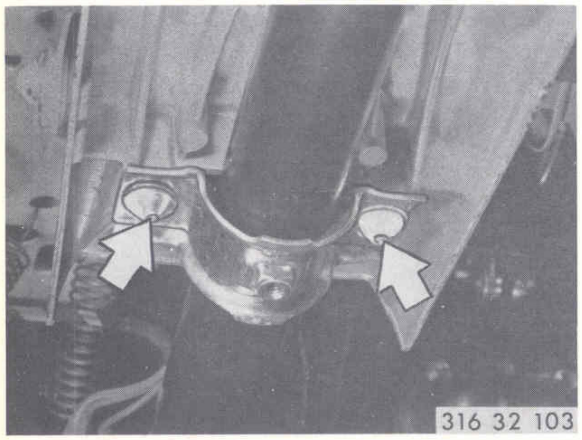
When installing: **Remove ignition key. Turn ignition/starter switch fully to left. Insert switch and tighten grub screw. Secure grub screw with paint.**


316 32 102

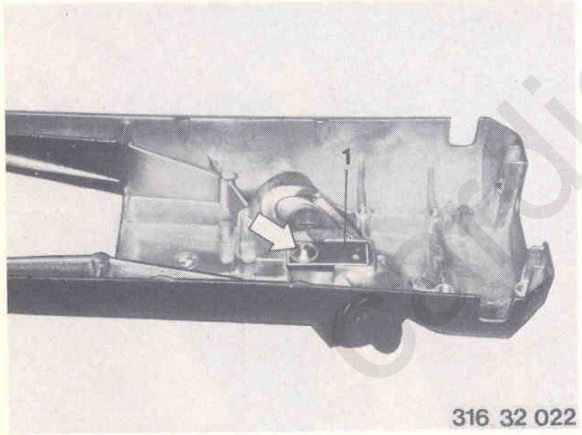
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Separate the shear bolts with a chisel or similar tool.

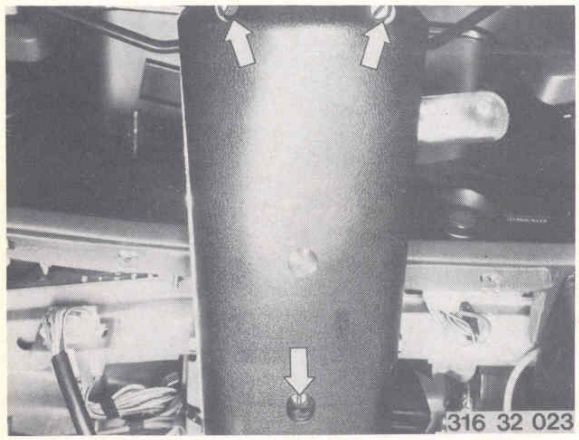


Separate the shear bolts with a chisel or similar tool and take off the upper surround.
When installing: Align the upper surround with the outer tube. Do not install under stress. Note correct tightening torque[1]).



32 31 001 Upper steering column surround – renewing

Remove and install the upper steering column surround – 32 31 000.
Separate the shear bolt with a chisel or similar tool.
Remove the plate (1) and pull out the steering lock.



32 31 020 Lower steering column surround – removing and installing

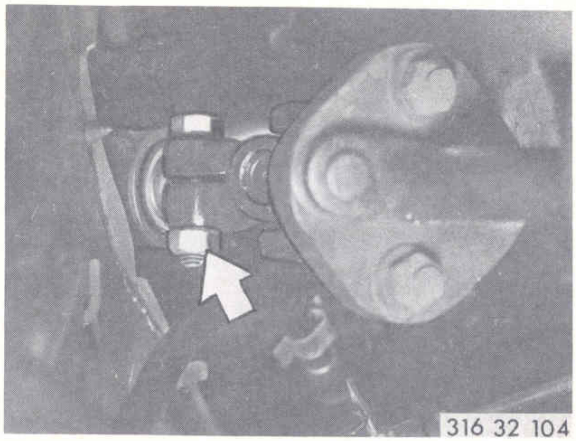
Detach and attach the lower center facia trim – 51 45 190.
Remove the retaining bolts and take off the lower steering column surround.

[1]) See specifications

carjiagn.com

32 31 051 Joint disc – renewing

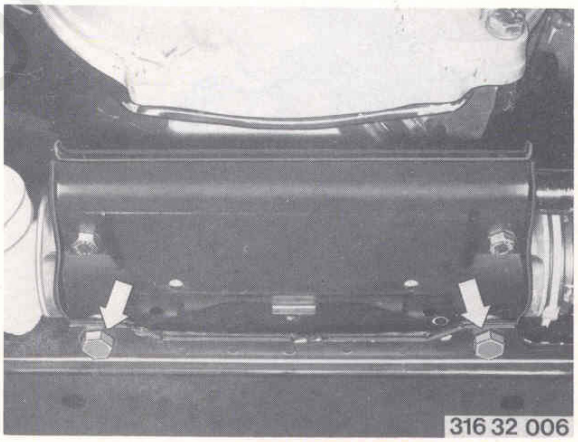
Unscrew nut and take out bolt at upper universal joint.
When installing: **bolt must be located in safety groove on steering spindle.**
Use a new self-locking nut.
Note correct tightening torque[1]).


316 32 104

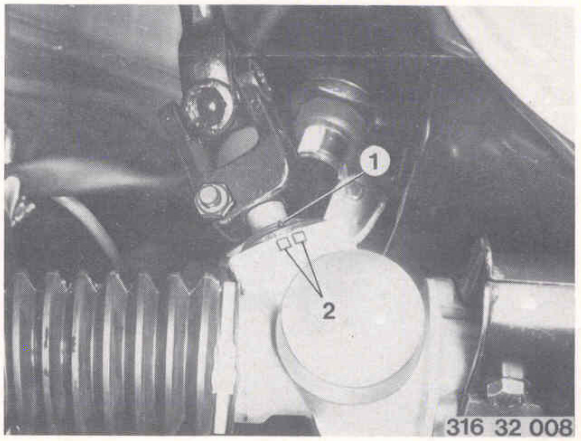
Remove nut and bolt from lower universal joint.
When installing: **use a new self-locking nut.**
Note correct tightening torque[1]).


323 31 015

Detach steering gear from front axle beam.
Take out the steering spindle.
When installing: **use new self-locking nuts.**
Note correct tightening torque[1]).


316 32 006

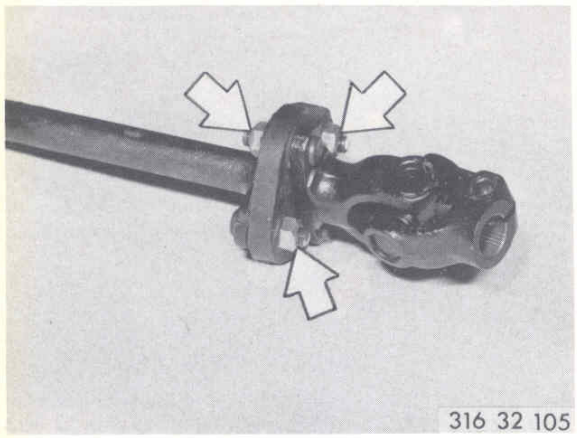
When installing: **steering wheel and steering gear must be in the straight-ahead position.**
The marking (1) on the dust seal must be between the two markings (2) on the steering gear housing.



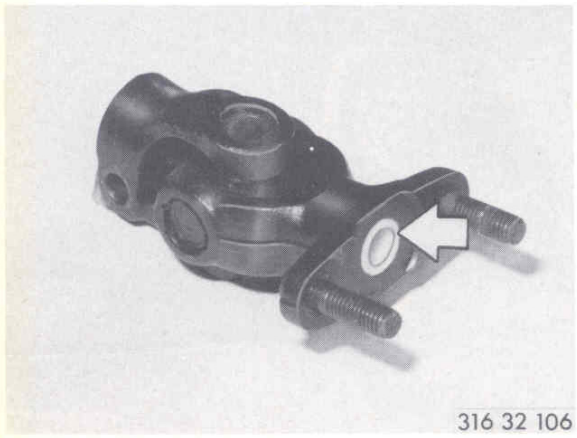
316 32 008

[1]) See specifications

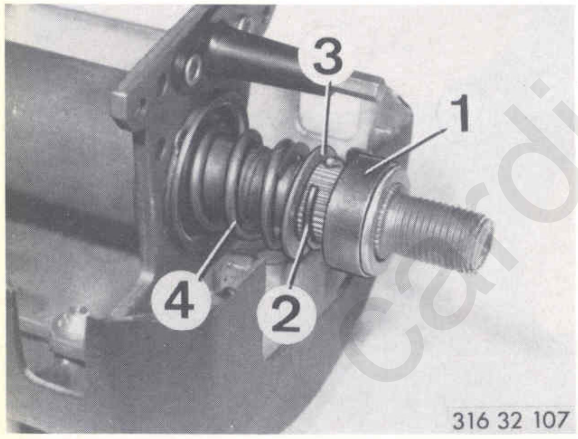
cardiagn



Unscrew nuts and take off joint disc.
When installing: **renew self-locking nuts. Note correct tightening torque[1]).**

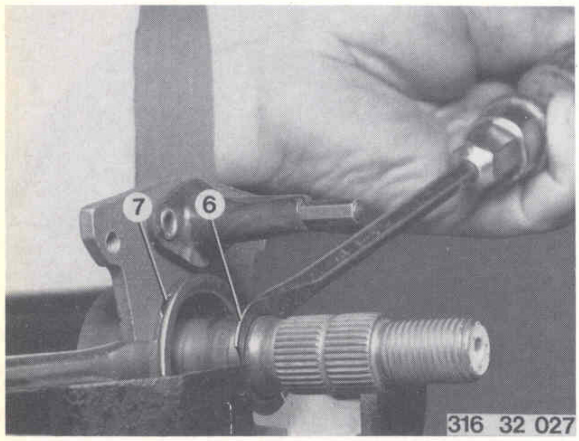


When installing: **check plastic bushing and renew if necessary.**



32 31 080 Steering shaft – renewing

Remove and install the steering column – 32 31 090. Take off shouldered ring (1), snap ring (2), washer (3) and spring (4).
When installing: **Make sure that the snap ring (2) is located in the recess in shouldered ring (1).**

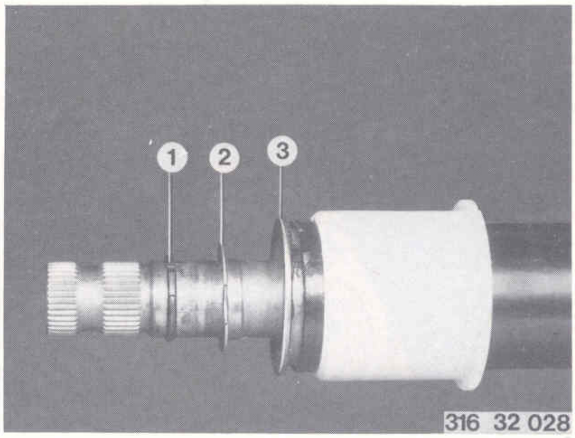


Press out the steering shaft bearing.
When installing: **The stem of the ring (6) must face towards the steering shaft bearing (7).**

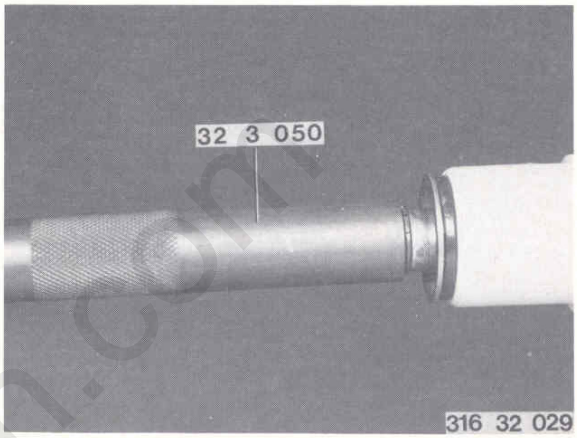
1) See specifications

cardiagn.com

Remove the snap ring (1), ring (2) and lower steering shaft bearing (3) from the steering shaft.
When installing: **The stem of ring (2) must face towards the steering shaft bearing (3).**

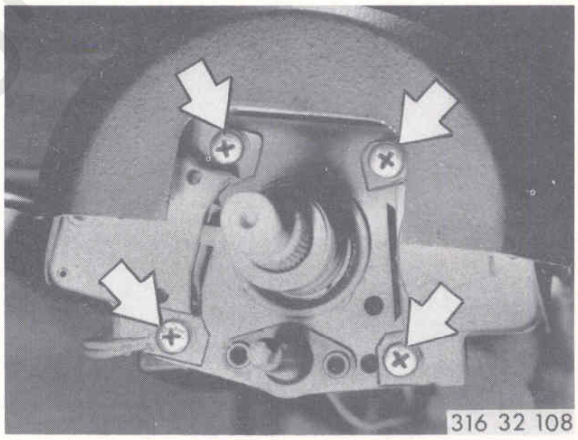


When installing: **Use special tool BMW 32 3 050 to insert the snap ring).**

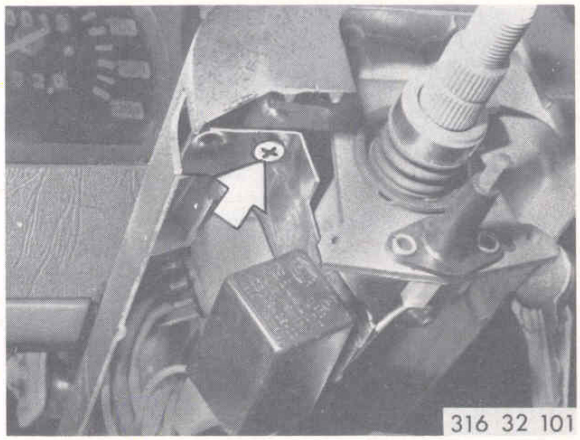


32 31 090 Steering column – removing and installing

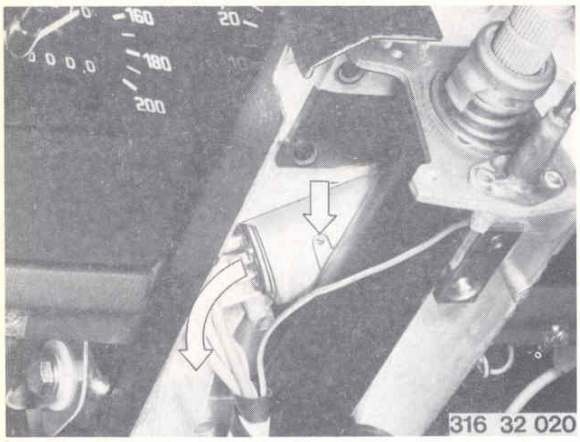
Disconnect the negative lead at the battery.
Remove and install the steering wheel – 32 33 000.
Remove and install the lower steering column surround – 32 31 020.
Detach the wiper and turn indicator switches from the switch panel.



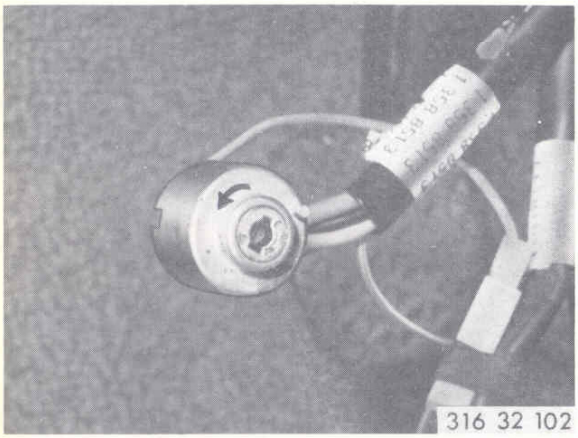
Unscrew and remove the hazard warning relay.



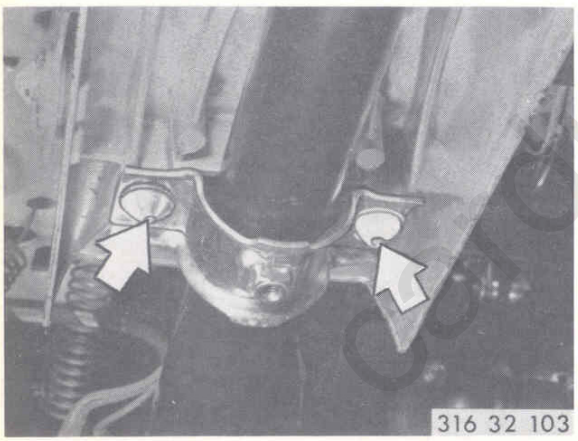
cardiagn.com



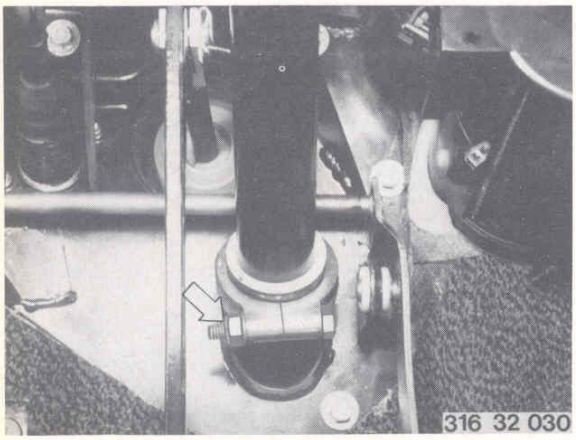
Remove the grub screw and pull out the ignition/starter switch.
Detach cable clips and place wiring harness to one side.



When installing: **Pull out ignition key. Turn ignition/starter switch fully to left. Insert switch and tighten grub screw. Secure grub screw with paint.**



Separate the shear bolts with a chisel or similar tool.

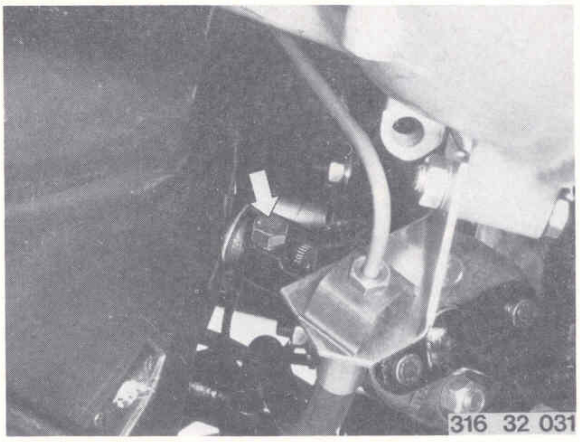


Remove the clip for the outer tube at the bearing block.
When installing: **Note correct tightening torque[1]).**

[1]) See specifications

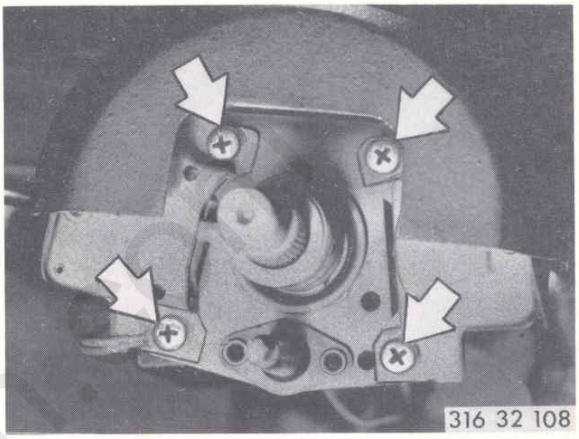
manualagn.com

Remove the bolt and pull the steering shaft with outer tube away from the universal joint.
When installing: **Make sure that the bolt is located in the safety groove. Note correct tightening torque[1]).**

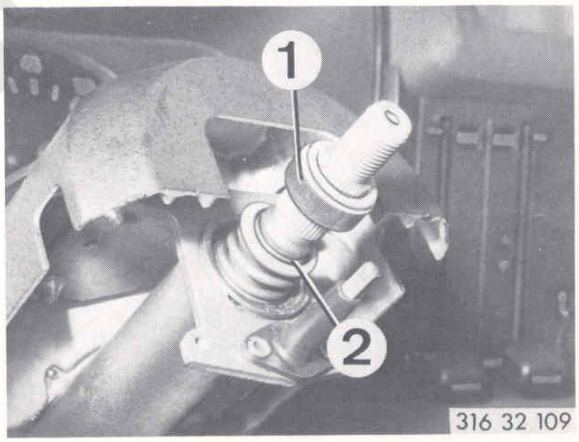

316 32 031

32 31 151 Upper steering shaft bearing – renewing

Detach and attach the lower steering column surround 32 31 020.
Remove and install the steering wheel 32 33 000.
Detach the wiper and turn indicator switches from the switch plate.

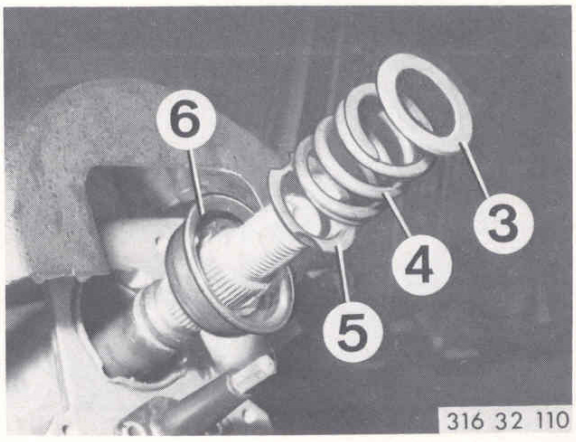

316 32 108

Extract shouldered ring (1) and snap ring (2).
When installing: **recess in shouldered ring (1) locates over snap ring (2).**



316 32 109

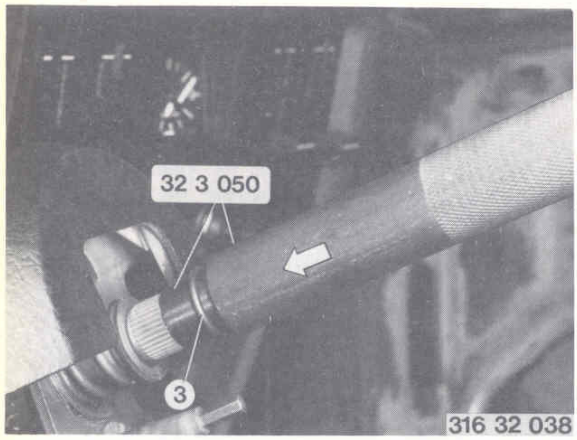
Take off the washer (3), coil spring (4) and ring (5). Lift the steering shaft bearing (6) out of the outer tube.
When installing: **The stem of ring (5) faces towards the steering shaft bearing.**



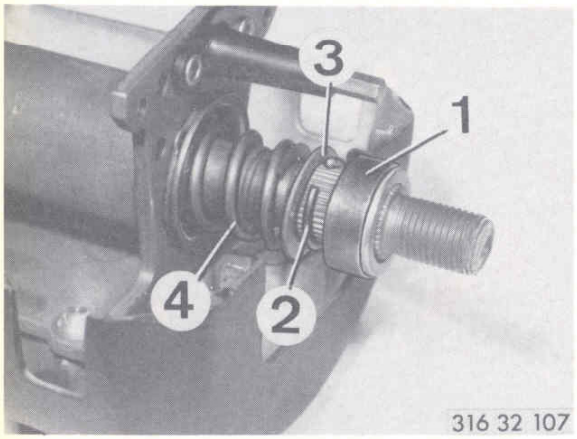
316 32 110

[1]) See specifications

cardiagn

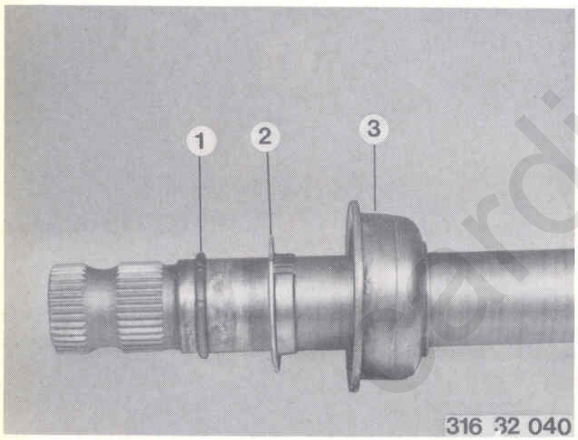


When installing: **Press in the steering shaft bearing until flush.**
Push assembly sleeve BMW 32 3 050 onto the steering shaft and press the snap ring (3) into the groove on the steering shaft.

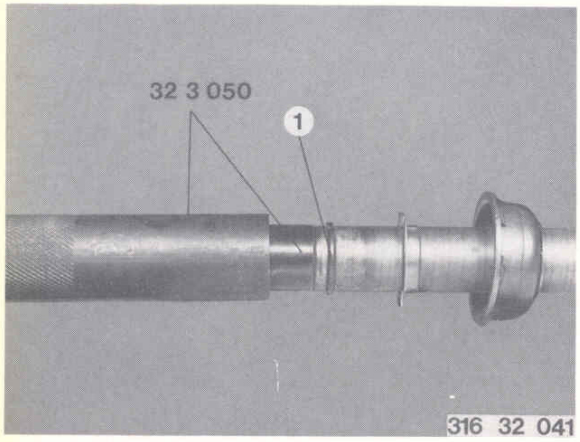


32 31 161 Lower steering shaft bearing – renewing

Remove and install steering column – 32 31 090. Take off shouldered ring (1), snap ring (2), washer (3) and spring (4).
When installing: **make sure that snap ring (2) is located in shouldered ring (1).**



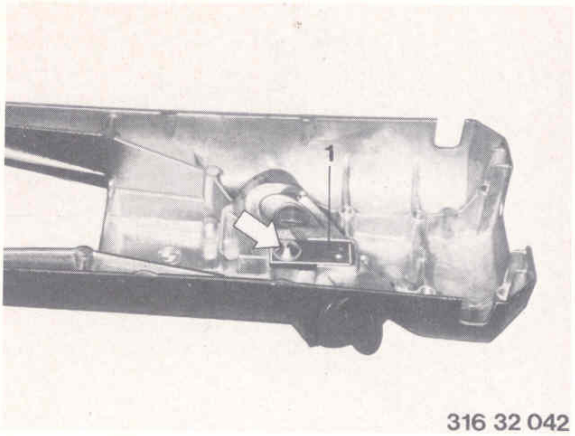
Drive the steering shaft bearing out downwards complete with the steering shaft.
Take off the snap ring (1), ring (2) and steering shaft bearing (3).
When installing: **The stem of ring (2) faces the steering spindle bearing.**



Install snap ring (1) in the locating groove with assembly sleeves BMW 32 3 050.

32 32 000 Steering lock – removing and installing

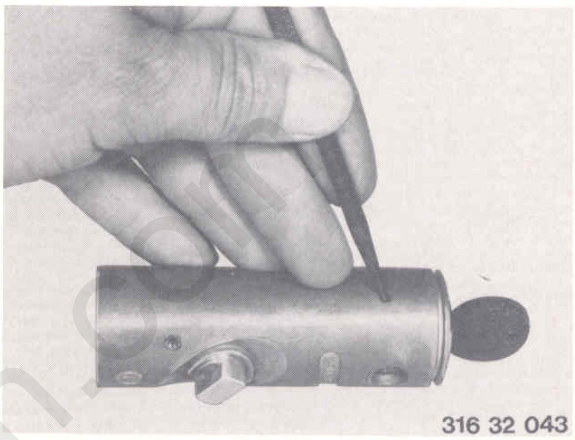
Remove and install the upper steering column surround – 32 31 000.
Separate the shear bolt with a chisel or similar tool. Take off panel (1) and pull out the steering lock.



316 32 042

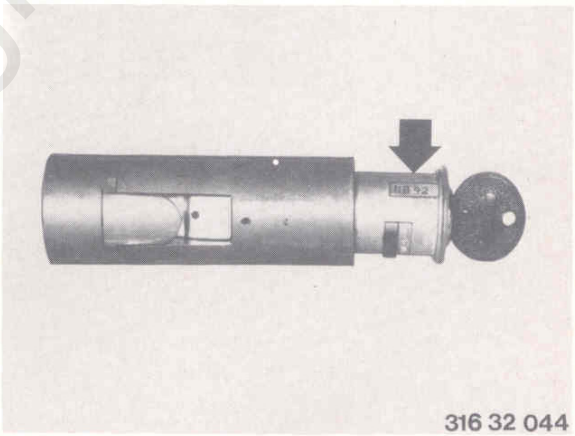
32 32 050 Steering lock barrel – removing and installing

Remove and install the steering lock – 32 32 000.
Press in the lock barrel retaining spring and remove the barrel.



316 32 043

Note the embossed key number.

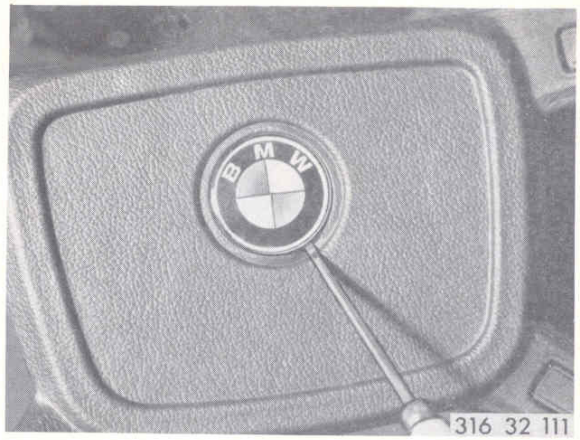


316 32 044

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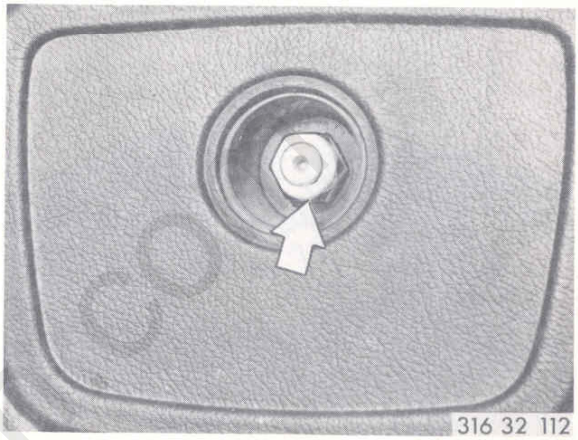
32 33 000 Steering wheel – removing and installing

Carefully lift out BMW badge with a small screwdriver.



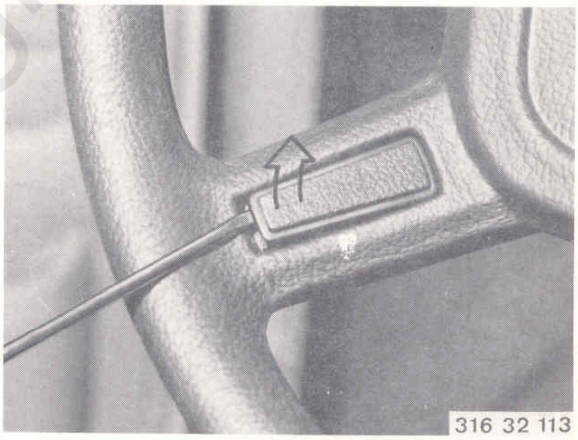
316 32 111

Loosen the nut and take off the steering wheel.
When installing: **Install steering wheel in straight-ahead position – align marks on steering housing and shaft. Use a new self-locking nut. Note correct tightening torque[1]).**

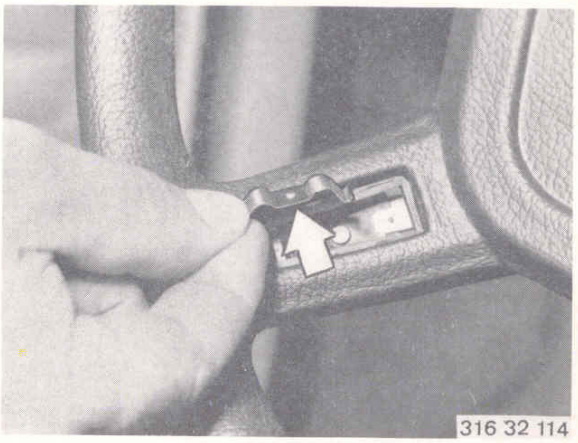

316 32 112

32 33 041 Steering wheel horn push – renewing

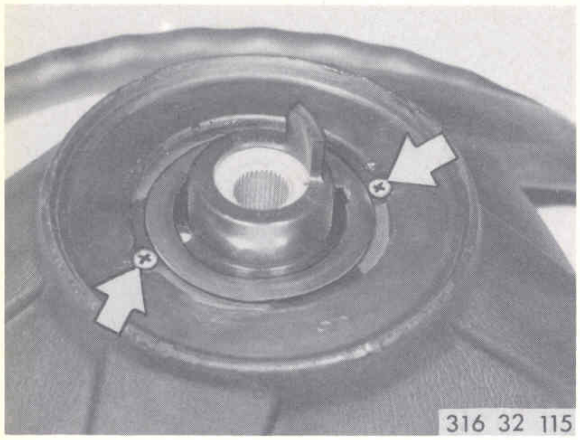
Carefully lift out the horn push with a small screwdriver.


316 32 113

When installing: **Note correct installed position of contact spring, with contact pin facing down. Press in the horn push.**

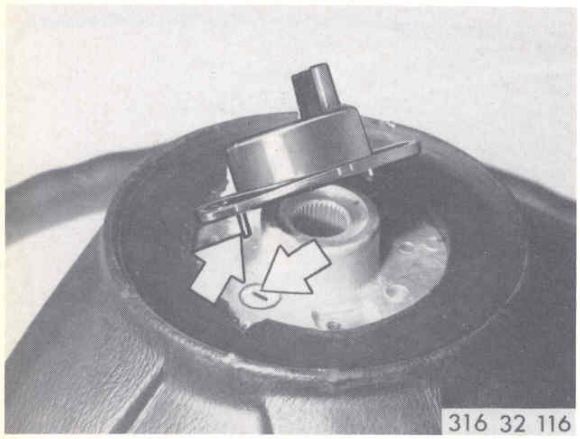

316 32 114

[1]) See specifications


316 32 115

32 33 551 Contact brush slip ring – renewing – Steering wheel removed –

Remove the screws and take off the slipring.


316 32 116

When installing: **insert lug of contact into socket.**

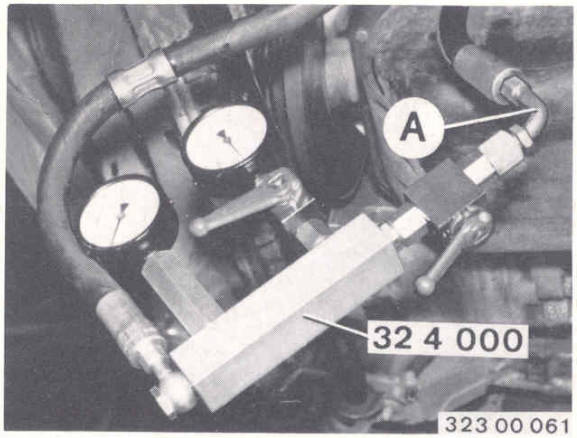
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32 41 009 Checking vane pump and function of power steering

A) Vane pump

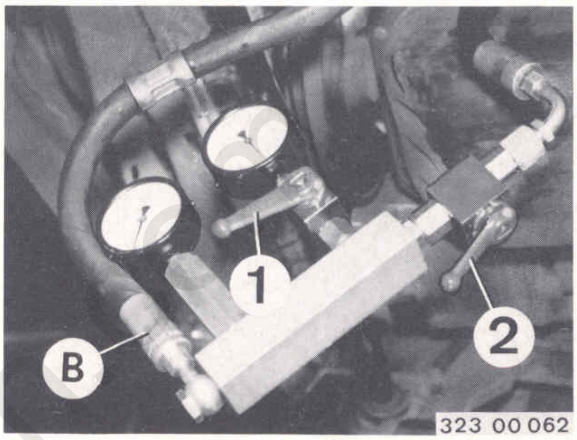
Always check delivery pressure of vane pump first. Detach pressure line (A) at vane pump and attach special tool 32 4 000.

Important: **Never re-use drained oil.**



323 00 061

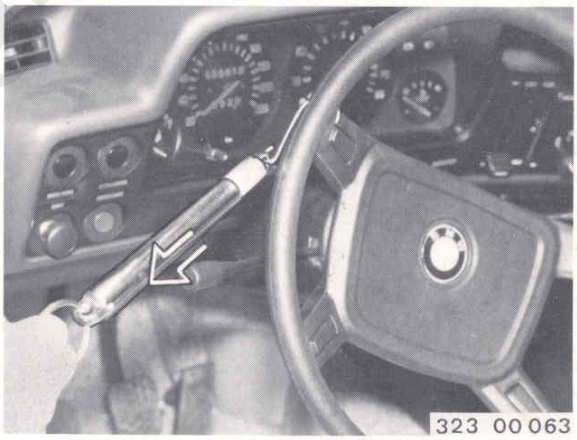
Connect pressure line (B) to vane pump.
Shut cut-off valve (1).
Open cut-off valve (2).
Bleed hydraulic system at engine idle speed – 32 13 006. This requires an engine at operating temperature. After bleeding, shut cut-off valve (2) for max. 10 seconds and read pressure.
The pressure[1]) must be within 10 % of the value specified on the vane pump's data plate.
Important: **Cut-off valve (1) must remain closed for all high-pressure tests.**



323 00 062

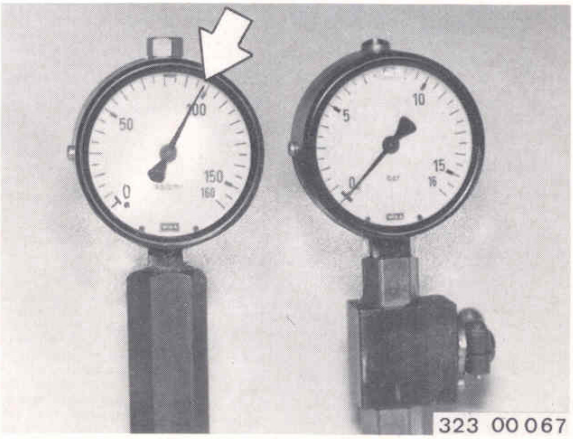
B) Power steering

Pull steering wheel against final stop with a pressure of 100 N (10 kp or 22 lb) for approx. 5 seconds, with engine on.
Read pressure from special tool 32 4 000.
Repeat measurement at right lock.


323 00 063

Measured pressures less than max. pump pressure[1]):

a) Vane pump delivers insufficient oil
b) Steering has too high an oil leak rate
c) Damaged gasket in steering box
d) Valve piston dirty
e) Valve piston does not seal properly.


323 00 067

[1]) See specifications

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Trouble-shooting – vane pump

	Cause	
Noise in vane pump	a) Insufficient oil in hydraulic circuit b) Air in oil c) Hydraulic system filled with foaming, non-suitable oil	a) Add oil, bleed b) Bleed hydraulic system c) Fill hydraulic system with specified ATF
No pressure build-up	a) Valve piston seized b) O-rings leaking c) Top of end plate not positioned on cam ring	a) Clean or replace valve piston[1]) b) Replace O-rings c) Check end plate for traces of wear, renew if necessary
Max. pressure exceeded	a) Pressure valve bore in valve piston blocked b) Spring length or shim thickness of pressure valve not to specifications	a) Clean or renew valve piston[1]) b) Install new valve piston
Max. pressure not reached	a) V-belt too loose b) Pressure valve will not shut c) Pressure valve out of adjustment d) Restrictor bore blocked e) O-rings damaged f) Wear on impeller or cam ring g) Foreign particles between end plates	a) Correct V-belt tension b) Clean or renew piston valve[1]) c) Renew valve piston[1]) d) Clean bore e) Renew O-rings f) Renew cam ring and rotor assembly g) Clean vane pump, replace end plate if scored

[1]) *Important!* Install same tolerance group.

Carlson Supply