

# 31 Front Axle

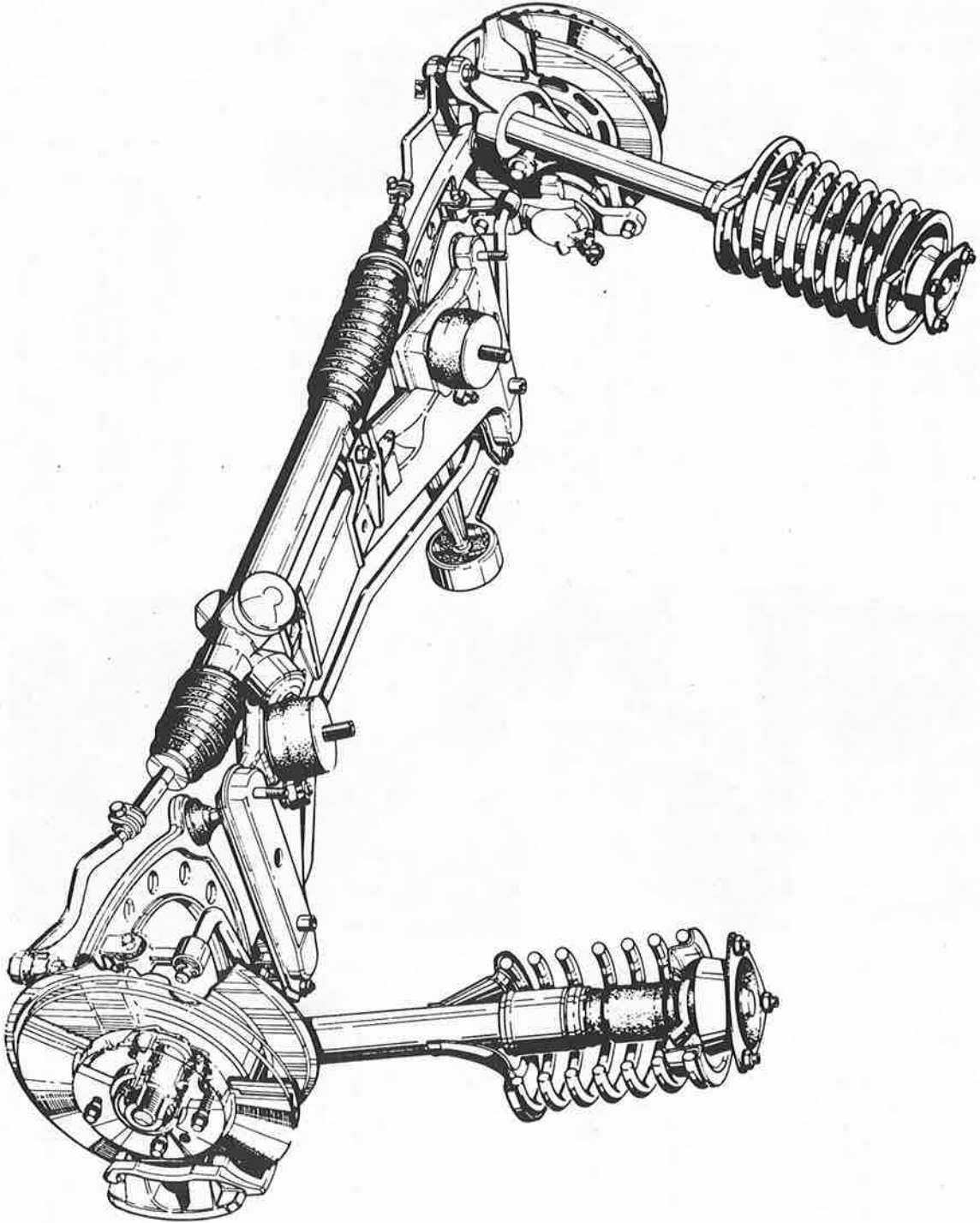
31 10 000	Front wheel suspension — layout drawing	31 - 1
31 11 001	Front axle assembly — remove and install	31 - 2
31 11 001	Front axle carrier — replace	31 - 4
31 12 000	Front axle carrier — replace (all wheel drive)	31 - 5,1
048	Control arm, left or right — remove and install	31 - 6
130	Control arm, left or right — remove and install (all wheel drive)	31 - 6,1
31 21 121	Bracket for left or right control arm — remove and install or replace	31 - 7
151	Rubber mount for left or right control arm — replace	31 - 8
180	Rubber mounts for control arms — check	31 - 8
31 31 000	Drive flange for front axle — replace (all wheel drive)	31 - 9
31 32 001	Bearings of wheel hub (drive flange), left or right — replace	31 - 9,1
	Bearings (wheel hub) for front wheel — replace	31 - 10
	Spring strut, front, left or right — remove and install	31 - 11
	Spring strut, front, left or right — remove and install (all wheel drive)	31 - 11,1
	Shock absorber with mount and coil spring — layout drawing	31 - 12
	Shock absorber for front spring strut — replace	31 - 13

# 31 Front Axle

31 53 050	Bearing (in console) for right output shaft - replace .....	31 - 32
500	Differential - remove and install (front axle final drive removed) .....	31 - 33
	Differential - layout crawling .....	31 - 34
510	Differential gears - replace (front axle final drive removed) .....	31 - 34
520	Differential mounts - replace (front axle final drive removed) .....	31 - 37
	Front axle final drive adjustments .....	31 - 39
31 60 000	Output shaft, left or right - remove and install or replace .....	31 - 45
020	Constant velocity joint (outer) of output shaft - replace .....	31 - 47
021	Constant velocity joint (inner) of output shaft - replace .....	31 - 47
030	Dust cover for left or right output shaft - replace .....	31 - 48

LAYOUT DRAWING OF FRONT WHEEL SUSPENSION

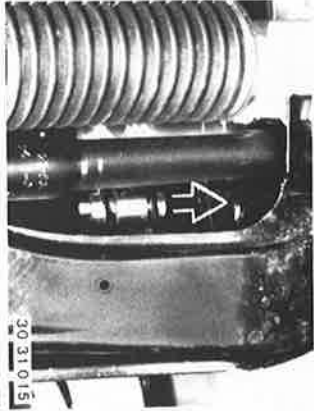
31-1



30 31 047

## 31-3

Four Cylinder Models:  
Unscrew engine damper on front axle carrier.



Unscrew left and right engine mounts on front axle carrier.

Loosen right engine mount at top.

Installation:

Engine mount turning lock (1) must engage in the bore.

Tightening torque\*.



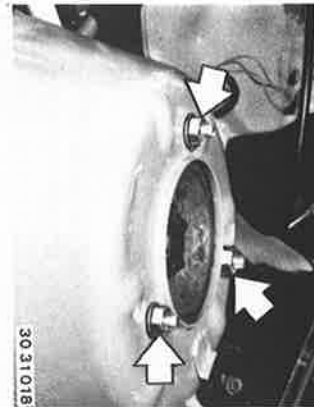
Attach Special Tool 00 0 200 on the engine. Adapters bear on bolts of side panel walls. Support front axle carrier from underneath with a shop jack.



Unscrew bolts on left and right sides.

Installation:

Tightening torque\*.



Unscrew nuts on left and right sides. Lower front axle slowly.

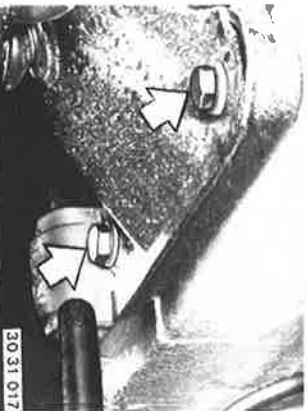
Caution!

Don't let spring struts tilt out or sag through. This would damage the ball joints.

Installation:

Replace self-locking nuts.

Tightening torque\*.



\* See Specifications of Gr. 11

\* See Specifications

## 31-5

Unscrew left and right engine mounts on front axle carrier.

Loosen right engine mount at top.

*Installation:*

Engine mount turning lock (1) must engage in bore.

Tightening torque\*.



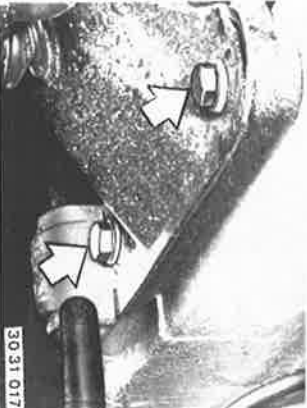
Attach Special Tool 00 0 200 on engine. Adapters bear on bolts of side walls.



Unscrew left and right bolts. Remove front axle carrier.

*Installation:*

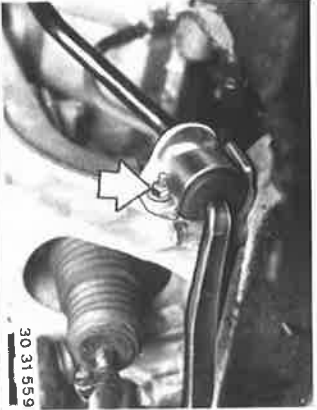
Tightening torque\*.



\* See Specifications

## 31-5.2

Unscrew left and right stabilizer mounts.



Support front axle carrier with Special Tool 00 2 020 and a workshop jack.

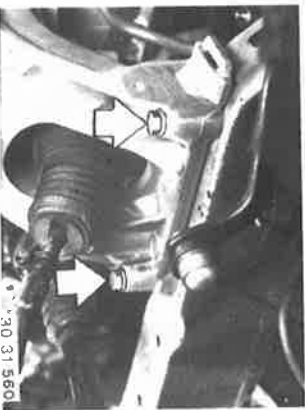
Unscrew bolts and lower front axle carrier.

*Installation:*

Clean tapped bores.

Always replace and install bolts with a bolt cement\*\*.

Tightening torque\*.



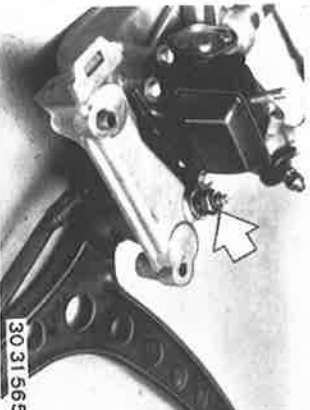
Unscrew both control arms.

*Installation:*

Mount control arms in installed position, so that rubber parts of tapered joints are not turned wrong.

Replace self-locking nuts.

Tightening torque\*.

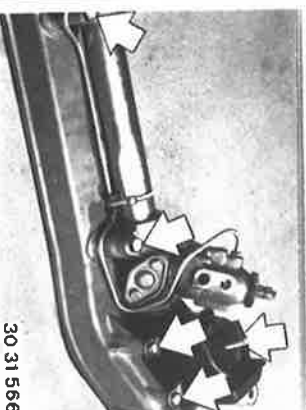


Unscrew engine mounts and steering gear.

*Installation:*

Replace self-locking nuts.

Tightening torque\*.



\* See Specifications of Groups 31 and 32

\*\* Source: HMB

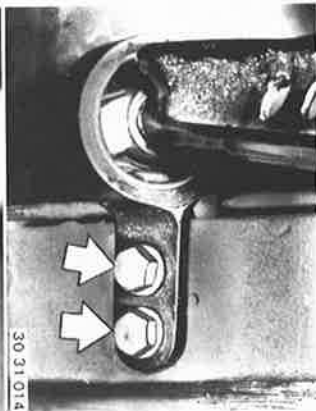
## 31-6.1

### 31 12 000 REMOVING AND INSTALLING LEFT OR RIGHT CONTROL ARM

— All Wheel Drive —

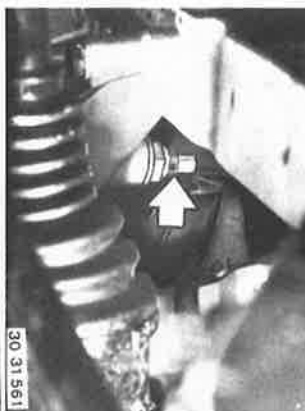
Remove front wheel — see Group 36.  
Unscrew control arm bracket.

*Installation:*  
Tightening torque\*.



Unscrew nut.

*Installation:*  
Replace self-locking nut.  
Tightening torque\*.



Unscrew nut.

Press off control arm with Special Tool  
31 2 160.

*Installation:*  
Keep grease out of bore and off of pin.  
Tightening torque\*.  
Lock nut with cotter pin.

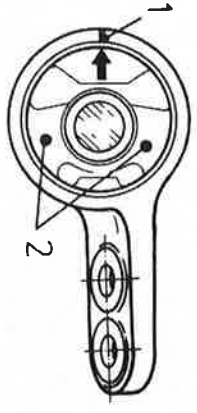
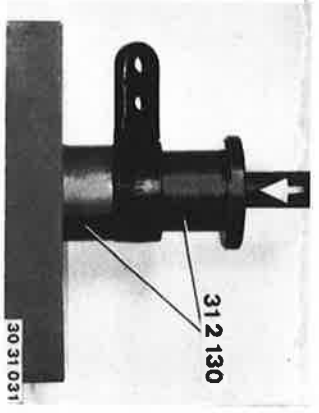


\* See Specifications

# 31-8

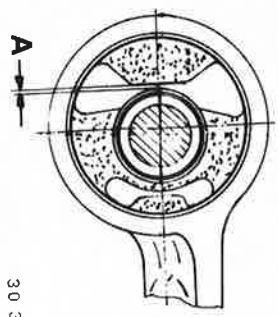
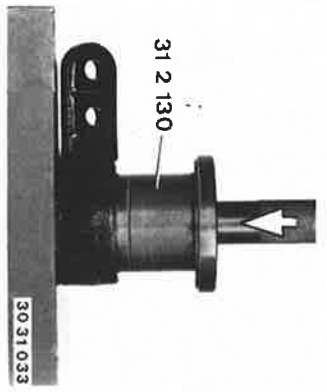
## 31 12 130 REPLACING RUBBER MOUNT FOR LEFT OR RIGHT CONTROL ARM

Remove and install control arm bracket  
31 12 048.  
Press rubber mount out of bracket with Special Tool 31 2 130.  
Always replace rubber bearings on both sides and use bearings of same make (visible on bearing).



**Installation:**  
Check installed position!  
Arrow on rubber mount faces cast boss (1) on bracket.  
Bracket and rubber mount cleaned to remove grease.  
Rubber mounts for 6 cylinder and M 3 models are marked with an "orange" paint dot (2).

Press rubber mount into bracket from the angled end of bracket with Special Tool 31 2 130.



**Checking Rubber Mount:**  
Car in normal position\*.  
Measure gap (A) with a feeler gauge blade.  
Nominal value A = 0.7 to 1.7 mm (0.028 to 0.067").  
If measured value deviates from nominal value, replace rubber mount.

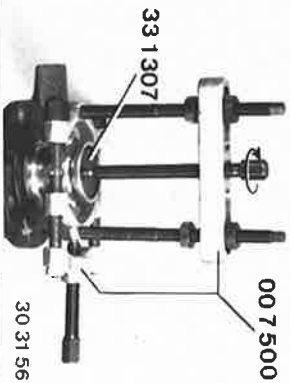
\* See Specifications



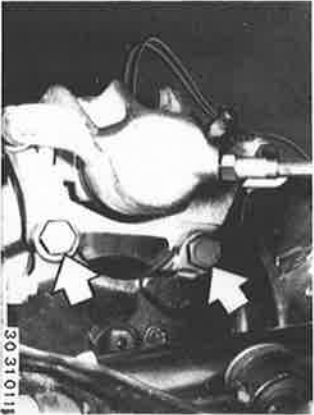
## 31-9.1

31 21 151 REPLACING BEARING OF  
LEFT OR RIGHT WHEEL HUB  
(DRIVE FLANGE)  
— All Wheel Drive —

Remove output shaft — 31 60 000.  
Mount control arm again finger tight, so that  
the spring strut is held in position for further  
procedures.

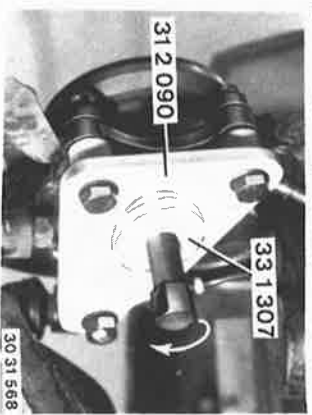
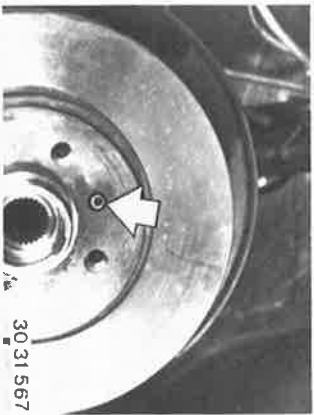


Note:  
If applicable, pull bearing inner race off of  
drive flange with Special Tools 33 1 307 and  
00 7 500.



Unscrew brake caliper and suspend from body  
on a piece of wire.  
Brake line remains connected.  
Installation:  
Tightening torque\*.

Unscrew brake disc.

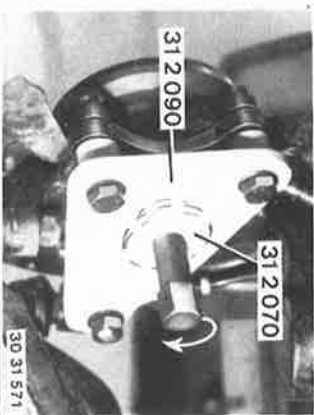


Apply Special Tool 33 1 307.  
Mount Special Tool 31 2 090 with the hook  
attached on the rod arm and press off the  
drive flange.

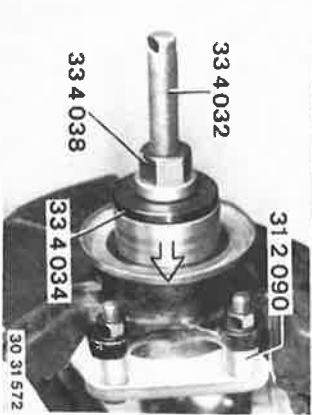
\* See Specifications of Group 34



Lift out circlip.



Remove Special Tool 31 2 090, apply Special  
Tool 31 2 070, mount Special Tool 31 2 090  
again and press out bearing.  
Special Tool 31 2 090 remains installed.

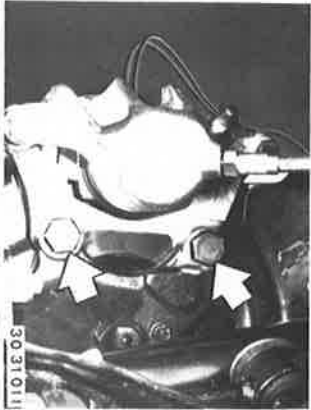


Unscrew spindle of Special Tool 31 2 090 and  
screw in Special Tool 33 4 032 flush.  
Pull in new bearing with Special Tools  
33 4 034 and 33 4 038.  
Remove Special Tool 31 2 090.

## 31-10

### 31 21 180 REPLACING BEARING FOR FRONT WHEEL

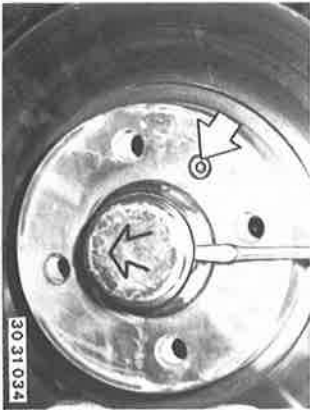
Remove front wheel — see Group 36.  
 Unscrew and suspend brake calliper from body on a piece of wire — brake hose remains connected.  
*Installation:*  
 Tightening torque\*.



30 31 011

Unscrew brake disc and take off grease cap.

*Important!*  
 Always replace grease caps.  
 Install new grease cap with cement, HWB No. 81 Z2 8 407 420.



30 31 034

Break the collar nut with a cross chisel and unscrew with Special Tool 11 2 180.

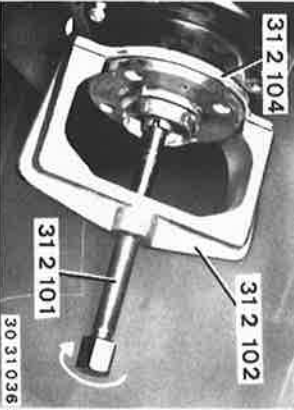
M 3:  
 Special Tool 31 2 080.  
*Installation:*  
 Replace collar nut.  
 Tightening torque\*.  
 Lock collar nut.



30 31 035

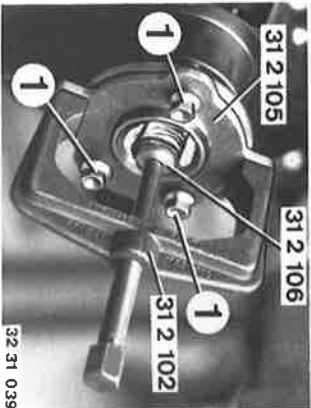
Pull off bearing unit with Special Tools 31 2 101/102/104.

*Important!*  
 A pulled off bearing unit must not be reused.



30 31 036

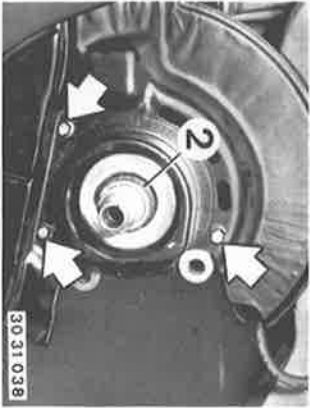
\* See Specifications of Gr. 34



32 31 039

M 3:  
 Pull off bearing unit with Special Tools 31 2 102/105/106 and wheel bolts (1).  
 Bearing unit must not be reused.

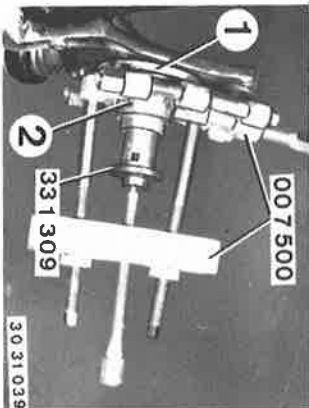
*Important!*  
 Remove the guard, if the inside bearing inner race (2) remains on the stub axle after pulling off the bearing unit.



30 31 038

Bend dust guard (1) back and pull off bearing inner race (2) with Special Tool 00 7 500 and Special Tool 33 1 309.

*Installation:*  
 Replace dust guard (1).



30 31 039

## 31-11

### 31 31 000 REMOVING AND INSTALLING LEFT OR RIGHT FRONT SPRING STRUT ASSEMBLY

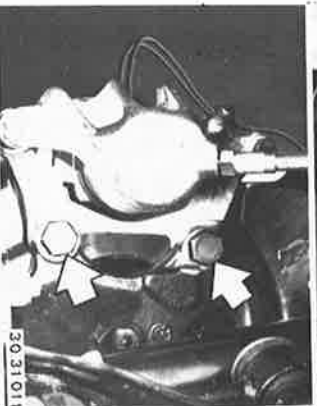
Remove front wheel — see Group 36.  
Disconnect plugs for brake pad wear indicator and EDC (see information in Group 37).  
Unscrew ground lead.  
Disconnect wires and brake hose in holder on spring strut.  
Remove ABS pulse sender — see Group 61.



30 31 010

Unscrew brake caliper and suspend from body on a piece of wire — brake hose remains connected.

*Installation:*  
Tightening torque\*.



30 31 011

Unscrew push rod on stabilizer.

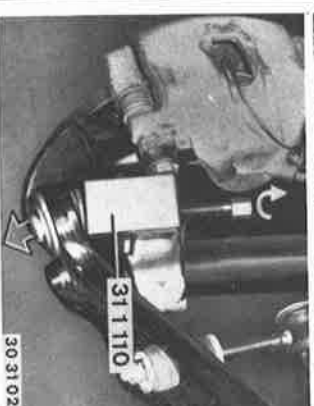
*Installation:*  
Tightening torque\*.



30 31 019

Unscrew nut and press off guide joint with Special Tool 31 1 110 (or 31 2 160 for M 3 cars).

*Installation:*  
Replace self-locking nut.  
Keep grease off or out of pin and bore.  
Tightening torque\*.

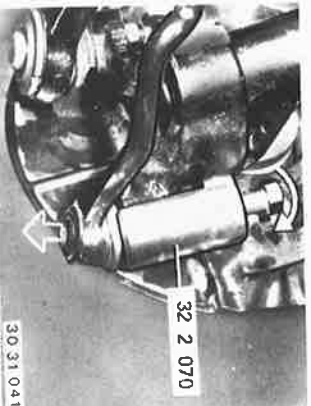


30 31 026

\* See Specifications

Unscrew nut and press off the rod joint with Special Tool 32 2 070 (or 31 2 160 for M 3 cars).

*Installation:*  
Replace self-locking nut.  
Keep grease off and out of pin and bore.  
Tightening torque\*.



30 31 041

Press spring strut out and push over the guide joint pin.

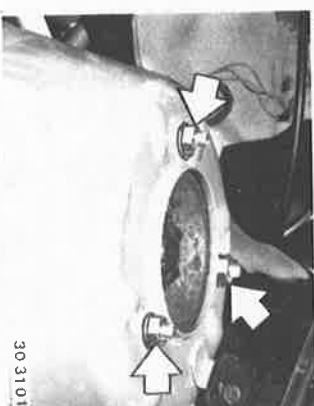


30 31 042

Support spring strut.

Unscrew nuts.

*Installation:*  
Replace self-locking nuts.  
Tightening torque\*.



30 31 018

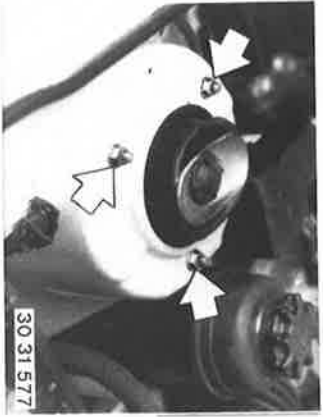
#### *Important!*

Always store shock absorbers in upright position. If shock absorbers are stored laying down with their piston rods moved in, this could cause a knocking noise when used in car again.  
*Remedy:*  
Store shock absorbers standing upright and with piston rods moved out at ambient temperature for 24 hours.

\* See Specifications

## 31-11.2

Support spring strut.  
Unscrew nuts.  
*Installation:*  
Replace self-locking nuts.  
Tightening torque\*.



\* See Specifications

## 31-13

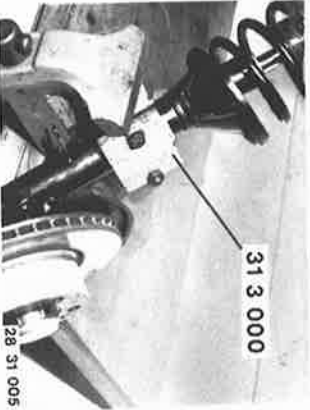


28 31 035

### 31 32 001 REPLACING FRONT SPRING STRUT SHOCK ABSORBER

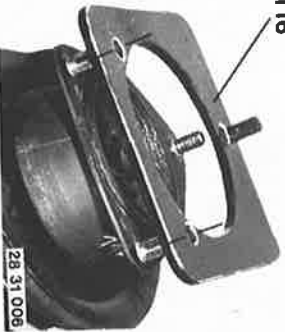
**Important!**  
Always replace shock absorbers with ones having same code K.  
To know whether shock absorbers have to be replaced, check installed absorbers with a "Shock Tester" or removed in an absorber testing machine.  
Also refer to Service Information 37 02 83 (177).

Cars with Electronic Absorber Control (EDC):  
Refer to information in Group 37.



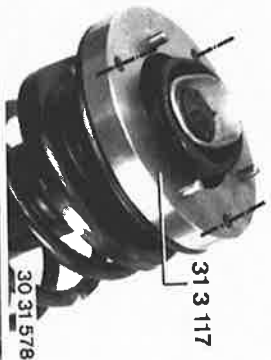
28 31 005

Remove spring strut assembly – see 31 31 000.  
Take up spring strut in a vise with Special Tool 31 3 000.



28 31 006

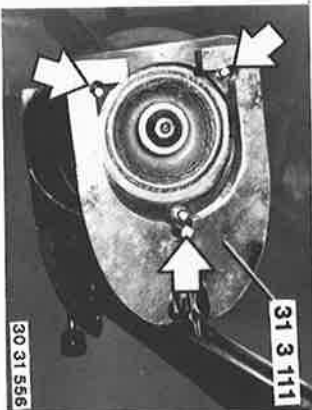
Set up Special Tool 31 3 116 on mount.



30 31 578

31 3 117

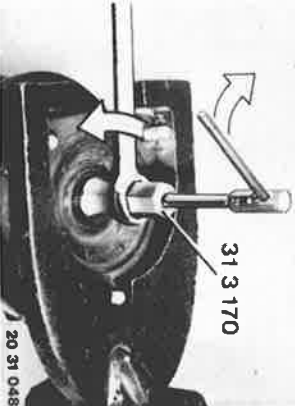
All Wheel Drive Cars:  
Set up Special Tool 31 3 117 on mount.



30 31 556

31 3 111

Compress coil spring with Special Tool 31 3 111.  
**Important!**  
Pins must fit in openings.



20 31 048

31 3 170

Lift off cap.  
Unscrew self-locking nut with Special Tool 31 3 170 – counterholding on the piston rod.  
**Installation:**  
Replace self-locking nut.  
Tightening torque\*.



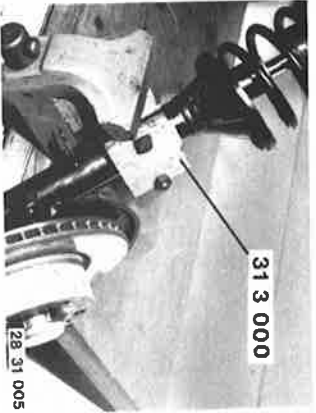
31 3 115

Take off washer (2).  
Screw in Special Tool 31 3 115 entire length of threads.  
Release and take off special tool compressor.

28 31 020

\* See Specifications

## 31-15



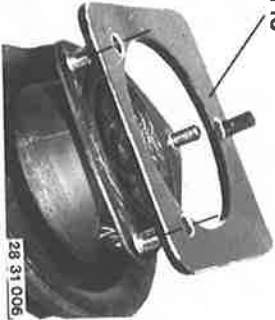
### 31 33 001 REPLACING SPRING STRUT MOUNT

Remove spring strut assembly – see 31 31 000. Take up spring strut in a vise with Special Tool 31 3 000.

*Important!* If a correction mount (see Group 32) is used, install a new mount with the same code.

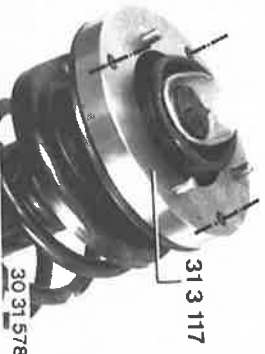
28 31 005

31 3 116



28 31 006

Set up Special Tool 31 3 116 on mount.



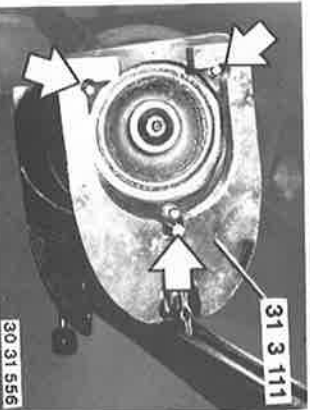
31 3 117

30 31 578

All Wheel Drive Cars:  
Set up Special Tool 31 3 117 on mount.

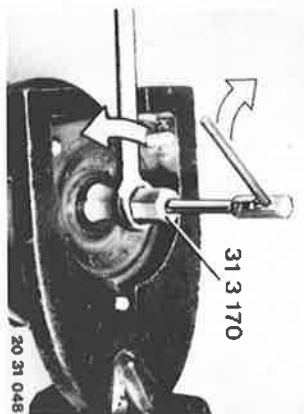
Compress coil spring with Special Tool 31 3 111.

*Important!*  
Pins must fit in openings.



31 3 111

30 31 556



31 3 170

20 31 048

Pull off cap.  
Unscrew self-locking nut with Special Tool 31 3 170.

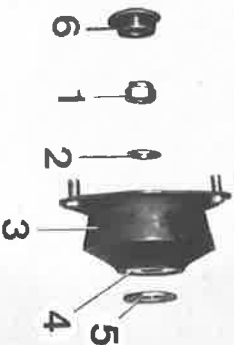
*Installation:*  
Replace self-locking nut.  
Tightening torque\*.



31 3 115

28 31 020

Remove washer (2).  
Screw in guide sleeve 31 3 115 entire length of threads.  
Release and remove special tool compressor.



Lift off mount.  
Installed Order:  
1 Self-locking nut  
2 Washer with small diameter  
3 Mount  
4 Seal  
5 Washer with large diameter  
6 Cap  
Internal curved surface of seal (4) faces the mount.

20 31 045

Lift off upper spring retainer with rubber ring and coil spring.

*Installation:*  
Check upper and lower rubber rings, replacing if necessary.  
Ends of coil spring must rest on shoulders in lower and upper spring retainers.

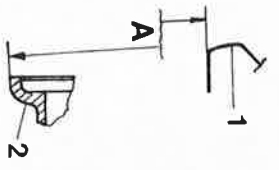


730 31 057

\* See Specifications

# 31-16.1

## 31 33 . . . CHECKING AND CORRECTING HEIGHT



28 32 0 91

- Load down car to normal position\*.
- Measure actual height (A) from wheel house lower edge (1) to rim flange (2) at center of wheel height. Determine the mean value of each wheel after lifting and lowering the car body, and then the mean value of the axle.
- Determine any deviation from the nominal height value\*.
- Identify the installed springs — see 31 33 100.
- Find correction spring in the table. The numbers are height deviation (nominal values in mm) between the pertinent springs.

**Example:**

The car is equipped with coil springs having BMW No. 1 126 516 and is, for example, 7 mm (0.275") too deep due to so many optional extra equipment parts. The nominal height is reached by installing springs with BMW No. 1 127 282 (see 31 33 100 for determination of part numbers).

Table for 318 i, 325 e up to 1986 Models:

- A = Equipment after correction
- B = Equipment of delivered car
- a = Adjusted higher
- b = Adjusted lower

**Information:**  
 Thick spring ring for coil springs with red stripe.  
 Thin spring ring for coil springs without red stripe.  
 The height can be adjusted additionally by ± 5 mm (0.197") by exchanging these spring rings.

		a		A															
b																			
1 127 935		1 127 935	+6	1 127 279	+14	1 126 516	+20	1 127 282	+21	1 128 349	+20	1 129 880	+20	1 125 341	+19	1 127 503	+16	1 125 726	+5
1 126 397	-6	1 126 397	+6	1 127 279	+8	1 126 516	+14	1 127 282	+21	1 128 349	+20	1 129 880	+20	1 125 341	+19	1 127 503	+16	1 125 726	+5
1 127 279	-12	1 127 279	-7	1 126 516	+7	1 127 282	+14	1 128 349	+20	1 129 880	+20	1 125 341	+19	1 127 503	+16	1 125 726	+5		
1 126 516	-12	1 126 516	-12	1 127 282	-7	1 128 349	+7	1 129 880	+20	1 125 341	+19	1 127 503	+16	1 125 726	+5				
1 127 282		1 127 282	-12	1 128 349	-12	1 129 880	-6	1 125 341	+19	1 127 503	+16	1 125 726	+5						
1 128 349		1 128 349	-12	1 129 880	-11	1 125 341	+19	1 127 503	+16	1 125 726	+5								
1 129 880		1 129 880	-9	1 125 341	+19	1 127 503	+16	1 125 726	+5										
1 125 341		1 125 341	-4	1 127 503	+16	1 125 726	+5												
1 127 503		1 127 503	-8																
1 125 726		1 125 726	-10																

\* See Specifications

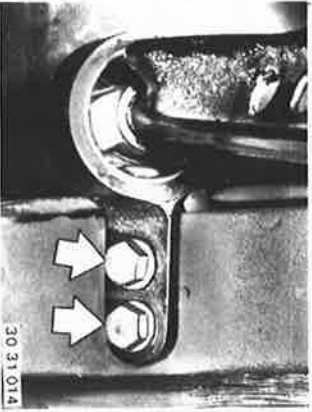
## 31-17

### 31 35 000 REMOVING AND INSTALLING OR REPLACING FRONT STABILIZER

Disconnect thrust rods on stabilizer at left and  
right sides.  
*Installation:*  
Tightening torque\*.



Disconnect left bracket for control arm.  
*Installation:*  
Tightening torque\*.



Disconnect left and right stabilizer mounts.  
Remove stabilizer.  
*Installation:*  
Tightening torque\*.



\* See Specifications



# 31 - 19

## TROUBLESHOOTING FRONT AXLE

Condition	Cause	Correction
Long after-swinging of body after passing over rough road	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Wiping of body when passing over successive rough road surfaces	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Rising of body when accelerating	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Wheels jumping even on normal road surfaces	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Car breaking out when braking	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers
Breaking out (skidding) in curves due to poor track holding	Shock absorber efficiency weak (see Troubleshooting Shock Absorbers)	Replace shock absorbers

**FRONT AXLE FINAL DRIVE**

**Type of teeth:** Gleason hypoid spiral teeth, right-hand spiral direction  
- code F 86 on ring gear and pinion -.

**Ratio\*:** On data plate (oil sump).

**Oil grade:** See Operating Fluids

**Oil volume\*:** Pour in oil slowly - recheck oil level approx. 30 seconds  
after the first overflow.

**Breaking-In Procedures After Replacing or Repairing Front Axle Final Drive:**

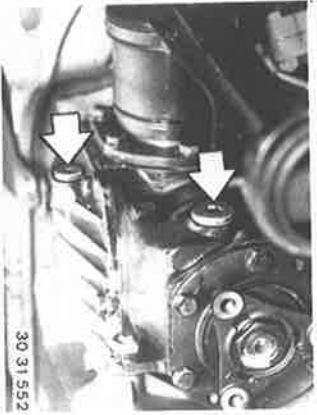
Max. permissible road speed during the first 1,000 km (600 miles) = 2/3rds of  
the top speed.  
The breaking-in procedures and oil change intervals for new cars are  
applicable.  
The driver must be reminded with a label or tag.

\* See Specifications

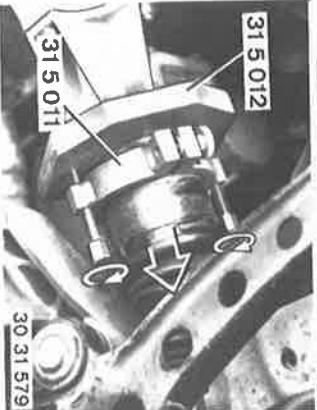
## 31-23

### 31 51 010 REPLACING SHAFT SEAL FOR INPUT FLANGE OF FRONT AXLE FINAL DRIVE

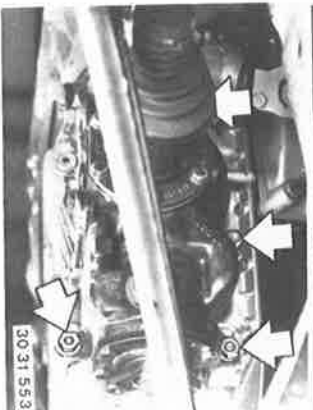
Remove splash guard — see Gr. 51.  
Remove front propeller shaft — see Gr. 26.



Drain final drive oil.  
*Installation:*  
Pour in final drive oil\*\*.  
Tightening torque\*.

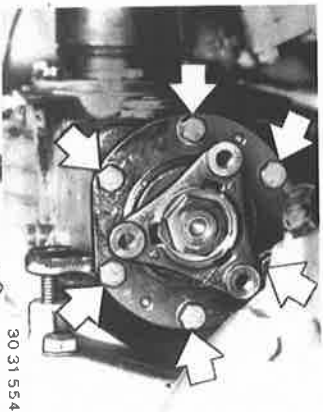


Pull right output shaft out of front axle final drive by approx. 15 mm (0.591") with Special Tools 31 5 011 / 012.  
*Installation:*  
See note for output shaft.

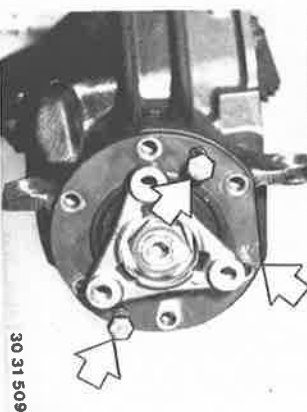


Unscrew nuts and press front axle final drive away from engine oil pan by 10 to 15 mm (0.394 to 0.591").  
*Installation:*  
Tightening torque\*.

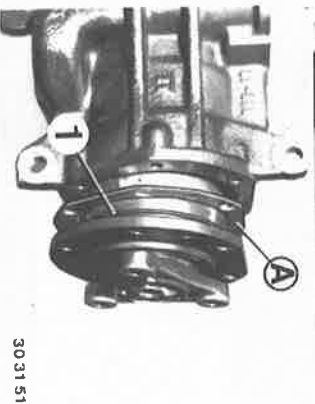
\* See Specifications  
\*\* See Operating Material Specifications



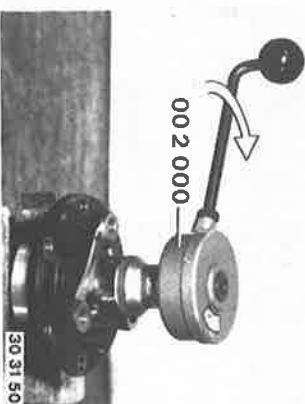
Unscrew bolts.  
*Installation:*  
Flat surface on drive set faces flat surface on case.  
Tightening torque\*.



Pull drive set out of case by screwing in two M 8 x 30 bolts uniformly.



*Installation:*  
Install shim (A) again and replace seal (1).



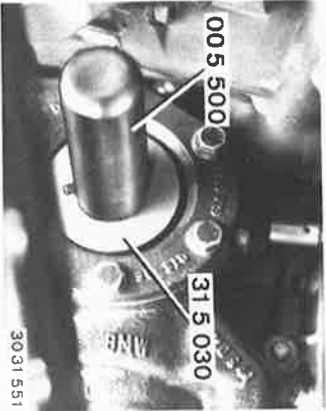
Clamp drive set in vise fitted with aluminum jaws.  
Measure friction torque with Special Tool 00 2 000 while turning uniformly and note value.

\* See Specifications

## 31-25

### 31 51 015 REPLACING SHAFT SEAL FOR LEFT OUTPUT SHAFT

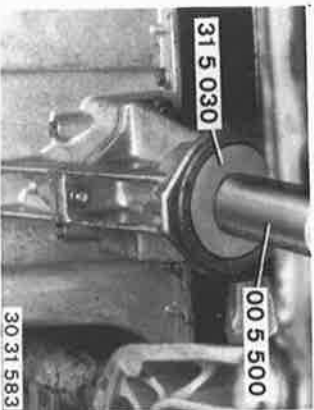
Remove output shaft 31 60 000, however only  
loosen collar nut of output shaft.



Lift out shaft seal.  
Dip new shaft seal in gear lube and drive in  
against stop with Special Tools 31 5 030  
and 00 5 500.

### 31 51 020 REPLACING SHAFT SEAL FOR RIGHT OUTPUT SHAFT

Remove output shaft 31 60 000.



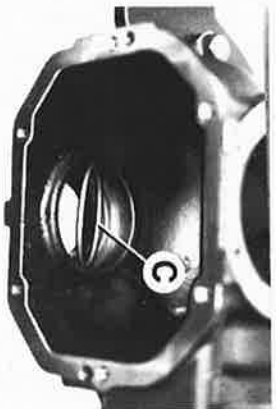
Lift out shaft seal.  
Dip new shaft seal in gear lube and drive in  
against stop with Special Tools 31 5 030  
and 00 5 500.

## 31-37

31 53 520 REPLACING BOTH BEARINGS  
FOR DIFFERENTIAL

— Front Axle Final Drive  
Removed —

Always replace both bearings.  
Remove differential for front axle final drive  
— 31 53 500.



Measure and note thickness of shim (C).



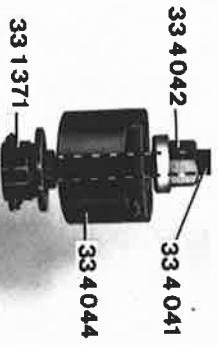
Drive shaft seal out of bearing cover.

*Installation:*

Replace shaft seal.  
Dip new shaft seal in front axle final drive gear lube\* and drive in with Special Tools 00 5 500 and 31 5 030.



30 31 516



33 4 042

33 4 041

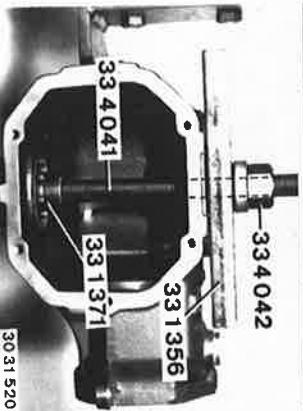
33 4 044

Clamp bearing cover in vise fitted with aluminum jaws.  
Pull out bearing outer race with Special Tools 33 1 371 and 33 4 041 / 042 / 044.



30 31 519

Pull out bearing outer race with Special Tools 33 1 356 / 371 and 33 4 041 / 042.



33 4 041

33 1 356

33 1 371

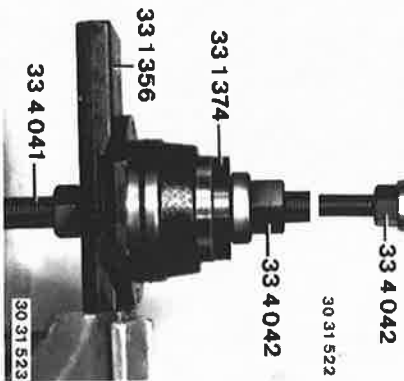
30 31 520

\* See Operating Material Specifications



30 31 521

Install shim (C) and pull in bearing outer race with Special Tools 33 1 374, 33 4 041 / 042 / 044.



30 31 522

Pull in bearing outer race with Special Tools 33 1 356 / 374 and 33 4 041 / 042.



33 1 301

33 1 308

31 5 090

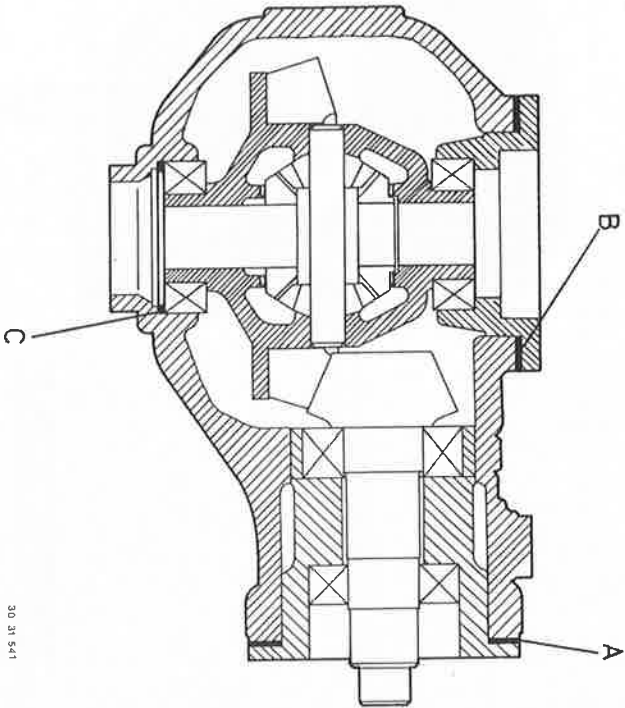
30 31 524

Clamp differential in vise fitted with aluminum jaws.  
Pull off both tapered roller bearings with Special Tools 33 1 301 / 308 and 31 5 090.

# 31-39

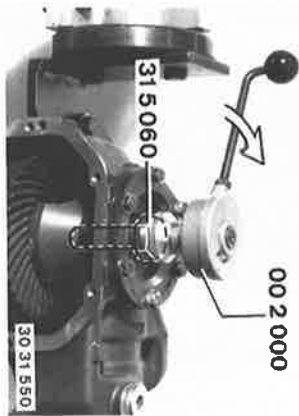
## ADJUSTMENTS ON FRONT AXLE FINAL DRIVE

Adjustments are made with shims A, B and C, which are available in appropriate thicknesses.



- A = Shim for block distance adjustment
- B and C = Shim for differential bearing torque adjustment
- Shim for backlash adjustment

30 31 541



1. Friction Torque Adjustment of Differential Tapered Roller Bearings:  
Dip bearings in gear lube\*\*.  
Install differential with the originally installed shim (B).

Measure friction torque with Special Tools.  
31 5 060 and 00 2 000, while turning uniformly.  
Nominal value\*.  
Friction Torque Excessive.  
Install thicker shim (B) until nominal value\* is reached.  
Friction Torque Insufficient:  
Install thinner shim (B) until nominal value\* is reached.  
Shims are available in steps of 0.03 (0.0012"), 0.02 (0.0008") and 0.01 mm (0.0004").

Add thicknesses of shims (B + C).  
This total thickness must be maintained while adjusting the backlash afterwards.

\* See Specifications  
\*\* See Operating Material Specifications

# 31-41

Determine shim thickness.

Example:

Installed shim (A)	1.80 mm (0.071")
+ D target	+ 3.98 mm (0.156")
<hr/>	
- D actual	5.78 mm (0.227")
	- 3.90 mm (0.153")
Shim thickness (A)	1.88 mm (0.074")

Max. deviation from determined shim thickness =  $\pm 0.01$  mm (0.0004").  
This means in our example, for instance a shim with a thickness of 1.89 mm (0.0744") must be installed.

Shims are available in appropriate thickness steps.

4. Tooth Contact Pattern

Type of teeth - Gleason.  
Coat ring gear with printer's ink.  
Turn differential several times in both directions and stop ring gear suddenly with a piece of wood.

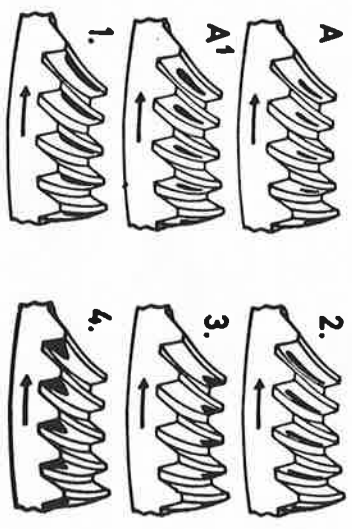
BASIC INFORMATION FOR TOOTH CONTACT PATTERN ADJUSTMENTS

Gleason Teeth

A Correct tooth contact pattern without load.

A 1 Loads will displace the tooth contact pattern slightly more toward the outside. Moving the ring gear will mainly change the backlash and also the tooth contact pattern in longitudinal direction of the teeth. Moving the drive pinion will change the tooth contact pattern in direction of tooth height, while the backlash will be changed only slightly. Here are the four basically wrong tooth contact patterns, which normally occur in combination and the knowledge of which will make practical adjustments easier.

- 1. High, narrow tooth contact pattern (head) on ring gear.  
*Move drive pinion toward ring gear axis and possibly correct backlash by pressing ring gear away from drive pinion.*
- 2. Deep, narrow tooth contact pattern (base) on ring gear.  
*Move drive pinion away from ring gear axis and possibly correct backlash by pressing ring gear closer.*
- 3. Brief tooth contact pattern on small tooth end (tip) of ring gear.  
*Move ring gear away from drive pinion. If applicable, move drive pinion closer to ring gear axis.*
- 4. Brief tooth contact pattern on large tooth end (heel) of ring gear.  
*Move ring gear closer to drive pinion. If applicable, move drive pinion away from ring gear axis.*





# 31-45

## 31 60 000 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT OUTPUT SHAFT

Remove front wheel — see Group 36.

Drain gear lube.

*Installation:*

Pour in gear lube\*\*.

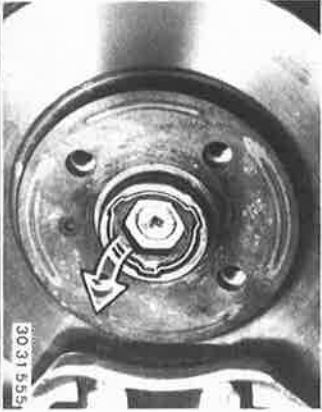
Tightening torque\*.

Lift out lockplate with a screwdriver.  
Unscrew collar nut.

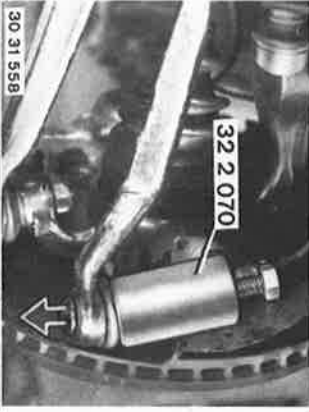
*Installation:*

Drive in new lockplate with Special Tools

33 4 050 and 00 5 500.



30 31 555



32 2 070

30 31 558



31 2 160

30 31 564

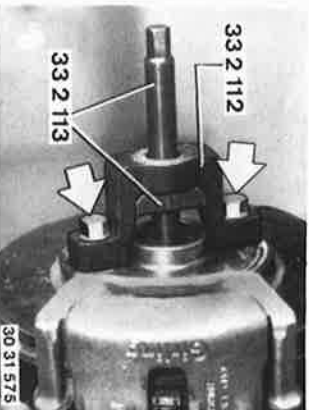
Unscrew nut and press off control arm with Special Tool 31 2 160.

*Installation:*

Tightening torque\*.

Look nut with a cotter pin.

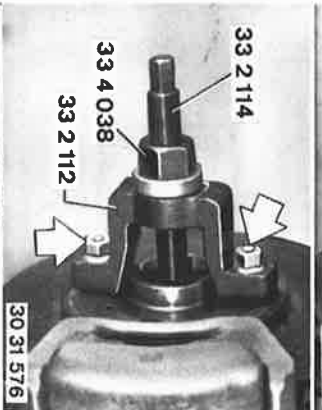
\*\* See Specifications  
\*\* See Operating Material Specifications



33 2 112

33 2 113

30 31 575



33 2 114

33 4 038

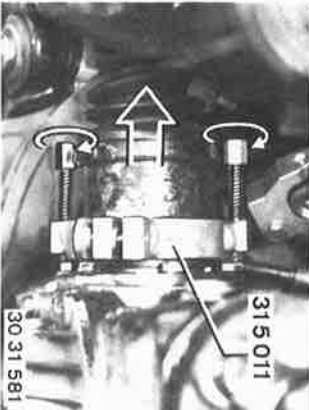
33 2 112

30 31 576

Mount Special Tools 33 2 112 / 113 with two wheel bolts and press off output shaft.

*Installation:*

Give splines of output shaft a light coat of oil and pull in output shaft with Special Tools 33 2 112 / 124 and 33 4 042.



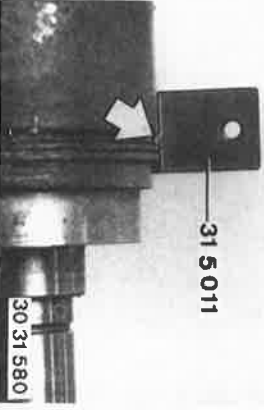
31 5 011

30 31 581

Left Side:

Pull off output shaft with Special Tool 31 5 011.  
Pressure spindle bears on bolt head.  
Screw in pressure spindle alternately.

*Note:*  
Ring of Special Tool 31 5 011 is located in groove of shaft.



31 5 011

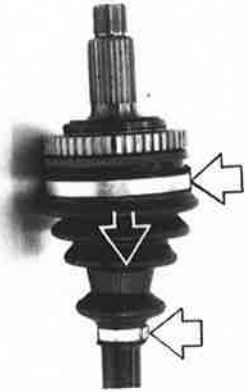
30 31 580

## 31-47

31 60 020 REPLACING ONE CONSTANT VELOCITY JOINT (OUTER)  
31 60 021 REPLACING ONE CONSTANT VELOCITY JOINT (INNER)  
OF OUTPUT SHAFT

Remove front output shaft 31 60 000.

Loosen both hose clamps and pull dust cover off of joint.



30 31 595

Spread open circlip and drive joint off of the shaft with a plastic hammer.



30 31 596

**Constant Velocity Joint (Outer):**  
Add about half of the grease in a 80 gr. tube.

**Constant Velocity Joint (Inner):**  
Add grease from a 80 gr. tube.



30 31 597



30 31 598

Clean and remove grease on splines of shaft and joint.  
Coat splines of shaft completely with Loctite No. 270.  
Drive joint on to shaft with a plastic hammer until circlip (1) engages.

**Outer Joint:**  
Add remaining amount of grease in joint.

**Inner Joint:**  
Add grease of 70 gr. tube in joint.

# 32 Steering and Wheel Alignment

060	Power steering pump — remove and install	32 - 16
109	Power steering pump drive belt — tighten	32 - 16
	Power steering pump — layout drawing	32 - 17
533	Power steering pump — disassemble and assemble	32 - 18

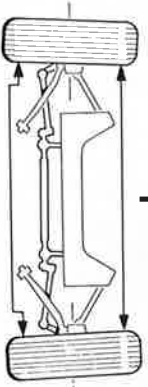
## SUPPLEMENT RESTRAINT SYSTEM

	Components	32 - 50
	Description	32 - 50
	Safety regulations	32 - 51
	Troubleshooting	32 - 52
32 31 090	Steering column assembly (SRS) — remove and install	32 - 56
32 33 000	Steering wheel (SRS) — remove and install	32 - 57
32 34 020	Airbag unit (SRS) — remove and install or replace	32 - 58
510	Contact ring (SRS) — replace	32 - 59
65 77 010	SRS diagnosis unit — remove and install or replace	32 - 60
020	Front crash sensor — remove and install or replace	32 - 60
040	SRS safety switch — replace	32 - 61

GENERAL INFORMATION + DEFINITIONS

Toe

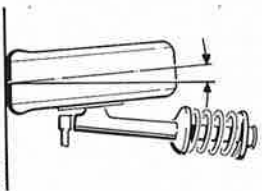
is the reduction in distance of front of front wheels to rear of front wheels. Toe prevents the wheels from running apart while driving and consequently wheel shimmy and grinding, excessive tire wear, excessive loads on steering linkage and joints as well as hard steering of car. Toe is measured in "straight ahead position".



323 32 012

Camber

is the inclination of the wheel to the car's axial plane, measured in the car's lateral plane with "straight ahead drive".

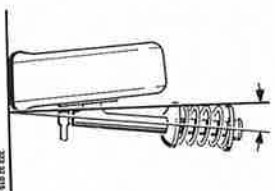


323 32 014

King Pin Inclination

is the angle, by which the king pin is inclined inward from a perpendicular line to the lateral axis of the car. The king pin inclination produces returning forces, which return the road wheels and steering wheel to straight ahead after driving through a curve or around a corner.

Camber and king pin inclination determine the location of the wheel contact point with the road surface. King pin inclination reduces the leverage, on which frictional forces are engaged, which makes it easier to turn the wheels to left or right lock. In addition, the jolts from rough road surfaces do not have strong influence on the steering.



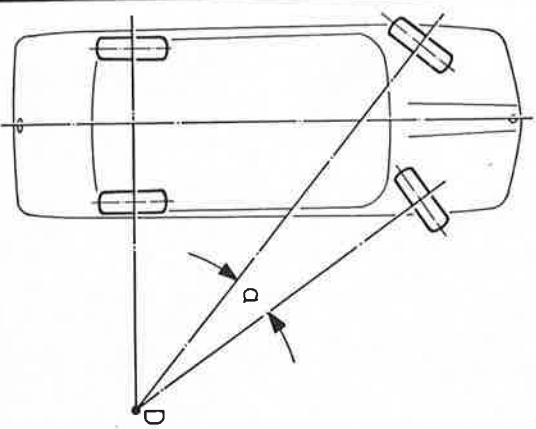
323 32 016

Toe Difference Angle

is the angular position of the wheel on the inside of a curve to the wheel on the outside of a curve when driving in a curve. The steering is designed that the angular position of the wheels changes as steering lock progresses. The toe difference angle provides information on the pertinent operation of the steering trapezoid for left or right steering lock from the center position. A correctly adjusted toe difference angle produces equal values for left and right lock in due consideration for plant tolerances.

a = Toe difference angle

D = Turning circle center point

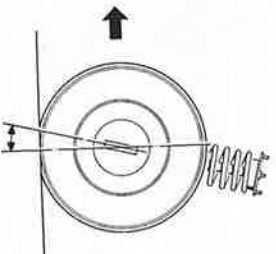


323 32 013

Caster

is the inclination of the king pin\* in forward direction as seen from the side. The wheels are pulled and not pushed because of caster. In a similar manner to king pin inclination, when driving in curves or around corners returning forces are produced to help return the wheels to straight ahead position.

\* The "king pin" is equal to a line through the center point of the spring strut mount and control arm ball joint.



323 32 015

# 32-3

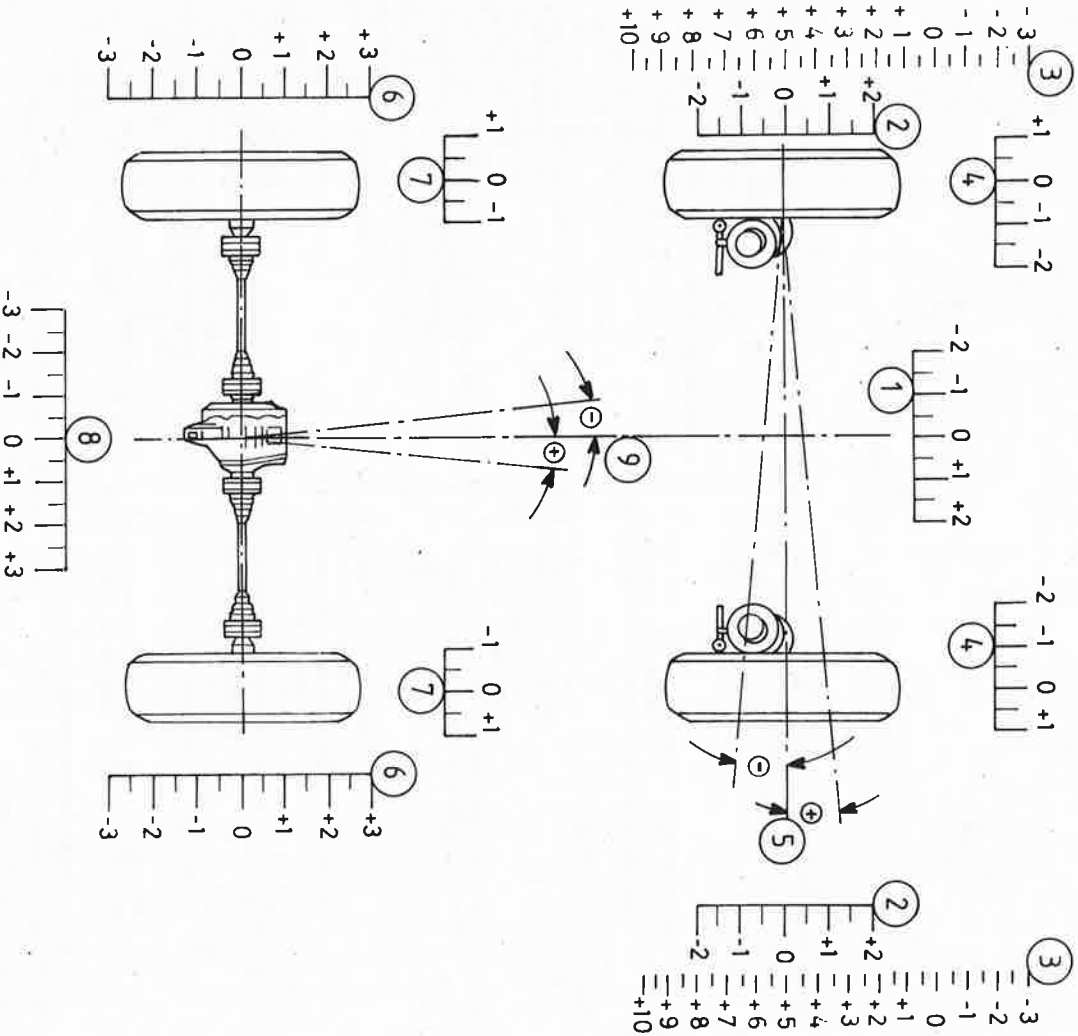
## WHEEL ALIGNMENT

### 32 00 . . . CHECKING AND ADJUSTING FRONT AND REAR WHEEL ALIGNMENT WITH OPTICAL TESTER

#### Requirements Prior to Checking Wheel Alignment:

1. Good, uniform tire treads.
  2. Specified tire inflation pressure\*\*.
  3. Wheel rims in perfect condition\*.
  4. Specified wheel bearing play\*.
  5. Car brought to normal position\*.
  6. Specified height\*.
- Check actual values with an optical tester.  
Fill in test sheet.  
Nominal values\*.

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

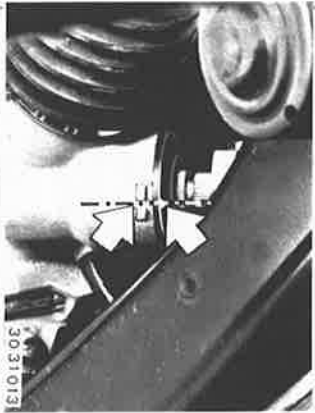


\* See Specifications of Gr. 31/32/33/36  
\*\* See Service Information of Gr. 36

## 32-5

### 32 00 004 ADJUSTING TOE AND TOE DIFFERENCE ANGLE

Position steering gear to straight ahead.  
(Marks on housing and steering shaft aligned.)



Loosen clamping bolts of tie rods.  
Adjust toe on left and right wheels to nominal  
value\* by turning tie rods.

*Installation:*  
Make sure ball socket joints and dust covers  
are not twisted.  
Tightening torque\*.



\* See Specifications

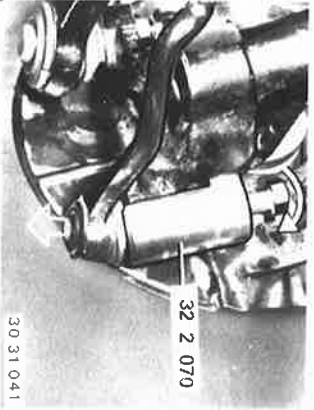
\* See Specifications

## 32-6

### TROUBLESHOOTING REAR WHEEL ALIGNMENT

Condition	Cause	Correction
6 Camber deviation	<ul style="list-style-type: none"> <li>a) Rubber mounts on rear axle carrier defective</li> <li>b) Rubber mounts on final drive defective</li> <li>c) Silent blocks in trailing arms defective</li> <li>d) Rear axle carrier deformed</li> <li>e) Trailing arms deformed</li> <li>f) Distortion in floor assembly</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace rubber mounts</li> <li>b) Replace rubber mounts</li> <li>c) Replace silent blocks</li> <li>d) Replace rear axle carrier</li> <li>e) Replace trailing arms</li> <li>f) Repair body</li> </ul>
7 Rear wheel positioning incorrect	<ul style="list-style-type: none"> <li>a) Rear axle carrier displaced laterally</li> <li>b) Distortion in floor assembly</li> </ul>	<ul style="list-style-type: none"> <li>a) Check rubber mounts on rear axle carrier, replacing if necessary</li> <li>b) Repair body</li> </ul>
8 Toe deviation	<ul style="list-style-type: none"> <li>a) Rear axle carrier deformed</li> <li>b) Trailing arms deformed</li> <li>c) Silent blocks in trailing arms defective</li> <li>d) Rubber mounts on rear axle carrier defective</li> <li>e) Suspension sag excessive or car not in normal position</li> <li>f) Unfavorable summation of tolerances</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace rear axle carrier</li> <li>b) Replace trailing arms</li> <li>c) Replace silent blocks</li> <li>d) Replace rubber mounts</li> <li>e) Height level, see Specifications of Group 33</li> <li>f) Replace coil springs, if necessary</li> <li>Install eccentric silent blocks, see 33 22 561</li> </ul>
9 Deviation in geometrical axis (alignment tester Type F 1600)	<ul style="list-style-type: none"> <li>a) Assuming total rear wheel toe is correct:</li> <li>a) Distortion in floor assembly</li> </ul>	<ul style="list-style-type: none"> <li>a) Repair body</li> </ul>

## 52-7.1



Unscrew nuts and press left and right tie rods off of the rod arms with Special Tool 32 0 070 (M 3: Special Tool 31 2 160).

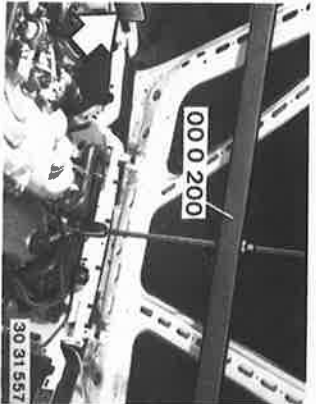
**Installation:**  
Clean pins and bores to remove grease. Replace self-locking nuts. Tightening torque\*.

Unscrew bolts and remove steering gear.

**Installation:**  
Mount steering gear in rear bores of front axle carrier.  
Replace self-locking nuts.  
Tightening torque\*.  
Bleed power steering – see 32 13 006.

If applicable, unscrew additional engine mounts on left and right sides.

**Installation:**  
Turning lock (1) of engine mount must engage in the bore.  
Tightening torque\*.



Attach Special Tool 00 0 200 on engine and lift engine about 5 cm (2"). Supports bear on the bolts of side panels.  
Remove steering gear.

\* See Specifications



## 32-7.3

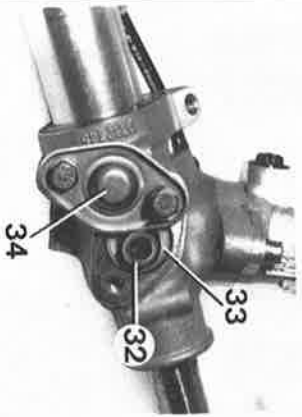
### 32 13 503 DISASSEMBLING/ASSEMBLING POWER STEERING GEAR -POWER STEERING GEAR REMOVED -

Remove and install tie rods 32 21 251.  
Extreme care and cleanliness are required for  
work on steering gears.



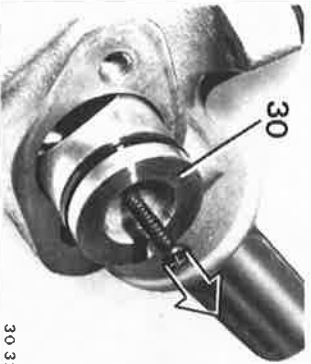
30 32 055

Disconnect lines.  
Pull off leak oil line.



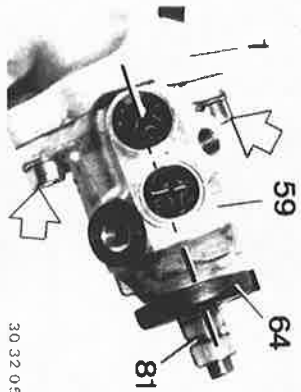
30 32 056

Unscrew bolts.  
Take off cover (34), spring (32) and washer  
(33).



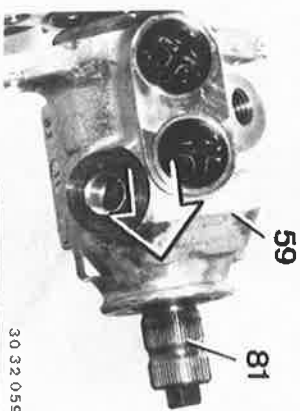
30 32 057

Screw self-tapping screw in bore and pull out  
pressure piece (30).



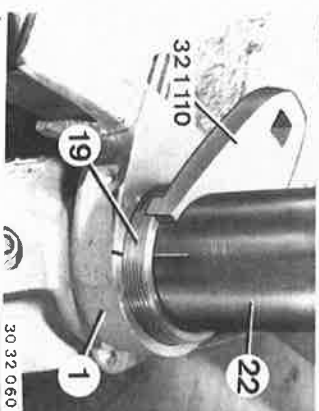
30 32 058

Pull off protective cap (64) on steering spindle  
stub.  
Turn steering to straight ahead position by  
taking half of the total number of steering  
wheel turns.  
Mark position of steering spindle (81), valve  
housing (59) and body (1) to each other in this  
position.  
Unscrew bolts.



30 32 059

Pull steering spindle (81) and valve housing (59)  
out of body.



30 32 060

Mark position of cylindrical tube (22) and  
body (1) to each other.  
Unscrew ring nut (19) with Special Tool  
32 1 110.  
Remove cylindrical tube.

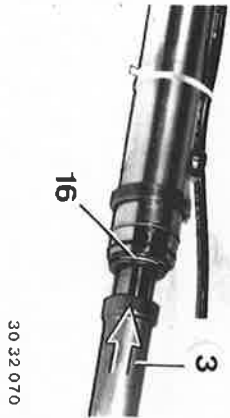


30 32 061

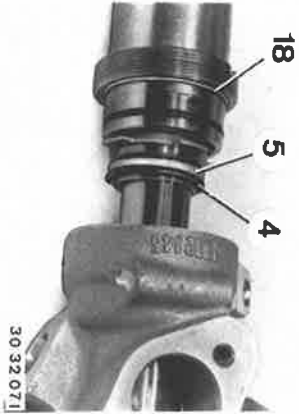
Pull rack (3) out of body.

## 32-7.5

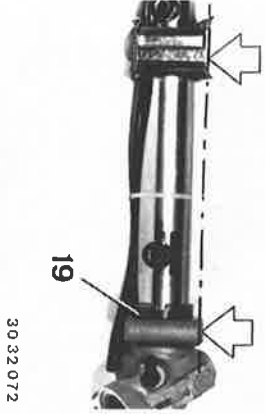
Guide rack (3) into cylindrical tube.  
*Caution!*  
Don't damage piston ring (16).



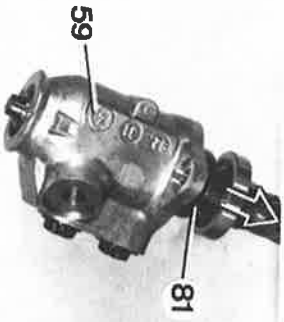
Replace spacer (5) and round seal (4).  
Lubricate splines of rack with grease\*.  
Measure and note diameter of snap ring (18).  
Guide cylindrical tube into body.



Align mounting flanges horizontally — check marks — and tighten ring nut (19).  
Tightening torque depends on wire gauge diameter of snap ring (18).  
2.5 mm (0.098") dia. = 120 Nm (87 ft. lbs.).  
3.5 mm (0.138") dia. = 150 Nm (108 ft. lbs.).  
Lock ring nut with a punch mark.



Pull valve body (81) out of valve housing (59).



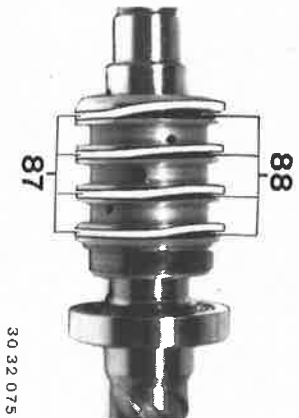
30 32 073

\* See Operating Material Specifications

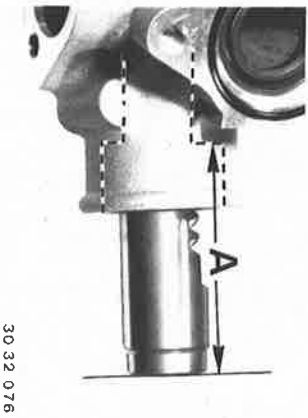


Knock out radial oil seal (58) with Special Tool 32 1 140.  
Knock in new radial oil seal (58) against stop (open end facing in) with Special Tool 32 1 080 and coat with hydraulic fluid\*.  
Knock in bearing (57) against stop with Special Tool 32 1 160.

Replace round seals (87) and seals (88) located underneath, and coat with hydraulic fluid\*.



Set rack (3) to straight ahead position.  
Distance A from end of rack to stop in cylindrical tube is 72 mm (2.835") for both left and right sides.



Dip pinion splines in grease\* and install pinion in body.  
The marks made prior to disassembling must align.



30 32 077

\* See Operating Material Specifications

## 32-8

### 32 21 251 REPLACING LEFT OR RIGHT TIE ROD

Remove front wheel – see 36 10 300.  
Unscrew nut and pry the rod end off of spring strut with Special Tool 32 0 070.

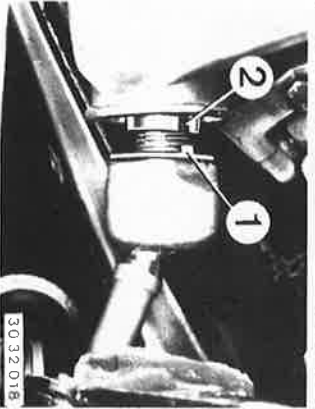
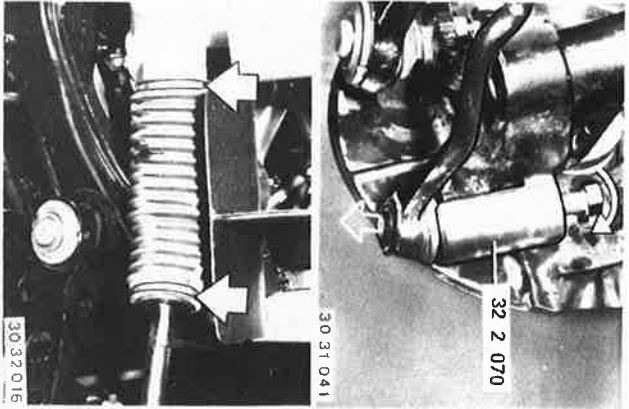
*Installation:*

Replace self-locking nut.  
Clean pin and bore to remove grease.  
Tightening torque\*.  
Check front wheel alignment with an optical tester – see 32 00 . . .

Loosen straps.

*Installation:*

Check dust cover, replacing if necessary.



Bend open lockplate.

Run in rack far enough that Special Tool 32 2 100 can just be applied.  
Disconnect the rod.

*Important!*

To avoid damage on rack and bearings, only lock (bend) lockplate with a water pump pliers (never use a hammer).

*Installation:*

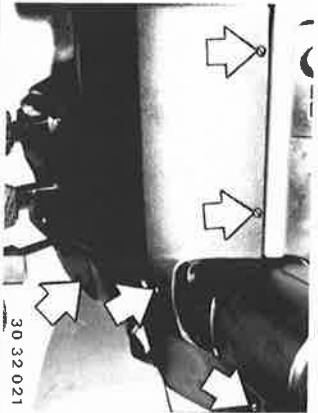
Replace lockplate.  
Shoulder (1) of lockplate rests in opening (2) of rack.  
Tightening torque\*.

\* See Specifications

## 32-10

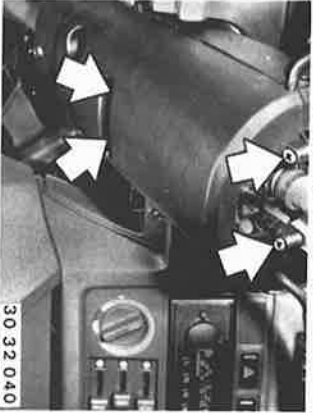
### 32 31 061 REPLACING (UPPER) STEERING SPINDLE

Disconnect battery ground lead.  
Remove and install steering wheel 32 33 000.  
Remove instrument panel trim.



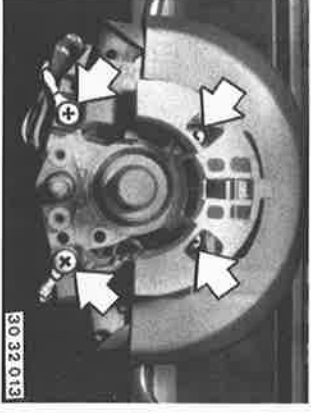
30 32 021

Remove steering column casing lower section.



30 32 040

Disconnect turn signal and wiper switch.



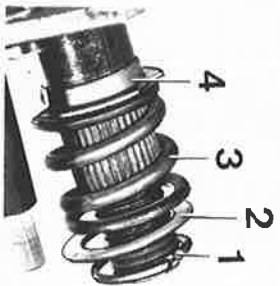
30 32 013

Remove collar ring (1).

*Installation:*  
Notch of collar ring (1) must lock snap ring (2).



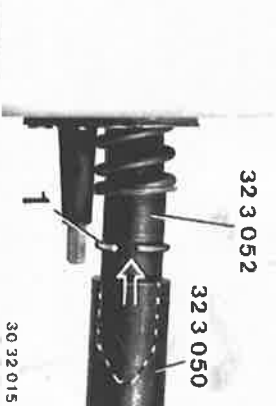
30 32 014



26 32 030

Remove snap ring (1), washer (2), spring (3) and ring (4).

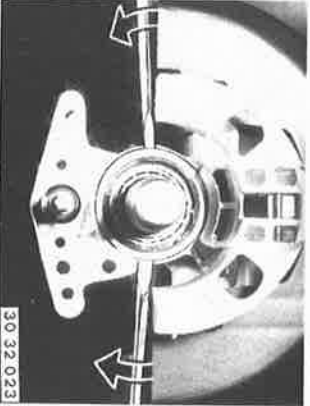
*Installation:*  
Stem of ring (4) faces bearing.



30 32 015

Lift out steering spindle bearings with a screwdriver.

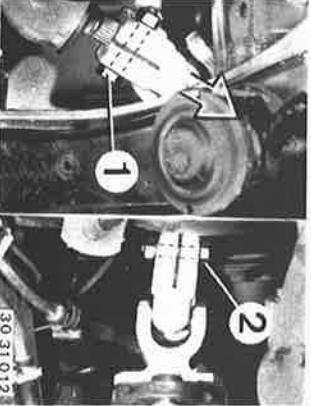
*Installation:*  
Drive in bearings with Special Tool 00 5 550.



30 32 023

Remove bolt (1) and loosen bolt (2).  
Press steering spindle off of steering gear and remove.

*Installation:*  
Bolt (1) must be located in locking groove of steering shaft.  
Replace self-locking nuts.  
Tightening torque\*.



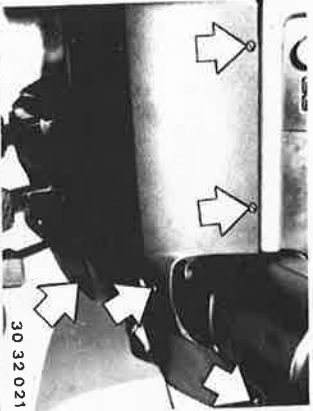
30 31 012

\* See Specifications

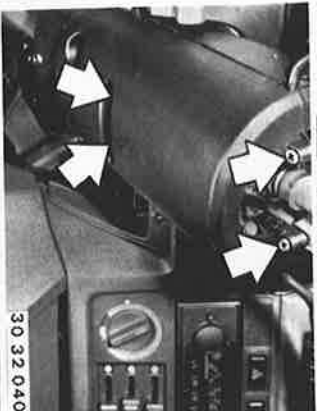
## 32-12

### 32 31 090 REMOVING AND INSTALLING STEERING COLUMN

Disconnect battery ground lead.  
Remove and install steering spindle 32 31 070.  
Remove and install steering wheel 32 33 000.  
Remove instrument panel trim lower section.



Remove steering column casing lower section.

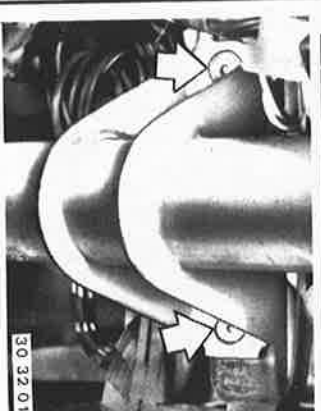


Disconnect central electric plug.

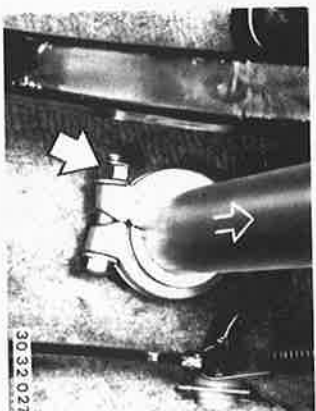


Remove shear-off screws with a chisel.  
Take off steering column casing upper section.

*Installation:*  
Tighten Torx shear-off screws to point of shearing off with Special Tool 32 3 120.



Loosen clamp and remove steering column.



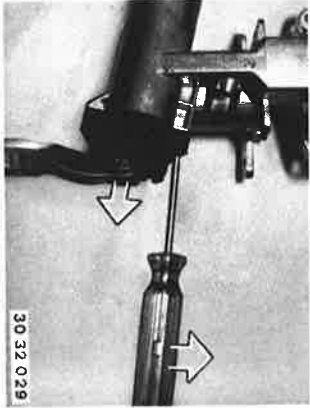
### 32 31 171 REPLACING BOTH STEERING SPINDLE BEARINGS

Procedures are identical with those for "replacing (upper) steering spindle" - 32 31 061.

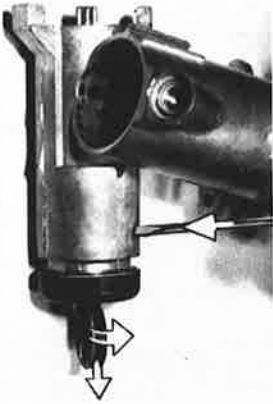
## 32-14

Press down locking hook and remove ignition/  
starter switch.

*Installation:*  
Check position of ignition/starter switch and  
steering wheel lock.

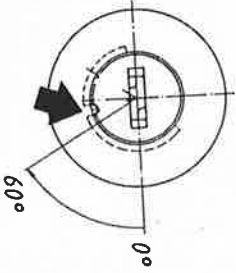


Press down lock with a screwdriver.  
Turn key to point of locking and pull out lock  
cylinder.



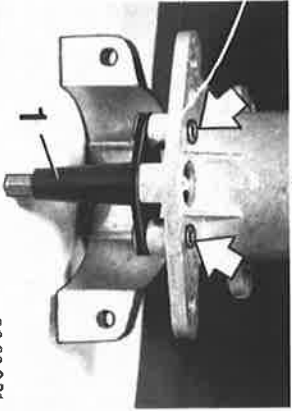
30 32 030

Since 1987 Models:  
Insert ignition key in lock cylinder and turn  
to position "R" = 60°.  
Push a 1.2 mm (3/64") dia. wire into bore of  
cylinder and pull out the lock cylinder.



32 32 093

Drill out rivets and bolt carbon contact (1) on  
new steering lock.

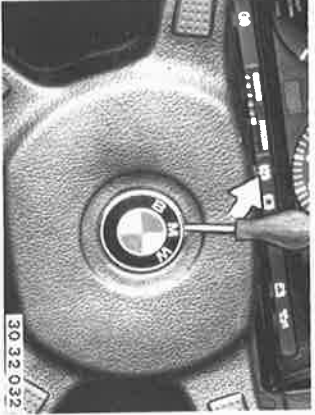


30 32 031

## 32-15

### 32 33 000 REMOVING AND INSTALLING STEERING WHEEL

Lift off BMW emblem.

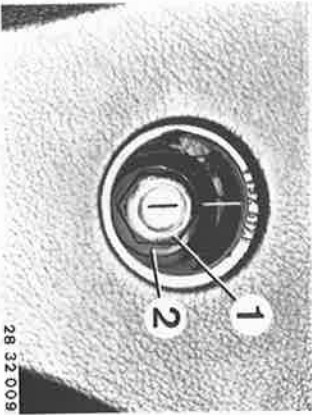


Mark position of steering wheel to steering spindle.

Unscrew nut (1) and remove washer (2).

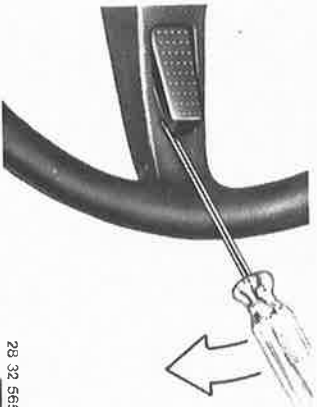
*Important!*  
Steering wheel can only be pulled off after unlocking steering lock.

*Installation:*  
Replace self-locking nut.  
Tightening torque\*.

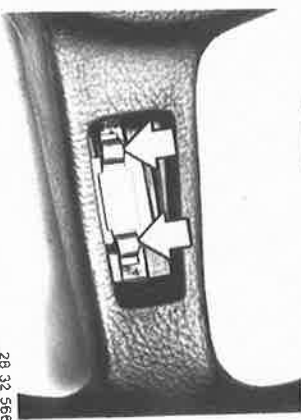


### 32 33 041 REPLACING HORN BUTTON ON STEERING WHEEL

Lift off horn button carefully with a screwdriver.



*Installation:*  
Insert spring contact with arcs facing up.

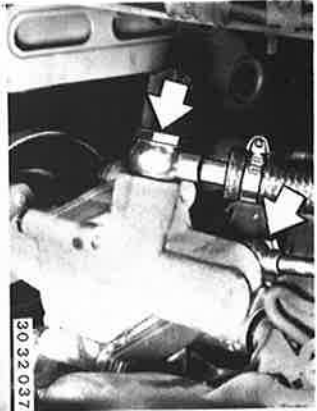


\* See Specifications

## 32-16

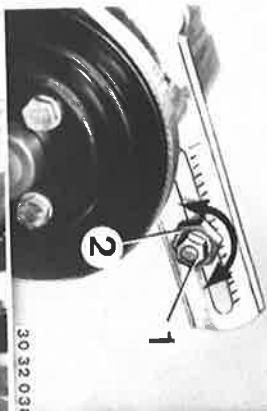
### 32 41 080 REMOVING AND INSTALLING POWER STEERING PUMP

Draw off hydraulic fluid in tank.  
Disconnect lines.  
Plug connections with dust caps.  
*Installation:*  
Replace seals.  
Tightening torque\*.  
Check for sufficient space between hoses and body-mounted parts.  
*Important!*  
Never reuse drained oil.



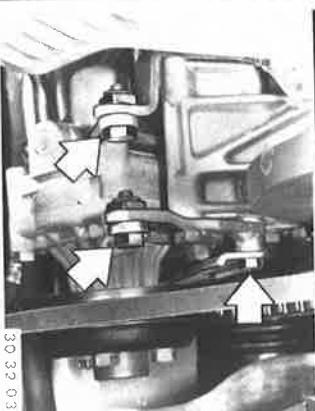
30 32 037

Loosen nut (1) and release drive belt by turning toothed element (2).



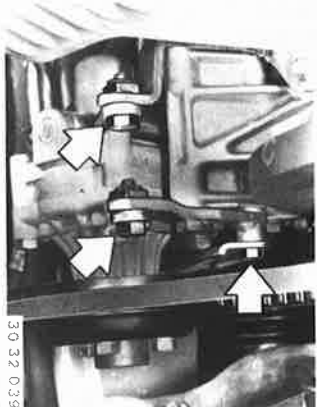
30 32 038

Unscrew bolts and take off pump.  
*Installation:*  
Tighten drive belt before tightening bolts.



30 32 039

**Tightening Drive Belt:**  
Tighten toothed element to torque of 8 to 8.5 Nm (5.8 to 6.1 ft. lbs.) and lock with nut.  
Check or correct drive belt tightness with tester 11 5 . . .  
Hook (4) rests on tip of tooth.  
Bleed power steering 32 12 006.

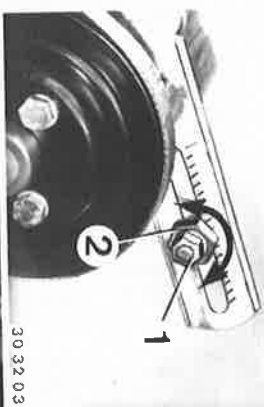


30 32 039

### 32 41 109 TIGHTENING POWER STEERING PUMP DRIVE BELT

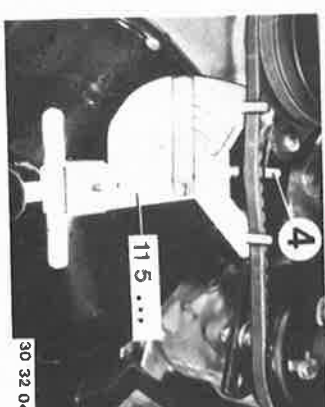
Loosen bolts.

Loosen lock nut (1).  
Tighten toothed element (2) to torque of 8 to 8.5 Nm (5.8 to 6.1 ft. lbs.) and tighten lock nut again.

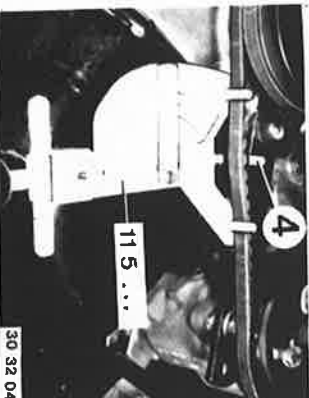


30 32 038

Check or tighten drive belt with tester 11 5 . . .  
Hook (4) rests on tip of tooth.  
Tighten bolts.  
*Installation:*  
Check for sufficient space between hoses and body-mounted parts, making corrections on hose connections if necessary.



30 32 042



30 32 042

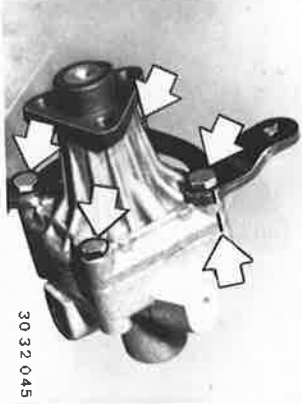
\* See Specifications



## 32 - 18

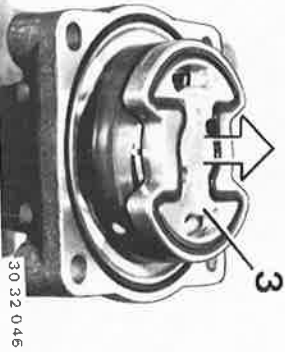
### 32 41 553 DISASSEMBLING/ASSEMBLING POWER STEERING PUMP — PUMP REMOVED —

Power steering pump code number: 7681 955.  
Absolute cleanliness is essential when working on power steering pumps.

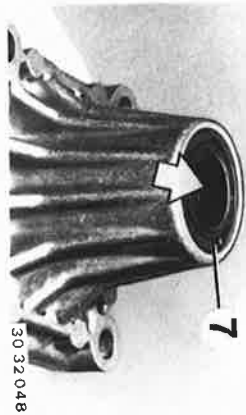
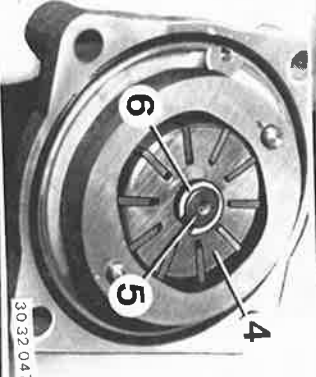


Mark position of holder (1) to pump body (2).  
Unscrew bolts and separate body.

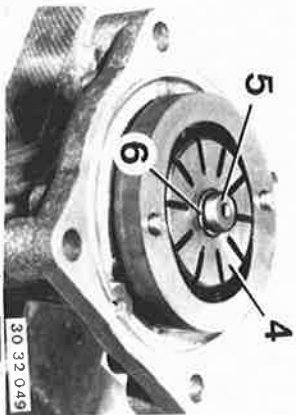
Remove face plate (3).



Press rotor (4) on shaft (5) down.  
Remove cirdclip (6) and pull shaft out of body.  
Remove rotor (4) with impellers.

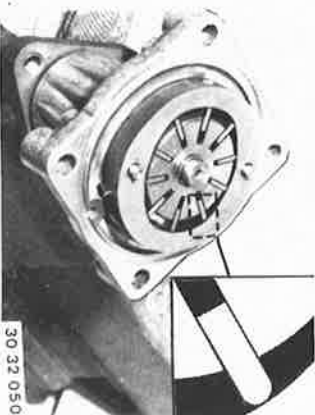


**Assembling:**  
Clean and lubricate all components with hydraulic fluid.  
Replace radial oil seal (7) and install with sealing lip facing in.  
Pack space between sealing and dust lips with grease.



Guide shaft (5) into body.  
Mount rotor (4) with recess for snap ring facing up and install snap ring (6) in radial groove of shaft.

Install impeller with polished, rounded outside surfaces facing cam ring.  
Check that impeller moves easily.



Place seal (8) with wide side facing down and guide (9) in face plate (3).



30 32 051

# 32-20

## TROUBLESHOOTING POWER STEERING GEAR

Condition	Cause	Correction
<p>Noise</p>	<ul style="list-style-type: none"> <li>a) Insufficient hydraulic fluid in system</li> <li>b) Pump drawing in air through leaking intake hose connections</li> <li>c) Pump drawing in air through pump shaft</li> <li>d) Intake hose bent sharply/clamped</li> </ul>	<ul style="list-style-type: none"> <li>a) Eliminate leak; add hydraulic fluid</li> <li>b) Check/tighten intake hose connections, replacing seals if necessary</li> <li>c) Replace radial oil seal or replace pump when pump shaft is scored seriously</li> <li>d) Route intake hose correctly</li> </ul>
<p>Pressure too low</p>	<ul style="list-style-type: none"> <li>a) Drive belt loose</li> <li>b) Seal and support ring in pump faulty</li> <li>c) Pump worn</li> </ul>	<ul style="list-style-type: none"> <li>a) Tighten drive belt</li> <li>b) Install new set of gaskets/seals</li> <li>c) Replace pump</li> </ul>
<p>Pump leaks</p>	<p>Seals in pump faulty</p>	<p>Install new set of gaskets/seals</p>

## SAFETY REGULATIONS FOR HANDLING "AIRBAG" GAS GENERATORS

Non-conformance with these instructions could lead to unwanted activation of the system and injury.

The airbag unit is a pyrotechnical object. Handling, transporting and storing are subject to "legislation concerning explosive materials" (Explosive Substance Laws of Sept. 13, 1976).

The specifications listed below are in reference to the Federal Republic of Germany. There must always be conformance with pertinent legislation in other countries.

### 1. Transporting

1.1 It is forbidden to transport airbag gas generators in the passenger compartment of a car!

1.2 Company level transportation must always be in the trunk (luggage compartment) or cargo room of a vehicle and in packed state — the quantity of units is limited to 50.

### 2. Storing

2.1 The maximum permitted quantity of airbag gas generators in one working room is twenty (20).

2.2 Storage of up to 200 units is permitted in a suitable and lockable room.

2.3 Airbag generators must be stored in packaging suitable for transportation.

### 3. Installation and Removal

SRS components and plugs can be recognized immediately on the orange color code.

Tests and installation/removal may only be performed by personnel with qualified training in BMW service.

Working on the "supplement restraint system" always requires the battery to be disconnected, the negative pole or terminal to be covered and the SRS plug (steering column) to be disconnected. If work on the system has to be interrupted, the gas generator must not be left laying around without supervision.

Components of the supplement restraint system may not be repaired. Instead they must always be replaced.

Conformance with the following points is essential.

- Never treat the airbag unit with cleaning solutions or grease.
- Never subject an airbag unit to temperatures above 100° C (212° F).
- Airbag units, front sensors and electronic diagnosis units, which have fallen down from a height of 0.5 meters (1 and 1/2 feet) or more, cannot be installed in cars again.
- The supplement restraint system can only be checked electrically in the car, see "Troubleshooting", and only with the testers mentioned in pertinent section.
- Airbag units may only be stored with the padded side facing up, since if the generator of an airbag facing down were ignited, the generator would be catapulted up and could cause injury!
- The ignition pill of gas generators must never be aimed at persons regardless of the circumstances.

#### Procedures for Repairing and After Accidents:

Always disconnect the battery, cover the negative pole or terminal and disconnect both plugs of the front sensors in the engine compartment and the SRS plug (steering column), to be sure that power supply to the gas generator is interrupted, prior to performance of body straightening work or welding work with an electric welder. Also refer to other instructions in the repair manual.

#### After Accidents:

If the airbag had been activated, always replace all components with exception of wiring when not damaged.

## 32-52

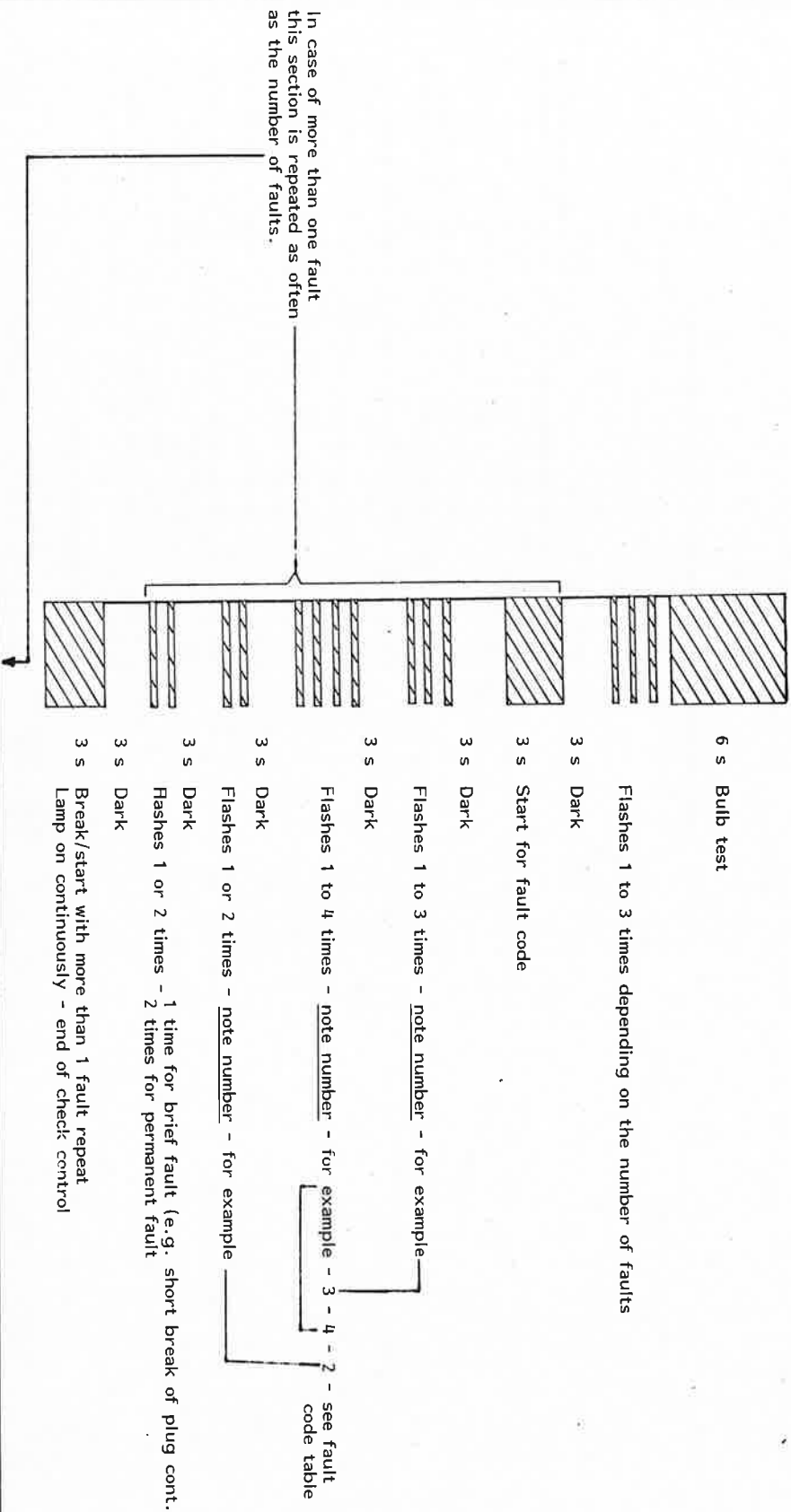
### TROUBLESHOOTING A - Control Lamp On Continuously - (Cipro Diagnosing Unit)

The "supplement restraint system" employs a fault detector and memory, even for briefly occurring faults. If the "SRS" indicator lamp does not go out after starting, there could be one or more faults. A flashing code from the indicator lamp will help only personnel with qualified training in BMW service to pinpoint and eliminate fault(s).

The flashing code can be called by performing the following procedures and as often as necessary.

- Turn off the ignition.
- Connect SRS diagnosing plug 62 1 250 in the engine diagnosing socket (pins 1 and 6 are bridged), using adapter 62 1 140 when applicable.
- Turn the ignition lock to position 1.

Flashing code will now run off and the number of flashes must be counted.



TEST PLAN A

Always disconnect the battery and cover the ground pole or terminal after concluding a flash code call for troubleshooting.  
 Measure with a BMW Service Tester or Digital Tester II at room temperature.  
 The use of other testers could cause activation of the airbag.  
 Pull off the SRS diagnosing plug.

Reconnect the battery and check the function of the system as a final step after finishing repairs.

If there is a sporadic fault – cancel memory of the diagnosing unit – disconnect and connect battery.  
 Check pertinent components for loose fit and damage with the ignition on.  
 If a fault is displayed – replace pertinent components.

Fault Code A or B =

High or low resistance in power supply lead (gray-white/gray lead) to SRS module.

Disconnect plug for diagnosing unit. — yes —  
 Connect SRS testing plug 62 1 260 and check supply lead with an ohmmeter.  
 Specification: 3.0 ... 5.0 ohms?

no

Disconnect plug (behind cap on steering column). Connect SRS testing plug 62 1 260 and check supply lead with an ohmmeter.  
 Specification: 3.0 ... 5.0 ohms?

no

Remove SRS module from steering wheel and pull off plug. Connect leads of SRS testing plug 62 1 260 and measure resistance on disconnected plug with two test points.  
 Specification: 1.4 to 1.8 ohms?

no

Replace contact ring.

Fault Code A:  
 Measure resistance of lead against car ground.  
 Resistance 200 ... 600 ohms? — yes — See Fault Code H.

no

Replace diagnosis unit.

Fault Code B:  
 Replace diagnosing unit.

Replace lead.

Replace SRS module.

## 32-55.1

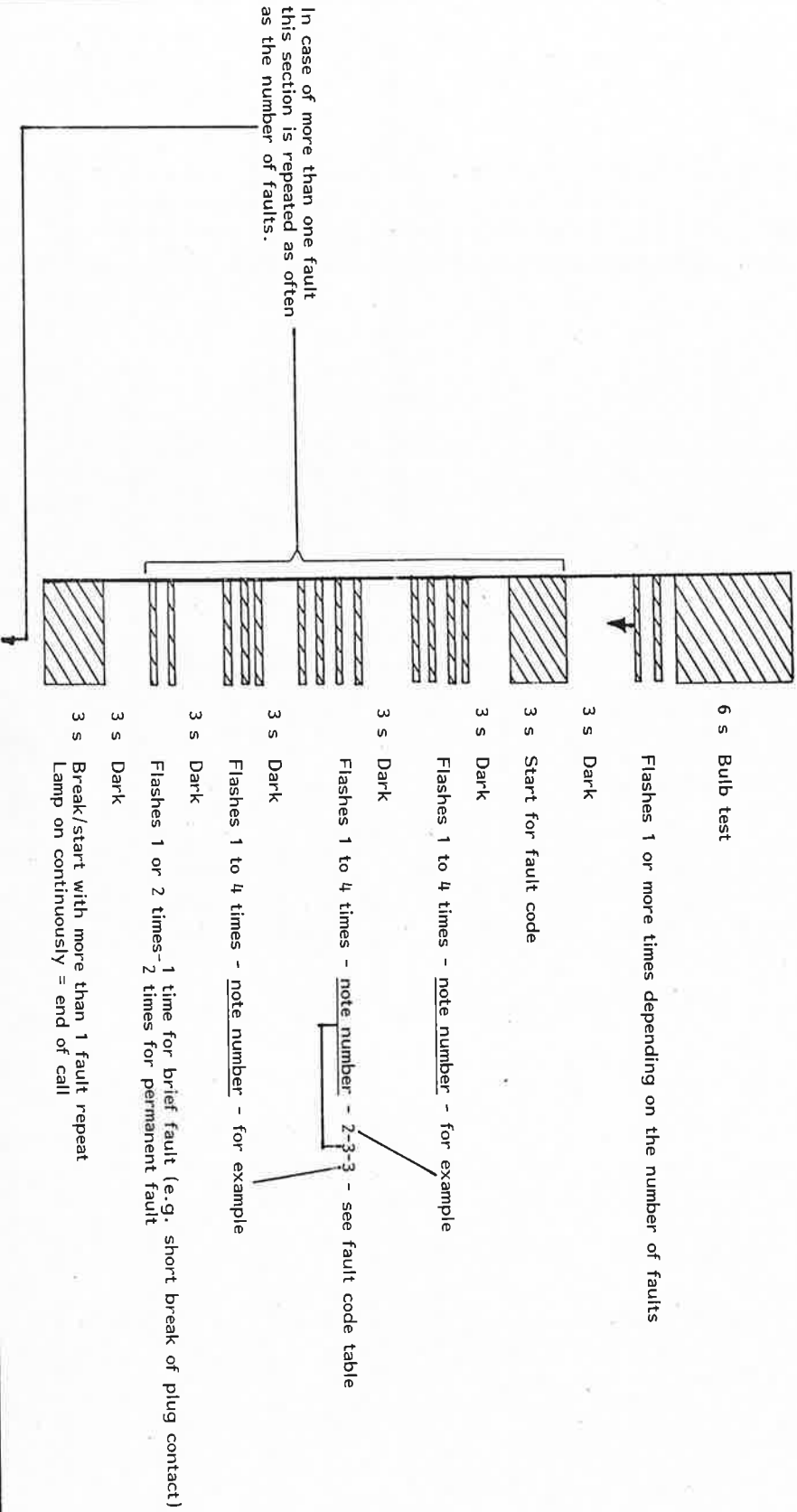
### TROUBLESHOOTING B - Control Lamp Flashes - (Siemens Diagnosing Unit)

The "supplement restraint system" employs a fault detector and memory, even for briefly occurring faults. If the "SRS" control lamp flashes after starting the engine (about 5 min. long) and then remains on continuously, there could be one or more faults. A flashing code from the control lamp will help only personnel with qualified training in BMW service to pinpoint and eliminate the fault(s).

The flashing code can be called by performing the following procedures and as often as necessary.

- A) Turn off the ignition.
- B) Connect SRS diagnosing plug 62 1 290 according to the operating instructions.
- C) Turn the ignition lock to position 1.

Flashing code will now run off and the number of flashes must be counted.



## 32-55.3

### TEST PLAN B

Always disconnect the battery and cover the ground pole or terminal after concluding a flash code call for troubleshooting.  
Measure with a BMW Service Tester or Digital Tester II at room temperature.  
The use of other testers could cause activation of the airbag.

Reconnect the battery and cancel faults with the SRS diagnosing plug according to operating instructions as a final step after finishing repairs.

If there is a sporadic fault – cancel memory of the diagnosing unit.  
Check pertinent components for loose fit and damage with the Ignition on.  
If a fault is displayed – replace pertinent components.

Fault Code 01 = Ignition capacitor faulty.

↓  
Replace ignition capacitor.  
Clean contact surfaces.

Fault Code 02 = Diagnosing unit malfunction.

↓  
Tighten mounting screws (ground connection) of diagnosing unit.  
Cancel fault; if Fault Code 02 is reported again = replace diagnosing unit.

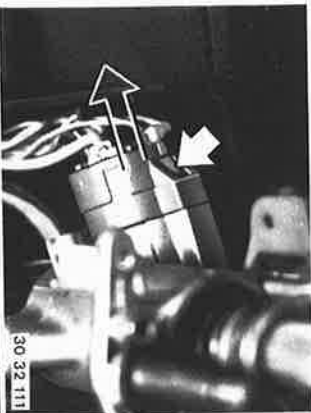
Fault Code 03 = Insulation of driver's SRS power supply lead insufficient.

↓  
Visual inspection of driver's SRS power supply lead and plug for cracks, moisture and dirt.  
Replace lead when necessary.

**32 31 090 REMOVING AND INSTALLING COMPLETE STEERING COLUMN (SRS)**

*Caution!*  
 Conform with safety regulations!  
 Improper handling could cause unwanted activation of SRS and in turn lead to injury!  
 Disconnect battery and cover negative pole or terminal.  
 Remove instrument panel trim at bottom left — see 51 45 180.  
 Remove steering wheel — see 32 33 000.

Unscrew knee guard.



30 32 111

Press down locking hook and remove ignition switch.

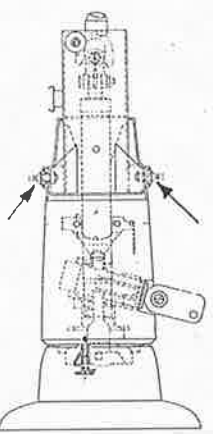
Unscrew screw.  
 Remove clamping bolt and pull joint off of steering spindle.

*Installation:*  
 Clamping bolt must be positioned in locking groove of the steering spindle.  
 Replace self-locking nut.  
 Tightening torque\*.

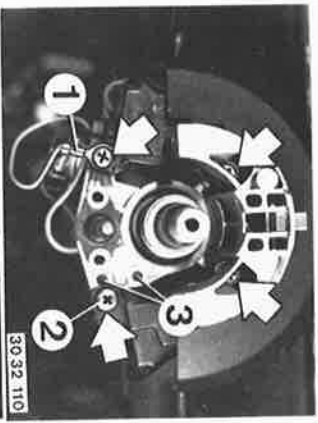


30 32 112

Remove both shear-off screws with a chisel or similar tool and take off the steering column.



Remove flasher relay.  
 Pull plug off of horn contact.  
 Remove switch.  
*Installation:*  
 Mount both ground wires (1).  
 With cruise control switch screw (2) = M 5 x 15.  
 Tabs of switch must engage in bores (3).



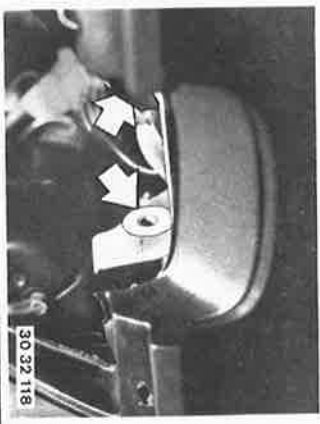
30 32 110

Take off collar ring (1).

*Installation:*  
 The recess in collar ring (1) must hold snap ring (2).



30 32 014



30 32 118

*Installation:*  
 Use spacer.  
 Pull up steering column completely.

\* See Specifications



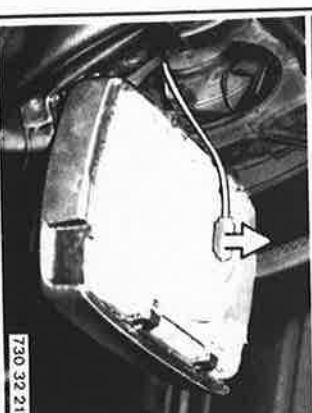
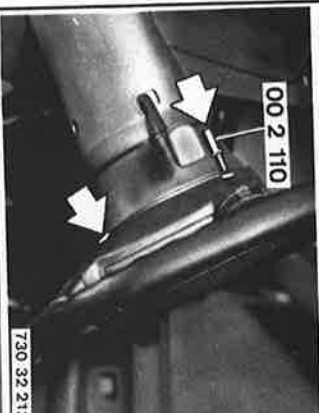
## 32-58

### 32 34 020 REMOVING AND INSTALLING OR REPLACING SRS UNIT

**Caution!**

Conform with safety regulations! Improper handling could cause unwanted activation of SRS and in turn lead to injury!

Disconnect the battery and cover the negative pole or terminal.



Lift cap out of the lower steering column casing section and disconnect the plug.

Unscrew four bolts with Special Tool 00 2 110.

**Installation:**  
If the SRS unit is mounted with two bolts, first tighten the bolt on the right hand side as seen looking forward in the car.

Pull off plug and remove SRS unit.

**Caution!**  
SRS unit must always be laid aside (in trunk of car) with the impact pad facing up.

**Installation:**  
Be careful not to clamp the wires.

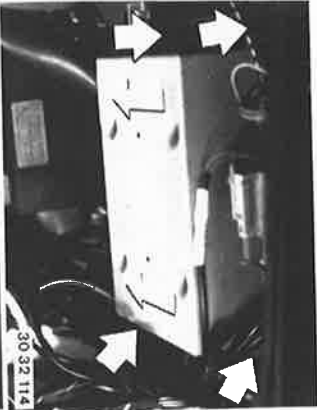
\* See Specifications

## 32-60

### 65 77 010 REMOVING AND INSTALLING OR REPLACING DIAGNOSIS UNIT (SRS)

**Caution!**  
Conform with the safety regulations!  
Improper handling could cause unwanted  
activation of SRS and in turn lead to injury!  
Disconnect the battery and cover the negative  
pole or terminal.

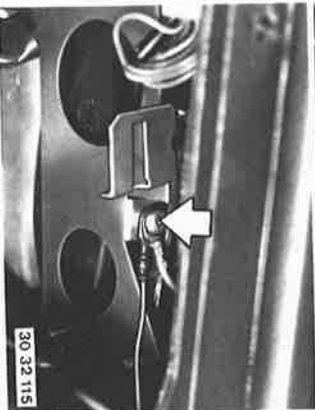
Remove instrument panel trim at bottom left  
— see 51 45 180.



If applicable, remove ABS control unit.  
Unscrew nuts and disconnect plug.

**Installation:**  
Arrow on the diagnosis unit faces forward.

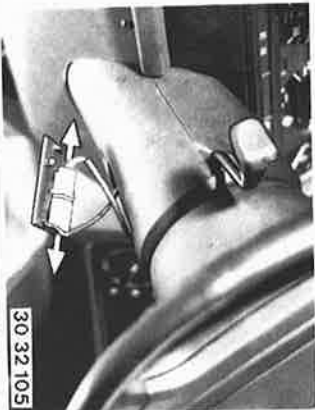
Disconnect ground lead on the central ground  
point.  
Remove the diagnosis unit.



### 65 77 020 REMOVING AND INSTALLING OR REPLACING ONE FRONT SENSOR (SRS)

**Caution!**  
Conform with the safety regulations!  
Improper handling could cause unwanted  
activation of SRS and in turn lead to injury!  
Disconnect the battery and cover the negative  
pole or terminal.

Lift the cap out of the lower steering column  
casing section and disconnect the plug.



Disconnect the plug and unscrew the bolts  
with Special Tool 00 2 110.

**Installation:**  
The arrow faces forward.  
Tightening torque\*.



\* See Specifications

# 33 Rear Axle

33 10 010	Rear axle layout drawing	33-0
	Visco rear axle lock (325 IX) - check in car	33-0/1
	Final drive - remove and install or replace	33-1
	Running-in instructions after exchanging/repairing final drive	33-1
33 11 151	Shaft seal for drive flange - replace	33-2
33 17 001	Rubber mounts for final drive - replace	33-3
33 21 000	Output shaft - remove and install	33-4
	Dust cover - replace	33-5
33 31 000	Rear axle carrier assembly - remove and install	33-6
33 32 000	Trailing arm - remove and install	33-7
	Trailing arm - replace	33-8
561	Silent mounts - replace	33-8
33 33 071	Rubber mounts for rear axle carrier - replace	33-13
33 41 151	Wheel bearings and shaft seal - replace	33-14
33 52 000	Shock absorber - remove and install	33-16
33 53 000	Coil spring - remove and install	33-17
	Rear axle - troubleshoot	33-18

# 33 Rear Axle

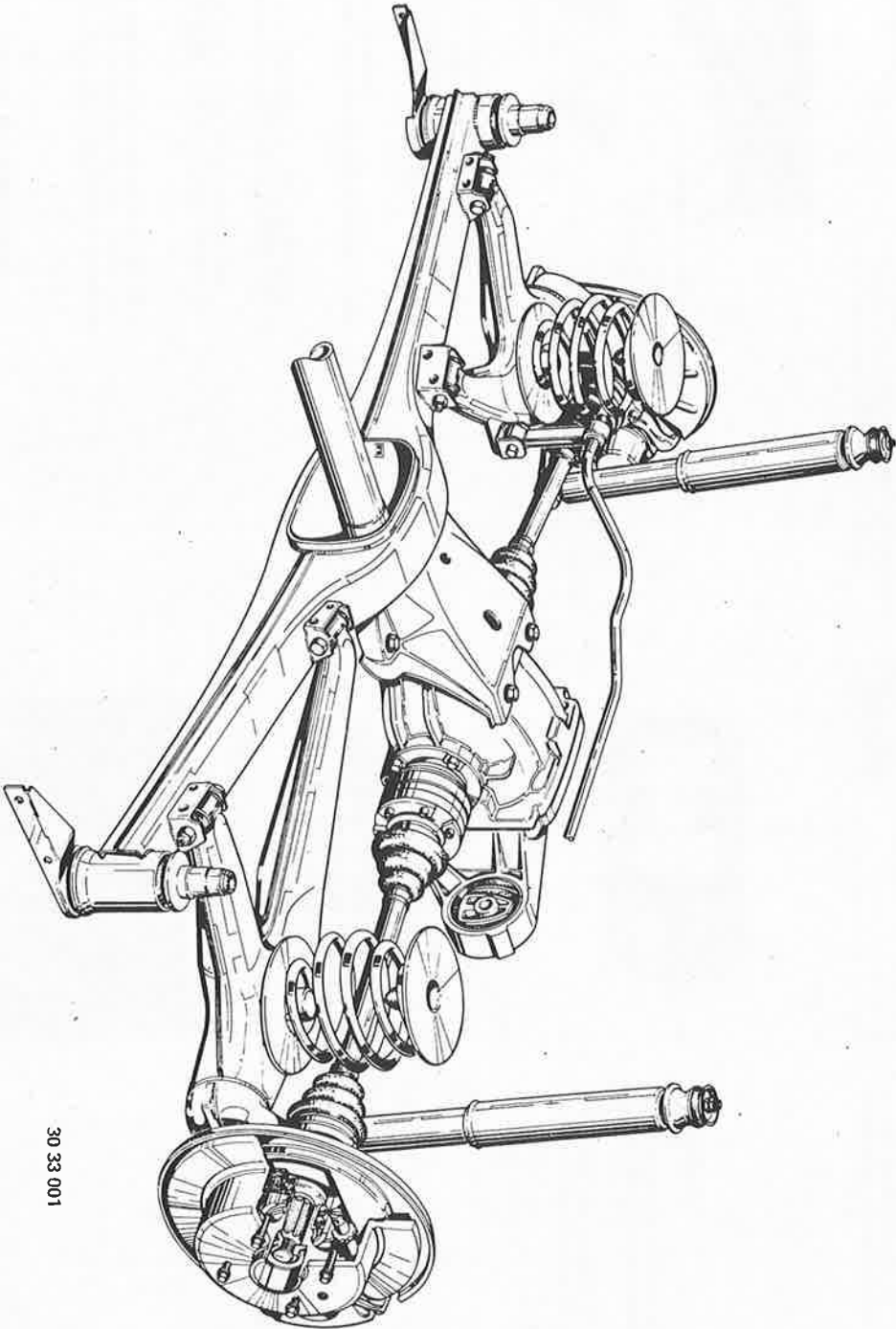
Transmission Type K = Side Cover with Four Bolts

33 12 551	Drive pinion and ring gear - replace . . . . .	33 - 117
	General Information on tooth contact pattern adjustments . . . . .	33 - 126
33 13 611	Differential gears - replace . . . . .	33 - 128
	Limited slip (25 %) differential - general Information . . . . .	33 - 130
33 14 520	Limited slip differential - replace . . . . .	33 - 130
593	Limited slip differential - disassemble and assemble . . . . .	33 - 136

# 33 Rear Axle

Transmission Type M = Side Cover with Six Bolts

33 12 551	Drive pinion and ring gear - replace	33 - 217
33 13 611	General information on tooth contact pattern adjustments	33 - 226
33 14 520	Differential gears - replace	33 - 228
	Limited slip (25 %) differential	33 - 231
	Limited slip differential - replace	33 - 231



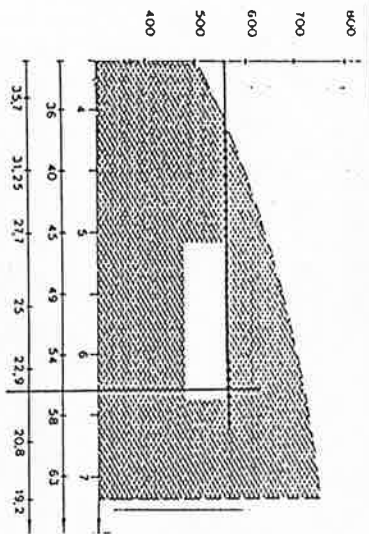
REAR AXLE LAYOUT DRAWING  
15" TRAIL AXLE

33-0

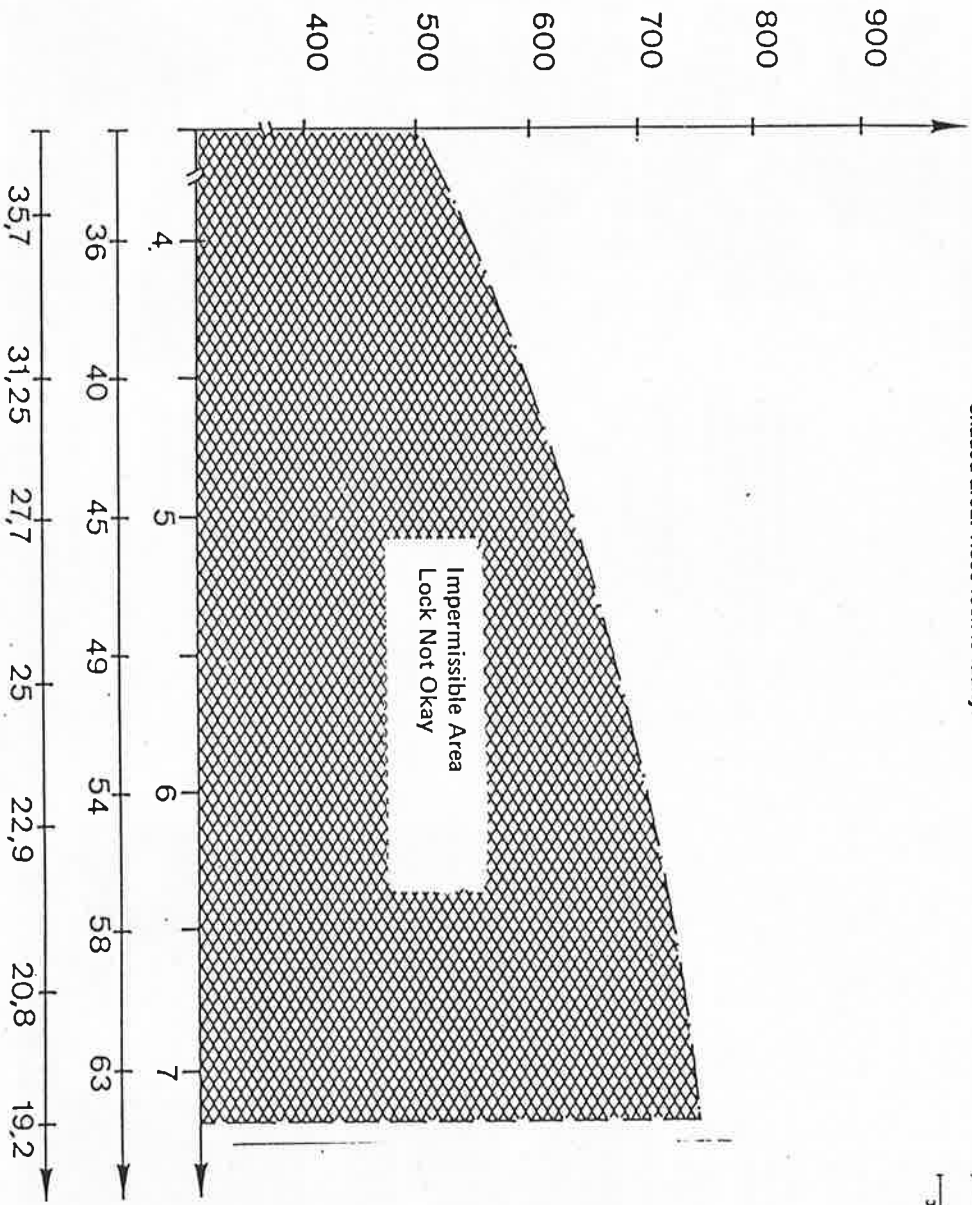
30 33 001

# 33-0/2

Enter period of time (ms) in diagram.  
 Enter braking force (on brake test stand) in diagram.  
 Condition of visco lock is seen at point of intersection of both lines.  
 Example:  
 Period of time for pulse wheel: 22 ms.  
 Braking force of left or right wheel: 121 lbs..  
 Intersection point of both lines in shaded area: visco lock is faulty.



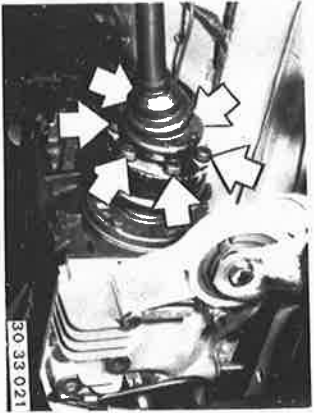
No. of pulse wheel teeth: 48  
 Rear wheels in brake stand rollers  
 Front wheels on floor  
 Ignition off  
 1st gear  
 Only one rear wheel driven  
 Warm-up time approx. 30 sec.  
 Testing time max. 10 sec.  
 Total testing time 40 sec.  
 Tested immediately after warm-up time  
 Thirty minutes between two tests



**31 11 151 REPLACING SHAFT SEAL FOR DRIVE FLANGE**

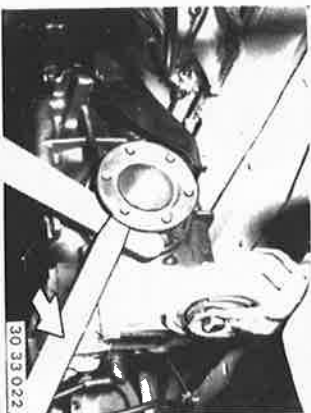
Unscrew output shaft on drive flange and suspend it on a piece of wire.

*Installation:*  
Use washers.  
Tightening torque\*.

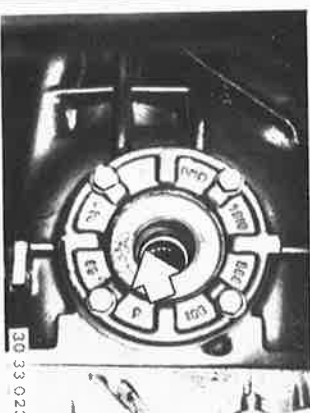


30 33 021

Press off drive flange with a tire iron.

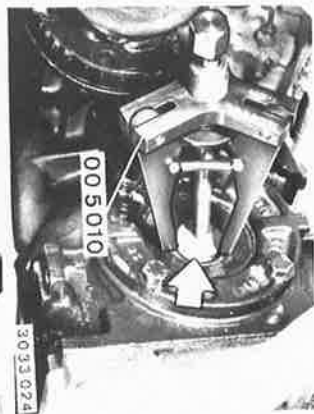


30 33 022



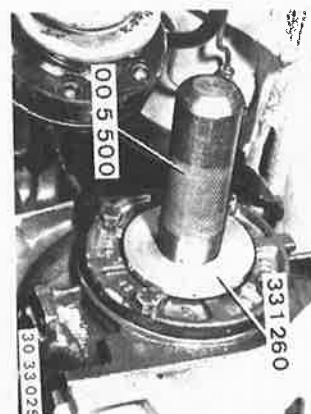
30 33 023

*Installation:*  
Place round wire snap ring in groove of the differential case in such a manner prior to installation of the drive flange that both ends of the snap ring are recessed in the groove. This prevents lateral bending of the ring.  
Press in the drive flange by hand and also be turning slightly, until the snap ring is heard to engage.  
Replace stretched snap rings.



30 33 024

Pull out the shaft seal with Special Tool 0 5 010 used together with a pressure piece.



30 33 025

*Installation:*  
Dip the shaft seal in final drive gear lube.  
Drive in shaft seal against stop with Special Tools 33 1 260 or 33 1 230 and 00 5 500.  
Replace a drive flange with a seriously scored bearing surface.

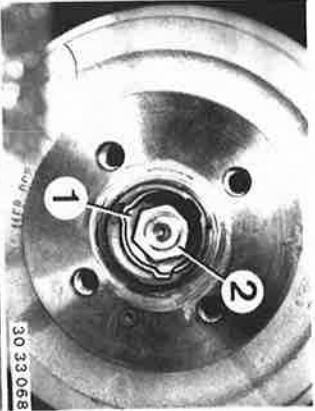


## 33-4

### 33 21 000 REMOVING AND INSTALLING OUTPUT SHAFT

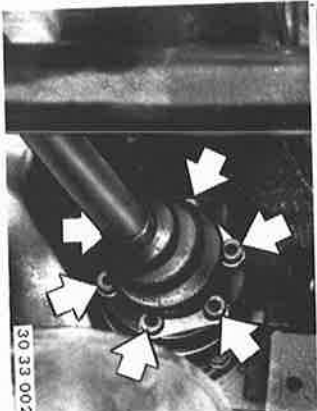
Remove wheel - see Group 36.  
Lift out lockplate (1).  
Unscrew nut (2).

*Installation:*  
Lubricate bearing surface of nut with oil.  
Tightening torque\*.  
Replace lockplate.

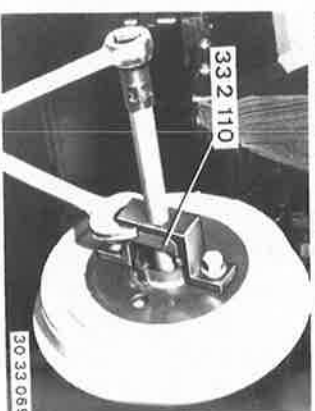


Disconnect output shaft on final drive and suspend with a piece of wire.

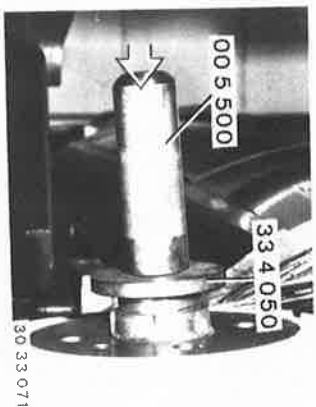
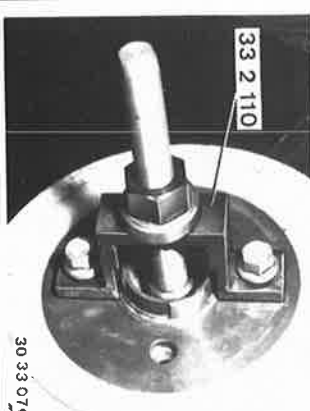
*Installation:*  
Tightening torque\*.



Press out output shaft with Special Tool 33 2 110.  
(Use spindle 33 2 111, bridge 33 2 112 - deleted and replaced by 33 2 116, threaded element 33 2 113 - deleted and replaced by 33 2 117, and wheel bolts.)



Pull in output shaft with Special Tool 33 2 110, by first screwing in spindle 33 2 114 completely; using bridge 33 2 112 and nut 33 4 042.



Knock in lockplate with Special Tools 33 4 050 and 00 5 000.

30 33 070

\* See Specifications

**33 31 000 REMOVING AND INSTALLING REAR AXLE CARRIER ASSY.**

Remove primary and final mufflers – see 18 12 000.  
Remove heat shield.  
Unscrew propeller shaft and center mount – see 26 11 000.

*Installation:*  
Replace self-locking nuts.  
Tightening torque\*.

Remove parking brake lever.  
Draw off brake fluid with a syringe used exclusively with brake fluids.  
Disconnect brake pipes on left and right sides.

*Installation:*  
Tightening torque\*.  
Fill brake system with brake fluid\* and bleed.

Support rear axle.  
Unscrew thrust strut on left and right sides.

*Installation:*  
Replace self-locking nuts.  
Tightening torque\*.

*Note:*  
Remove rear seat cushion (52 20 000) when replacing staybolts.  
Remove rear side trim panel (51 43 000) for convertibles.

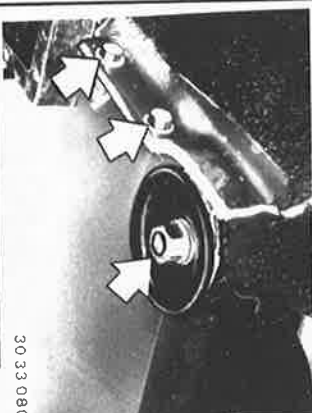
If necessary, loosen clamp on rear axle carrier.



30 33 078



30 33 079



30 33 080



30 33 081

\* See Specifications

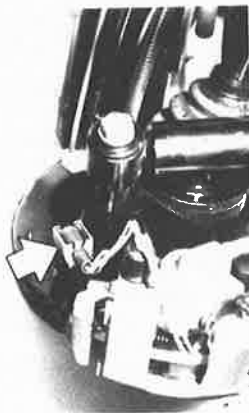


30 33 082

Pull off wires on speed pulse sender.  
Unscrew mounting bolt on rubber mount.

*Installation:*  
Replace self-locking nut.  
Tightening torque\*.

**Cars with Rear Disc Brakes:**  
Disconnect plug for pad wear indicator. If applicable, unscrew stabilizer on left and right sides.  
Support both trailing arms, having wheels rest on floor if necessary.

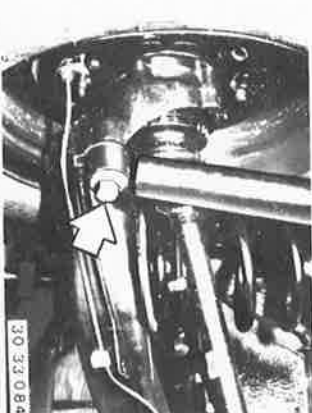


30 33 083

Unscrew left and right shock absorbers on trailing arms.

**Caution!**  
Shock absorbers act as retaining straps.

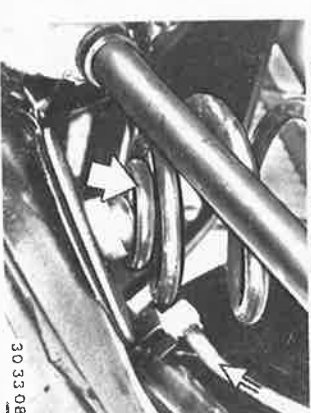
*Installation:*  
Tighten mounting bolts after lowering car that it rests on its wheels.  
Tightening torque\*.



30 33 084

Lower rear axle carrier.  
Pull parking brake cables out of the protective tube.

**Caution!**  
This will release the rear axle coil springs.



30 33 085

\* See Specifications

## 33-8

### 33 32 021 REPLACING TRAILING ARM

Remove trailing arm - see 33 32 000.  
Replace wheel bearings and shaft  
seals - see 33 41 151.  
Transfer guard.

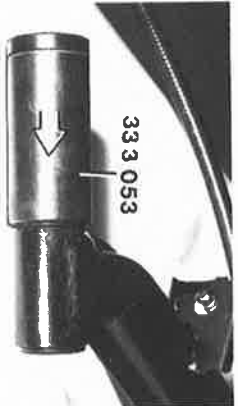


30 33 089

### 33 32 561 REPLACING BOTH SILENT BLOCKS

- Trailing Arm Removed -

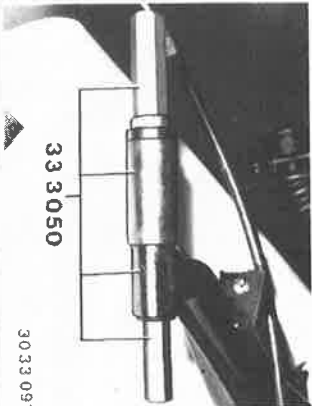
Coat collar in Special Tool 33 3 053  
with water and slide over bead of  
silent block.



33 3 053

30 33 090

Pull out silent block with Special Tool  
33 3 050.



33 3 050

30 33 091

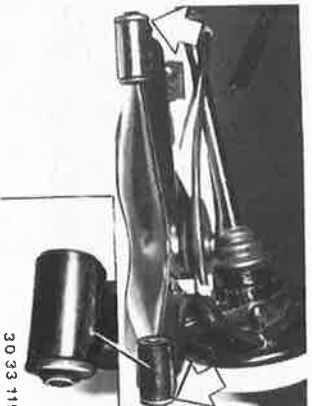
Give new silent blocks a thin coat of  
Cresta, lubricating oil II or relaxed  
water.  
Pull in silent blocks with Special Tool  
33 3 050, using thrust washer (1) and  
bushing (2) with two tabs.



33 3 050

30 33 118

*Installation:*  
Collar end of silent blocks always  
faces out.



30 33 119

## 33-13

### 33 33 071 REPLACING RUBBER MOUNT FOR REAR AXLE CARRIER

Remove rear seat cushion – 52 20 000.

**Convertible:**

Remove rear side trim panel – see 51 43 000.

Support trailing arm.

Unscrew thrust strut.

**Installation:**

Replace self-locking nuts.

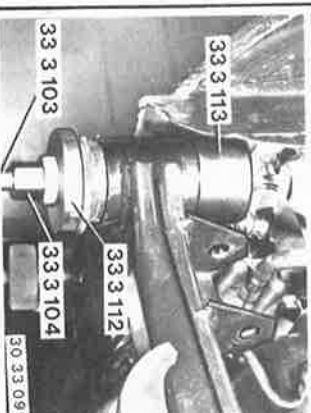
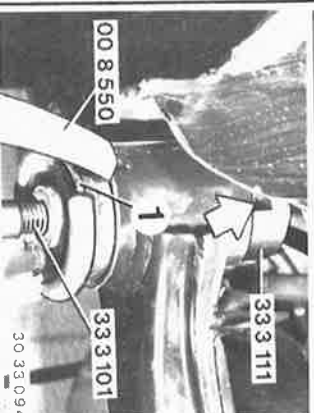
Use washers.

Tightening torque\*

Drive out threaded pin upwards.

**Important!**

Be careful not to damage threads. If applicable, cut off protruding rubber in openings.



Place Special Tool 33 3 111 between body and rear axle carrier on rubber mount and screw in Special Tool 33 3 101.

**Important!**

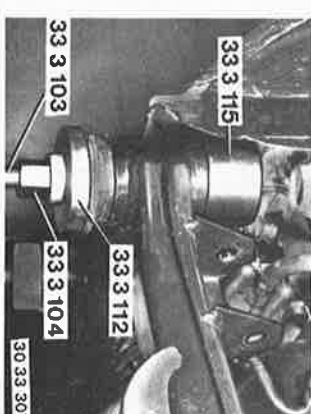
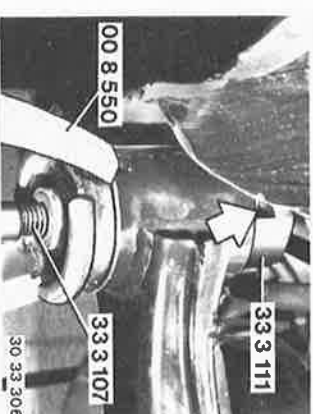
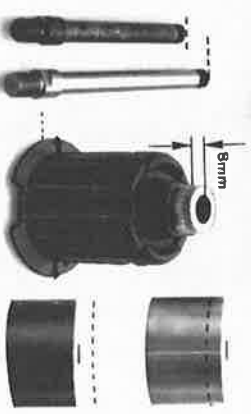
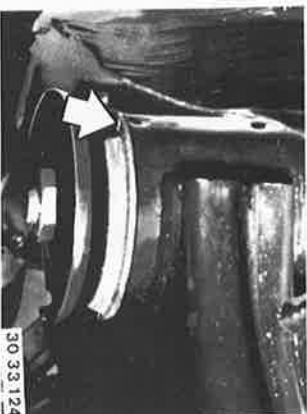
Flat sides of Special Tool 33 3 111 must face in direction of openings.

Apply Special Tool 00 8 550 with claws in openings, bolt down with Special Tool 33 3 101 and pull out rubber mount.

Place Special Tool 33 3 113 between body and rear axle carrier on edge of bushing and screw in Special Tool 33 3 103.

Coat rubber mount with diluted Cresta, lubricating oil II or relaxed water and apply on rear axle carrier.

Pull in rubber mount with Special Tools 33 3 112 and 33 3 104.



**Installation:**  
Check installed position of rubber mount opening in rear axle carrier.

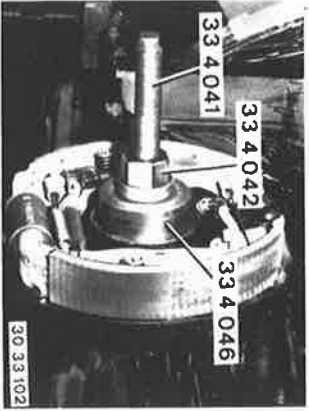
**BMW 325 IX:**  
The rubber mount is 8 mm (0.315") higher.

Special Tool 33 3 107 with a longer threaded spindle is required together with Special Tools 33 3 111 and 00 8 550 for pulling out.

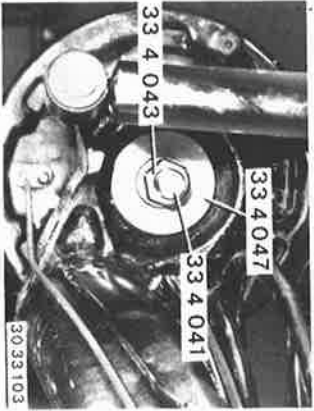
New Special Tool 33 3 115 is required together with Special Tool 33 3 103 of Special Tool 33 3 112 and Special Tool 33 3 104 for pulling in the rubber mount.

\* See Specifications

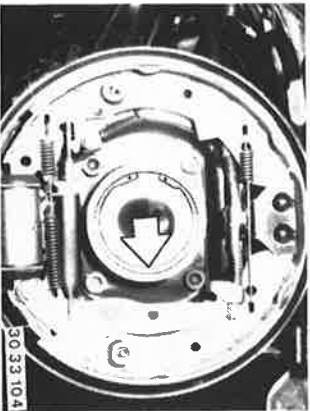
## 33-15



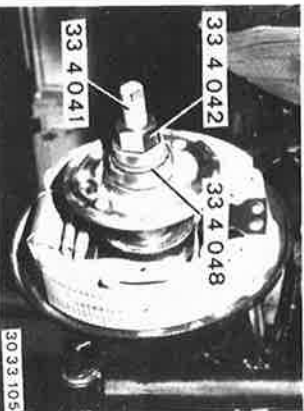
Pull In wheel bearing assembly with Special Tool 33 4 040.  
 323 I, 325 e/I and Cars with ABS beginning with 1986 Models:  
 Use Special Tool 33 4 049.



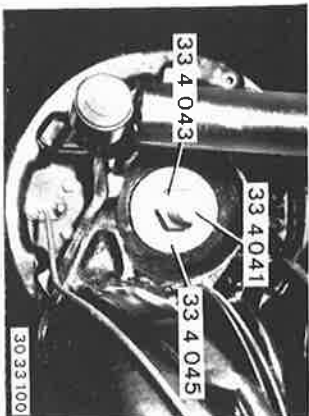
Apply Special Tool 33 4 047.



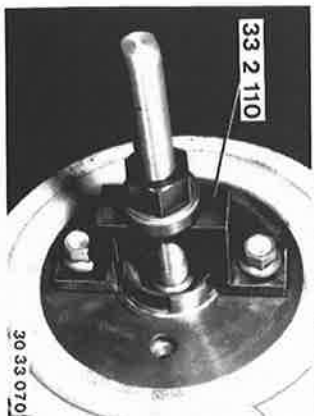
Pull In rear axle shaft with Special Tools 33 4 040 and 33 4 048.



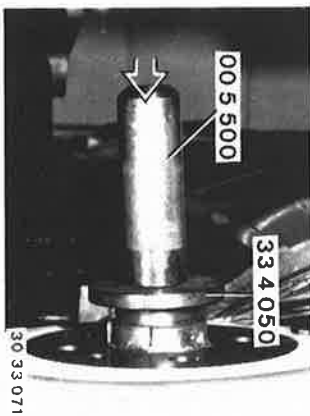
Insert circlip.



Use Special Tool 33 4 045.



Install output shaft, pulling In with Special Tool 33 2 110.  
 Tightening torque\*.



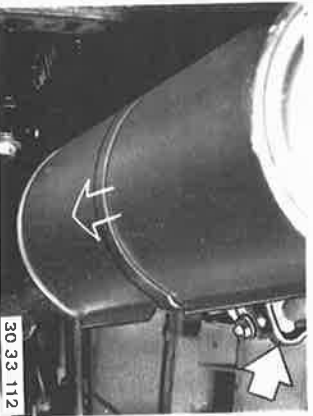
Drive In lockplate with Special Tools 33 4 050 and 00 5 000.

\* See Specifications

## 33-17

### 33 53 000 REMOVING AND INSTALLING OR REPLACING LEFT OR RIGHT REAR COIL SPRING

Disconnect and suspend exhaust assembly with a piece of wire.



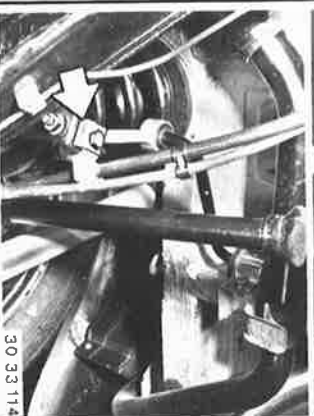
30 33 112

Unscrew final drive rubber mount and push down. Hold down with a wedge of wood or similar item.

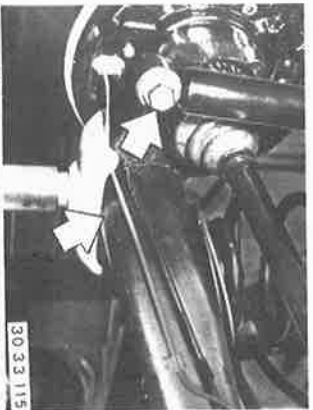


30 33 113

If applicable, unscrew stabilizer.



30 33 114



30 33 115

Support trailing arm.

*Important!*  
Don't damage the brake pipe.

Unscrew shock absorber on trailing arm.

*Important!*  
Only lower trailing arm enough to be able to remove the coil spring. The output shaft joints could be damaged when lowered too far.

*Installation:*  
Check installed position of coil spring.  
*Important!*  
Check surface of springs for damage. Replace damaged springs.

Only install coil springs with the same BMW number\*, same color code\* and correct rubber ring\*.

30 33 117



\* See Specifications

## 33-101



30 33 006

**33 11 511 REPLACING SHAFT SEAL AND INPUT FLANGE**  
- Final Drive Removed -

Mount final drive on Special Tool

33 1 010.

Drain oil.

Unscrew case cover.

Replace gasket.

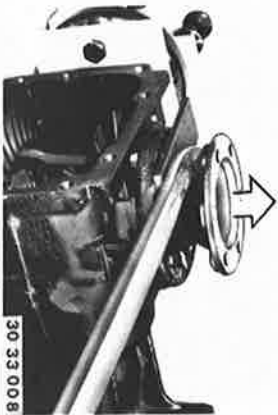
*Installation:*

Tightening torque\*

Pour in correct volume\* of oil – see

Group 33 InOperating Fluids.

Press off drive flange with a tire iron.



30 33 008

Mark both bearing covers with punch marks.

Unscrew both bearing covers.

*Important!*

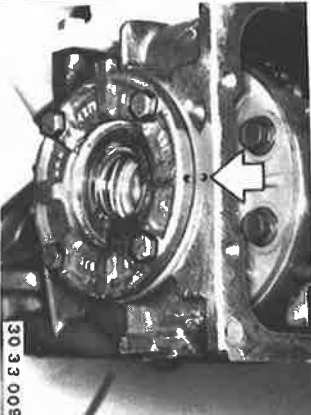
Don't mix up bearing covers and shims.

Secure shims on bearing cover with a

piece of wire, if necessary.

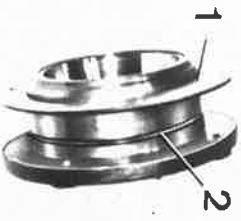
*Installation:*

Tightening torque\*



30 33 009

The differential bearing and backlash are adjusted with shims (1).  
Check O-ring (2), replacing if necessary.



30 33 010

\* See Specifications

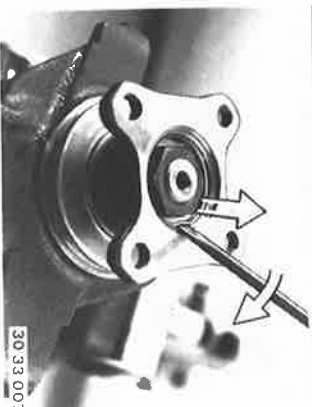


30 33 149

Remove the complete differential.

*Important!*

Don't bend the pulse spider.



30 33 007

Lift out lockplate.

Check friction torque with Special Tool 00 2 000 and note the value.

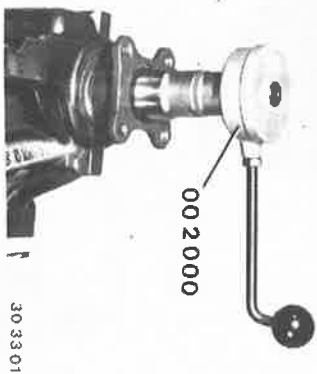
*Important!*

The measured friction torque + friction

torque for the new shaft seal = 20 Ncm

(17 in. lbs.) must be reached during

installation, but not exceeded.



30 33 013

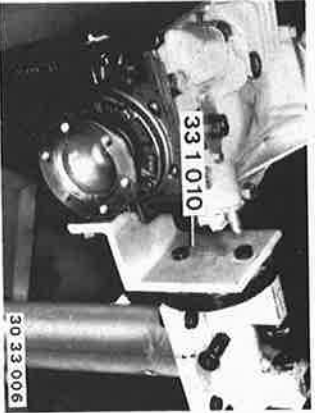
Hold the drive flange with Special Tool 23 0 020 and unscrew the collar nut.

*Installation:*

Tightening torque\*

\* See Specifications

## 33-103



30 33 006

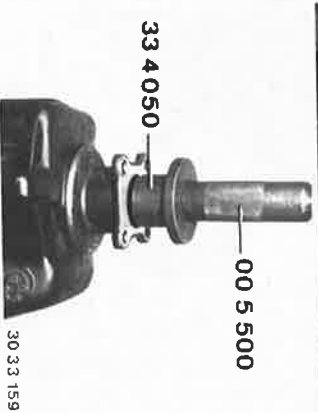
**33 1 512 REPLACING SHAFT SEAL FOR INPUT FLANGE**  
- Final Drive Removed -

Mount final drive on Special Tool 33 1 010.  
Drain oil.

*Installation:*  
Pour in correct volume\* of oil - see Group 33 In Operating Fluids.

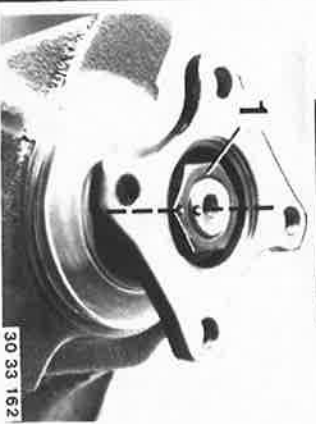
Lift out lockplate.

*Installation:*  
Drive in new lockplate with Special Tools 33 4 050 and 00 5 500.



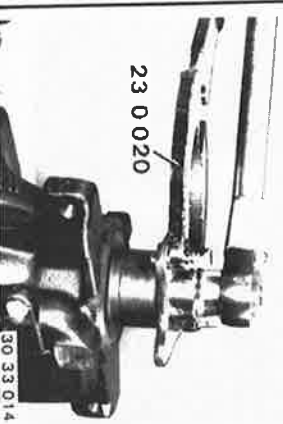
30 33 159

Punch mark position of nut (1) to the input shaft.



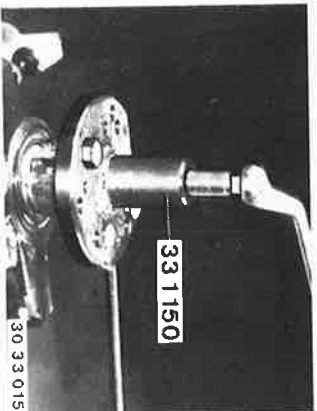
30 33 162

Unscrew nut (1), counterholding on the flange with Special Tool 23 0 020.



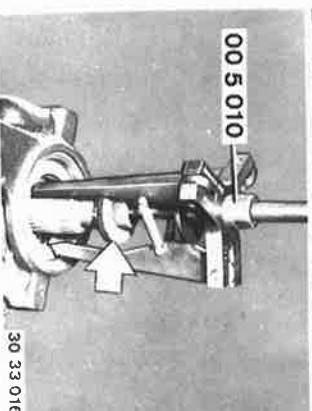
30 33 014

\* See Specifications



30 33 015

Pull off input flange with Special Tool 33 1 150.

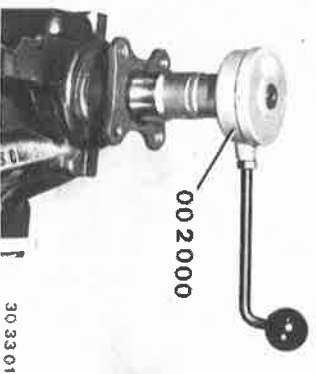


30 33 016

Pull out shaft seal with Special Tool 00 5 010 and a suitable thrust piece.

*Installation:*  
If the bearing surface on the input flange is scored seriously, replace the input flange.

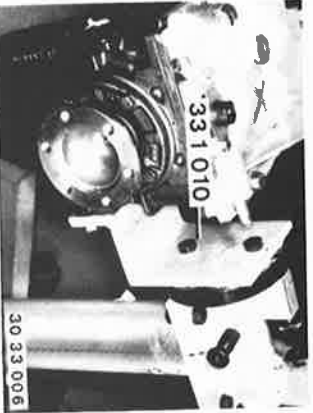
*Important!*  
If the input flange has to be replaced, measure the friction torque with the old input flange.  
If applicable, tighten nut to the punch mark, measure and note the friction torque value - see 33 11 011.  
The old shaft seal does not have to be installed for measuring.



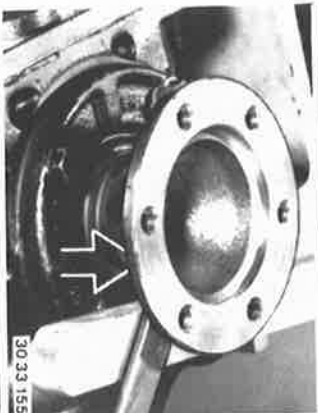
30 33 013



## 33-105



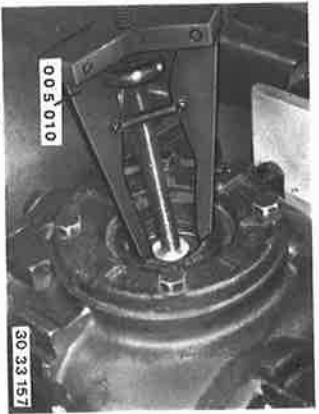
**33 11 621 REPLACING SHAFT SEAL  
FOR DRIVE FLANGE**  
- Final Drive Removed -  
Mount final drive on Special Tool  
33 1 010.



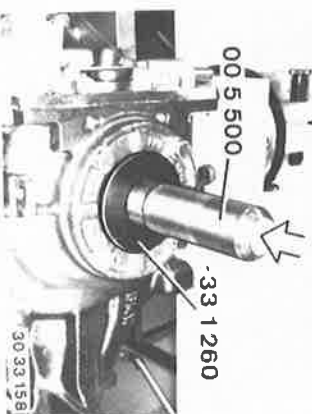
Press off drive flange with the Irons.



*Installation:*  
Prior to installation of the drive flange, place wire snap ring (1) in groove of the differential case that both ends of the wire snap ring are recessed in the groove.  
This will prevent lateral bending of the ring.  
Press in drive flange by hand and turn slightly until the wire snap ring is heard to engage.  
Replace stretched snap rings.



Pull out shaft seal with Special Tool 00 5 010 in conjunction with a thrust piece.



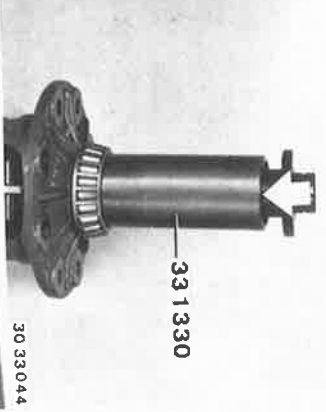
*Installation:*  
Dip shaft seal in final drive gear lube. Drive in shaft seal against the stop with Special Tools 33 1 260 and 00 5 500.  
Replace a drive flange with a seriously scored bearing surface.

\* See Specifications

## 33-107

**Installation:**  
Press on new tapered roller bearings cold with Special Tool 33 1 020.

**Important!**  
Always only install both bearings of same make.

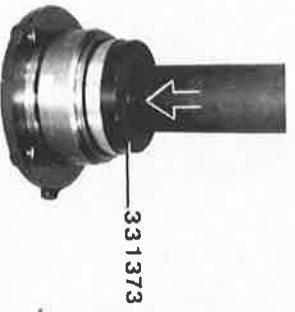


Lift shaft seals out of both bearing caps.

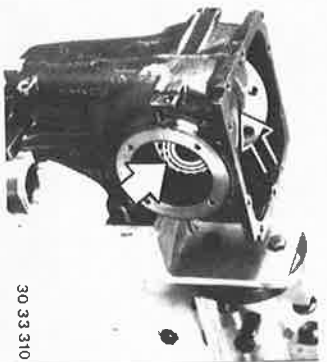


Press out bearing outer races with Special Tools 33 1 350 and 33 1 351.

**Important!**  
Pulley must engage in the bearing outer race.



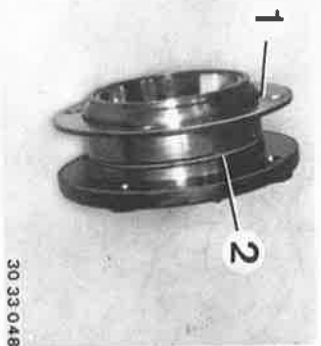
**Installation:**  
Press in new bearing outer races with Special Tool 33 1 373.



If only differential bearings are being replaced, the drive pinion can remain installed and the differential case is installed without the ring gear to determine the thickness of shims.

**Important!**  
Note make of bearings - needed for friction torque determination.

Lubricate new bearings with approved final drive gear lube\*\* thoroughly and let them drip dry.



Install side bearing caps as marked with corresponding shims (1), but without O-rings (2) at first. Tighten bolts of bearing cap opposite the ring gear end uniformly. Tightening torque\*.

Compensating bores (1), recognized on the outside by tab (2), always face up in the installed position of the transmission.

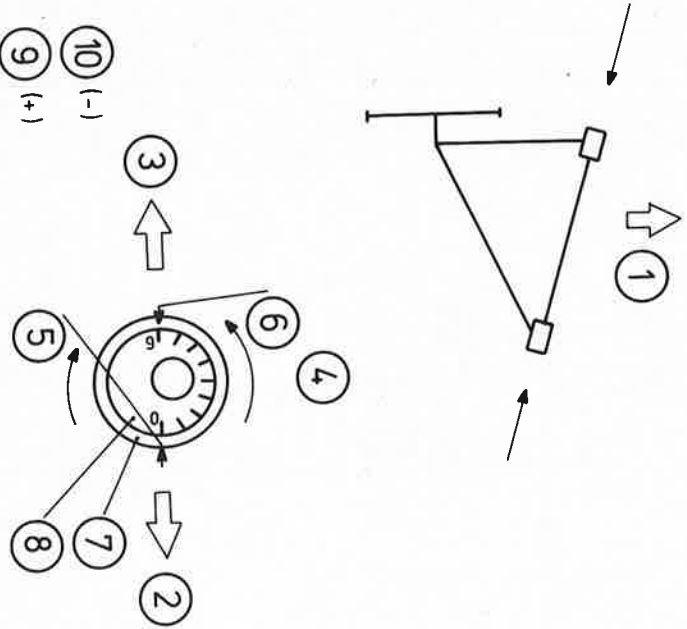
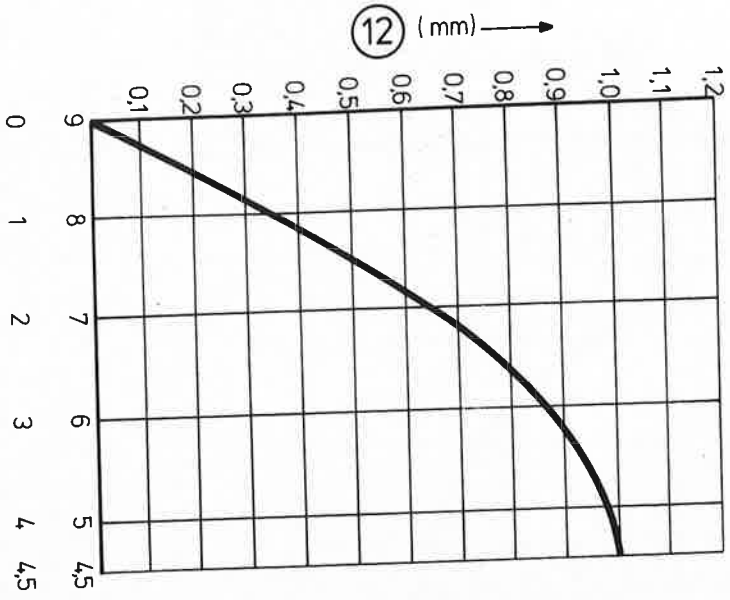


\* See Specifications  
\*\* See Gr. 33 in Operating Fluids

# 33-10

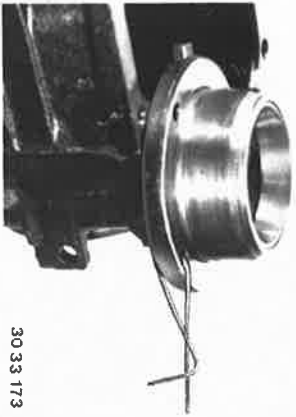
## CHANGING TOE ON "LEFT" WHEEL

- 1 Forward direction
- 2 Forward direction - inner silent block
- 3 Forward direction - outer silent block
- 4 Pressing-in note
- 5 Reading point - toe increase
- 6 Reading point - toe decrease
- 7 Trailing arm eye
- 8 Silent block
- 9 Toe increase
- 10 Toe decrease
- 11 Displacement angle
- 12 Toe change



## 33-109

Remove differential case.  
Arrange side covers and shims of determined thickness and don't mix them up.



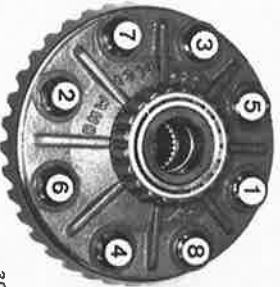
30 33 173

*Installation:*  
Clean tapped bores thoroughly (with taper).  
Heat ring gear to max. 100° C (212° F), checking temperature with a thermocolor pencil.  
Mount ring gear with two locally manufactured staybolts for guiding.



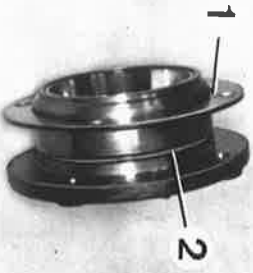
30 33 0 41

Install new bolts with Loctite No. 270.  
Tighten bolts in order of 1 ... 8.  
Tightening torque\*.  
Then tighten bolts with torque angle\*.



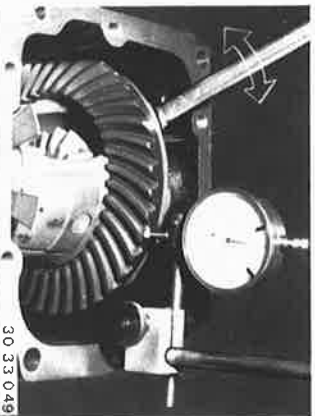
30 33 0 42

Install differential with ring gear and pinion gear.  
Install side covers as marked with corresponding washers (1) and new O-rings (2).  
Tightening torque\*.



30 33 0 48

\* See Specifications

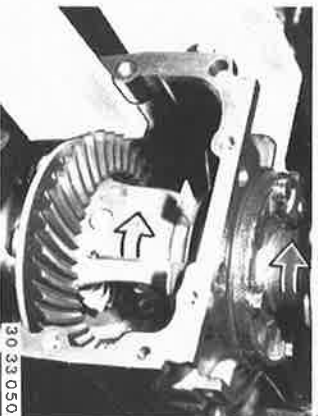


30 33 0 49

**Backlash/Tooth Contact Pattern Adjustments:**  
Mount Special Tool 00 2 500 and measure the backlash\*.

*Important!*  
The tooth contact pattern is always most important for a perfectly adjusted pinion/ring gear set.  
See "Replacing Drive Pinion and Ring Gear" in 33 12 551 for general instructions on tooth contact pattern adjustments.

To check the tooth contact pattern, coat the ring gear teeth with printer's ink, turn in both directions several times and stop the ring gear abruptly with a piece of hard wood.

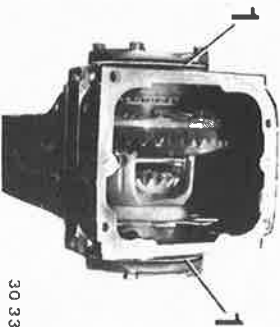


30 33 0 50

Correct backlash\* and tooth contact pattern by changing the thickness of both shims (1).  
If backlash is excessive, use a thinner shim on the ring gear end.  
If backlash is insufficient, use a thicker shim on the ring gear end.  
An axial displacement of the ring gear by 0.01 mm (0.0004") will cause a change in backlash of 0.0076 mm (0.0003").

*Important!*  
The total thickness of both shims must not be changed.  
If a thinner or thicker shim is required to correct the tooth contact pattern, the total thickness must be corrected with the second shim, since otherwise the friction torque of bearings would be changed again.

30 33 0 52



\* See Specifications

## 33-111

### 33 12 526 REPLACING BEARINGS FOR DRIVE PINION

- Final Drive Removed -

Mount final drive on Special Tool

33 1 010.

Drain oil.

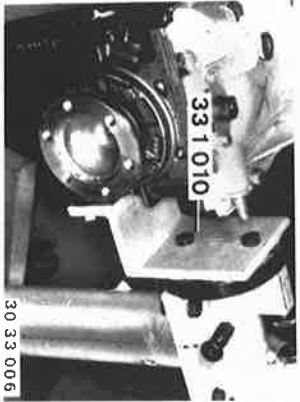
Unscrew case cover.

Replace gasket.

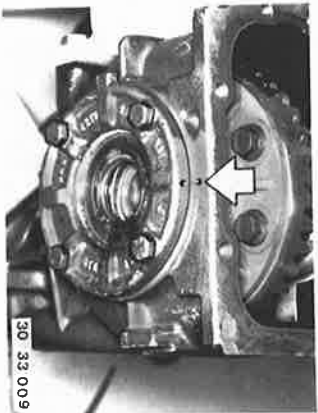
Tightening torque\*.

Pour in correct volume\* of oil - see

Group 33 in Operating Fluids.



30 33 006



30 33 009

Punch mark both bearing caps. Unscrew bolts of both bearing caps and take off bearing caps (turn if necessary, since seals suck tight).

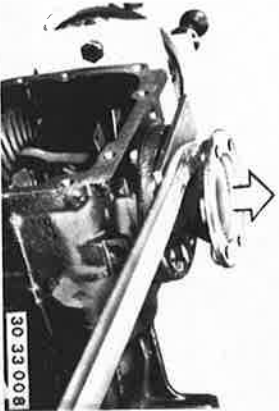
**Important!**

Don't mix up bearing caps and shims. If necessary, attach shims on bearing caps with pieces of wire.

**Installation:**

Tightening torque\*.

Pry off drive flanges with a tire iron.



30 33 008

**Installation:**

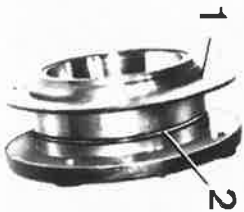
Place round wire snap ring (1) in groove of the differential case prior to installation of the drive flange in such a manner, that both ends of the snap ring are recessed in the groove. This prevents lateral bending of the snap ring.

Press in drive flange by hand and turn slightly, until the snap ring is heard to engage. Replace a stretched snap ring.

\* See Specifications



30 33 156



30 33 010

Axial preload force (4000 N = 882 lbs.) of differential bearings and backlash of ring gear/pinion are adjusted with shims (1).

Remove the complete differential.

**Important!**  
Don't bend the pulse splder.

\* See Specifications



30 33 149

## 33-119

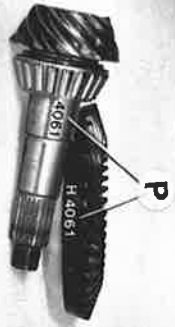
**Important!**  
Drive pinions and ring gears are paired for optimal smooth running in special machines.

The pairing code (P) is inscribed electrically on the drive pinion and ring gear.  
Never install a ring gear and drive pinion with different pairing codes (P) together.

H Gleason hypoid teeth  
(helical shape)

The number inscribed together with "+", "-" or "0" is the deviation from basic distance C in hundredths of millimeter and is required for adjustment of the tooth contact pattern with shims.

+ e is added to C.  
- e is subtracted from C.



30 33 031



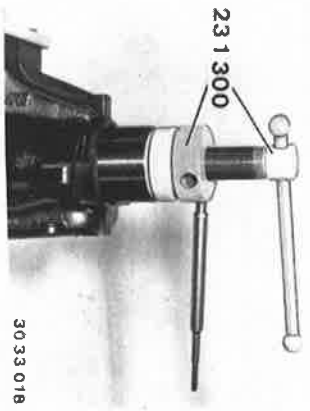
30 33 032



30 33 033

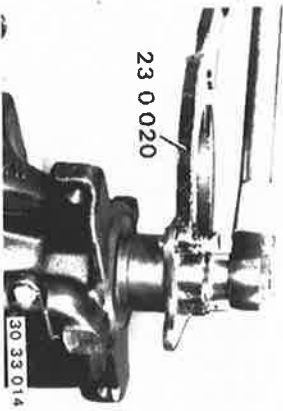
To determine the thickness of shim (X), install drive pinion with new tapered roller bearings, but without bush.

Install drive pinion in rear bearing outer race.  
Press (don't pull) front tapered roller bearing on to the drive pinion with Special Tool 23 1 300 together with a spacing sleeve.



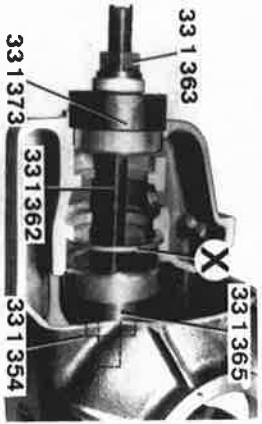
30 33 018

Mount input flange.  
Tighten collar nut in steps and measure the friction torque after each step with Special Tool 00 2 000, adjusting it to 250 Ncm (22 in. lbs.) with the collar nut.



30 33 014

## 33-121



30 33 029

Remove drive pinion and rear bearing outer race.  
Press in shim (X) of determined thickness and bearing outer race.

**Important!**  
Do not install the drive pinion at this point, since it is first necessary to measure and adjust the friction torque of the new differential case bearing.



30 33 041

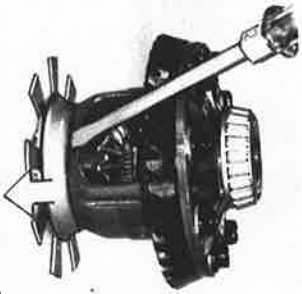
Remove ring gear (cold).  
**Installation:**  
Heat new ring gear to max. 100° C (212° F), checking the temperature with a thermochrome pencil.  
Mount ring gear with two locally made staybolts as guides.



30 33 042

Install new bolts with Loctite No. 270 and tighten in order of (1 ... 8).  
Tightening torque\*  
Tighten bolts to torque angle\*.

Pull off tapered roller bearing on the differential case with Special Tool 33 1 300.



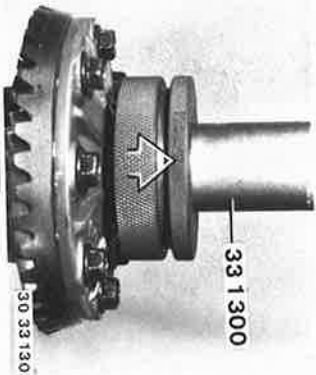
30 33 011

Press pulse spider off of the differential case.  
**Caution!**  
Be careful not to bend the pulse spider.



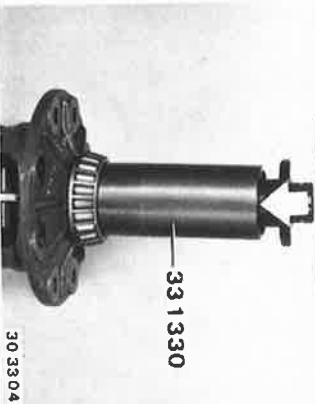
33 1 304

**Installation:**  
Press on pulse spider with Special Tool 33 1 304.



30 33 130

**Installation:**  
Press on new tapered roller bearing inner races cold with Special Tool 33 1 330.



33 1 330

30 33 044

\* See Specifications

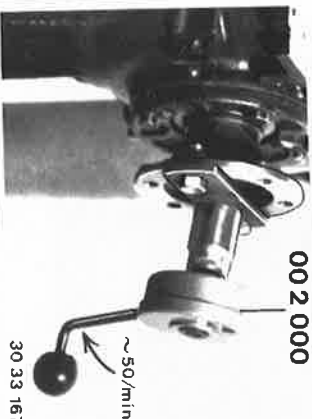
30 33 012

## 33-123



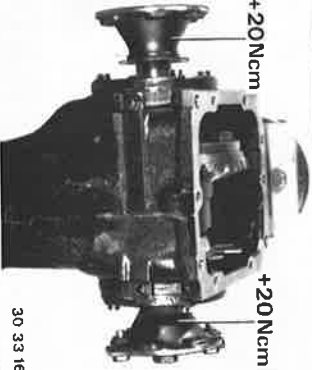
30 33 166

00 2 000



30 33 167

+20Ncm



30 33 168

+20Ncm



30 33 169

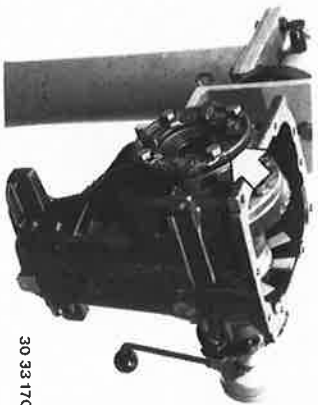
**Determining Friction Torque of New Differential Case Bearings:**  
Axial preload force (4000 N = 882 lbs.) of differential case bearings can be determined with help of the friction torque\*.  
Tighten bolts of second bearing cap uniformly only enough, that the differential can still be turned easily.

Install an output flange on the end opposite the ring gear and determine the friction torque with a locally made holder with welded nut and Special Tool 00 2 000.  
Turn the friction torque tester at approx. 50 rpm.

The friction torque\* specified in the differential case bearing table\* should be reached, but not exceeded.  
If new shaft seals had already been installed, add 20 Ncm (2 in. lbs.) for each seal in which an output shaft runs while measuring.

If the given friction torque is not reached, even though both bearing caps are tightened to the correct tightening torque\*, install a thinner shim opposite the ring gear and repeat the measuring procedures.

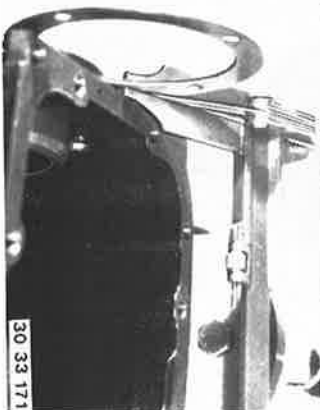
\* See Specifications



30 33 170



30 33 172



30 33 171

If the friction torque is reached, even though the second bearing cap has not yet been tightened to the correct tightening torque\*, a thicker shim must be used on the ring gear end and the measuring procedures repeated.

To make finding the shim thickness easier, the distance between the shim and case can be measured with a feeler gage blade and added to the thickness of the used shim.

**Example:**  
Second bearing cap not tightened fully (bolts screwed in uniformly).  
Specified friction torque\* (e.g. 190 Ncm = 16.5 in. lbs.) is reached and shaft seals are not yet installed.  
Gap measured with blade of feeler gage 0.20 mm (0.008")  
Used shim thickness 1.40 mm (0.055")  
Install shim of thickness 1.60 mm (0.063") and measure again.

\* See Specifications

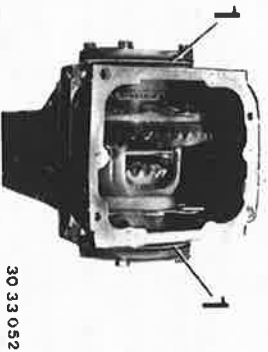
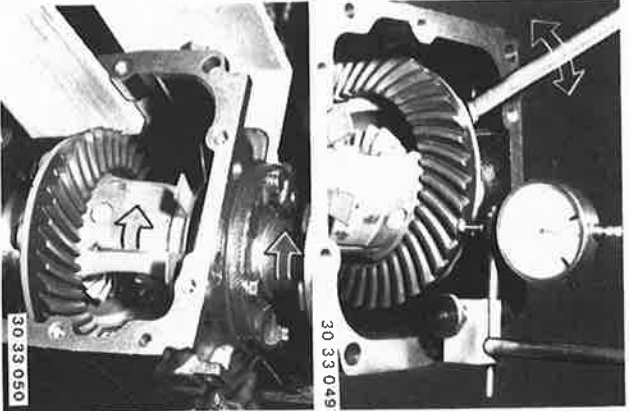


## 33-125

**Adjusting Backlash/Tooth Contact Pattern:**  
Mount Special Tool 00 2 500 and measure backlash\* with a dial gage.

**Important!**  
The tooth contact pattern is always most important for a perfectly adjusted pinion/ring gear set.

To check the tooth contact pattern, coat the ring gear teeth with printer's ink, turn in both directions several times and stop ring gear suddenly with a piece of hard wood.



Correct the backlash\* and tooth contact pattern by changing the thickness of both shims (1).  
If backlash is excessive, use a thinner shim on the ring gear end.  
If backlash is insufficient, use a thicker shim on the ring gear end.  
An axial displacement of the ring gear by 0.01 mm (0.0004") will cause a change in backlash of 0.0076 mm (0.0003").

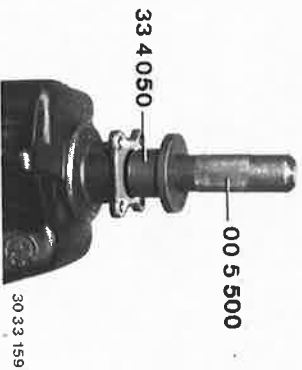
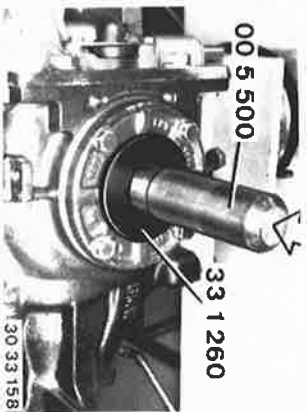
**Important!**  
The total thickness of both shims must not be changed.  
If a thinner or thicker shim is required to correct the tooth contact pattern, the total thickness must be corrected with the second shim, since otherwise the friction torque of bearings would be changed again.

\* See Specifications

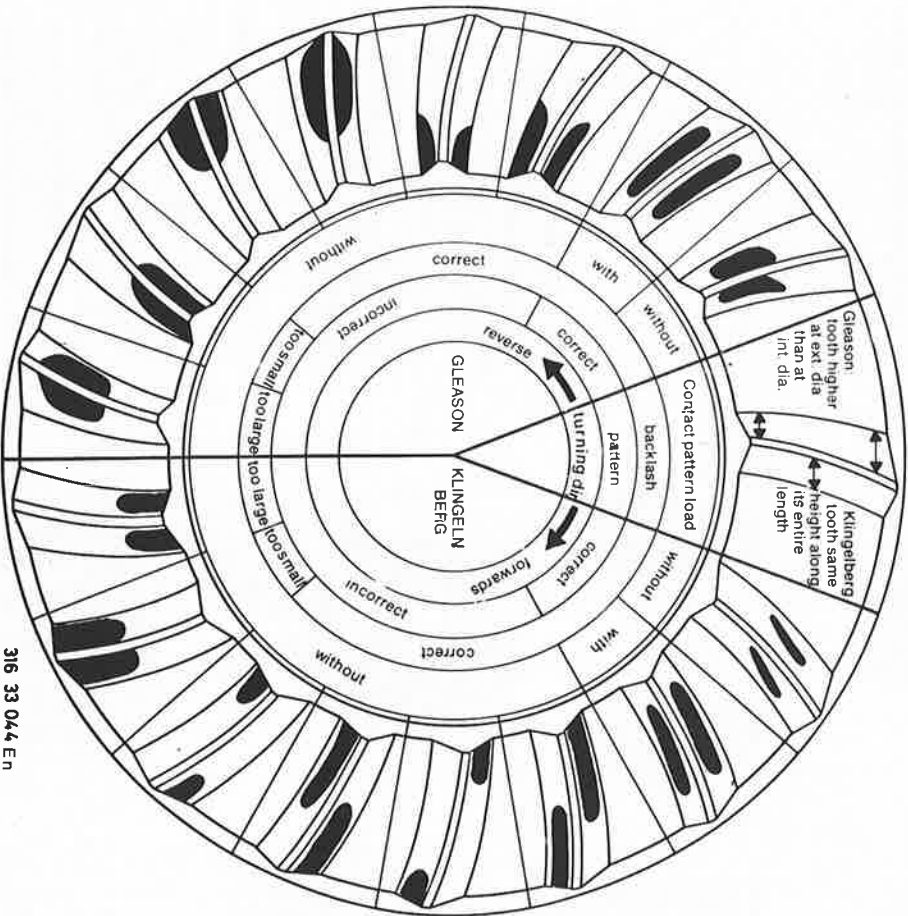
Refer to following pages for general information on tooth contact pattern adjustments.

**Installation:**  
Dip new shaft seals in final drive gear lube.  
Drive in shaft seals against the stop with Special Tools 33 1 260 and 00 5 500.  
Replace a drive flange with seriously scored bearing surfaces.

Drive in new lockplate with Special Tools 33 4 050 and 00 5 500.



Adjustment of contact pattern



## 33-129

Insert new differential gears opposite each other precisely.  
Move differential gears into installed position by turning the drive flange. Remove thrust piece, threaded plate and spindle.



30 33 057

Drive in differential gear shaft. Turn the differential side gears with the drive flange and leave them at the highest point of meshing (hardest turning).



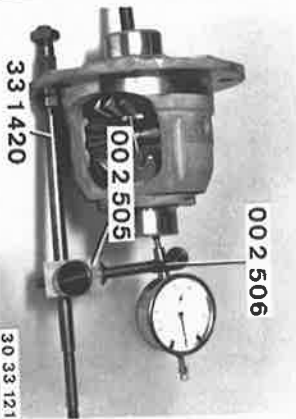
30 33 058

Install Special Tools 33 1 441 and 33 1 431 for measuring.  
If applicable, machine a small amount away from Special Tool 33 1 441 to make application of the dial gage easier.  
Screw in the bolt until the shaft gear is "blocked".



30 33 059

Mount holder with dial gage, consisting of Special Tools 33 1 420, 00 2 505 and 00 2 506, on the differential case. Set dial gage to zero on the blocked shaft gear with preload.



33 1 420

30 33 121



30 33 122

Loosen Special Tool 33 1 431. Read dial gage and note the value. Also note the end, e.g. ring gear end, 0.36 mm (0.014"). Repeat measurement on the opposite shaft gear and note the value, for example: 0.28 mm (0.011").

Remove differential side gears and diaphragm springs.

**Important!**  
Don't mix up differential side gears and diaphragm springs. Measure diaphragm springs with a micrometer, note values and locations, e.g. 1.16 mm for ring gear end and 1.18 mm for other end. Determine correct shim thickness with consideration for a play of 0.02 to 0.07 mm (0.001 to 0.003").

Example:

**Ring gear end:**  
Diaphragm spring 1.16 mm (0.045")  
± measured value 0.36 mm (0.014")

± measured value 1.52 mm (0.059")  
= play 0.02 mm (0.001")  
1.50 mm (0.058")

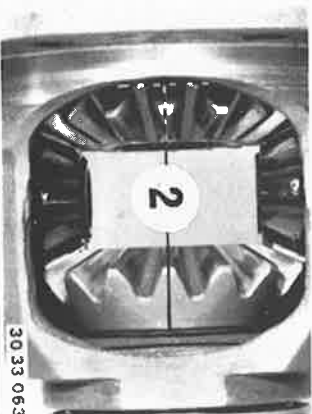
**Opposite end:**  
Diaphragm spring 1.18 mm (0.046")  
± measured value 0.28 mm (0.011")

± measured value 1.46 mm (0.057")  
= play 0.02 mm (0.001")  
1.44 mm (0.056")

**Thickness of Shims:**  
1.50 mm (0.058") and 1.45 mm (0.057").  
Shims (2) are available in steps of 0.05 mm (0.002").  
Install shims (2) of determined thickness.



30 33 123



30 33 063

## 33-133



30 33 319

Install new limited slip differential with new bearings. Only use same make for both bearings. Note make.

Lubricate new bearings thoroughly with approved final drive lube\*\* and let them drip dry.



30 33 048

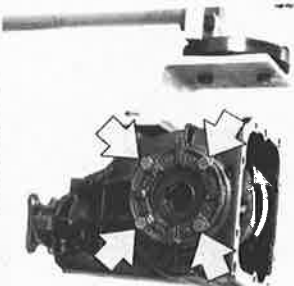
Install side bearing caps as marked with corresponding shims (1), but without O-rings (2) at first. Tighten bearing cap bolts opposite the ring gear end uniformly with correct tightening torque\*.

The compensating bore (1), recognized on the outside by tab (2), always faces up in the installed position of the transmission.



30 33 148

\* See Specifications  
\*\* See Gr. 33 In Operating Fluids



30 33 311

Axial preload force (4000 N = 882 lbs.) of differential case bearings can be determined with help of the friction torque\*. Tighten bolts of the second bearing cap uniformly only enough, that the differential is still easy to turn.

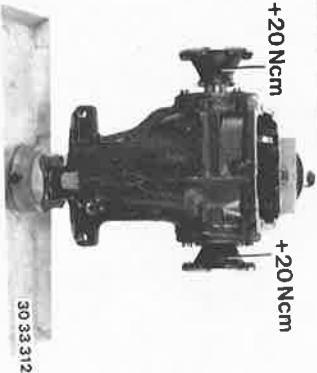


30 33 167

Install an output flange on the end opposite the ring gear and measure the friction torque with a locally made holder with welded nut and friction torque tester, Special Tool 00 2 000. Turn the friction torque tester at approx. 50 rpm.

The friction torque\* specified in the differential case bearing table\* should be reached, but not exceeded. If new shaft seals had already been installed, add 20 Ncm (2 In. lbs.) for each seal in which an output shaft runs while measuring.

If the given friction torque is not reached, even though both bearing caps are tightened to the correct tightening torque\*, a thinner shim must be used on the end opposite the ring gear and the measuring procedures repeated.



30 33 312



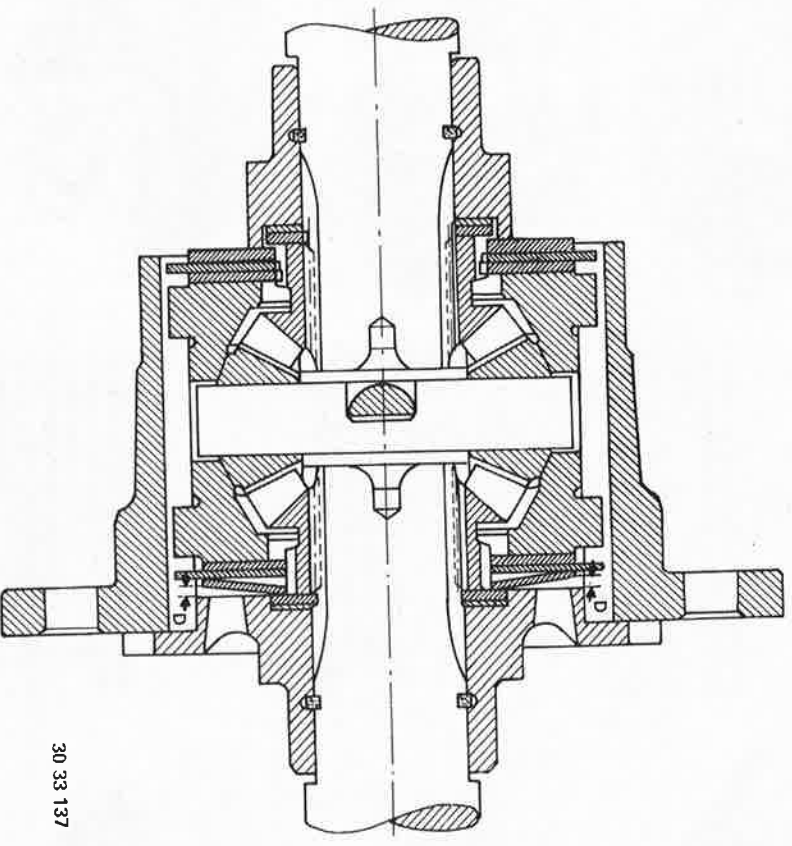
30 33 313

\* See Specifications

# 33-137

An installed play of 0.1 to 0.4 mm (0.004 to 0.016") is required to prevent pressing the diaphragm springs flat.

- Example:**
- B (cover) 6.8 mm (0.268")
  - C (diaphragm springs) 3.6 mm (0.142")
  - A (case) 10.8 mm (0.425")
  - Sum of B + C 10.4 mm (0.409")
  - Installed play D 0.4 mm (0.016")
- Correct any deviation in installed play D by installing outer plates of correct thickness.



30 33 137



30 33 138

Remove all parts from case and insert with the additional parts, thrust washers (2), diaphragm springs (3) and stepped washers (4). Mount and press on case cover (12) firmly (don't bolt). The pre-load of small diaphragm springs (2) should produce an uniform gap all around (check with a feeler gage blade). If there is no clearance between cover and case, check diaphragm springs (2) and thrust washers (3).

## 33-201

### 33 11 511 REPLACING SHAFT SEAL AND INPUT FLANGE - Final Drive Removed -

Mount final drive on Special Tool

33 1 010.

See Special Tool Service Information for new special tool to take final drive with 3-point (DEHAZ) suspension. Drain oil.

Unscrew case cover.

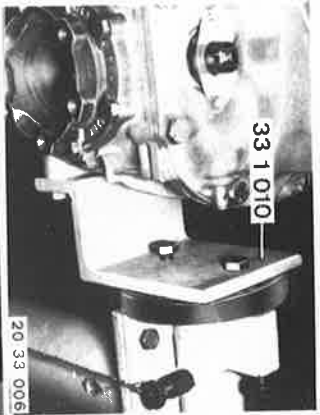
*Installation:*

Replace gasket.

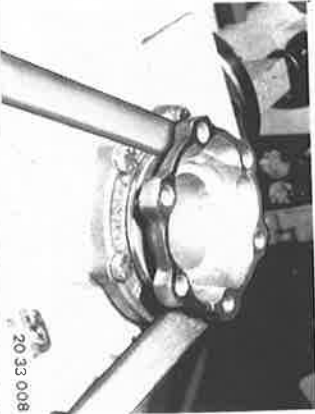
Tightening torque\*

Pour in correct volume\* of oil - see Group 33 In Operating Fluids.

Press off drive flange with a tire iron.



20 33 006



20 33 008



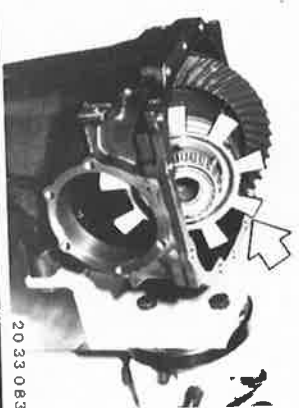
20 33 009



2

1

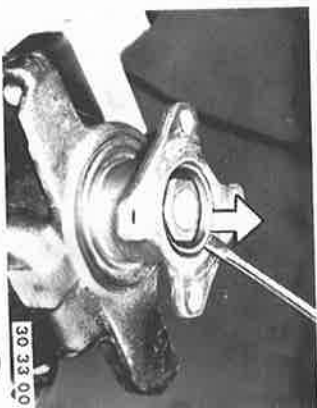
The differential bearing and backlash are adjusted with shims (1). Check O-ring (2), replacing if necessary.



20 33 083

Remove the complete differential.

*Important!*  
Don't bend the pulse spider.



30 33 007

Lift out lockplate.

Check friction torque with Special Tool 00 2 000 and note the value.

*Important!*

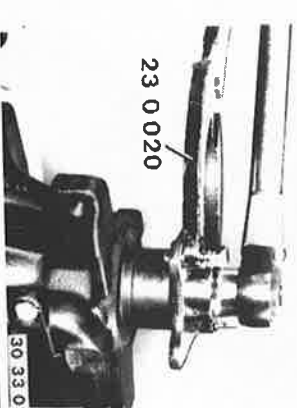
The measured friction torque + friction torque for the new shaft seal = 20 Ncm (17 in. lbs.) must be reached during installation, but not exceeded.



30 33 013

Hold the drive flange with Special Tool 23 0 020 and unscrew the collar nut.

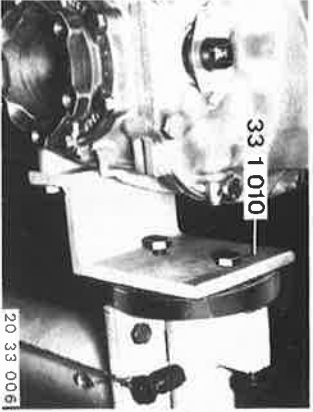
*Installation:*  
Tightening torque\*



30 33 014

\* See Specifications

## 33-203



20 33 006

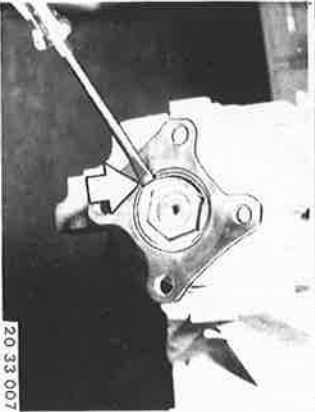
**33 11 512 REPLACING SHAFT SEAL  
FOR INPUT FLANGE**  
- Final Drive Removed -

Mount final drive on Special Tool  
33 1 010.  
Drain oil.

*Installation:*  
Pour in correct volume\* of oil - see  
Group 33 In Operating Fluids.

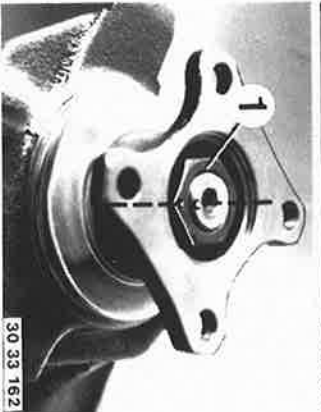
Lift out lockplate.

*Installation:*  
Drive in new lockplate with Special  
Tools 33 4 050 and 00 5 500.



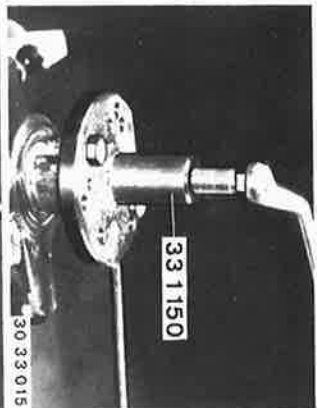
20 33 007

Punch mark position of nut (1) to the  
input shaft.



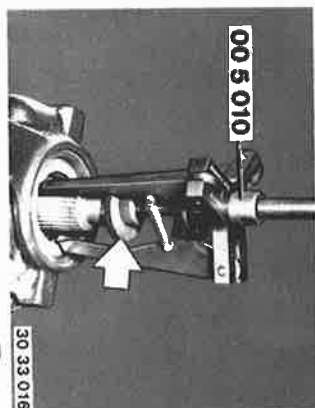
30 33 162

Unscrew nut (1), counterholding on the  
flange with Special Tool 23 0 020.



30 33 015

Pull off input flange with Special Tool  
33 1 150.



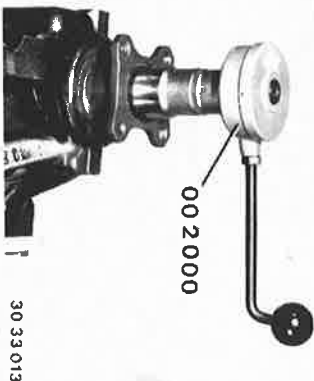
30 33 016

Pull out shaft seal with Special Tool  
00 5 010 and a suitable thrust piece.

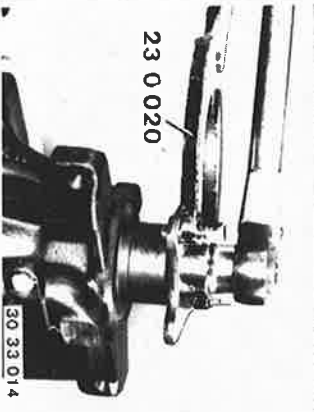
*Installation:*  
If the bearing surface on the input  
flange is scored seriously, replace the  
input flange.

*Important!*  
If the input flange has to be replaced,  
measure the friction torque with the  
old input flange.

If applicable, tighten nut to the punch  
mark, measure and note the friction  
torque value - see 33 11 011.  
The old shaft seal does not have to be  
installed for measuring.



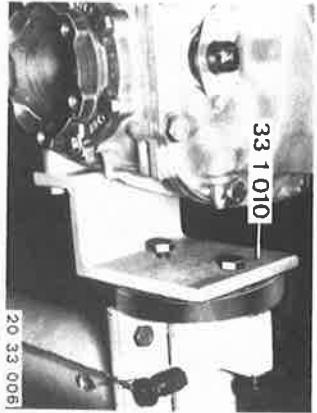
30 33 013



30 33 014

\* See Specifications

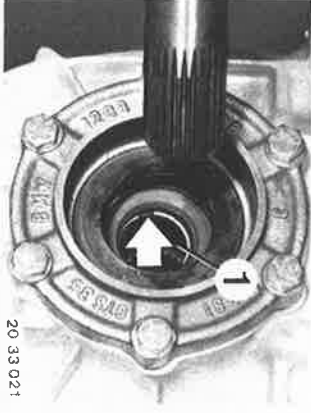
## 33-205



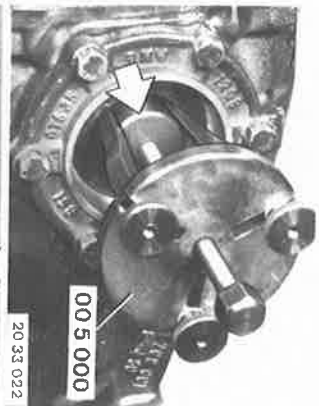
**33 11 621 REPLACING SHAFT SEAL  
FOR DRIVE FLANGE**  
- Final Drive Removed -  
Mount final drive on Special Tool  
33 1 010.



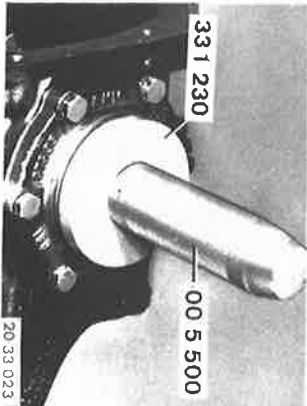
Press off drive flange with tire irons.



**Installation:**  
Prior to installation of the drive flange, place wire snap ring (1) in groove of the differential case that both ends of the wire snap ring are recessed in the groove.  
This will prevent lateral bending of the ring.  
Press in drive flange by hand and turn slightly until the wire snap ring is heard to engage.  
Replace stretched snap rings.



Pull out shaft seal with Special Tool 00 5 000 or 00 5 010 in conjunction with a thrust piece.



**Installation:**  
Dip shaft seal in final drive gear lube. Drive in shaft seal against the stop with Special Tool's 33 1 230 and 00 5 500.  
Replace a drive flange with a seriously scored bearing surface.

**Note:**  
It might be necessary to machine Special Tool 33 1 230 because of the side cover casting tolerances.



## 33-207

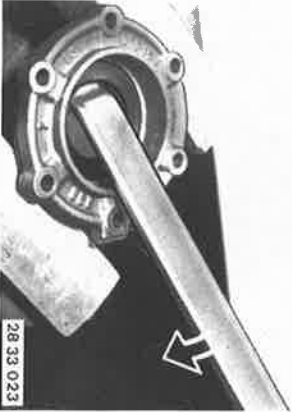


30 33 030

**Installation:**  
Press on new tapered roller bearings cold with Special Tool 33 1 020.

**Important!**  
Always only install both bearings of same make.

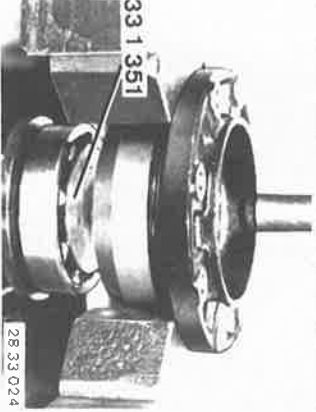
Lift shaft seals out of both bearing caps.



28 33 023

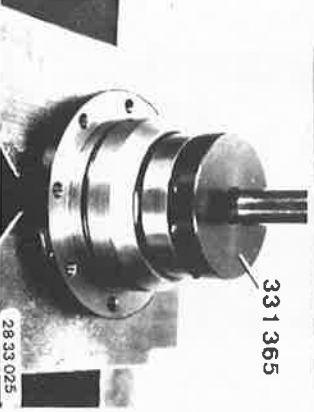
Press out bearing outer races with Special Tools 33 1 350 and 33 1 351.

**Important!**  
Puller must engage in the bearing outer race.



28 33 024

**Installation:**  
Press in new bearing outer races with Special Tool 33 1 365.



28 33 025



28 33 094

If only differential bearings are being replaced, the drive pinion can remain installed and the differential case is installed without the ring gear to determine the thickness of shims.

**Important!**  
Note make of bearings - needed for friction torque determination.

Lubricate new bearings with approved final drive gear lube\*\* thoroughly and let them drip dry.



20 33 010



28 33 072

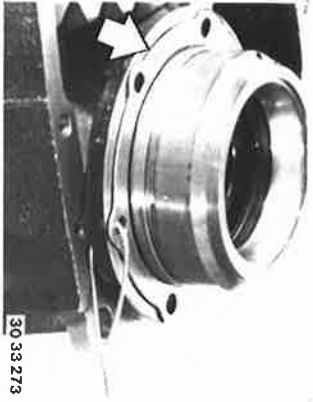
Install slide bearing caps as marked with corresponding shims (1), but without O-rings (2) at first.  
Tighten bolts of bearing cap opposite the ring gear end uniformly.  
Tightening torque\*\*.

Compensating bores (1), recognized on the outside by tab (2), always face up in the installed position of the transmission.

\* See Specifications

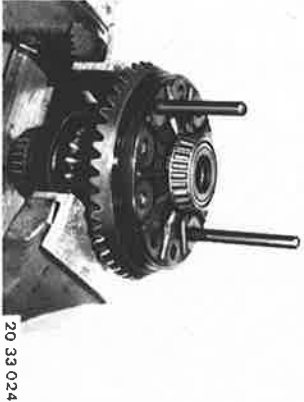
\*\* See Gr. 33 in Operating Fluids

Remove differential case.  
Arrange side covers and shims of determined thickness and don't mix them up.



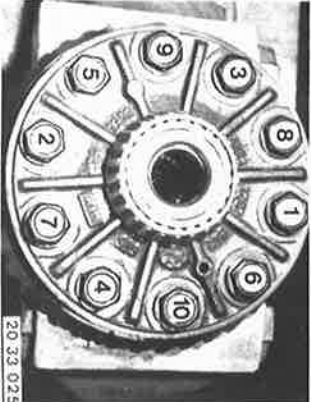
30 33 273

**Installation:**  
Clean tapped bores thoroughly (with tapper).  
Heat ring gear to max. 100° C (212° F), checking temperature with a thermo-color pencil.  
Mount ring gear with two locally manufactured staybolts for guiding.



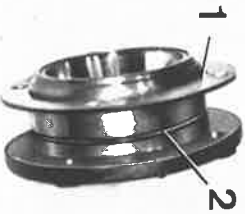
20 33 024

Install new bolts with Loctite No. 270.  
Tighten bolts in order of 1 ... 10.  
Tightening torque\*.  
Then tighten bolts with torque angle\*.



20 33 025

Install differential with ring gear and pulse gear.  
Install side covers as marked with corresponding washers (1) and new O-rings (2).  
Tightening torque\*.



30 33 010

\* See Specifications

**Backlash/Tooth Contact Pattern Adjustments:**  
Mount Special Tool 00 2 500 and measure the backlash\*.



28 33 026

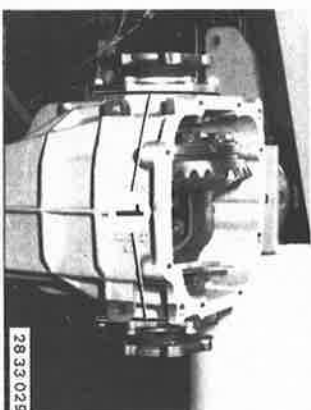
**Important!**  
The tooth contact pattern is always most important for a perfectly adjusted pinion/ring gear set.  
See "Replacing Drive Pinion and Ring Gear" in 33 12 551 for general instructions on tooth contact pattern adjustments.

To check the tooth contact pattern, coat the ring gear teeth with printer's ink, turn in both directions several times and stop the ring gear abruptly with a piece of hard wood.



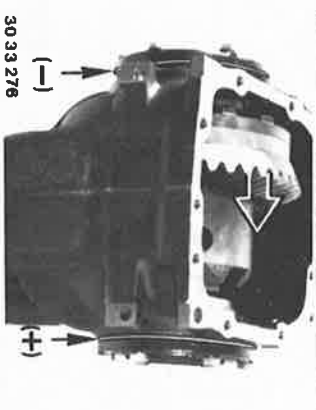
28 33 027

Correct backlash\* and tooth contact pattern by changing the thickness of both shims (1).  
If backlash is excessive, use a thinner shim on the ring gear end.  
If backlash is insufficient, use a thicker shim on the ring gear end.  
An axial displacement of the ring gear by 0.01 mm (0.0004") will cause a change in backlash of 0.0076 mm (0.0003").



28 33 029

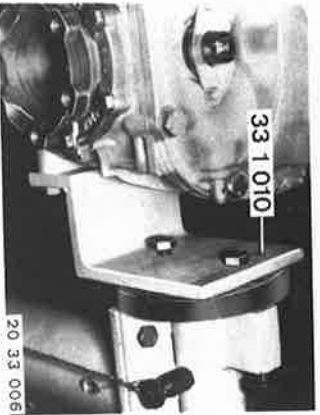
**Important!**  
The total thickness of both shims must not be changed.  
If a thinner or thicker shim is required to correct the tooth contact pattern, the total thickness must be corrected with the second shim, since otherwise the friction torque of bearings would be changed again.



30 33 276

\* See Specifications

## 33-211



20 33 006

### 33 12 526 REPLACING BEARINGS FOR DRIVE PINION

- Final Drive Removed -

Mount final drive on Special Tool

33 1 010.

Drain oil.

Unscrew case cover.

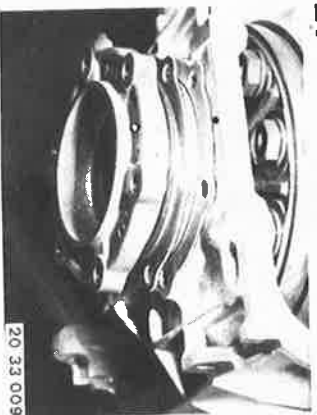
Replace gasket.

Tightening torque\*.

Pour in correct volume\* of oil - see

Group 33 in Operating Fluids.

Group 33 in Operating Fluids.



20 33 009

Punch mark both bearing caps. Unscrew bolts of both bearing caps and take off bearing caps (turn if necessary, since seals suck tight).

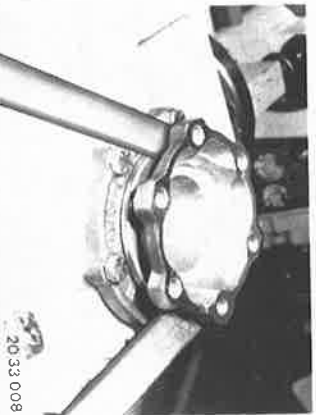
**Important!**

Don't mix up bearing caps and shims. If necessary, attach shims on bearing caps with pieces of wire.

**Installation:**

Tightening torque\*.

Pry off drive flanges with a tire iron.



20 33 008

**Installation:**

Place round wire snap ring (1) in groove of the differential case prior to installation of the drive flange in such a manner, that both ends of the snap ring are recessed in the groove. This prevents lateral bending of the snap ring.

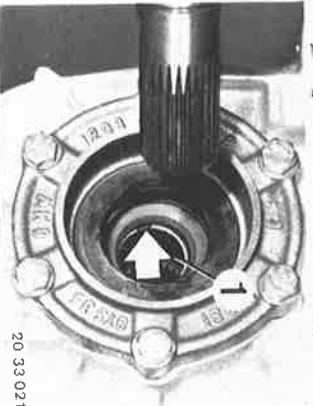
Press in drive flange by hand and turn

slightly, until the snap ring is heard to

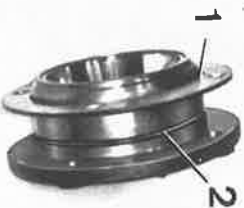
engage.

Replace a stretched snap ring.

\* See Specifications



20 33 021



30 33 010

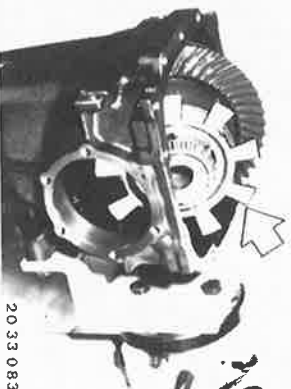
Axial preload force (4000 N = 882 lbs.) of differential bearings and backlash of ring gear/pinion are adjusted with shims (1).

Remove the complete differential.

**Important!**

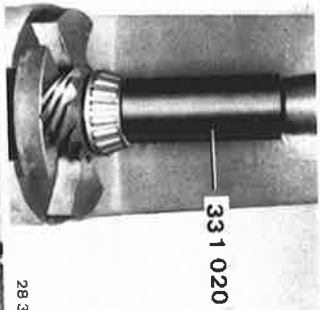
Don't bend the pulse spider.

\* See Specifications



20 33 083

## 33-213

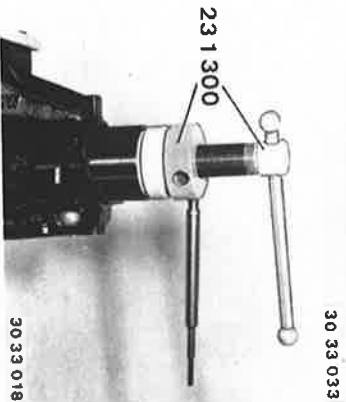


Press new tapered roller bearing on to drive pinion with Special Tool 33 1 020.

**Important!**  
Always only use both bearings of the same make.



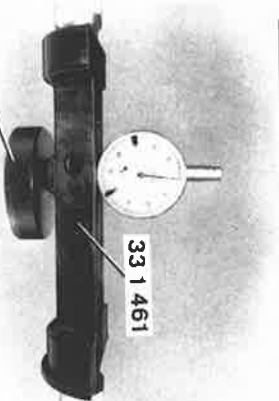
The drive pinion is installed with new tapered roller bearings, but without clamping sleeve, to determine correct thickness of shim (X).



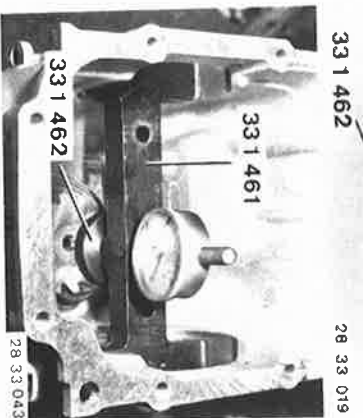
Install drive pinion in rear bearing outer race.  
Pull front tapered roller bearing on to drive pinion with Special Tool 23 1 300 in conjunction with a spacing sleeve.



**Important!**  
Measure friction torque at intervals during the tightening procedures with Special Tool 00 2 000.

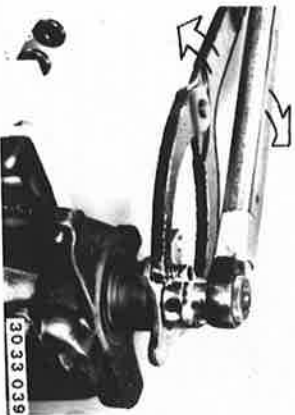


**Block Distance of Drive Pinion:**  
Mount dial gage in Special Tool 33 1 461.  
Place Special Tool 33 1 461 with dial gage on Special Tool 33 1 462 and set the dial gage to 0 (zero) with preload.



Place Special Tool 33 1 462 on the drive pinion.  
Place Special Tool 33 1 461 in case.

**Determine value Y:**  
Basic distance C = 11.50 mm (0.453")  
Gage thickness B = 9.50 mm (0.374")

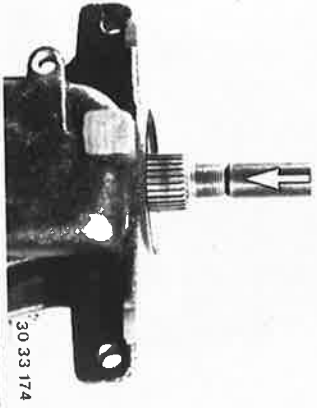


Mount input flange.  
Adjust the friction torque of the drive pinion bearings to 250 Ncm (22 In. lbs.) by tightening the collar nut carefully.

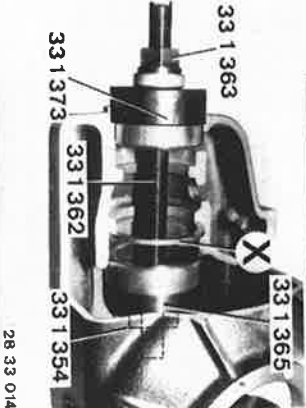
## 33-215

Remove drive pinion after determining the thickness of shim (X).

*Important!*  
Note make of bearings - this is required for determination of friction torque.



Remove rear bearing outer race and install it again with shim (X) of determined thickness.



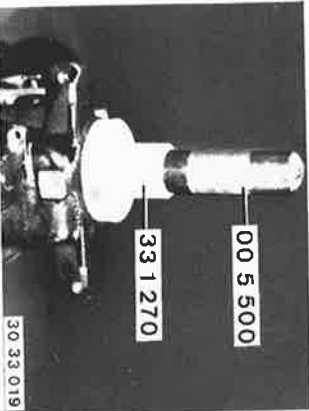
28 33 014

Install drive pinion with a new clamping sleeve (2).



20 33 016

Dip shaft seal in final drive gear lube and drive in flush with Special Tools 33 1 270 and 00 5 500.

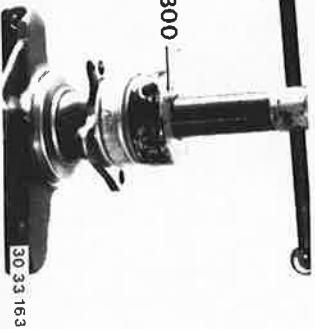


30 33 019



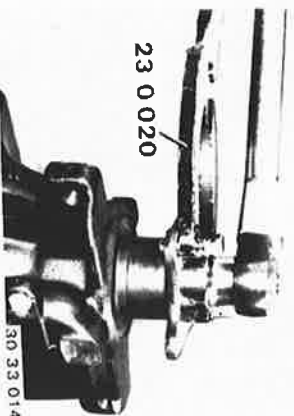
23 1 300

Press (don't pull) input flange on to the input shaft with Special Tool 23 1 300. Axial preload force (5000 N = 1102 lbs.) of drive pinion bearings can be determined with help of the friction torque.



30 33 163

Tighten input flange with the collar nut in steps, measuring the friction torque after each step (see below).



23 0 020

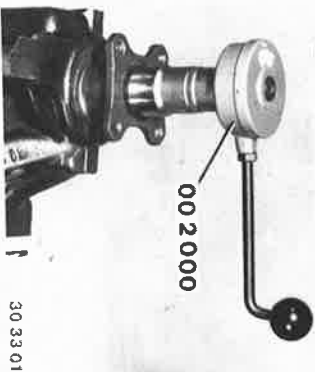
30 33 014

Measure friction torque\* with Special Tool 00 2 000 and a suitable wrench socket.

*Important!*

The relation between friction torque and preload force differs depending on the make of bearings.

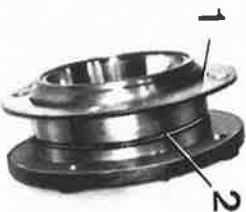
Take the specified friction torque from the pinion bearing table\* and add 20 Ncm (2 in. lbs.) for the new shaft seal.



00 2 000

30 33 013

Install differential.  
Install side covers as marked with corresponding washers (1) and new O-rings (2).  
Tighten bolts uniformly.  
Tightening torque\*.



30 33 010

\* See Specifications

## 33-217

### 33 12 551 REPLACING DRIVE PINION WITH RING GEAR

- Final Drive Removed -

Mount final drive on Special Tool

33 1 010.

Drain oil.

Unscrew case cover.

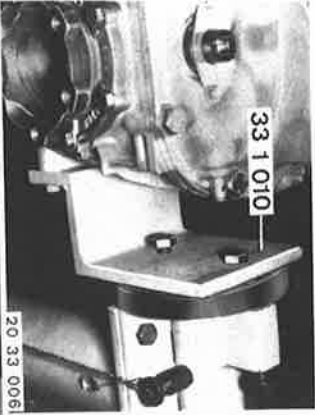
Replace gasket.

Tightening torque\*.

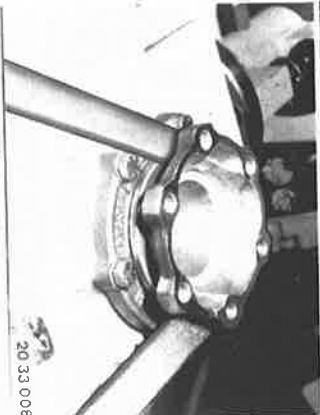
Pour in correct volume\* of oil - see

Group 33 in Operating Fluids.

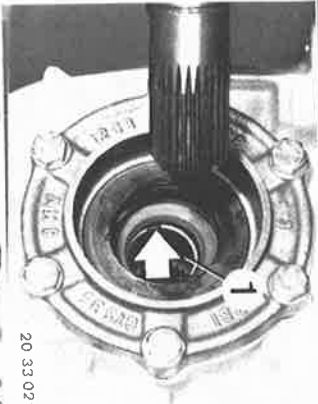
Pry off both drive flanges with a tire iron.



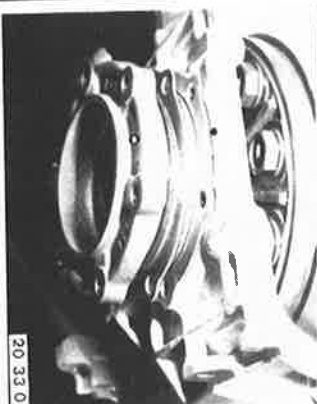
20 33 006



20 33 008



20 33 021



20 33 009

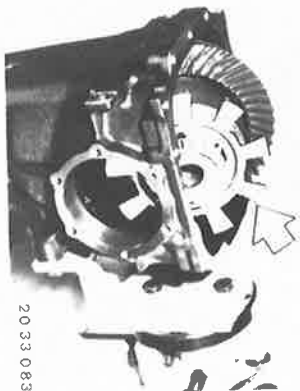


20 33 010

Differential case bearings and backlash are adjusted with shims (1). Check O-ring (2), replacing if necessary.

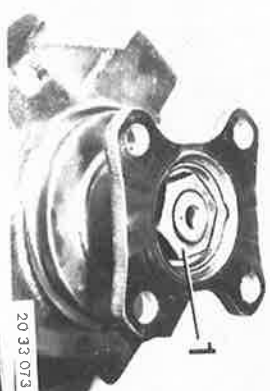
Remove complete differential case.

**Important!**  
Don't bend the pulse spider.



20 33 083

Lift out lockplate.  
Hold with Special Tool 23 0 020 and unscrew nut (1).



20 33 073

Pull off input flange with Special Tool 33 1 150.  
The specified friction torque\* is given for new drive pinion bearings and the friction torque of old bearings does not have to be determined.

Punch mark both bearing caps.  
Remove both bearing caps.

**Important!**  
Don't mix up bearing caps and shims.  
Attach shims on bearing caps with pieces of wire, if necessary.

**Installation:**  
Tightening torque\*.

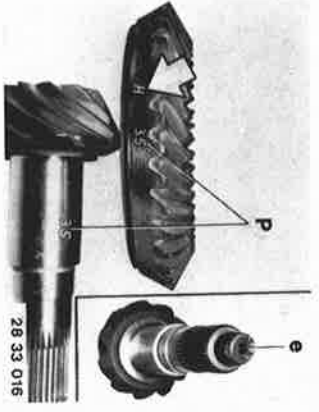
\* See Specifications



20 33 014

\* See Specifications

# 33-219



28 33 016

**Important!**  
 Drive pinions and ring gears are paired for optimal smooth running in special machines.  
 The pairing code (P) is inscribed electrically on the drive pinion and ring gear.  
 Never install a ring gear and drive pinion with different pairing codes (P) together.

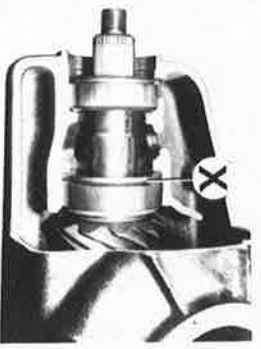
H Gleason hypoid teeth  
 (helical shape)

The number inscribed together with "+", "-" or "H" is the deviation from basic distance C in hundredths of millimeter and is required for adjustment of the tooth contact pattern with shims.

+ e is added to C.  
 - e is subtracted from C.

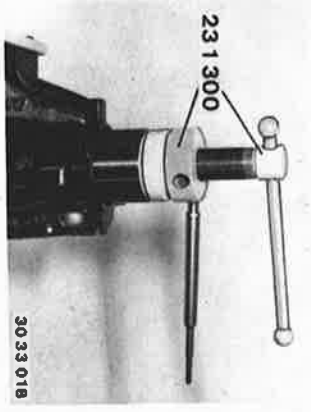


28 33 017



28 33 018

To determine the thickness of shim (X), install drive pinion with new tapered roller bearings, but without bush.



30 33 018

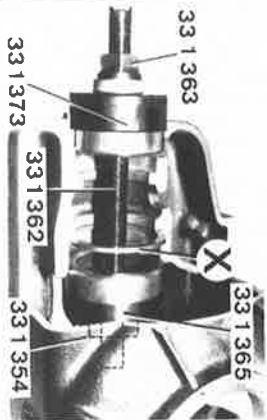
Install drive pinion in rear bearing outer race.  
 Press (don't pull) front tapered roller bearing on to the drive pinion with Special Tool 23 1 300 together with a spacing sleeve.

Mount input flange.  
 Tighten collar nut in steps and measure the friction torque after each step with Special Tool 00 2 000, adjusting it to 250 Nm (22 in. lbs.) with the collar nut.



20 33 072

## 33-221



28 33 014

Remove drive pinion and rear bearing outer race.  
Press in shim (X) of determined thickness and bearing outer race.

**Important!**  
Do not install the drive pinion at this point, since it is first necessary to measure and adjust the friction torque of the new differential case bearing.



20 33 011

Press pulse spider off of the differential case.

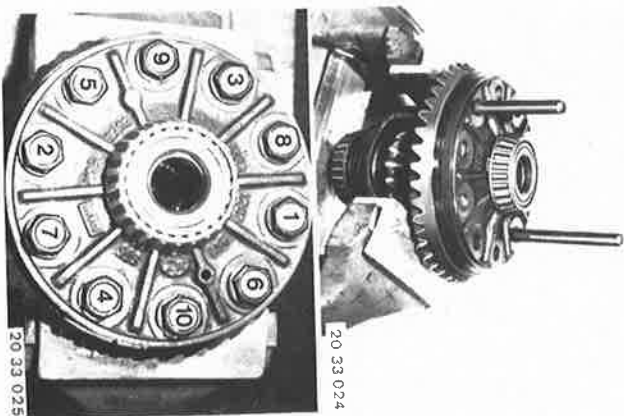
**Caution!**  
Be careful not to bend the pulse spider.

**Installation:**  
Press on pulse spider with Special Tool 33 1 304.



33 1 358

20 33 012



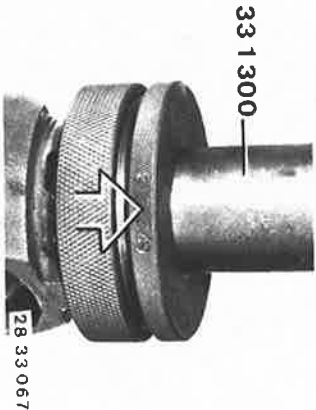
20 33 024

Remove ring gear (cold).

**Installation:**  
Clean threads thoroughly (with a taper).  
Heat ring gear to max. 100° C (212° F), checking the temperature with a thermochrome pencil.  
Mount ring gear with two locally made staybolts as guides.

Install new bolts with Loctite No. 270 and tighten in order of (1 ... 10).  
Tightening torque\*  
Tighten bolts to torque angle\*.

Pull off tapered roller bearing on the differential case with Special Tool 33 1 300.



28 33 067

**Installation:**  
Press on new tapered roller bearing inner races cold with Special Tool 33 1 003.



31 1 003

28 33 022

\* See Specifications

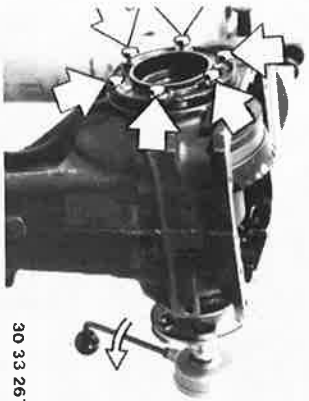


## 33-223

### Determining Friction Torque of New Differential Case Bearings:

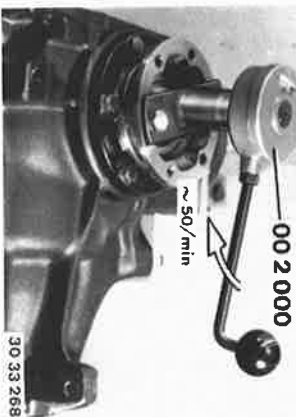
Axial preloaded force (4000 N = 892 lbs.) of differential case bearings can be determined with help of the friction torque\*.

Tighten bolts of second bearing cap uniformly only enough, that the differential can still be turned easily.



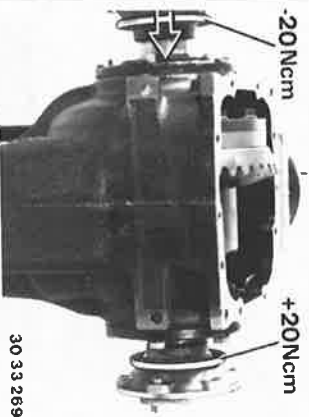
30 33 267

Install an output flange on the end opposite the ring gear and determine the friction torque with a locally made holder with welded nut and Special Tool 00 2 000.  
Turn the friction torque tester at approx. 50 rpm.



30 33 268

The friction torque\* specified in the differential case bearing table\* should be reached, but not exceeded.  
If new shaft seals had already been installed, add 20 Ncm (2 in. lbs.) for each seal in which an output shaft runs while measuring.



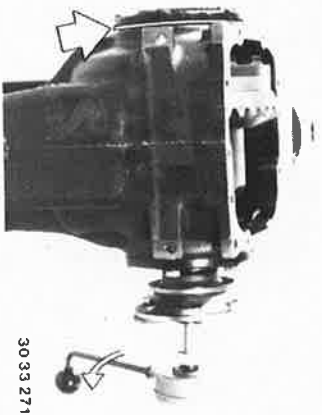
30 33 269

If the given friction torque is not reached, even though both bearing caps are tightened to the correct tightening torque\*, install a thinner shim opposite the ring gear and repeat the measuring procedures.



30 33 270

\* See Specifications



30 33 271

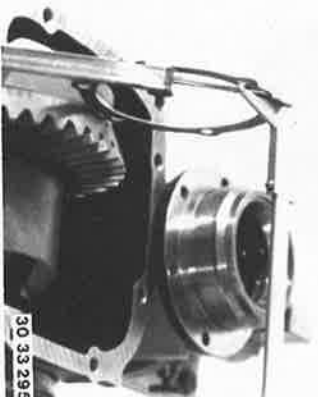
If the friction torque is reached, even though the second bearing cap has not yet been tightened to the correct tightening torque\*, a thicker shim must be used on the ring gear end and the measuring procedures repeated.

To make finding the shim thickness easier, the distance between the shim and case can be measured with a feeler gage blade and added to the thickness of the used shim.



30 33 272

**Example:**  
Second bearing cap not tightened fully (bolts screwed in uniformly).  
Specified friction torque\* (e.g. 190 Ncm = 16.5 in. lbs.) is reached and shaft seals are not yet installed.  
Gap measured with blade of feeler gage 0.20 mm (0.008")  
Used shim thickness 1.40 mm (0.055")  
Install shim of thickness 1.60 mm (0.063") and measure again.



30 33 295

\* See Specifications

## 33-225

Refer to following pages for general information on tooth contact pattern adjustments.

**Adjusting Backlash/Tooth Contact Pattern:**  
Mount Special Tool 00 2 500 and measure backlash\* with a dial gage.

**Important!**  
The tooth contact pattern is always most important for a perfectly adjusted pinion/ring gear set.



28 33 026

To check the tooth contact pattern, coat the ring gear teeth with printer's ink, turn in both directions several times and stop ring gear suddenly with a piece of hard wood.



28 33 027

Correct the backlash\* and tooth contact pattern by changing the thickness of both shims (\*).  
If backlash is excessive, use a thinner shim on the ring gear end.

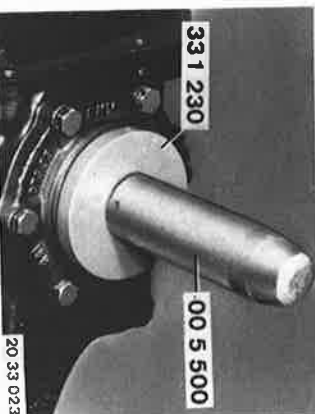
If backlash is insufficient, use a thicker shim on the ring gear end.  
An axial displacement of the ring gear by 0.01 mm (0.0004") will cause a change in backlash of 0.0076 mm (0.0003").

**Important!**  
The total thickness of both shims must not be changed.

If a thinner or thicker shim is required to correct the tooth contact pattern, the total thickness must be corrected with the second shim, since otherwise the friction torque of bearings would be changed again.



28 33 029

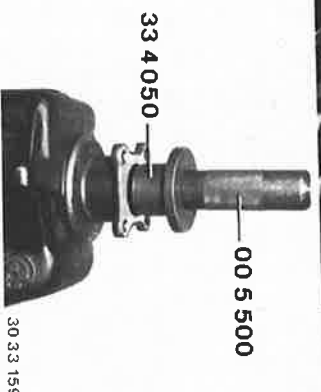


20 33 023

**Installation:**  
Dip new shaft seals in final drive gear lube.  
Drive in shaft seals against the stop with Special Tools 33 1 230 and 00 5 500.  
Replace a drive flange with seriously scored bearing surfaces.

**Note:**  
It might be necessary to machine Special Tool 33 1 230 because of the side cover casting tolerances.

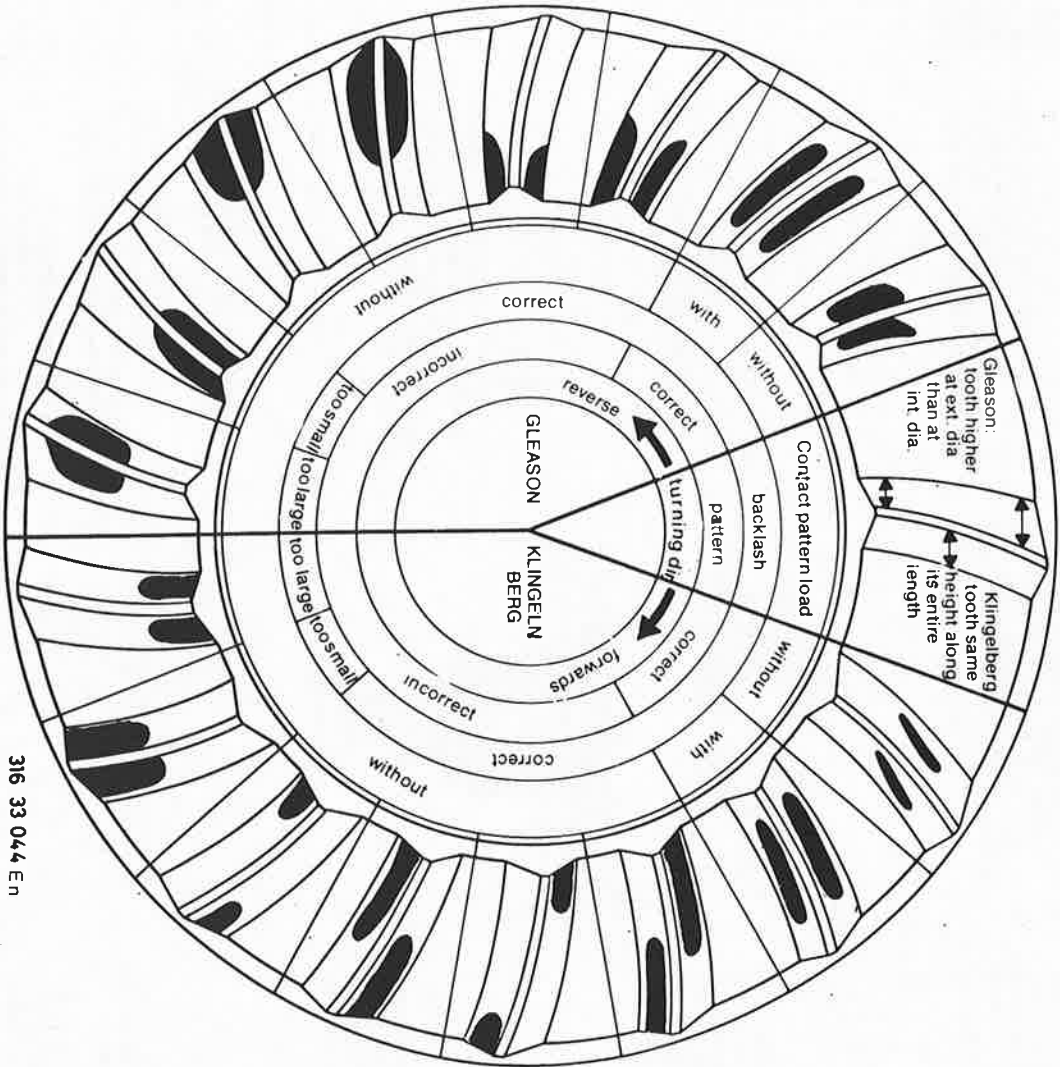
Drive in new lockplate with Special Tools 33 4 050 and 00 5 500.



30 33 159

\* See Specifications

Adjustment of contact pattern



## 33-229

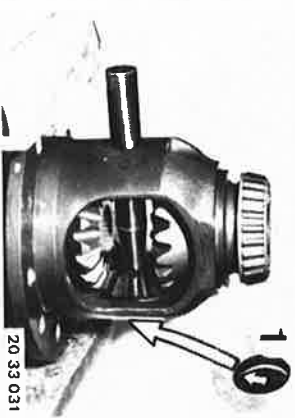
Install differential bevel gears exactly opposite each other.  
Move differential gears to installed position by turning the drive flange.  
Remove special tools.



20 33 030

### Procedures with Hydraulic Press:

Check that circlip (1) is in correct installed position.  
Slide in feed mandrel from the side without a circlip.



20 33 031

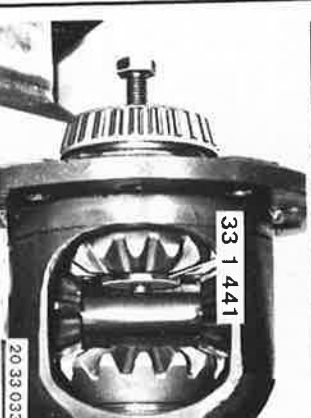
Place differential shaft with large opening on the feed mandrel and press it in. The pressing-in force will increase strongly, when the circlip has engaged.

### Caution!

Stop the pressing-in step as soon as the force increases - danger of shearing off the circlip.  
Do not push back the differential shaft after installation.

### Measuring Preload of Diaphragm Springs:

Install Special Tools 33 1 441 and 33 1 431.  
Tighten the bolt by hand.



20 33 032

20 33 033



28 33 068

Mount dial gage with holder, consisting of Special Tools 33 1 420, 00 2 505 and 00 2 506, on the differential case.  
Set the dial gage to zero with preload on the blocked shaft gear.



28 33 069

Tighten spindle until diaphragm springs are pressed flat.  
Read dial gage.  
Loosen spindle.  
Turn shaft gear and measure again at several points.  
A play of 0.03 to 0.1 mm (0.0012 to 0.0039") is required to avoid pressing the diaphragm springs flat.  
The lower value would be ideal.  
Repeat measurements on the opposite shaft gear.

### Excessive Clearance:

Install thicker shim.

### Insufficient Clearance:

Install thinner shim.

Shims (2) are available in 0.05 mm (0.0020") thickness steps.  
The opposite end is determined in the same manner.



20 33 036

Install shims (2) of determined thickness and diaphragm springs (1).  
Inside curved surfaces of diaphragm springs (1) face the differential case.



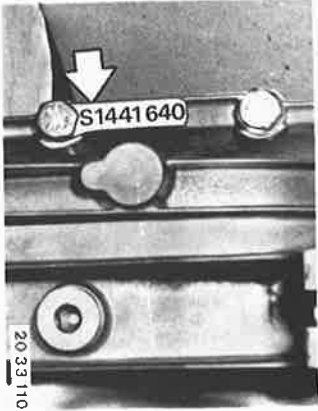
20 33 028

## 33-231

### LIMITED SLIP DIFFERENTIAL WITH 25% LOCKING RATIO

The limited slip differential is marked with a "S" on the case or data plate. A limited slip differential has the following advantages.

- Prevention of wheel slip when driving on rough road surfaces.
- Prevention of wheel slip when moving off with different traction underneath left and right sides of car wheels.
- Prevention of wheel slip when driving fast on wet roads.
- Prevention of wheel slip on inside of curve when driving fast in curves.
- Prevention of slip when driving fast on roads with different traction between left and right.



20 33 110

#### Checking Function Without Removing:

- Level workshop floor.
- Drive car's left wheel on Special Tool 33 1 450.
- Release parking brake completely.
- Engage 1st gear and accelerate engine.
- Function of limited slip differential is okay, if the car can be driven off of Special Tool 33 1 450.

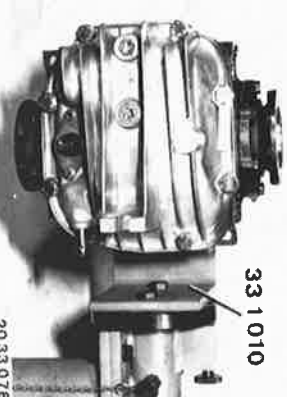
#### Important!

Drive off of fixture slowly.



33 1 450

28 33 066



33 1 010

### 33 14 520 REPLACING LIMITED SLIP DIFFERENTIAL ASSEMBLY - Final Drive Removed -

Remove final drive - see 33 10 010.

Drain oil.

Mount final drive on Special Tool 33 1 010.

Installation: Pour in correct volume\* of oil - see Group 33 in Operating Fluids.

Unscrew case cover.

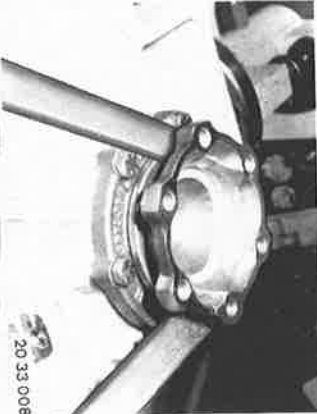
Installation: Replace gasket. Tightening torque\*.

Pry off both drive flanges with a tire iron.



20 33 080

Pry off both drive flanges with a tire iron.



20 33 008

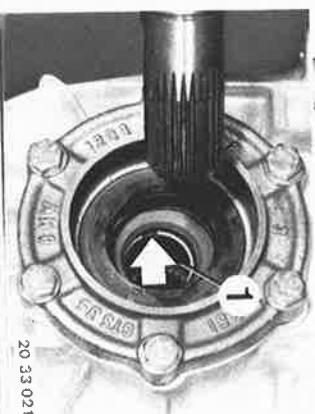
#### Installation:

Before installation of the drive flange, place round wire snap ring (1) in groove of the differential case that both ends are recessed in the groove. This prevents lateral bending of the ring.

Push in and turn drive flange slightly by hand until round wire snap ring is heard to engage.

Replace a stretched snap ring.

\* See Specifications



20 33 021

## 33-235

If the friction torque is reached, even though the second bearing cap is not yet tightened to correct tightening torque\*, use a thicker shim on the ring gear and repeat the measuring procedures.

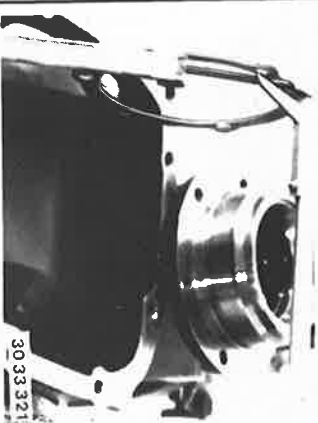
To make finding the thickness of shims easier, the distance between the shim and case can be measured with a feeler gage blade and this value is then added to the thickness of the used shims.



28 33 085

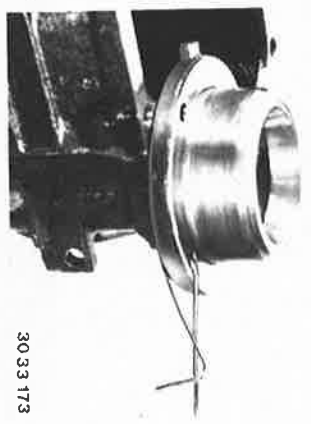


28 33 084

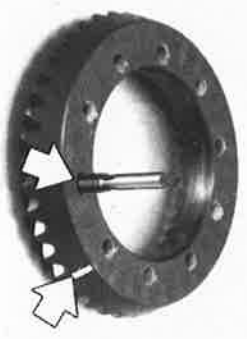


30 33 321

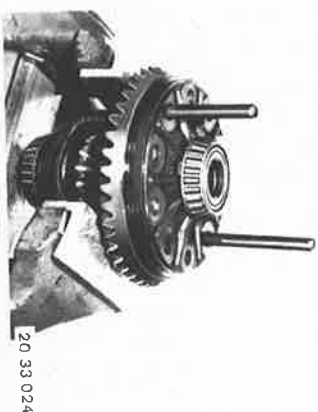
**Example:**  
 Second bearing cap not tightened fully (bolts screwed in uniformly).  
 Specified friction torque\* (e.g. 190 Ncm = 16.5 in. lbs.) is reached and shaft seals are not yet installed.  
 Gap measured with blade of feeler gage 0.20 mm (0.008")  
 Used shim thickness 1.40 mm (0.055")  
 Install shim of 1.60 mm (0.063") thickness and measure again.



30 33 173



30 33 262



20 33 024



20 33 085

Remove differential case.  
 Arrange side covers and shims; don't mix them up.

**Installation:**  
 Clean tapped bores thoroughly (with a tapper).  
 Heat ring gear to max. 100° C (212° F), checking the temperature with a thermocolor pencil.

Mount ring gear with two locally made staybolts as guides.

Install new bolts with Loctite No. 270 and tighten in order of 1 through 10. Tightening torque\*.  
 Tighten bolts with torque angle\*.

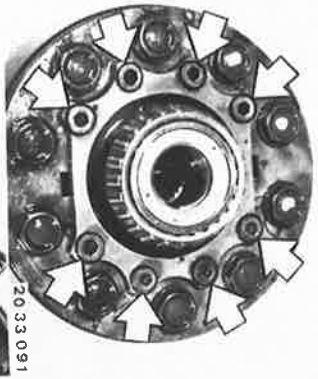
\* See Specifications

\* See Specifications

## 33-237

### 33 14 583 DISASSEMBLING AND ASSEMBLING LIMITED SLIP DIFFERENTIAL - Final Drive Removed -

Remove limited slip differential - see 33 14 520.  
Unscrew case cover mounting bolts.  
Take off case cover.

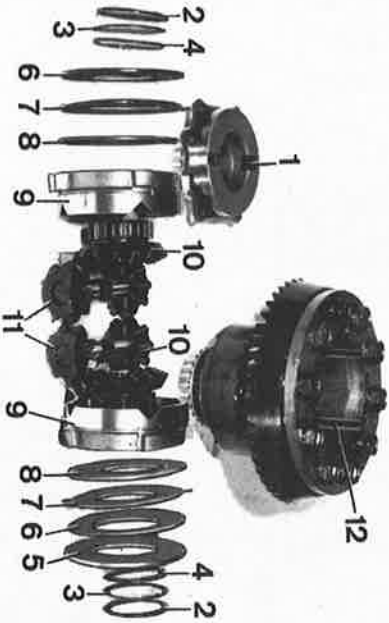


20 33 091

Turn case upside down to let the parts slide out.

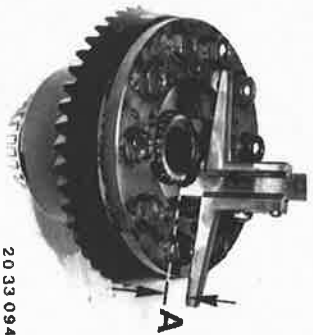
**Installed Order:**  
(1) case cover, (2) thrust washer, (3) diaphragm spring, (4) stepped washer, (5) spacer, (6) diaphragm spring, (7) outer plate, (8) inner plate, (9) thrust ring, (10) differential side gear, (11) differential gears with differential shafts and (12) differential case.

20 33 092



20 33 093

Check all parts for wear, e.g. molybdenum coat, splines, etc..  
**Installation:**  
Lubricate all parts with approved final drive gear lube before assembling.



20 33 094

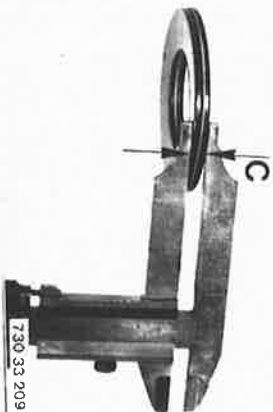
Install the following parts in correct order to measure the preload.  
Spacer (5), outer plates (7), inner plates (8), thrust rings (9), differential side gears (10) and differential gears with differential shafts (11).  
Measure distance A from case edge to outer plate, e.g. A = 19.5 mm (0.768").

Measure distance B on cover, e.g. B = 14.4 mm (0.567").

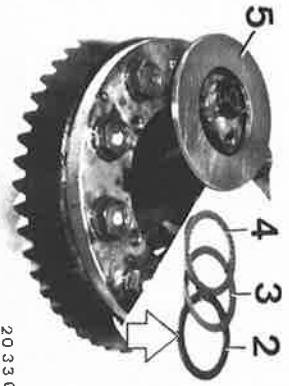


20 33 095

Place both diaphragm spring curved surfaces together.  
Measure distance C on diaphragm springs, e.g. C = 4.8 mm (0.189").

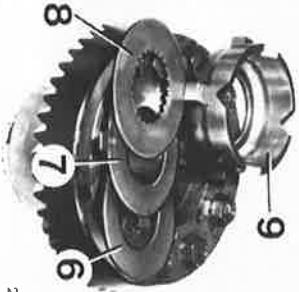


730 33 209



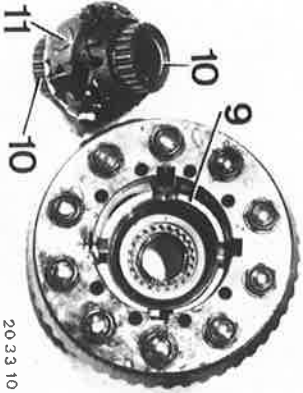
20 33 099

**Installed Order:**  
 Thrust washer (2) with oil pockets facing case (down), diaphragm spring (3) with inside curved surface facing differential shaft (up), stepped washer (4) with smooth side facing diaphragm spring (down) and tab engaging in guide in case.



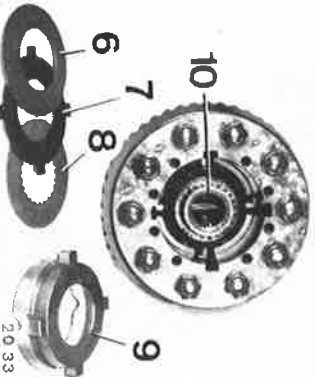
20 33 100

Install spacer (5), diaphragm spring (6) with inside curved surface facing differential shaft and outer plate (7) with four tabs.  
 Install molybdenum coated inner plate (8).



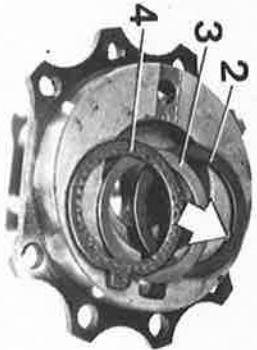
20 33 101

Install thrust ring (9) and differential side gear (10) by turning in guides or spline of inner plate.  
 Install differential gears with shafts (11), second differential side gear (10) and thrust ring (9).



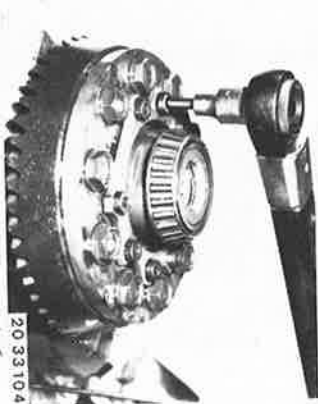
20 33 102

Install molybdenum coated inner plate (9) and outer plate (7).  
 Insert diaphragm spring (6) with inside curved surface facing differential shaft (down).



20 33 103

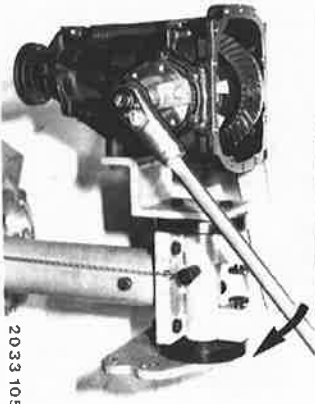
Insert thrust washer (2) with oil pockets facing cover, diaphragm spring (3) with inside curved surface facing out and stepped washer (4) with smooth side facing diaphragm spring and with tab in case cover groove in case with grease.



20 33 104

Mount case cover with washers (don't let stepped washer slide out of groove).  
 Install bolts with Loctite No. 270 and tighten cover uniformly.

**Installation:**  
 Tightening torque\*.



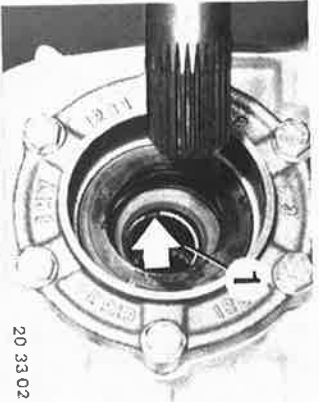
20 33 105

Check slip torque\* of differential lock by holding one and driving the other differential side gear.  
 Make up tool locally for this purpose by, for example, welding a nut on a drive flange which is no longer required.

\* See Specifications



## 33-241

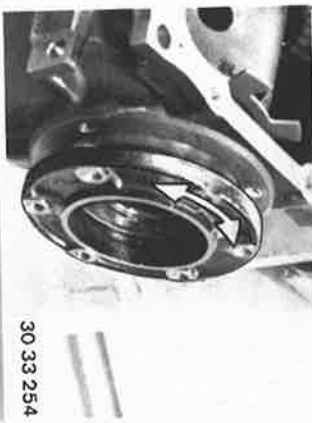


20 33 021

**Installation:**  
Place round wire snap ring (1) in groove of the differential case to have both ends recessed in the groove prior to installation of the drive flange. This prevents lateral bending of the ring. Press in and turn the drive flange by hand until the snap ring is heard to engage. Replace stretched snap rings.

Remove both bearing caps by turning slightly while pressing them off, since the O-ring has a suction effect.

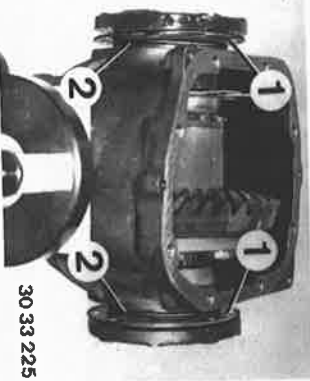
**Important!**  
Mark both bearing caps – don't mix them up. Don't mix up shims; secure them on pertinent bearing cap with wire if necessary.



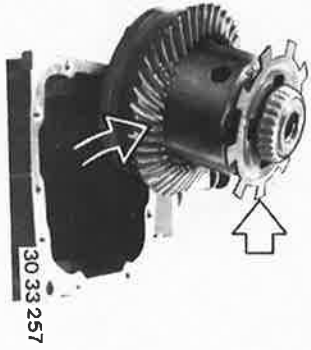
30 33 254

**Installation:**  
Differential case bearing and backlash are adjusted with shims (1). Check O-ring (2), replacing if necessary.

**Important!**  
Changing the total thickness of shims (1) will change the friction torque. The backlash and tooth contact pattern must be readjusted after adjusting the friction torque.



30 33 225



30 33 257

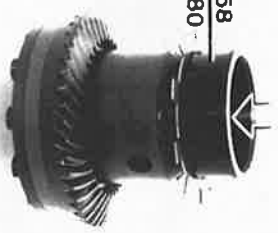
Remove complete limited slip differential.  
**Installation:**  
Don't bend the pulse spider.

Press off pulse spider.



30 33 260

**Installation:**  
Press on pulse spider with Special Tool 33 1 358.



30 33 261

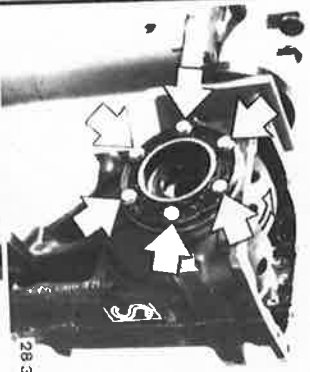
Remove ring gear (cold).



28 33 075

\* See Specifications

## 33-243

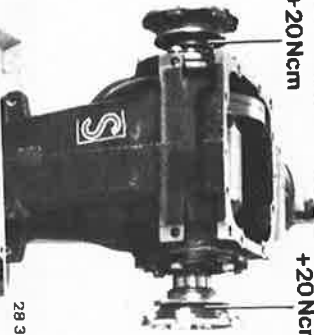


28 33 079



~ 50 U/min

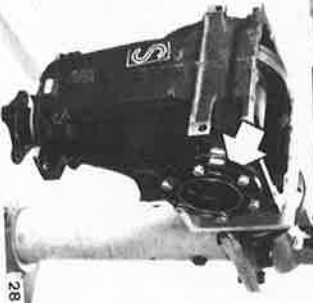
28 33 080



+20 Ncm

+20 Ncm

28 33 081



28 33 082

Axial preload force of differential case bearings (4000 N = 882 lbs.) can be determined with help of the friction torque\*  
Tighten bolts of the second bearing cap uniformly only enough, that the differential can still be turned easily.

Apply an output flange on the end opposite the ring gear and measure the friction torque with a locally made clamp with a welded nut and friction torque meter, Special Tool 00 2.000. Turn the friction torque meter at a speed of approx. 50 rpm.

The friction torque\* specified in the differential case bearing table\* should be reached, but not exceeded. If new shaft seals have already been installed, 20 Ncm (2 In. lbs.) must be added for each seal in which an output shaft runs while measuring.

If the specified friction torque is not reached, even though both bearing caps are bolted with the specified tightening torque\*, a thinner shim must be installed on the end opposite the ring gear and measuring repeated.

\* See Specifications



28 33 083



28 33 084



28 33 085

If the friction torque is reached, even though the second bearing cap has not yet been tightened to the correct tightening torque\*, a thicker shim must be used on the ring gear end and measuring procedures repeated.

To make finding the shim thickness easier, the distance between the shim and case can be measured with a feeler gage blade and added to the thickness of the used shim.

**Example:**

Second bearing cap not tightened fully (bolts screwed in uniformly).  
Specified friction torque\* (e.g. 190 Ncm = 16.5 In. lbs.) is reached, but without shaft seals.  
Gap measured with blade of feeler gage 0.20 mm (0.008")  
Used shim thickness 1.40 mm (0.055")  
Install shim of 1.60 mm (0.063") thickness and measure again.

\* See Specifications

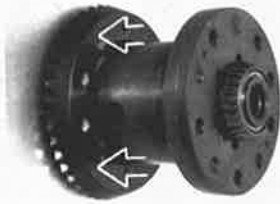
## 33-245

**33 14 631 REPLACING VISCO LOCK  
AND DIFFERENTIAL GEARS**  
- Rear Axle Removed -  
Remove differential case - see  
33 11 731.



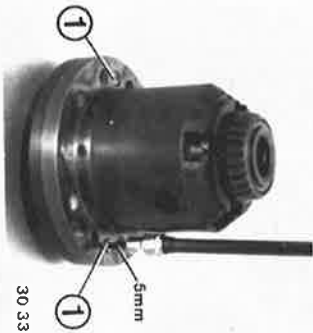
30 33 277

Remove ring gear - see 33 11 731.



30 33 256

Unscrew bolts (1) with a 5 mm socket  
key.

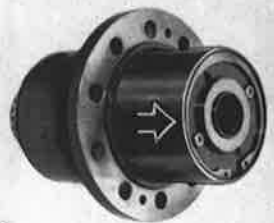


30 33 278

Separate differential case with light  
knocks from a plastic hammer.

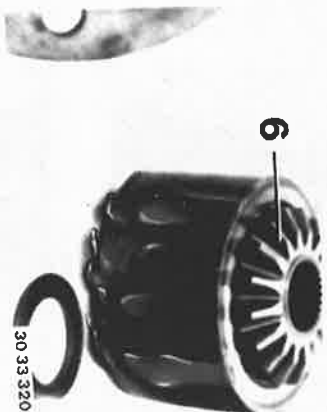


30 33 279



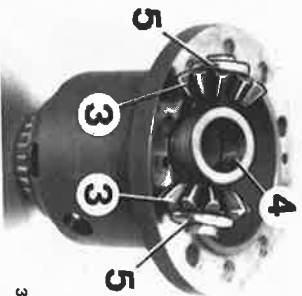
30 33 280

Pull out complete visco lock; don't  
disassemble.  
The amount of oil in the visco lock  
housing is precise and can not be  
weighed with sufficient precision in a  
workshop.



30 33 320

If the visco lock is faulty, i.e. not  
working, leaking or heated excessively  
(recognized on strong discoloration of  
the entire housing), it must be replac-  
ed as a complete unit.  
The differential side gear (6) can only  
be replaced together with the visco  
lock unit.



30 33 301

Pull out differential gears (3) with  
differential shaft (4) and washers (5).

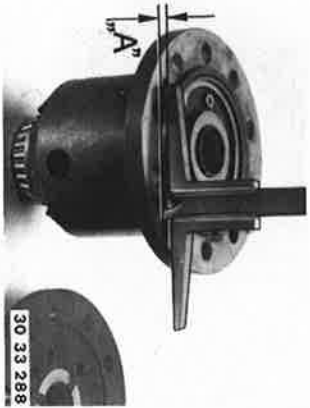


30 33 302

Let differential side gear (2) and shim  
(1) slide out.  
Inspect parts, replacing if necessary.

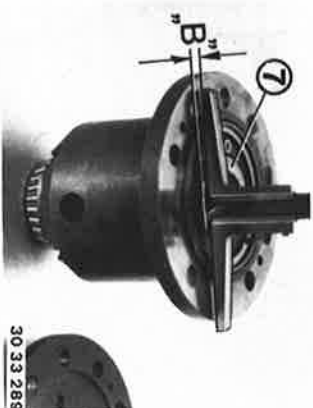
## 33-247

Determine the shim thickness. Measure distance "A" on the differential case and note this value.



30 33 288

Measure distance "B" from edge of differential case to bearing surface of the shim, without washer (7), and note this value.



30 33 289

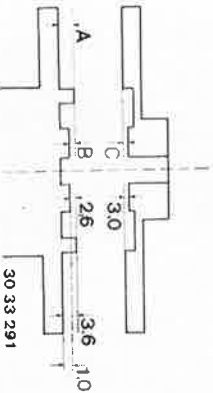
Measure distance "C" on upper section of the differential case and note this value.

Subtract distance "B" from distance "A". Subtract the difference as well as 0.05 mm (0.002") play from distance "C" to determine the shim thickness.

Example:

Distance A	3.6 mm (0.142")
- Distance B	2.6 mm (0.102")
Difference	1.0 mm (0.040")
Distance C	3.00 mm (0.118")
- Difference	1.00 mm (0.040")
- Play	0.05 mm (0.002")
Shim thickness	1.95 mm (0.076")

Shims are available in steps of 0.05 mm (0.002").



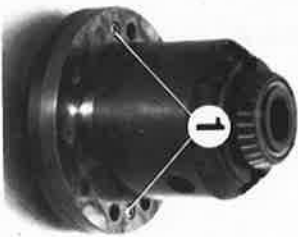
30 33 291

Install shim (7) of determined thickness.



28 33 089

Mount upper section of differential case and tighten the 5 mm socket head screws (1).



30 33 292

Mount a dial gage with a magnetic holder or dial gage holder (Special Tool 00 2 500). Use extension on housing of visco lock and set dial gage to zero with 2 mm (0.079") preload.

*Important!*

Do not measure on the bolt head or clip of the visco lock.

Pull differential case off of the drive flange shaft carefully.



28 33 091

# 34 Brakes

Introduction	0-1
34 00 009 Brakes - check on test stand	34-1
519 Brakes - check (high and low pressure tests)	34-1
046 Brakes - bleed	34-2
047 Brakes - bleed (ABS)	34-2
34 10 014 Parking brake - adjust	34-3
34 11 000 Front brake pads - remove and install	34-4
020 Front brake callipers - remove and install	34-4
020 Front brake discs - remove and install	34-5
220 Front brake discs - check runout and difference in thickness	34-5
599 Front brake discs - check runout and difference in thickness	34-5
667 Front brake discs - grind	34-6
34 21 530 Rear brake shoes - remove and install	34-7
600 Rear brake cylinders - remove and install	34-8
200 Rear brake pads - remove and install	34-8
220 Rear brake callipers - remove and install	34-9
292 Rear brake callipers - overhaul	34-9
320 Rear brake discs - remove and install	34-10
879 Rear brake discs - check runout and difference in thickness	34-10
947 Rear brake discs - grind	34-10a
34 31 000 Brake pipe/hose layout	34-11
012 Tandem brake master cylinder - remove and install	34-11
104 Tandem brake master cylinder - overhaul	34-12
34 32 361 Stop light switch - adjust	34-13
381 Brake pipes - replace	34-14
451 Brake hose, front - replace	34-14
34 33 000 Brake hose, rear - replace	34-14
000 Brake booster and tandem brake master cylinder - remove and install	34-15
051 Brake booster - replace	34-16
071 Brake booster check valve - replace	34-16
34 34 099 Brake booster vacuum hose - replace	34-17
100 Brake force regulator - check	34-17
100 Brake force regulator - remove and install	34-18
34 41 000 Parking brake lever - remove and install	34-19
100 Parking brake cable - remove and install	34-20
200 Parking brake cable - remove and install (rear brake discs)	34-20
200 Parking brake shoes - remove and install	34-20

# 34 Brakes

ABS — troubleshoot ..... 34 - 35

## 34-1

### 34 00 009 BRAKE TEST ON TEST STAND

Inspect condition and treads of tires and also check/correct tire inflation pressure prior to testing the brakes.

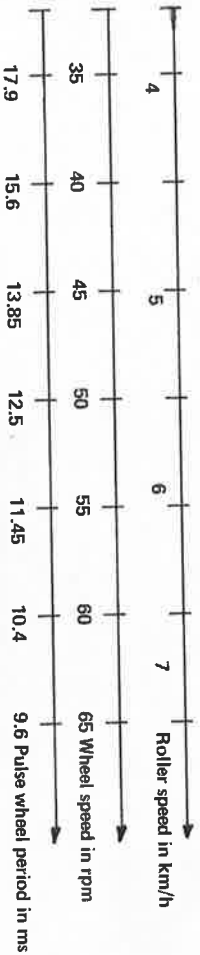
The brakes should have operating temperature, i.e. brake discs/drums should be warm and dry by way of braking the car several times.

Comply with operating instructions supplied with pertinent test stand in order to avoid damage on the car or system as well as injury of personnel.

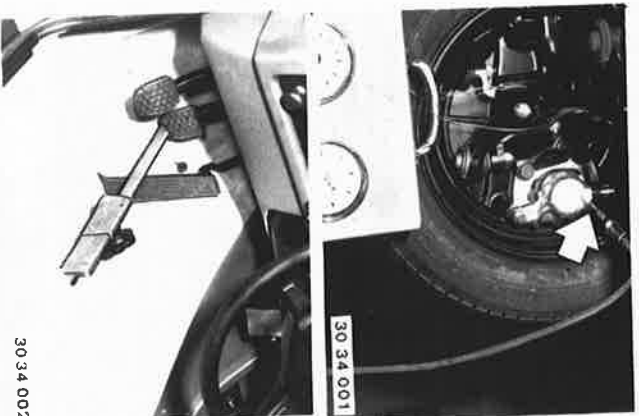
#### Important!

Cars with four driven wheels (325 iX) must not be tested on a brake test dynamometer longer than 60 seconds or faster than 7.5 km/h (4.5 mph), in order to avoid damaging the central lock. In other words the total testing time for the front axle, rear axle and parking brake must not exceed 60 seconds. If testing has to be repeated, wait at least 30 minutes to have the central lock cool down.

If not specified and guaranteed by the manufacturers, the precise roller speed of a brake test dynamometer must be checked with a '3' series car fitted with ABS, but without all wheel drive. Drive car on to dynamometer, connect BMW service tester and see ABS nominal value microfiche for connections. Select ABS test step 03 dynamic/speed sensor and switch on the dynamometer. Conversion of displayed ms:



30 34 125



30 34 001

30 34 002

### 34 00 519 CHECKING SERVICE BRAKES IN HIGH AND LOW PRESSURE TESTS

#### High Pressure Leak Test.

Perform test on both brake circuits.

1. Brake circuit front left and right
2. Brake circuit rear left and right

Unscrew bleeder screw.

Connect and bleed pressure tester.

Do not run engine.

Apply load\* on brake pedal and hold brake pedal down with a pedal prop.

Max. pressure drop after 2 minutes is 8 %.

#### Important!

High pressure leak test must be performed with the engine stopped.

#### Low Pressure Test:

Perform test on both brake circuits.

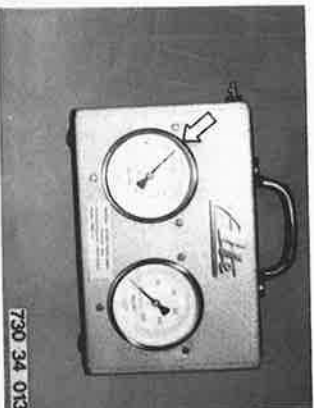
Release pedal prop that test pressure in brake system is 2 to 5 bar (28 to 71 psi).

Car and tester must remain still, since movement would cause incorrect test results.

Pressure should remain constant during 5 minutes test.

If pressure drops considerably, inspect all rubber parts.

Bleed brake callipers and wheel brake cylinders after finishing test.



730 34 013

\* See Specifications

# 34-3

## 34 10 014 ADJUSTING PARKING BRAKE

Discs:

**Requirements:**  
Both parking brake cables move easily and automatic slack control functions correctly. Parking brake lever can be pulled up by more than 8 teeth.

**Note:**  
The parking brake system, which is completely independent of the service brakes, is only subjected to limited wear since the parking brake will not be needed during normal car operation. This consequently reduces the friction torque, e.g. caused by corrosion of brake drums or contamination of liners.  
The force required for operating will increase proportionally.  
To acquire optimal parking brake efficiency, it will normally be sufficient to drive the car from the parking lot to the workplace max. 400 meters (1300 feet) with the parking brake applied (pull up lever until resistance is felt and then one further catch) before adjusting the parking brake.



30 34 007

Lift out front clamp.  
Pull off rubber cap (1).  
Disconnect rear clamp.



30 34 008

UnscREW adjusting bolts (2).



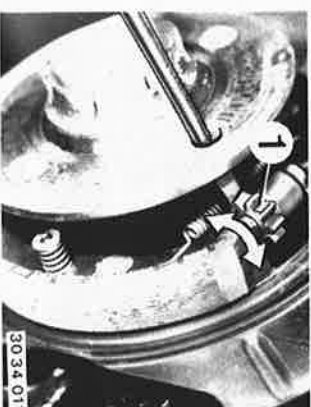
30 34 009

**Drums:**  
Operate brake pedal several times. Basic clearance will be adjusted automatically. This is indicated by a clicking noise on the rear wheels.  
Function of automatic slack control can be checked through a wheel bolt bore.



30 34 010

UnscREW one wheel bolt on each rear wheel and remove.  
Turn wheels that each tapped bore is approx. 30° behind the perpendicular on top.  
**Installation:**  
Tightening torque\*.



30 34 011

Turn adjusting nut (1) with a screwdriver to move out the parking brake shoes and prevent the brake disc from turning.  
Then loosen adjusting nut by 3 or 4 threads.  
Left adjusting nut turned up to tighten.  
Right adjusting nut turned down to tighten.  
Brake disc must turn easily.



30 34 012

**Brake Cable Adjustment:**  
Pull up parking brake lever by 5 teeth and adjust adjusting nuts (2) enough that left and right rear wheels can just be turned and both uniformly. Release parking brake lever and check whether wheels can be turned easily.  
The indicator lamp should go out when the parking brake is released with the ignition on. Adjust switch (3), if necessary.

\* See Specifications

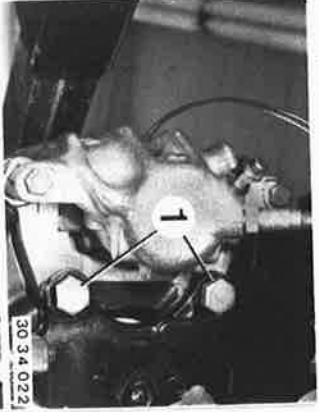


## 34-5

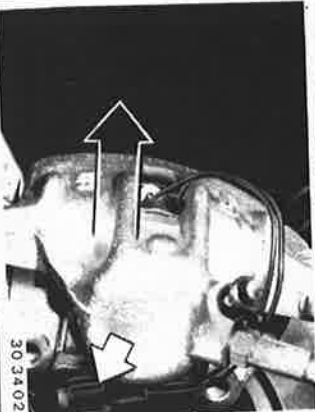
### 34 11 220 REMOVING AND INSTALLING FRONT BRAKE DISCS

Remove and install front wheels 36 10 300. Unscrew calliper mounting bolts (1).

*Installation:*  
Tightening torque\*.



Unplug brake pad wear indicator on left side. Pull off calliper toward rear and suspend with a piece of wire.



Unscrew bolt (2). Take off brake disc. Tool: wrench socket 34 1 020.



### 34 11 598 CHECKING FRONT BRAKE DISC FOR RUNOUT AND DIFFERENCE IN THICKNESS

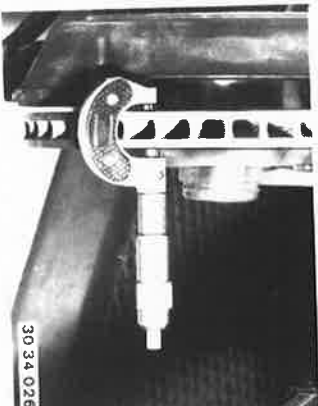
— FRONT WHEEL REMOVED —

Requirement: wheel bearings okay. Mount dial gauge holder and check lateral runout\* of brake disc with dial gauge.

*Note:*  
Mount brake disc with two M 12 x 1.5 bolts.



Measure difference in thickness\* within braking surface at about 8 points with a micrometer.



### 34 11 667 GRINDING FRONT BRAKE DISCS — BRAKE DISCS REMOVED —

*Important!*  
Always fine grind both sides of both brake discs on one axle.

After machining to minimum thickness\* install only one more set of brake pads. Note the wear limit\* of brake discs.

*Installation:*  
Even if only one brake disc has to be replaced, always replace both brake discs of one axle. See also SI Group 34.



\* See Specifications

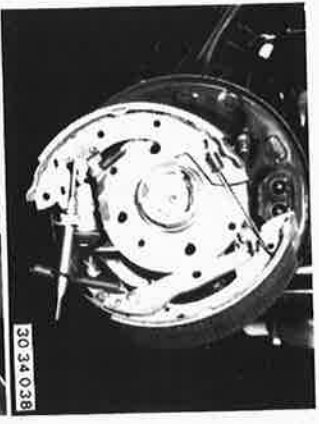
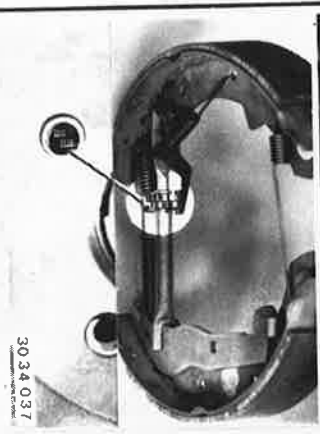
\* See Specifications

# 34-7

If brakes have to be bled, this must be done before adjusting the parking brake.

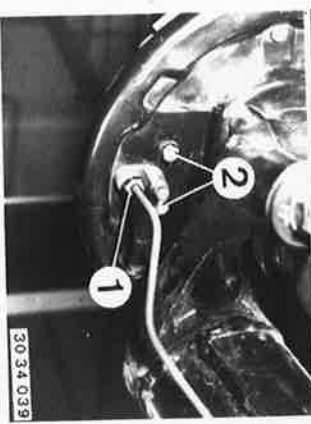


Adjust basic clearance by operating brake pedal.  
A click will be heard on the rear wheel brakes until reaching the basic clearance.  
Adjust parking brake 34 10 014.



**34 21 600 REMOVING AND INSTALLING WHEEL BRAKE CYLINDER**  
Remove and install brake shoes 34 21 530.  
Draw off brake fluid with a syringe which is used exclusively with brake fluid.

*Installation:*  
Bleed brakes 34 00 046.



Unscrew brake line (1) and bolts (2) on wheel brake cylinder.

## 34 - 9

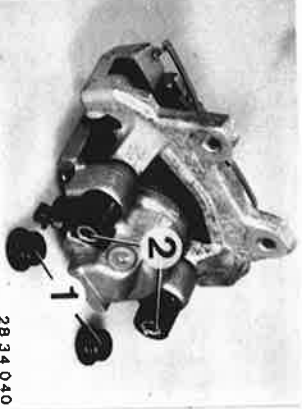
### 34 21 292 OVERHAULING REAR BRAKE CALLIPERS

— USE REPAIR KIT —

Remove and install rear brake caliper

34 21 220.

Press off plastic caps (1).  
Unscrow guide bolts (2).



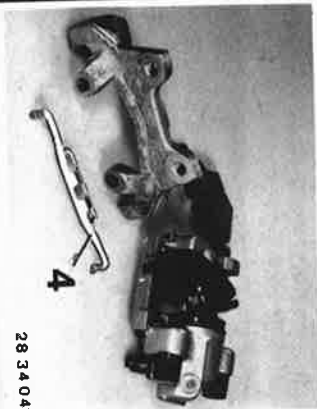
28 34 040

Disassemble caliper.

Remove brake pads.

*Installation:*

Push brake pad toward outside completely before inserting spring (4).



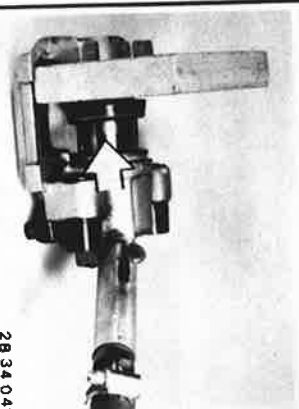
28 34 041

Press off rubber guard and clamping ring.

Place a liner (hard wood, hard felt or similar material) in caliper recess to protect the piston. Press out piston with compressed air applied through connection bore.

*Caution!*

10 bar (140 psi) air pressure is equal to a force of about 1250 N (275 lbs.).



28 34 042

Check dowel sleeves (5), replacing with dowel sleeves from repair kit if necessary.



28 34 043



28 34 044

Remove seal carefully with a plastic needle. Clean cylinder bores and parts with alcohol and dry with compressed air.

Inspect pistons and flange surfaces thoroughly for damage.

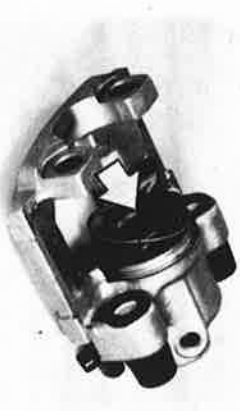
Machining of cylinder bores and pistons is not approved.

*Installation:*  
Give all parts a light coat of ATE brake cylinder paste and install.

First pull rubber guard on to piston.

Don't cant piston.

Press in piston with a piece of hard wood.



28 34 045

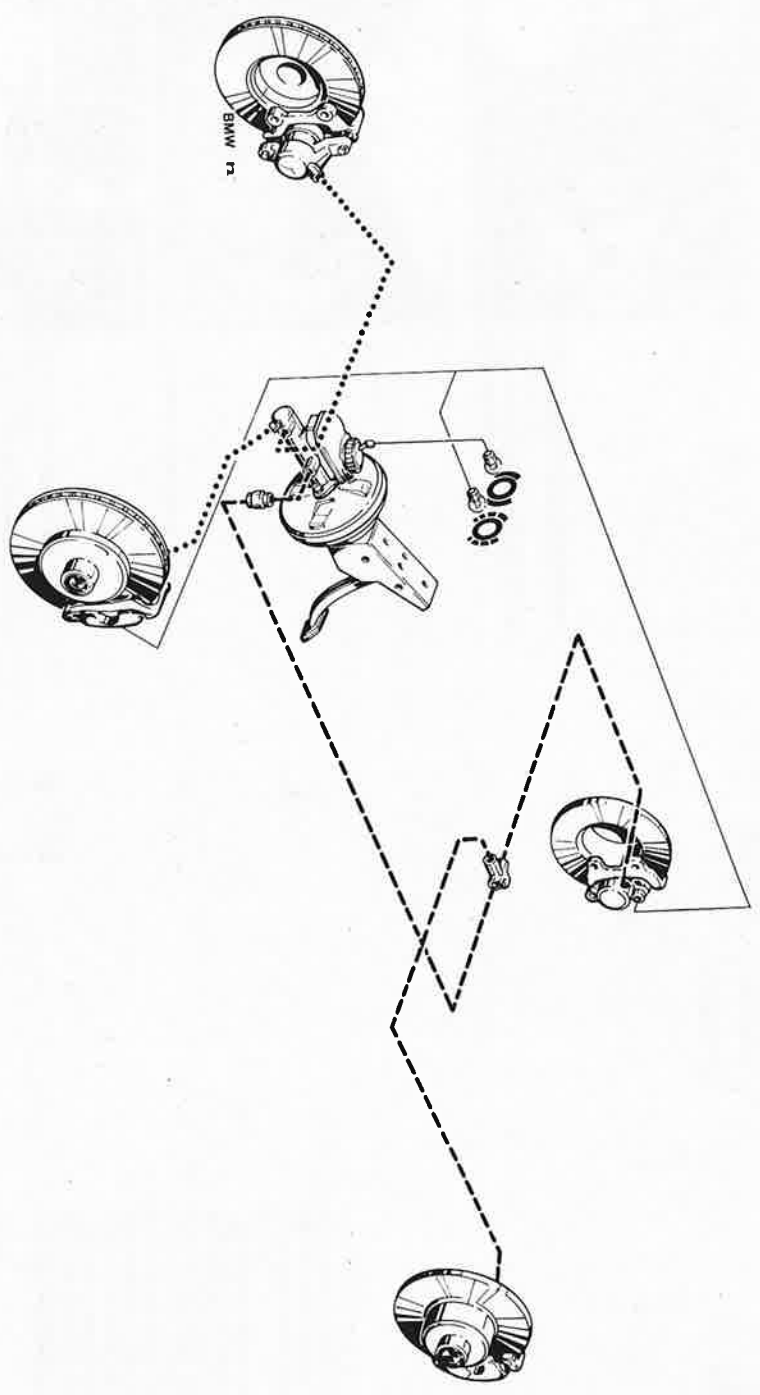
Pull rubber guard over edge of cylinder bore and secure with a clamping ring.  
Assemble caliper.



28 34 046

# 34 - 10 a

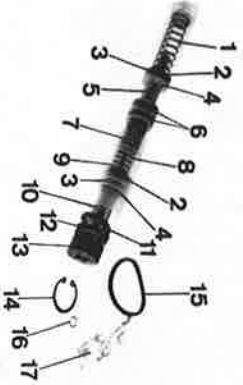
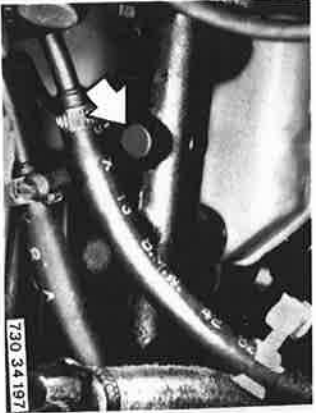
BRAKE LINE ROUTING LAYOUT -- E 30



# 34-12

## 34 31 012 OVERHAULING BRAKE MASTER CYLINDER

Remove and install tandem brake master cylinder 34 31 000.  
Replacement parts are not available for brake master cylinders with a recessed stop pin (ABS).

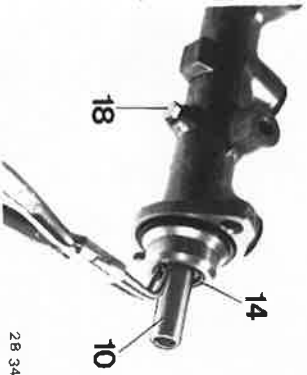


28 34 084

**Important!**

Use repair kit:  
(1) spring, (2) support, (3) primary cup, (4) fill-in washer, (5) intermediate piston, (6) separating cup, (7) stop sleeve, (8) spring, (9) screw, (10) push rod piston, (11) stop washer, (12) secondary cup, (13) plastic bushing, (14) circlip, (15) aluminum seal and (17) silicone grease.

Apply light pressure on push rod piston (10), lift out circlip (14) and unscrew stop screw (18).  
Release push rod piston (10) slowly and pull out.

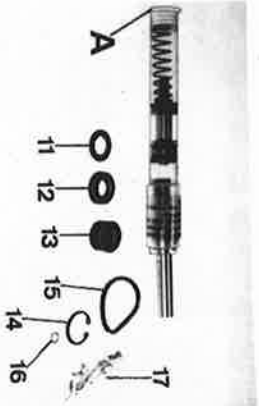


28 34 094

Knock out intermediate piston by knocking housing on a piece of wood lightly.  
Clean cylinder housing and other parts not contained in the repair kit with alcohol and dry with compressed air.  
Tandem brake master cylinders with surface damage in the cylinder bore may not be reused.  
Check whether all connecting, compensating and feeding bores are clean.



28 34 083



28 34 085

Give cylinder bore a very thin coat of ATE brake cylinder paste.  
Remove large plugs from assembly sleeve.  
Slide short sleeve section on long sleeve pipe far enough that stop washer (11), secondary cup (12), plastic bushing (13), circlip (14), seal (15), aluminum seal (16) and silicone grease (17) can be removed.  
Remove small plugs.



28 34 086

Clamp cylinder housing in a vise fitted with aluminum jaws.  
Guide assembly sleeve with long sleeve pipe into cylinder bore.

Push stepped short sleeve pipe into cylinder bore against shoulder and hold.



28 34 087

Push contents of assembly sleeve into cylinder bore carefully with a suitable mandrel until the intermediate piston touches the bottom of the cylinder.



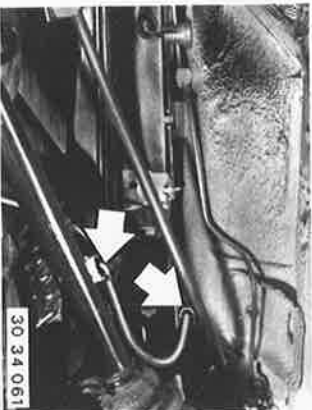
28 34 088

## 34-14

### 34 32 361 REPLACING ALL BRAKE LINES

Brake lines are only available from Parts in straight version and correct length with connecting nipples.

Use the removed brake line as a template for bending.  
Use special bending tool\*.  
Don't damage finish of brake lines; don't bend lines too sharply and don't bend back lines.  
Also refer to Service Information of Group 34.



### 34 32 381 REPLACING FRONT BRAKE HOSE

Draw off brake fluid in tank with a syringe used exclusively with brake fluids.  
Disconnect brake hose.

*Installation:*  
Never twist brake hose when installing.  
Bleed brakes 34 00 046.  
Tightening torque\*.

### 34 32 451 REPLACING REAR BRAKE HOSE

Draw off brake fluid in tank with a syringe used exclusively with brake fluids.  
Disconnect brake hose.

*Installation:*  
Never twist brake hose when installing.  
Bleed brakes 34 00 046.  
Tightening torque\*.

\* Source: HMB

\* See Specifications

## 34-18

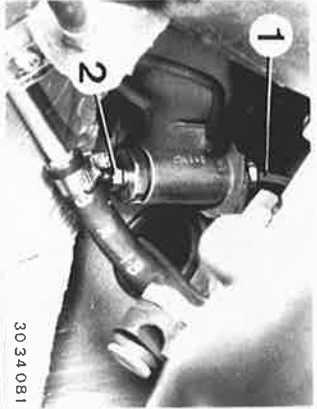
### 34 34 100 REMOVING AND INSTALLING BRAKE FORCE REGULATOR

Draw off brake fluid in tank with a syringe used exclusively with brake fluids.

Disconnect lines (1 and 2).

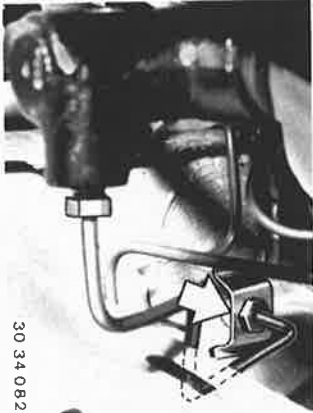
*Installation:*

Tightening torque\*.  
Bleed brakes 34 00 046.



30 34 081

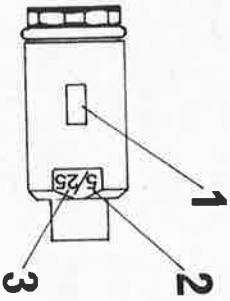
Remove clamp and brake force regulator.



30 34 082

Check codes when replacing a brake force regulator.

- (1) Calendar day / year number
- (2) Reduction  $\frac{5}{25}$  (e.g. 0.45)
- (3) Switching over pressure



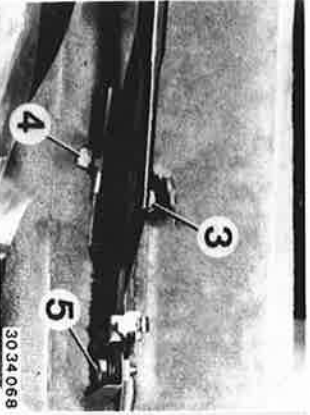
30 34 083

\* See Specifications

## 34-20

### 34 41 100 REMOVING AND INSTALLING PARKING BRAKE CABLE — REAR DISC BRAKES —

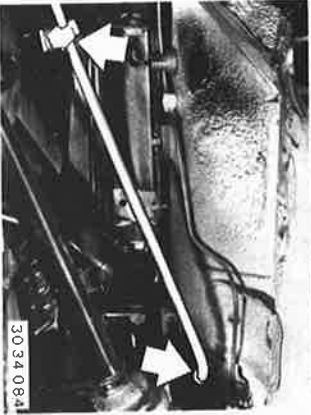
Remove and install spreader for parking brake shoes 34 41 250.  
Remove and install parking brake lever 34 41 000.  
*Installation:*  
Adjust parking brake 34 10 014.



30 34 068

Disconnect parking brake cable on swinging arm.

Pull parking brake cable out of protective tube.  
*Installation:*  
Cable holder must rest on protective tube.

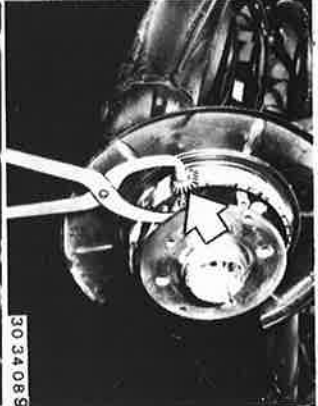


30 34 084

Disconnect support for parking brake cable.  
Pull out parking brake cable.



30 34 085

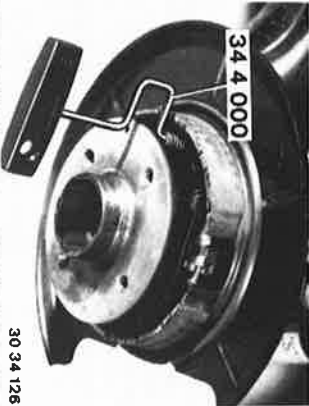


30 34 089

### 34 41 200 REMOVING AND INSTALLING PARKING BRAKE SHOES

Remove and install rear disc brake 34 21 300.  
Disconnect bottom return spring with brake spring pliers.  
*Installation:*  
Check return spring, replacing if necessary.  
Adjust parking brake 34 10 014.

Turn retainer springs 90° with Special Tool 34 4 000 and disconnect.



34 4 000

30 34 126

Spread brake shoes apart at bottom and lift off from above.

Breaking In Parking Brake After Replacing Brake Shoes:

Car must be broken in in three phases.  
Phase 1: 5 full stop braking actions from 50 km/h (30 mph).

Phase 2: Let brakes cool down.  
Phase 3: 5 additional braking actions from 50 km/h (30 mph).

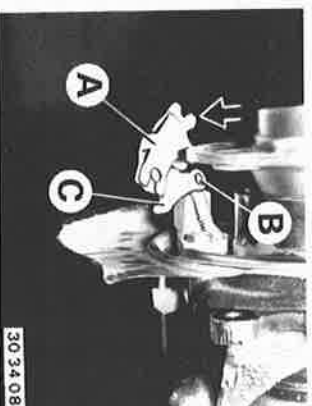


30 34 087

### 34 41 250 CHECKING / REMOVING AND INSTALLING SPREADER

Remove and install parking brake shoes 34 41 200.  
Pull off part A toward rear.  
Press out pin B.  
Pull out part C.

*Installation:*  
Give sliding surfaces and pins a thin coat of Molykote G paste.  
Adjust parking brake 34 10 014.



30 34 088



## 34 - 22

### TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Brake pedal motion too soft and spongy	<ul style="list-style-type: none"> <li>a) Air in brake system</li> <li>b) Insufficient brake fluid in brake fluid tank</li> <li>c) Overheated brake fluid - vapor lock due to excessive water content in brake fluid or excessive brake loads</li> </ul>	<ul style="list-style-type: none"> <li>a) Add or replace brake fluid and bleed brakes</li> <li>b) See a)</li> <li>c) See a)</li> </ul>
Brake pedal travel excessive even though brakes have been bled and adjusted	<ul style="list-style-type: none"> <li>a) Primary cup in master cylinder damaged</li> <li>b) Separating cups on floating piston of tandem brake master cylinder leak</li> <li>c) Leak in brake system</li> </ul>	<ul style="list-style-type: none"> <li>a) Overhaul or replace brake master cylinder</li> <li>b) See a)</li> <li>c) Check brake system for leaks</li> </ul>
Uneven pad wear	<ul style="list-style-type: none"> <li>a) Wrong type of brake pads</li> <li>b) Caliper recesses dirty, caps damaged</li> <li>c) Corrosion in callipers or wheel cylinders</li> <li>d) Rubber ring for piston control swollen</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace brake pads</li> <li>b) Remove and install, repair or replace callipers or wheel cylinders</li> <li>c) See b)</li> <li>d) See b)</li> </ul>
Brake pads worn at angle	<ul style="list-style-type: none"> <li>a) Wheel bearing play excessive</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Corrosion in callipers or wheel cylinders</li> <li>d) Brake disc wear angular</li> <li>e) Pads worn less than minimum thickness</li> <li>f) Spring force insufficient</li> <li>g) Guide bolts damaged</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace wheel bearings</li> <li>b) Check caliper installation</li> <li>c) Remove and install, repair or replace callipers or wheel cylinders</li> <li>d) Grind or replace brake discs</li> <li>e) Replace brake pads</li> <li>f) Replace spring</li> <li>g) Replace guide bolts</li> </ul>

# 34-24

## TROUBLESHOOTING BRAKES

Condition	Cause	Correction
Seized pistons in caliper	<ul style="list-style-type: none"> <li>a) Caliper recesses dirty, caps damaged</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Corrosion of pistons in calipers or wheel cylinders</li> </ul>	<ul style="list-style-type: none"> <li>a) Remove and install, repair or replace calipers</li> <li>b) Check caliper installation</li> <li>c) Remove and install, repair or replace calipers or wheel cylinders</li> </ul>
Pulsating effect on brake pedal	<ul style="list-style-type: none"> <li>a) Wheel bearing play excessive</li> <li>b) Brake disc not aligned with caliper</li> <li>c) Brake disc runout</li> <li>d) Excessive thickness difference within braking surface</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace wheel bearings</li> <li>b) Check caliper installation</li> <li>c) Check brake discs for runout, replacing if necessary</li> <li>d) Measure brake disc thickness and grind or replace discs</li> </ul>
Parking brake effect insufficient	<ul style="list-style-type: none"> <li>a) Parking brake shoes splattered with oil</li> <li>b) Excessive dead travel between brake shoes and brake drums</li> <li>c) Excessive dead travel in cables</li> <li>d) Cables maladjusted</li> <li>e) Corroded transmitting elements</li> </ul>	<ul style="list-style-type: none"> <li>a) Replace brake liners and eliminate cause</li> <li>b) Adjust parking brake</li> <li>c) See b)</li> <li>d) See b)</li> <li>e) Remove and install parking brake and spreader locks; check cables, replacing if necessary</li> </ul>

**Design:**

The ABS consists of a control unit, hydraulic unit, speed sensors and a wire harness.

**Description of Separate Components:****Speed Sensors:**

Each speed sensor has a gear wheel, which runs past the permanently magnetized edge of the speed sensor and is installed in the wheel hub.

The rotary motion of the wheels is recorded by inductive sensors and an electric signal is sent to the electronic control unit.

**Electronic Control Unit:**

The electronic control unit is located in the passenger compartment below the instrument panel on the left-hand side.

In a small multi-channel electronic computer acceleration, deceleration and slip factors are derived from the electric signals of the wheel velocity. By logical connection of these factors there are control demands for the electromagnetically operated valves in the hydraulic unit.

The signal processing in the computer determines the control behavior of the system. The expected degree of dependability is based on digital engineering with highly integrated circuitry.

The control unit contains electronic monitoring circuits, which control the function prior to each trip and the ABS wire harness with equipment constantly during a trip. If the control unit detects a defect in the wire harness or electrical part of the equipment, the monitoring circuit will switch off the ABS and guarantees normal use of the brake system. An ABS indicator lamp reports this condition to the driver.

**Hydraulic Unit:**

The hydraulic unit is located in the engine compartment and was added to the conventional brake system.

To control the brake pressure in the wheel brake cylinders, the brake hydraulic unit has the three-way valves which permit three brake pressure conditions.

Pressure build-up, pressure holding and pressure drop. These three pressure phases adapt themselves in the sequences and length to the requirements of the desired control characteristic and power flow between the road surface and tires. In principle the control procedures are as follows. As soon as a wheel deceleration or slip indicates the locking of a wheel, the brake pressure is first held. If the wheel still tends to lock, the pressure will be dropped so long until the wheel accelerates or the slip limit is exceeded. Afterwards the pressure is raised again and the control phases begin from new.

An electrically driven return delivery pump returns the brake fluid taken from the wheel brake cylinder while dropping the pressure to an appropriate brake circuit.

The pump is designed as a two-piston pump, so that the circuits of a dual brake circuit system remain fully separated.

**Wire Harness:**

The control unit is connected with the speed sensors and electric part of the hydraulic unit via a special wire harness for the sake of signal input and order output as well as power supply.



#### DESCRIPTION OF AND CHECKING ABS INDICATOR LAMP

The ABS indicator lamp comes on after turning on the ignition. The indicator lamp should go out when the engine has started, if the ABS is okay.

These procedures are repeated each time the ignition is turned off and on.

The causes for erroneous indication (indicator lamp doesn't come on, doesn't go out or comes on while driving — even occasionally — can be found with the help of a BMW service tester and a brake test dynamometer.

#### Important!

Each started test step must be finished completely without a break!

The control unit will automatically switch to "normal braking" when there is an electric or electronic defect in ABS.

This means the car can still be braked, but without control (the wheels could lock!).

The defective system will be indicated by a continuously burning ABS indicator lamp in the instrument panel.

#### Note:

BMW 325 iX with Four Driven Wheels:

First measure resistance on acceleration pickup and power supply wire, see 34 52 000, prior to checking ABS, if ABS lamp comes on while driving.

Check throttle valve positioner, see 13 54 130, when comfort is impaired, e.g. shaking or stopping of engine during ABS regulation.

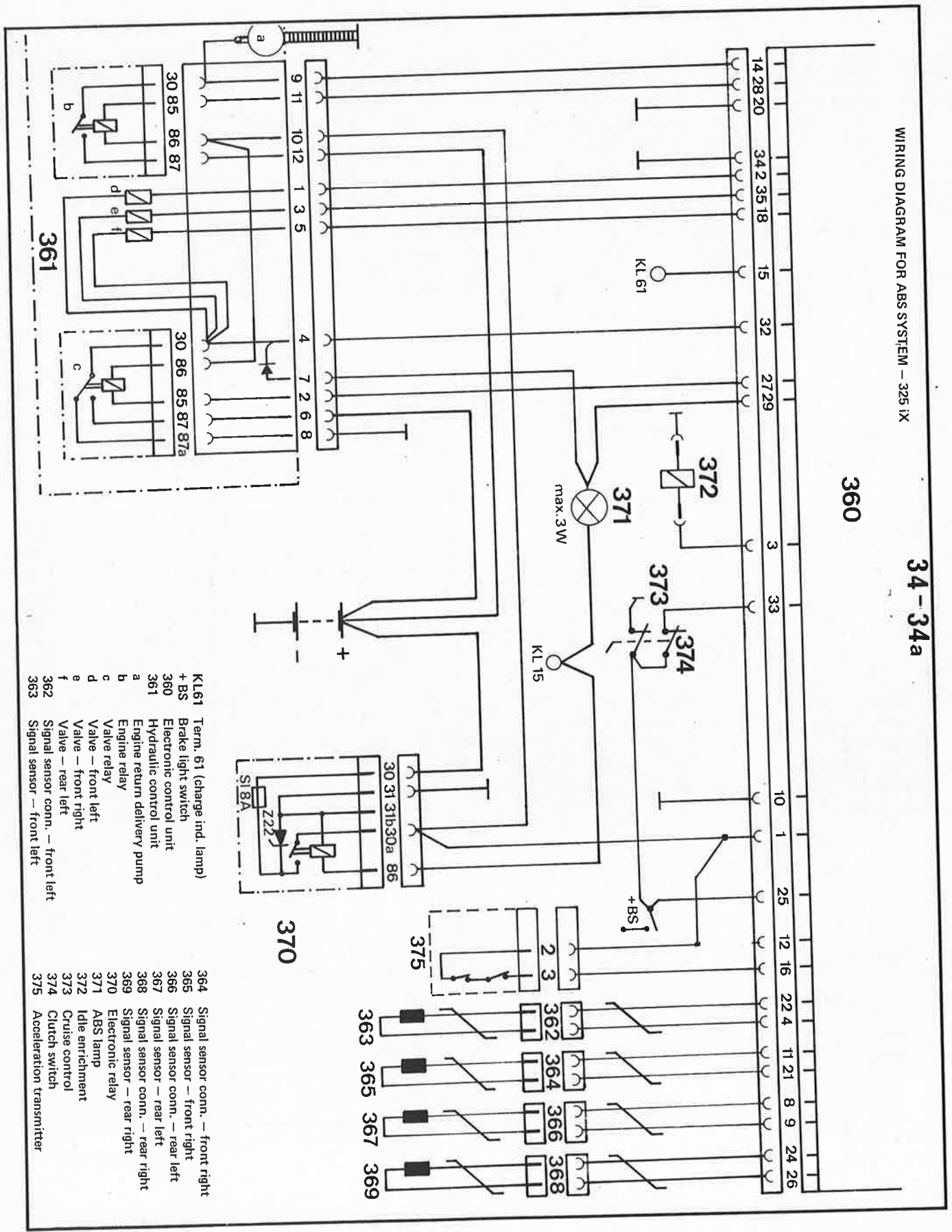
The ABS test on a brake test dynamometer (test steps 8, 9 and 10) may not be performed on BMW 325 iX cars.

#### GENERAL INFORMATION ON REPAIRS AND THE BRAKE SYSTEM

Basically the ABS does not require servicing, however, the following must be observed when working on cars with ABS.

- a) Remove plugs from the electronic control unit and turn off ignition when welding with an electric welder.
- b) When painting, the electronic control unit can be subjected to max. 95° C (203° F) briefly and to max. 85° C (185° F) for a longer period (about 2 hours).
- c) If the battery had been removed, the battery terminals must be tightened on the end poles perfectly after reinstallation of the battery.
- d) After replacement of the hydraulic unit, the control unit, the speed sensors and the wire harness as well as after performance of jobs which are in contact with ABS equipment (e.g. repair of accident damage), the entire antilock system has to be checked with the BMW service tester. It is important that brake lines be routed correctly.
- e) After each job on the brake system, the brakes must be bled and high/low pressure tests carried out. Check all connection points for leaks.

360



- KL61 Term. 61 (charge ind. lamp)
- + BS Brake light switch
- 360 Electronic control unit
- 361 Hydraulic control unit
- a Engine return delivery pump
- b Valve relay
- c Valve - front left
- d Valve - front right
- e Valve - rear left
- f Valve - rear right
- 362 Signal sensor conn. - front left
- 363 Signal sensor - front left

- 364 Signal sensor conn. - front right
- 365 Signal sensor - front right
- 366 Signal sensor conn. - rear left
- 367 Signal sensor - rear left
- 368 Signal sensor conn. - rear right
- 369 Signal sensor - rear right
- 370 Electronic relay
- 371 ABS lamp
- 372 Idle enrichment
- 373 Cruise control
- 374 Clutch switch
- 375 Acceleration transmitter

**TROUBLESHOOTING ABS**

*Note:* No overvoltage protection relay since 1989 models (except for four wheel drive); now integrated in ABS control unit (Control Unit No. 0265 103 041).

Test Step	Tested	Troubleshoot, if Nominal Values Not Reached	Job Position
01 Wire harness Speed sensors	Speed sensors (DF)	Turn off ignition for single tests, control unit not connected.	Group 34
	front left	<ol style="list-style-type: none"> <li>1. Check front left plug connection (visual inspection).</li> <li>2. Disconnect front left plug; DF reading must then be &gt; 999 k-ohms; DF reading lower: fault in wire harness.</li> <li>3. Check flow in wires 4 and 6 (325IX: 22); bridge front left plug on wire harness side; DF reading should then be &lt; 1 ohm; DF reading higher: fault in wire harness.</li> <li>4. Measure resistance at plug on speed sensor side (M 05). Specifications not reached: replace front left speed sensor.</li> </ol>	61 11 530 61 12 510
	front right	<ol style="list-style-type: none"> <li>1. and 2. as above, however front right plug connection.</li> <li>3. Check flow in wires 11 and 21; bridge front right plug on wire harness side, DF reading should then be &lt; 1 ohm; DF reading higher: fault in wire harness.</li> <li>4. As above: replace front right speed sensor.</li> </ol>	61 11 530 61 12 510
	rear left	<ol style="list-style-type: none"> <li>1. and 2. as above, however rear left plug connection.</li> <li>3. Check flow in wires 8 and 9; bridge rear left plug on wire harness side, DF reading should then be &lt; 1 ohm; DF reading higher: fault in wire harness.</li> <li>4. As above: replace rear left speed sensor.</li> </ol>	61 11 530 61 12 520
	rear right	<ol style="list-style-type: none"> <li>1. and 2. as above, however rear right plug connection.</li> <li>3. Check flow in wires 24 and 26; bridge rear right plug on wire harness side, DF reading should then be &lt; 1 ohm; DF reading higher: fault in wire harness.</li> <li>4. As above: replace rear right speed sensor.</li> </ol>	61 11 530 61 12 520
	Speed sensor resistance to ground	<ol style="list-style-type: none"> <li>1. Visual inspection for line and wire damage (connection to vehicle ground - insulation resistance).</li> <li>2. Disconnect speed sensor plugs in order for reading &gt; 999 k-ohms: replace pertinent speed sensor.</li> <li>3. Reading remains &lt; 999 k-ohms: fault in wire harness.</li> </ol>	61 12 510/520 61 11 530
	Speed sensor resistance to B +	<p>Also refer to test step 03 when testing speed sensors!</p> <p>Bridge connections 30a and 86 on electronic relay plug.</p> <p>Reading &gt; 80 ohms: ABS indicator lamp faulty or poor contact. Check or replace lamp. Check connections on lamp and term. 15.</p> <p>Reading &lt; 10 ohms: check wires 1 and 29 for ground out.</p> <p>Measure between connection 86 on electronic relay plug and wire 29 on control unit plug.</p> <p>Repeat test with connected diagnosis plug for "wrong connection" display (better ground connection with tester).</p>	62 99 080
	Safety lamp		

# 34-37

Test Step	Tested	Job Position
03 Dynamic speed sensor test	Speed sensors (DF)  front left rear right rear left rear right	Group 34

Troubleshoot, if Nominal Values Not Reached

Wire harness and control unit connected.

1. Cycle time

Cycle time < specified value: wheel turns too fast.  
Cycle time > specified value: wheel turns too slow.

61 12 510  
61 12 520

Visual inspection:

Excessive clearance between speed sensor and pulse wheel.  
Speed sensor loose or dirty, check installation.

Check arrangement of wheel with gage.  
Hold opposite wheel on rear axle.  
Replace speed sensor.

61 12 510 / 520

2. Pulse

Wheel rotation not uniform enough.  
Check pulse wheel teeth (condition, dirt).  
Check clearance between speed sensor and pulse wheel.  
Replace pulse wheel.

61 12 510 / 520

# 34-39

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
05 Dyn./Ground/ Overvoltage/ Bits		<i>Caution!</i> Turn off ignition before pulling off a plug and measuring resistance.	Group 34
	Voltage between wires 1 and 10	Turn on Ignition. Run engine. Battery charged, check.	
	Ground wire 10	Check ground connection below instrument panel on left side. Check flow of multiple pin plug on wire harness (control unit) wire 10 to ground connection. Replace electronic relay, if necessary.	61 11 530
	Ground wire 20	Check ground connection below instrument panel on left side. Check flow of multiple pin plug on wire harness (control unit) wire 20 to ground connection.	61 11 530
	Ground wire 34	Check ground connection below instrument panel on left side. Check flow of multiple pin plug on wire harness (control unit) wire 34 to ground connection.	61 11 530
	Wire 14/return delivery pump ground	Check ground connection on battery console. Check ground connection on return delivery pump. Check flow in ground wire. Check flow in multiple pin plug on wire harness (control unit) wire 14 to plug on hydraulic unit and wire 9 to term. 30 in hydraulic unit. If there is power flow break: replace wire harness. Wire power flow okay: replace hydraulic unit, see test step 08 ABS pump.	61 11 530 34 51 620
	Overvoltage protector	Replace electronic relay (watch above mentioned points!). No overvoltage protection relay since 1989 models.	34 52 510
	Test cycle	Replace control unit (watch above mentioned points!). If motor relay only switches (clicks) at intervals without the pump motor running, the voltage will briefly drop excessively due to the high switching on power at the feed wires from the battery. Repeat test with engine running. See test step 04 and test steps 06 / 07.	34 52 510
	Fault simulation	Replace control unit (watch above mentioned points!).	34 52 510



# 34-41

Test Step	Tested	Troubleshoot, If Nominal Values Not Reached	Job Position
07 Control unit/ simulation – rear wheels	Voltage between wires 1 and 10  (solenoid) pressure build-up drop hold	Turn on ignition. Run engine. Battery charged, check.  Due to high switching on power, possibly repeat test step with engine running. Replace control unit and repeat test step. If in test steps 08, 09 and 10 valves do not switch or pump does not run: replace hydraulic unit.	Group 34  34 52 510 34 51 520

Only the pressure building-up and pressure holding phases (2 A) can be checked in 325 iX cars because of the changed activation times in the control unit. Irregular values will be displayed on adapter B in switch position (5 A).  
It might be necessary to repeat this test step to reach the nominal values due to the high switching-on power and short switching phase.

# 34-43

Test Step

Tested

Troubleshoot, If Nominal Values Not Reached

Job Position

09

Group 34

Hydraulic unit  
pressure drop

Voltage between  
wires 1 and 10

Front left  
right  
left/right  
Rear left/right

Turn on ignition.  
Run engine.  
Battery charged, check.

Due to high switching on power, possibly repeat test step with engine running.  
Refer to test steps 05, 06 and 07.  
Testing the ABS requires the conventional brake system to be okay:  
bled properly, brake line connections tight, brake pads okay.  
Watch uniformity of wheels on one axle.

Replace hydraulic unit.

34 51 520

This test step may not be performed on a dynamometer for 325 iX cars, since the total loading time for the central lock in the transfer box must not exceed 60 seconds at a wheel speed of max. 7.5 km/h (4.5 mph). Refer to brake test dynamometer in 34 00 009.

TROUBLESHOOTING ABS - 325 iX (ABS Lamp Comes On After Repeated Cancellation By Starting Engine)

Fault Diagnosis (Engine Switched Off)	Possible Cause	Correction (or Testing Instructions)
Control lamp immediately after starting engine	Hydraulic control unit, operating voltage . . . power supply Acceleration sender has ground contact	Service Tester Check pin 16 on ABS wire harness plug for ground contact.
Control lamp 15 to 20 seconds after starting engine (car stopped, engine running at idle speed)	Break in "idle speed boost" current path	Break in connection between ABS wire harness plug pin 3 and solenoid ground
Control lamp at high engine speed of stopped car (or longer lasting ABS control after stopping car) (> 1 second)	Dispersion in sensor wire	Check routing of wires for ABS sensors
Control lamp after exceeding approx. 12 km/h (7.5 mph)	Return delivery pump motor, electronics	Service Tester
Control lamp about 15 to 20 seconds after moving off (road speed > 3 km/4 = 2 mph)	Break in acceleration sender current path Sensor fault (break in wire)	Pin 16 on ABS wire harness plug or connections 2 and 3 on acceleration sender — check plug connections in particular — Service Tester

# 35 Pedals

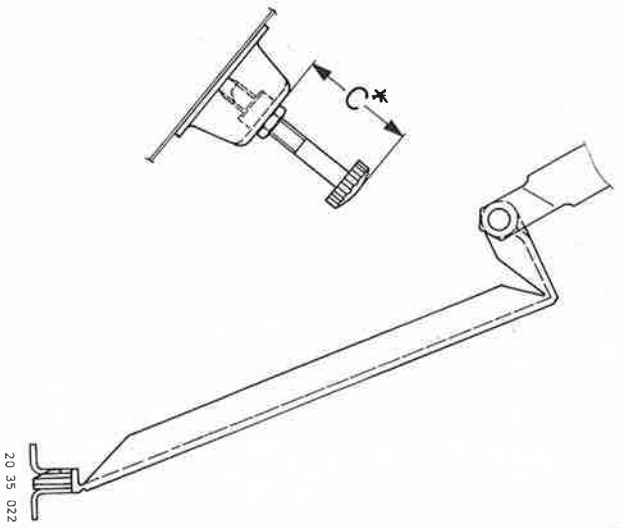
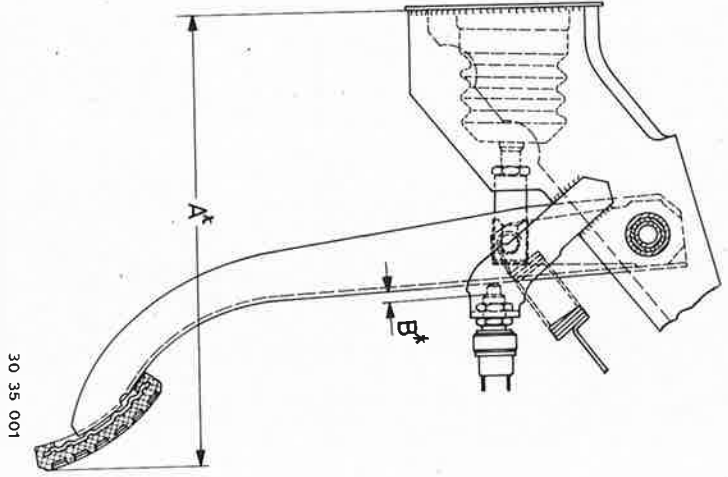
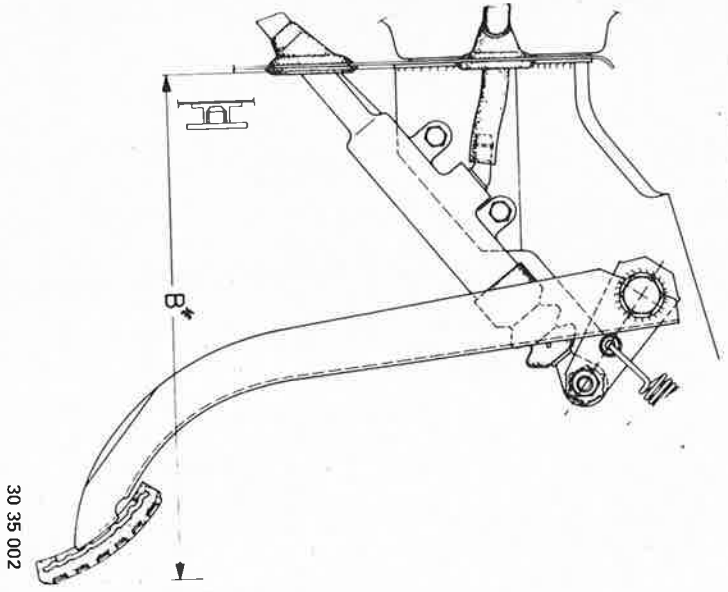
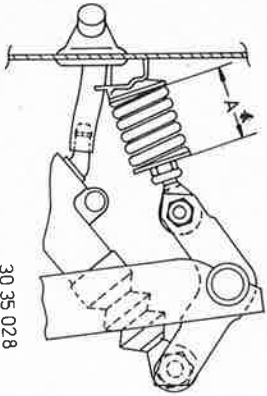
Pedals — layout drawing .....	35 - 1
Side clearance of pedals — control distances .....	35 - 2
Pedal base — remove and install .....	35 - 3
Brake pedal — remove and install .....	35 - 5
35 21 000 .....	35 - 7
Bearing sleeve for brake pedal — replace .....	35 - 6
35 31 000 .....	35 - 7
Clutch pedal — remove and install .....	35 - 7
Bearing sleeve for clutch pedal — replace .....	35 - 8
35 41 000 .....	35 - 8
Accelerator pedal — remove and install .....	35 - 8
010 .....	35 - 9
Accelerator lever — remove and install .....	35 - 10
421 .....	35 - 10
Accelerator cable — replace .....	35 - 10
480 .....	35 - 10
Kickdown switch — replace (EH transmission) .....	35 - 10

# 35-1

## PEDAL LAYOUT DRAWINGS BRAKE PEDAL

## ACCELERATOR PEDAL

## CLUTCH PEDAL Over-center Helper Spring

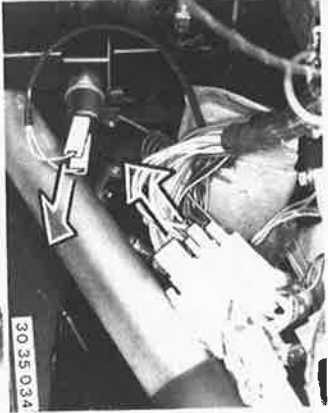


\* See Specifications

# 35-3

## 35 11 000 REMOVING AND INSTALLING PEDAL BASE ASSEMBLY

Disconnect battery ground lead.  
Remove dashboard trim panel at  
bottom left - see Group 51.



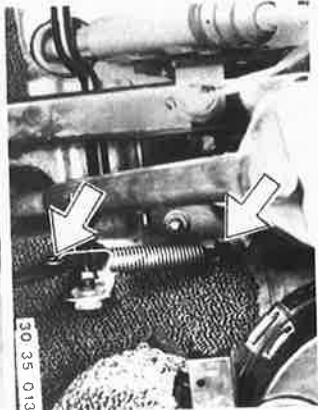
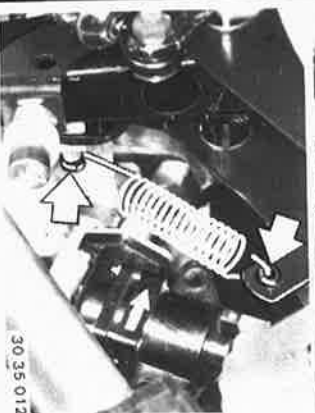
Pull off plug on stop light switch.  
Pull off central electric plug on  
steering column.

Note:  
Beginning with 1987 models, pull off  
plug of stop light switch - see  
Group 51.

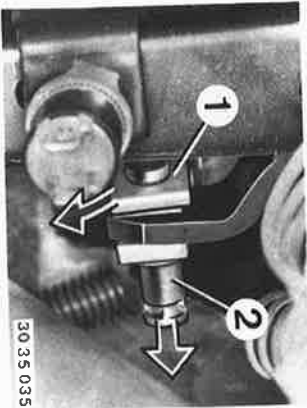


Version with Return Spring on Clutch  
Pedal:  
Disconnect return spring on body.

Disconnect brake pedal return spring  
on pedal.

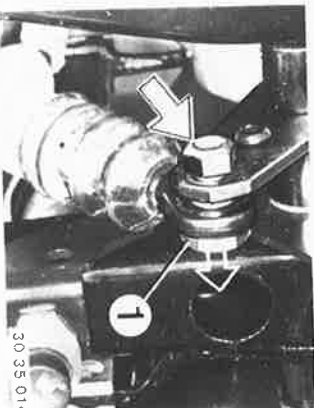


Disconnect accelerator pedal return  
spring on pedal.



Press off clamp (1) on brake linkage.  
Pull out shaft (2).

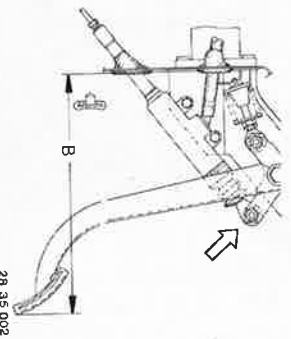
Installation:  
Lubricate bearing surfaces with  
grease\*.



Unscrew nut.  
Pull out eccentric (1).

Installation:  
Lubricate seiscREW with grease\* before  
installing.  
Tightening torque\*.

Installation:  
Adjust clutch pedal to distance (B)\*  
with the eccentric.  
Tightening torque\*.

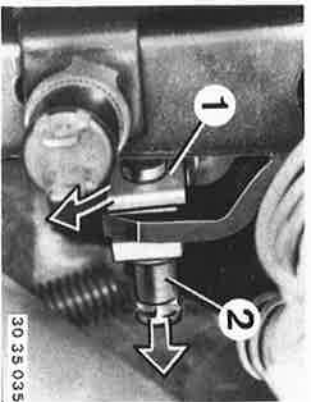


\* See Specifications

## 35-5

### 35 21 000 REMOVING AND INSTALLING BRAKE PEDAL

Remove dashboard trim panel at  
bottom left - see Group 51.



Press off clamp (1) on brake linkage.  
Pull out shaft (2).

*Installation:*  
Lubricate bearing surfaces with  
grease\*.

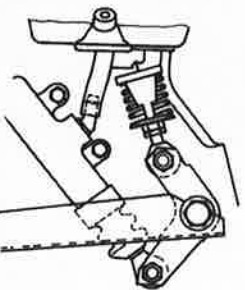
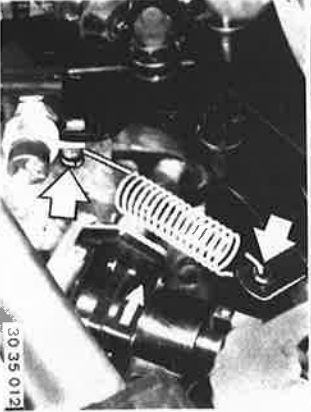
Unscrew nut.  
Pull out shaft.  
Take off pedal.

*Installation:*  
Lubricate bearing surfaces with  
grease\*.  
Replace self-locking nuts.  
Tightening torque\*.



Version with Return Spring on Clutch  
Pedal:  
Disconnect return spring on body.

Disconnect brake pedal return spring  
on pedal.

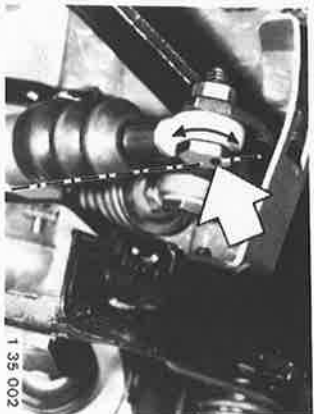


28 35 001

\* See Specifications

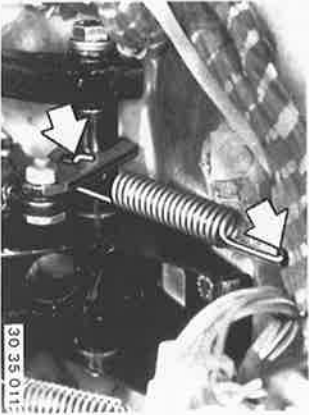
**35 31 000 REMOVING AND INSTALLING CLUTCH PEDAL**

Remove dashboard trim panel at bottom left - see Group 51.

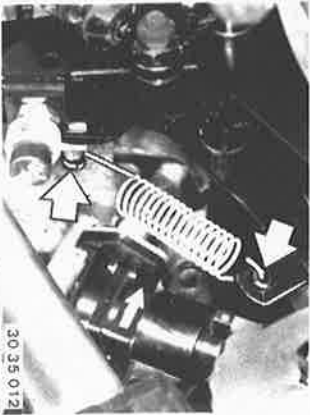


**Adjusting Clutch Pedal Eccentric Bolt:**  
Turn eccentric bolt until dot on the eccentric bolt is opposite the clutch master cylinder.

**Version with Clutch Pedal Return Spring:**  
Disconnect clutch pedal return spring on body.

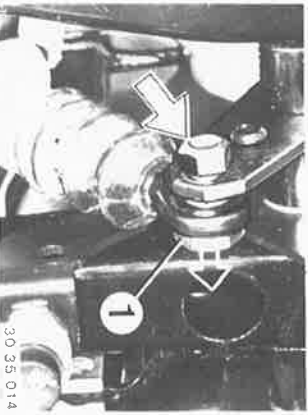


Disconnect brake pedal return spring on pedal.

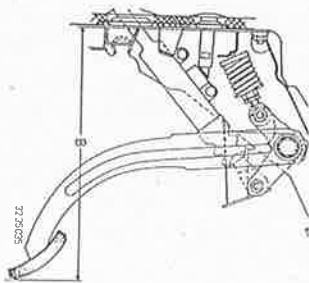


Unscrew nut - pull out eccentric (1).

**Installation:**  
Install eccentric bolt with Molykote Longterm 2.  
Tightening torque\*.

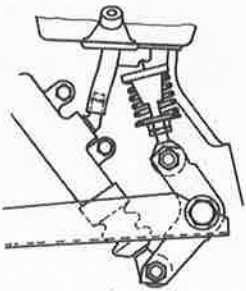


\* See Specifications



**Distance B\* must be reached.**  
Turn the eccentric bolt 180°. If distance B is not reached with the previously described adjustment.

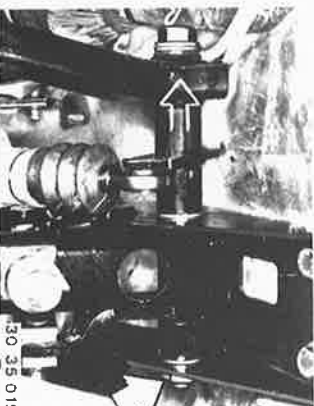
**Important!**  
Intermediate positioning of the eccentric bolt is not permitted!



**Installation:**  
Check for correct installed position in models with an over-center helper spring.

Unscrew nut.  
Pull out shaft and take off pedal.

**Installation:**  
Replace self-locking nut.  
Tightening torque\*.

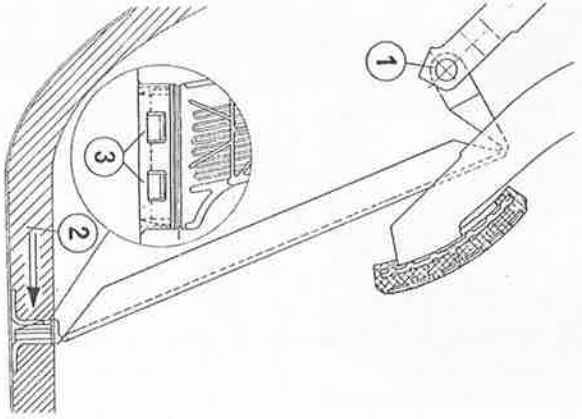


\* See Specifications



**35 41 000 REMOVING AND INSTALLING ACCELERATOR PEDAL**

**Important!**  
 Replace a removed accelerator pedal with a new part in general. Clips on the old part could be damaged, so that the accelerator pedal can slide out of the plate. This could lead to an accident!



28 35 006

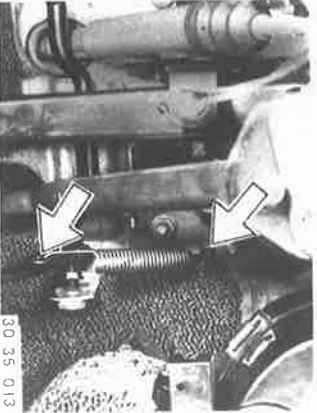
Press off retainer (1) on the accelerator pedal shaft. Press down on carpet (2) behind the accelerator pedal. Press in clips (3) in direction of arrow and lift out accelerator pedal upward.

**Important!**  
 Always check that clips engage correctly.

**35 41 010 REMOVING AND INSTALLING ACCELERATOR PEDAL LEVER**

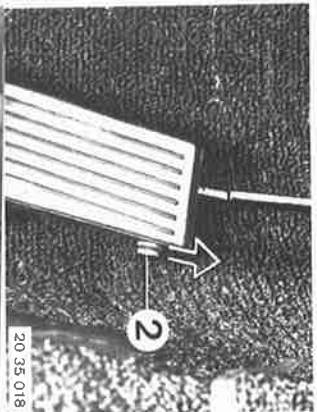
Remove dashboard trim panel at bottom left – see Group 51.

Disconnect accelerator lever spring on pedal.



30 35 013

Press off retainer (2). Disconnect pedal.



20 35 018

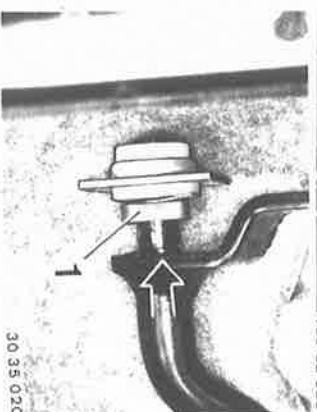
Disconnect cable on pedal.



730 35 036

Pull off retainer (1). Side shaft to the left.

*Installation:*  
 Lubricate bearing surfaces with grease\*.



30 35 020

\* See Specifications

## 35-10

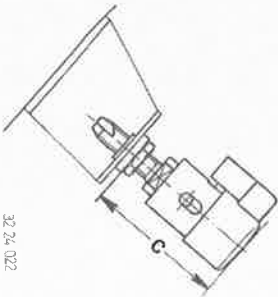
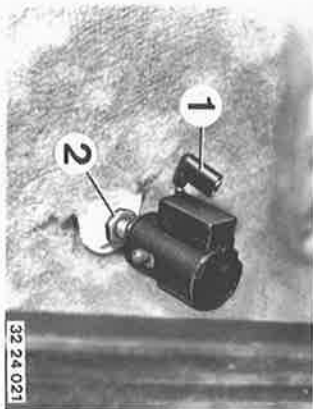
### ACCELERATOR CABLE ADJUSTING PROCEDURES:

#### Manual Transmission:

1. Accelerator pedal on neutral stop.
2. Throttle valve in neutral position (automatic choke switched off).
3. Adjust the cable to remove tension.
4. Turn adjusting screw on full throttle stop of pedal base that there is still 0.5 mm (0.020") play on the full throttle stop of the throttle valve with the accelerator pedal plate in full throttle position. Unscrewing the adjusting screw one and one half turns = 0.5 mm (0.020") play.

#### Automatic Transmission:

- 1.—3. same as for manual transmission.
4. Check control distance C\* of the full throttle stop.
5. Adjust full throttle stop that there is still 0.5 mm (0.020") play on full throttle stop of the throttle valve in kickdown position (pedal pressed beyond full throttle stop). Unscrewing the full throttle stop one and one half turns = 0.5 mm (0.020") play. Lock with the M 8 nut.
6. Check the pressure point for automatic transmission — see 24 00 004.



### 35 41 480 REPLACING KICKDOWN SWITCH (EH TRANSMISSION)

Check — see BMW Test Plan in Group 24.  
Pull off flat male plug (1).  
Unscrew nuts (2).  
Unscrew switch.

**Installation:**  
Adjust locknuts to distance C\*.  
Make final adjustments after installation.  
Tightening torque\*.

\* See Specifications

\* See Specifications

# 36 Wheels and Tires

36 10 030	Front wheels on car — balance dynamically and electronically .....	36 - 1
080	Rear wheel on car — balance dynamically and electronically .....	36 - 1
090	Front and rear wheels — balance dynamically and electronically (325 IX) .....	36 - 2
209	Front or rear wheel — check for radial and lateral runout .....	36 - 5
300	Front or rear wheel — remove and install .....	36 - 6
508	Wheel — balance dynamically (wheel removed) .....	36 - 7
36 10 715	Wheel rim — check for lateral and radial runout .....	36 - 8
	Tire — replace .....	36 - 9
	Tire — mounting with modern mounting machine .....	36 - 10

## 36-1

### 36 10 030 BALANCING BOTH FRONT WHEELS ON CAR DYNAMICALLY AND ELECTRONICALLY

**Important!**

Always first balance the wheels stationary precisely prior to electronic (finish) balancing.

Apply measuring support for balancing on control arm end (1) (up to 5" rims). Use a suitable holding fork or additional fork (see Service Information or Workshop Equipment Planning Documents).

From 5 1/2" Rims On: Apply the measuring support without an additional fork on control arm (2). Lift car with the measuring support.

Paste adhesive tape or make a chalk mark, both 3 to 4 cm (1.181 to 1.575") long, on the outside of the tire being balanced, opposite the valve.

Connect leads for test sender.

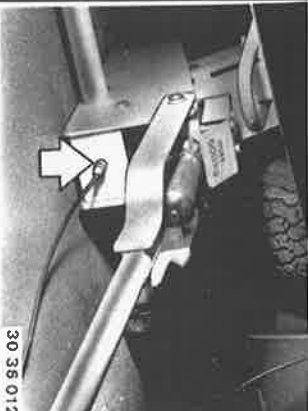
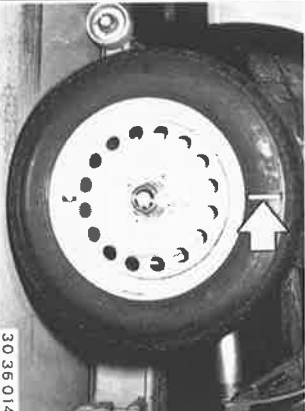
**Important!**

Balance wheels to operating Instructions supplied with pertinent balancing machine.

Balancing must be carried out on firm underground (concrete floor without basement).

Also refer to Service Information of Group 36.

If a value of more than 15 grams is displayed for finish balancing of a wheel, the possible causes (e.g. inaccurate stationary balancing, centering, etc.), also refer to Service Information 36 0 483 (196), must be eliminated prior to finish balancing and before rechecking the finished wheel.

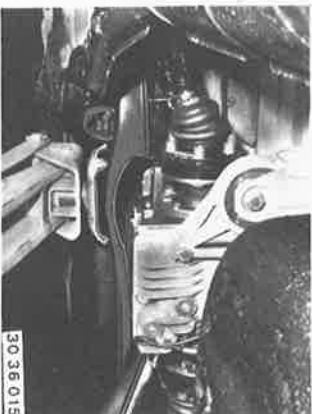


### 36 10 080 BALANCING BOTH REAR WHEELS ON CAR DYNAMICALLY AND ELECTRONICALLY

**Important!**

Always first balance the wheels stationary precisely prior to electronic (finish) balancing. Paste a strip of adhesive tape or make a chalk mark, both 3 to 4 cm (0.181 to 1.575") long, on outside of the tire being balanced, opposite the valve.

Use wedges on the front wheels. Apply jack at middle of car on the rear axle carrier and lift the car.



Apply measuring support underneath the trailing arm of the wheel being balanced.

Use an unsprung support on the trailing arm of the running wheel (be careful of brake pipes and hoses), in order to suppress the oscillation from the final drive.

Lower the jack and place it underneath the differential with slight pressure.

Check, whether it is possible to turn the wheels easily.

## 36-3

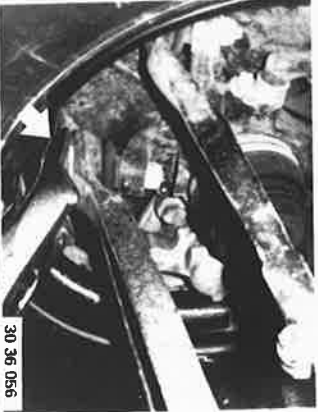
Balancing must be carried out on firm underground (concrete floor without basement). The car must be level after jacking up and all wheels must turn easily. Also refer to Service Information of Group 36.



30 36 058

Apply a workshop jack underneath the front axle final drive in the middle and with light pressure, in order to suppress the oscillation of the front axle final drive.

Lift car with a two-pillar hoist if applicable. Apply measuring supports underneath the front axle on each wheel carrier/control arm joint, using suitable holding forks or additional forks (see Service Information or Workshop Equipment Planning Documents).



30 36 056

Apply measuring supports underneath the rear axle on each trailing arm as close as possible to the wheel, using suitable holding forks or additional forks (see Service Information or Workshop Equipment Planning Documents).



30 36 057



30 36 059

Apply a workshop jack underneath the rear axle final drive in the middle and with light pressure, in order to suppress the oscillation of the rear axle final drive.



30 36 054

Lower the arms of the hoist until they have just barely cleared, but never touch the body during balancing procedures (resonance oscillation).

## 36-5

### 36 10 209 CHECKING FRONT OR REAR WHEEL FOR LATERAL AND RADIAL RUNOUT

Remove wheel – see 36 10 300.  
Mount wheel on a balancing machine.  
The wheel must be mounted on the  
balancing machine in the same manner  
as mounted on the car (valve facing  
down), in order to avoid transmitted  
tension.



Use suitable center of pertinent  
balancing machine.

- 1 Basic flange
- 2 Center
- 3 Type flange

Also refer to Workshop Equipment  
Planning Documents.



32 36 014

Apply Special Tool 36 1 000 on road  
contact surface of tire.  
Turn wheel by hand and measure max.  
tire radial runout\*.

*Note:*  
Special tool must be perpendicular to  
the tire's road contact surface.

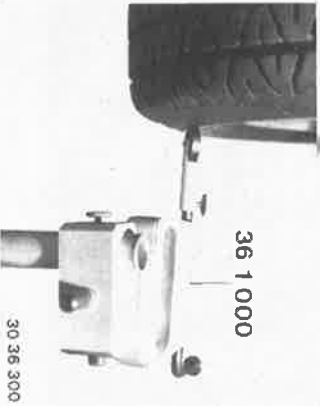


36 1 000

30 36 229

Apply Special Tool 36 1 000 on side  
surface of tire.  
Turn wheel by hand and measure max.  
tire lateral runout\*.

*Note:*  
Special tool must be perpendicular to  
the tire's side surface.  
Don't measure on tire specifications!



36 1 000

30 36 300

\* See Specifications

## 36-7

### 36 10 508 BALANCING WHEEL DYNAMICALLY - Wheel Removed -

Remove old balance weights, stones in treads and large pieces of dirt. Check tire inflation pressure, condition of tire (damage, cuts, flat spots caused by not using car with hot tires for a long time). If necessary, check wheel and tire for radial and lateral runout - see 36 10 209.

Use a suitable center of pertinent balancing machine.

- 1 Basic flange
- 2 Center
- 3 Type flange

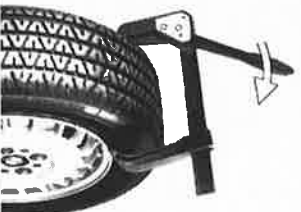
Also refer to Workshop Equipment Planning Documents.



32 36 014

*Important!*  
To avoid clamping errors, the wheel must be mounted on the balancing machine in the same manner (e.g. valve facing down) as mounted afterwards on the car.

Balance wheel to operating instructions of pertinent balancing machine.



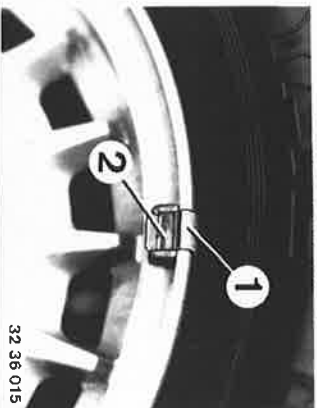
30 36 062

**Aluminum Wheel Rims:**  
Press the side of the tire away from the rim flange slightly at an appropriate point with a tire clamp\*\* and insert a holder.  
Remove the tire clamp and push a balance weight underneath the holder until it engages.

**Arrangement Of Balance Weights for Cast Aluminum Rims:**

- 1 Spring holder
- 2 Balance weight

Max. Imbalance per wheel and side\*.



32 36 015

**Arrangement of Balance Weights for Steel Rims:**

Max. Imbalance per wheel and side\*.



30 36 028



30 36 049

\* See Specifications  
\*\* See Workshop Equipment Planning Documents

## 36-9

### REPLACING TIRE:

Refer to operating instructions supplied with pertinent tire mounting machine for correct mounting of tires. However, also make sure that the machine is in perfect condition and that the wheel rim and tire are not damaged.

#### General Tire Mounting Instructions:

##### Removing:

Removal of tire begins at the valve.

After pressing the tire off of the rim flange, remove balance weights, press tire bead into well and coat thoroughly with the mounting paste\*\*.

Clean wheel rim thoroughly and inspect rim for damage before mounting the tire. The valve and valve insert must be replaced each time a tubeless tire is removed and installed.

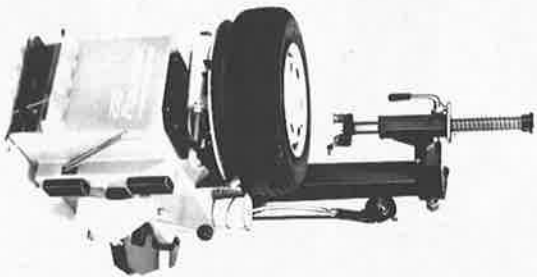
It will be necessary to loosen the tire on the inside and outside by applying the pressing-off horn on the bead periphery at several points before pressing off the bead.

Pressing-off force for "TD tires" will have to be somewhat greater because of the tight fit of the bead toe.

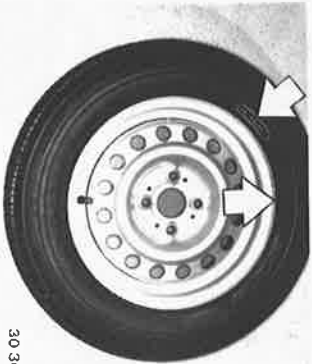
It will be necessary to loosen the tire on the inside and outside by applying the pressing-off horn on the bead periphery at several points before pressing off the bead.

##### Caution!

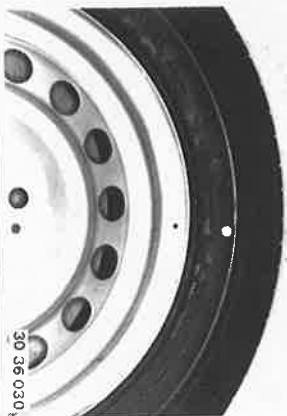
The TD bead toe could spring out of the Denloc groove suddenly, which in turn causes the pressing-off horn to jump inward!



28 36 023



30 36 029



30 36 030

##### Mounting:

Coat tire bead with tire mounting paste\*\*.

Make sure tire is mounted on correct side, especially in case of asymmetric tires. The "outsides" of these tires is marked.

In addition, the green dot on the tire must be aligned with the punch mark in the rim flange. Mount tire with as little as possible stress on the beads, since otherwise there would be danger of damaging the tire, or TD bead toe in case of TD tires.

Let the tire bead jump over the hump of the rim shoulder first — coming from the rim well.

Inflate tire in steps while observing constantly.

Maximum "spring pressure" = 3,3 bar (47 psi). If the tire is not seated on the rim correctly, increasing the inflation pressure will not improve the tire seating!

Instead it will be necessary to press off both tire beads, apply another coat of tire mounting paste and to inflate the tire again. Increase the inflation pressure slowly to have the tire "settle" only when beads seat correctly on the rim flanges.

Maximum "settle pressure" = 4,0 bar (57 psi). Refer to Service Information of Group 36 for approved tires, tire sizes and wheel rims as well as special equipment.

It is important to remember, that TD tires may only be mounted on TD rims! Installing TD tires on wrong types of rims (including TRI) could cause tire damage, which could lead to tire blowouts while driving.

This tire could no longer be used, not even on a TD rim!

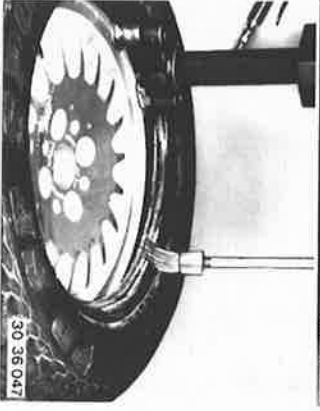
\*\* Source of Supply: HWB



## 36-11



Release lock and tilt back or swing away the mounting pillar.  
Unclamp and clean the rim.  
Replace the valve.  
Coat the rim flange and tire beads with mounting paste.  
Clamp the rim on the mounting machine.  
Slide on the tire with the lower bead over the rim flange partially.  
Valve is 10 cm (4") to the right of the mounting head.



Swing or tilt the mounting pillar into position and lock.  
Check adjustment of the mounting finger, readjusting if necessary and clamp.  
Press the tire underneath the mounting finger by hand.  
Tire bead should seat in the roller next to the mounting finger.  
Let the mounting machine run forward (clockwise) a short distance.  
The lower tire bead will drop into the well.



Press the upper tire bead underneath the mounting finger.  
Tire bead should seat in rollers next to the mounting finger.

*Important!*  
Don't pinch or damage the bead.

Run the mounting machine forward (clockwise) a short distance, while checking that the lower tire bead remains in the well.

After mounting, first release the clamps and then inflate the tire (without valve insert).  
Increase the pressure in steps to 3.3 bar (47 psi) (spring pressure).  
If the tire bead does not slide on to the rim edge all around, do not increase the pressure.  
Instead the tire must be deflated and the tire bead pressed off, then coat the tire bead and rim flange with mounting paste again and inflate again to 3.3 bar (47 psi) pressure.  
If the beads seat on rim flange correctly, increase the inflation pressure to max. 4.0 bar (57 psi) to have the tire "settle".  
Screw in the valve insert and correct the tire inflation pressure.

