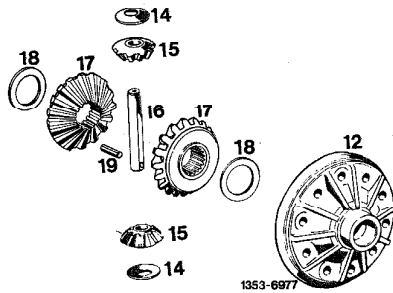


A. Standard differential



12 Differential housing . . . . .	Check vertical and axial runout on fitted dia. for ring gear, max. 0.02
14 Spherical washer . . . . .	Renew
15 Differential . . . . .	Check for damage
16 Differential pinion shaft . . . . .	Check for wear
17 Differential side gear . . . . .	Check for damage
18 Thrust washer . . . . .	Renew, selecting thickness to obtain a friction torque of 30-90 Nm
19 Clamping sleeve . . . . .	Renew

## 35-560 Reconditioning differential

### Adjustment of differential gears

Friction torque when rotating complete differential	30-90 Nm
---	----------

### Differential

Permissible vertical runout of differential housing on fit for ring gear	0.02
--	------

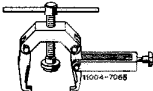
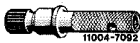

Permissible lateral runout of differential housing on flange surface for ring gear	0.02
--	------

Thrust washer on side gear	Thickness	large center piece <sup>1)</sup>	1.3 to 1.7
		small center piece <sup>1)</sup>	1.0 to 1.7
	Steps		0.1 mm each

Clamping sleeve	large center piece <sup>1)</sup>	6 x 45
	small center piece <sup>1)</sup>	6 x 40

<sup>1)</sup> Refer to installation survey rear axle center piece 35-500

### Special tools

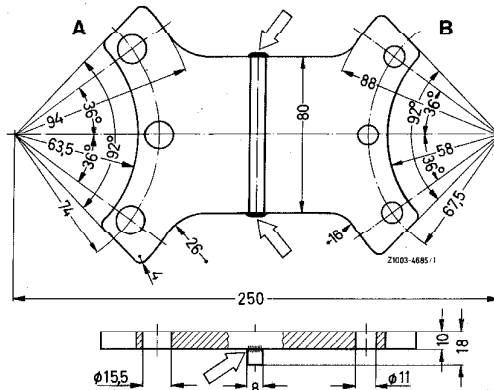
Puller for tapered roller bearing		123 589 08 33 00
Assembly mandrel (2 each) for side gears		116 589 18 61 00
Assembly mandrel for differential gears	large center piece	126 589 02 15 00
	small center piece	123 589 06 15 00
Assembly mandrel for inner race of tapered roller bearing	large center piece	116 589 08 61 00
	small center piece	115 589 04 61 00
Support for differential housing		126 589 06 31 00

## 35-560 Reconditioning differential

### Self-made tool

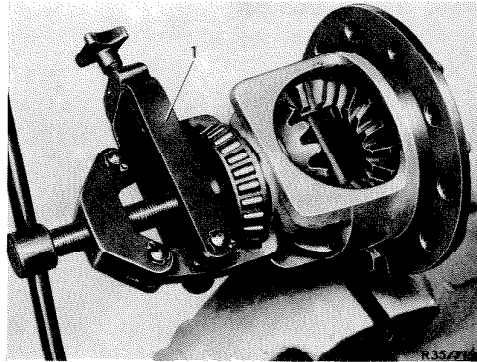
#### Clamping device for differential

A = large rear axle center piece  
 B = small rear axle center piece  
 Arrow = intermediate web welded

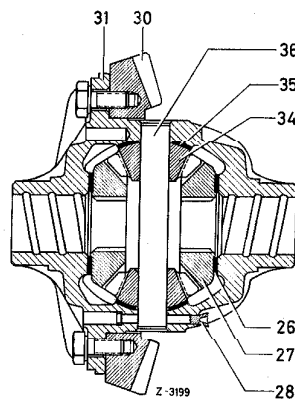


### Disassembly

- 1 Clamp differential with self-made clamping device into vise.
- 2 Pull both tapered roller bearing inner races from differential housing with puller (1).



- 3 Knock clamping sleeve (28) for differential pinion shaft (36) out of differential housing (31) by means of a matching mandrel.



#### Complete differential of 1st version

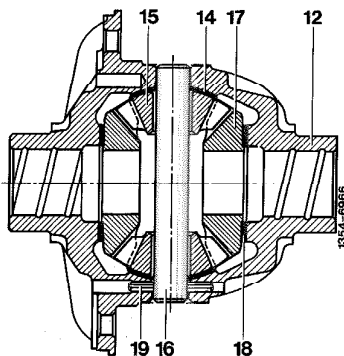
- |                    |                              |
|--------------------|------------------------------|
| 26 Thrust washer   | 31 Differential housing      |
| 27 Side gear       | 34 Differential pinion       |
| 28 Clamping sleeve | 35 Ball washer               |
| 30 Ring gear       | 36 Differential pinion shaft |

## 35-560 Reconditioning differential

4 Force out differential pinion shaft and remove differential pinions, side gears, thrust washers and ball washers.

Complete differential of 2nd version

- |                              |                    |
|------------------------------|--------------------|
| 12 Differential housing      | 17 Side gear       |
| 14 Ball washer               | 18 Thrust washer   |
| 15 Differential pinion       | 19 Clamping sleeve |
| 16 Differential pinion shaft |                    |



5 Check individual parts for re-use. Renew all overheated or seized differential pinions, thrust washers and ball washers on principle.

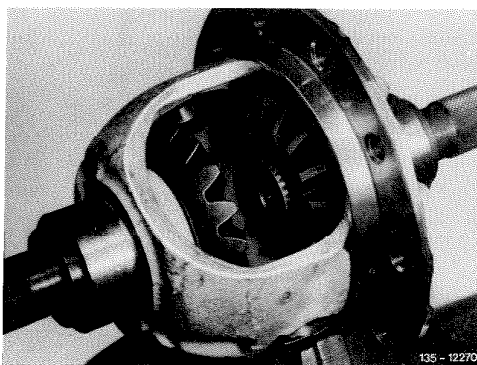
6 Check bores in differential housing. Check fit and supporting surface for ring gear for radial and axial runout.

### Assembly

7 Insert both assembly mandrels into bores of differential housing.

8 Place thrust washer on side gears.

9 Place both side gears with thrust washers on assembly mandrels in differential housing.

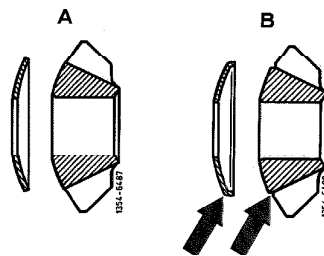


135 - 12270

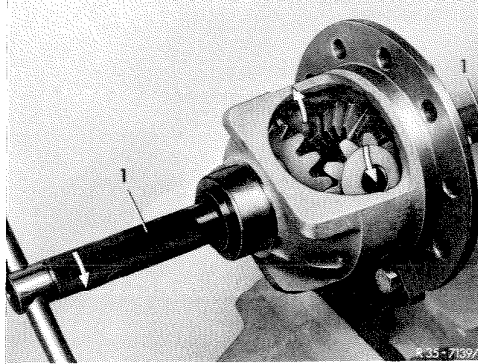
### Attention!

To facilitate assembly, the ball washers of the present version (B) of the differential are provided with a collar at OD and the differential pinions with a shoulder (arrow).

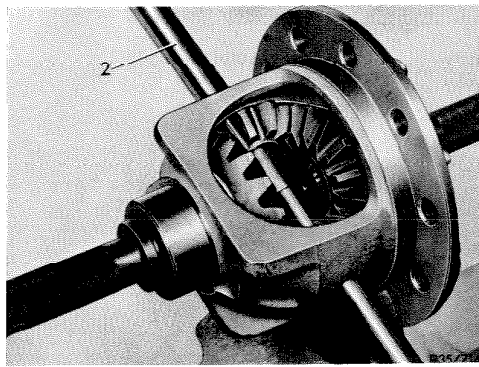
Mount differential pinions and ball washers only in the combination shown in illustration.



10 Turn both differential pinions and ball washers together into differential housing by means of assembly mandrel (1).

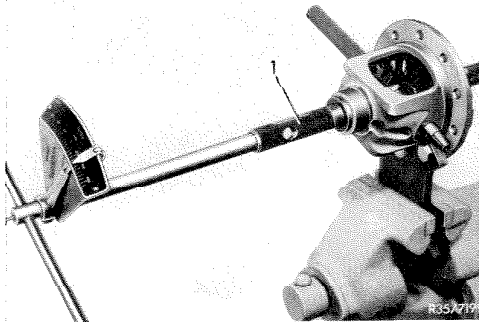


11 Slip assembly mandrel (2) instead of differential bolt into differential housing to locate differential pinions and ball washers.

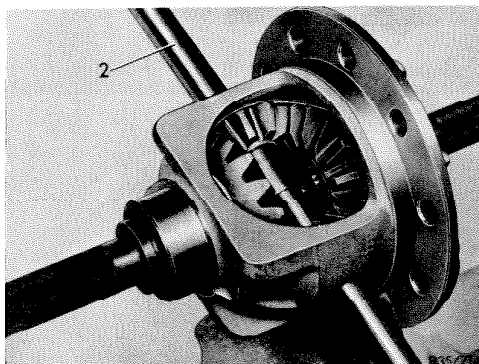


12 Check friction torque. Friction torque should amount to 30-90 Nm, at restraining points up to 100 Nm.

**Note:** Select thrust washers for side gears in such a manner that a given friction torque is available during assembly.



13 Knock in differential bolt while paying attention to bore for clamping sleeve.



## 35-560 Reconditioning differential

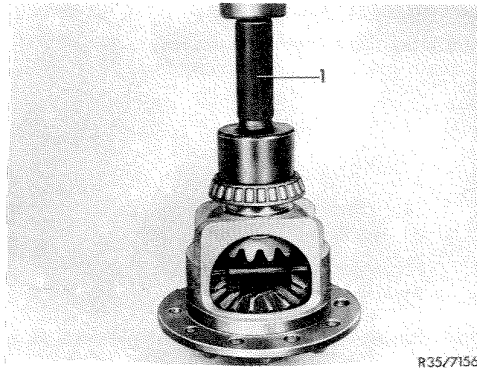
---

14 Knock in new clamping sleeve.

15 Press inner races of tapered roller bearings on differential housing by means of assembly mandrel (1).

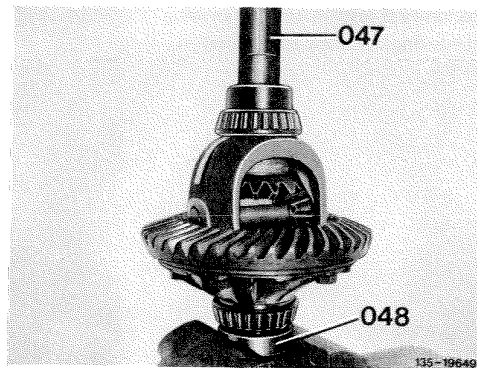
Assembly mandrel for:

small	rear axle center piece:	115 589 04 61 00
large	rear axle center piece:	116 589 08 61 00

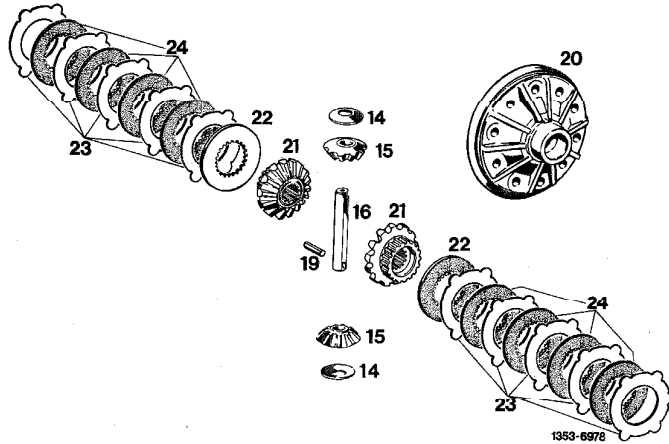


### Attention!

To prevent damage to roller cage when pressing-on second inner race, use support (048) (for small rear axle center piece without lateral bearing caps only).



B. Differential with limited slip



14 Spherical washer . . . . .	Renew
15 Differential pinion . . . . .	Check for damage
16 Differential pinion shaft . . . . .	Check for wear
19 Clamping sleeve . . . . .	Renew
20 Differential housing . . . . .	Check vertical and axial runout on fitted dia. for ring gear, max. 0.02 mm
21 Differential side gear . . . . .	Check for damage
22 Friction disc with lining on one side . . . . .	Renew, selecting thickness to obtain a friction torque of 80-140 Nm
23 Friction disc without lining . . . . .	Check for wear
24 Friction disc with lining on both sides . . . . .	Check for wear

## 35-560 Reconditioning differential

### Adjustment of differential gears

Friction torque when rotating complete differential	80-140 Nm
---	-----------

### Differential

Permissible vertical runout of differential housing at fit for ring gear	0.02
--	------

Permissible lateral runout of differential housing at flange surface for ring gear	0.02
--	------

### Thickness of friction discs

Without lining	1.1
----------------	-----

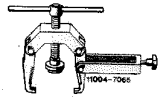
With lining on both sides	1.8
---------------------------	-----

With lining on one side	Thickness	3.0-3.6 and 4.0
	Steps	from 0.1 to 0.1 and 0.4

Clamping sleeve	6 x 45
-----------------	--------

### Special tools

Puller for tapered roller bearing



123 589 08 33 00

Assembly mandrel (2 each) for side gears



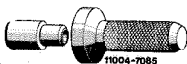
116 589 18 61 00

Assembly mandrel for differential gears



126 589 02 15 00

Assembly mandrel for inner race of tapered roller bearing

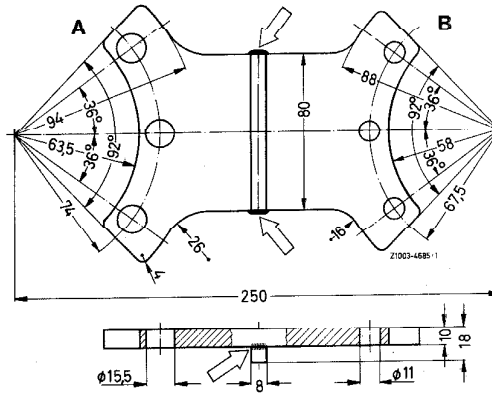


116 589 08 61 00

## Self-made tool

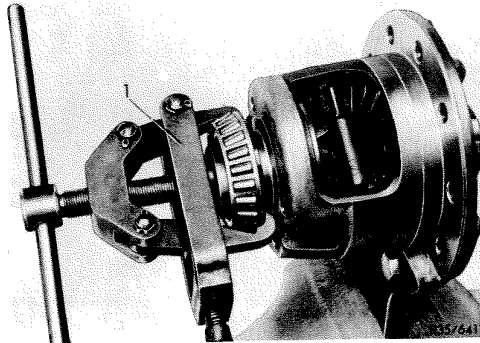
### Clamping device for differential

A = large rear axle center piece  
 B = small rear axle center piece  
 Arrow = intermediate web welded



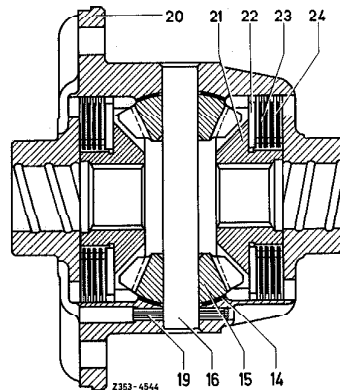
## Disassembly

- 1 Clamp differential with clamping device (self-made) into vise.
- 2 Pull both tapered roller bearings from differential housing by means of puller (1).



- 3 Knock clamping sleeve (19) for differential pinion shaft (16) out of differential housing (20) by means of a matching mandrel.
- 4 Knock out differential bolt (16).

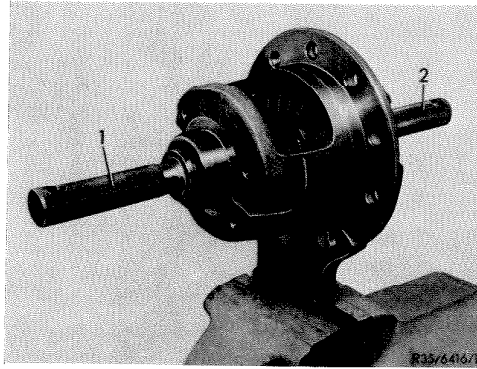
- |                                       |  |
|---------------------------------------|--|
| 14 Ball washer (spherical washer)     | 22 Friction disc with lining on one side   |
| 15 Differential pinion                | 23 Friction disc with lining on both sides |
| 16 Differential pinion shaft          | 24 Friction disc without lining            |
| 19 Clamping sleeve (hollow dowel pin) |  |
| 20 Differential housing               |  |
| 21 Side gear                          |  |



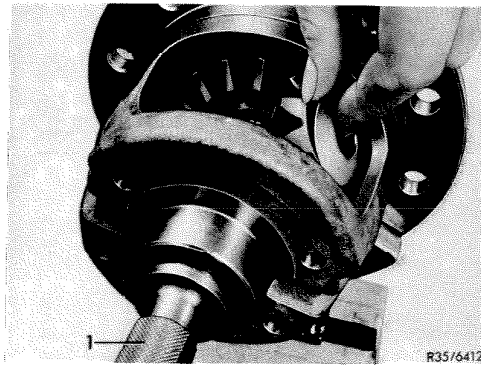
## 35-560 Reconditioning differential

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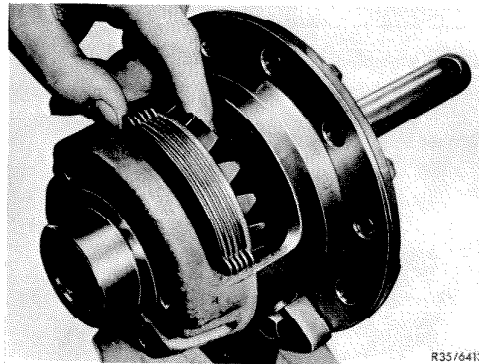
5 Insert assembly mandrels (1 and 2) for guiding side gears.



6 Turn out differential pinions with ball washers and remove.



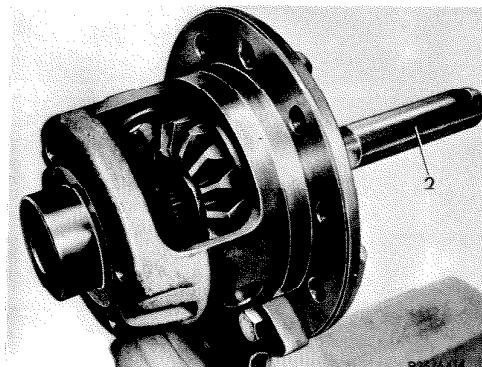
7 Remove righthand side gear with friction discs.



8 Remove lefthand side gear with friction discs.

9 Check individual parts for re-use and renew, if required.

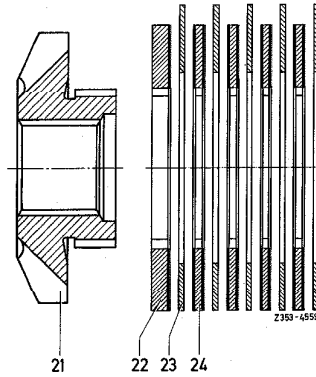
10 Check bores in differential housing. Check fit for ring gear for vertical runout and contact surface for lateral runout.



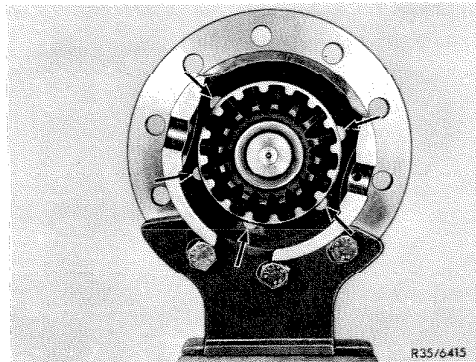
## Assembly

**Note:** When new friction discs are installed, it will be of advantage to measure the removed friction discs with lining on one side (22) and to reinstall new friction discs of the same thickness.

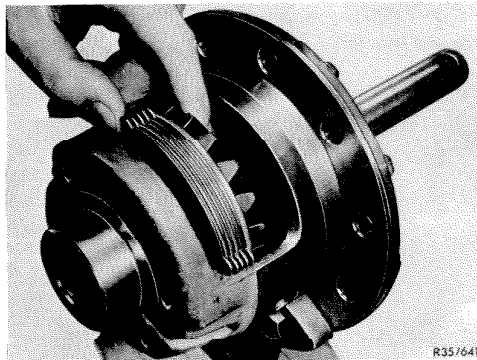
11 Place friction discs in correct sequence on both side gears and coat friction discs with lining (22 and 24) with Hypoid gear oil (refer to specifications for service products page 235.3).



12 Install lefthand side gear (ring gear end) together with friction discs and insert assembly mandrel, while paying attention to lugs of friction discs without lining (arrows).

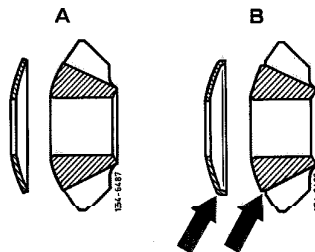


13 Install righthand side gear with friction discs and assembly mandrel.



### Attention!

To facilitate assembly, the ball washers of the present version (B) of the differential are provided with a collar at OD and the differential pinions with a shoulder (arrows). Mount differential pinions and ball washers only in the combination shown in illustration.

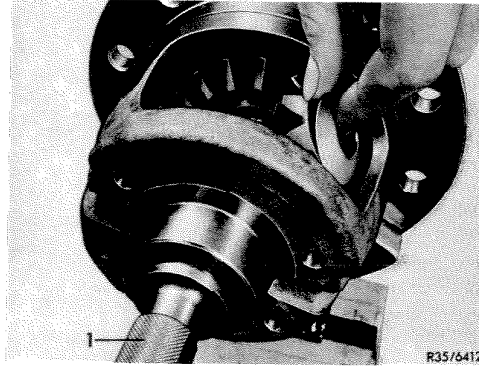


## 35-560 Reconditioning differential

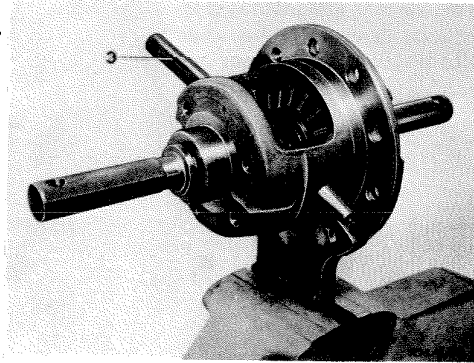
---

14 Insert one differential pinion with ball washer into differential and turn downward.

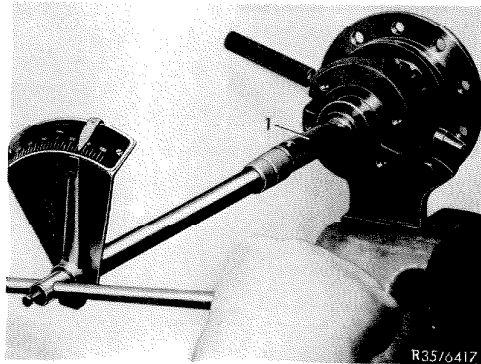
15 Insert second differential pinion with ball washer exactly opposite and turn down together until bores of differential pinion and differential housing are in alignment.



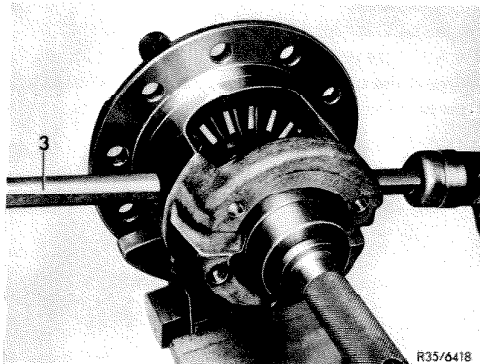
16 Insert assembly mandrel (3) instead of differential pinion shaft to locate differential pinions and ball washers.



17 Check friction torque. Friction torque should amount to approx 80-140 Nm.

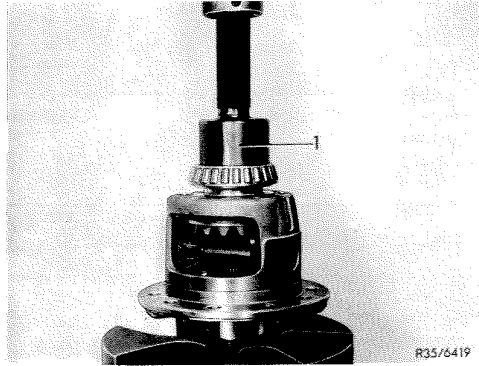


18 Knock in differential pinion shaft and remove assembly mandrel (3).



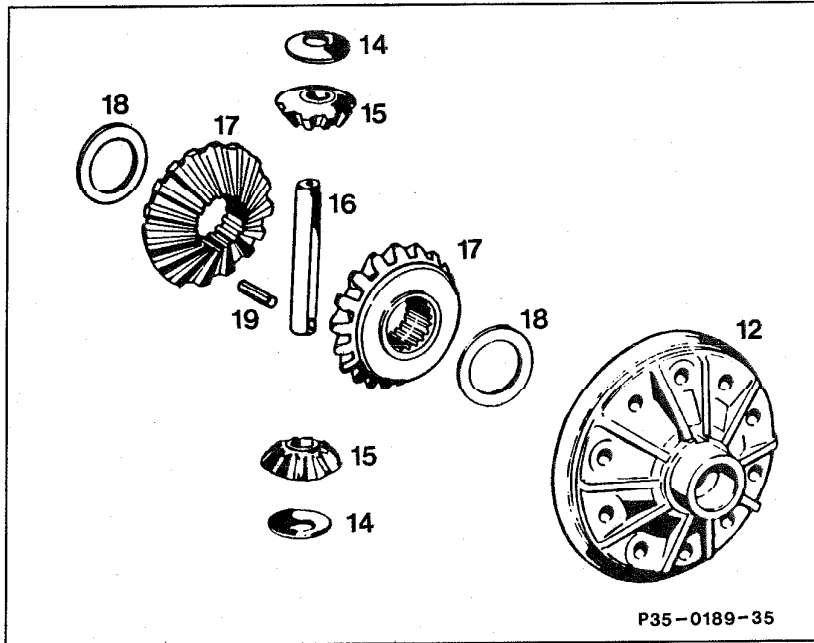
19 Knock in new clamping sleeve.

20 Press on inner races of tapered roller bearings by means of assembly mandrel (1).



Preliminary work:  
R and R rear axle differential housing (35-520)  
R and R differential gear set (35-550)

**A. Standard differential**



P35-0189-35

## 35-560 Reconditioning differential

Differential .....	clamp, unclamp, clamping tool 201 589 02 31 00.
Clamping sleeve (19) .....	knock out, knock in, replace.
Differential pinion shaft (16) .....	press out, press in, remove.
Differential gears (15), rear axle shaft gears (17), thrust washers (18) and ball washers (14) .....	screw out, screw in, remove (step 4). To install, fix differential case in relation to ring gear with installation punch 123 589 06 15 00 for 185 mm dia. ring gear and installation punch 126 589 02 15 00 for 210 mm dia. ring gear. <b>Check frictional torque</b> (nominal value 40-90 Nm, step 5).
Check .....	all parts for reusability.

### Adjustment of differential gears

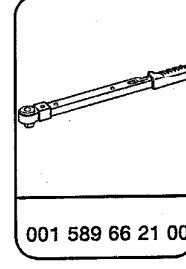
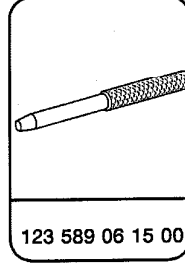
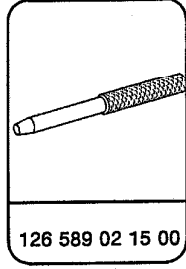
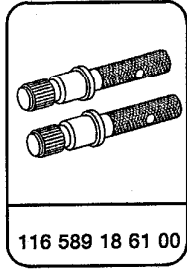
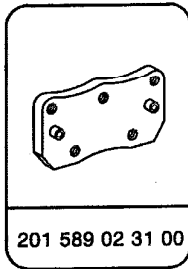
Frictional torque when rotating complete differential	40-90 Nm
---	----------

### Differential

Permissible vertical runout of differential case on fit for ring gear	0.02		
Permissible lateral runout of differential case on flange surface for ring gear	0.02		
Thrust washer on rear axle shaft gear	Thickness	Ring gear dia. 210 <sup>1)</sup>	1.3 to 1.7
		Ring gear dia. 185 <sup>1)</sup>	1.25 to 1.65
	Increments		0.05 to 0.05
Clamping sleeve		Ring gear dia. 210 <sup>1)</sup>	6 × 45
		Ring gear dia. 185 <sup>1)</sup>	6 × 40

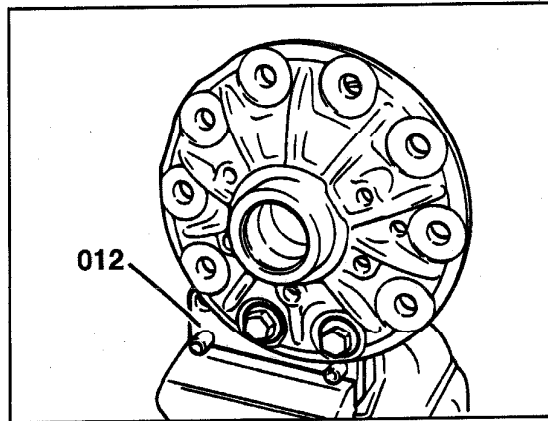
<sup>1)</sup> See installation survey, rear axle differential housing 35-500.

## Special tools



## Disassembly, assembly

1 Clamp differential onto clamping tool (012)  
201 589 02 31 00, unclamp.



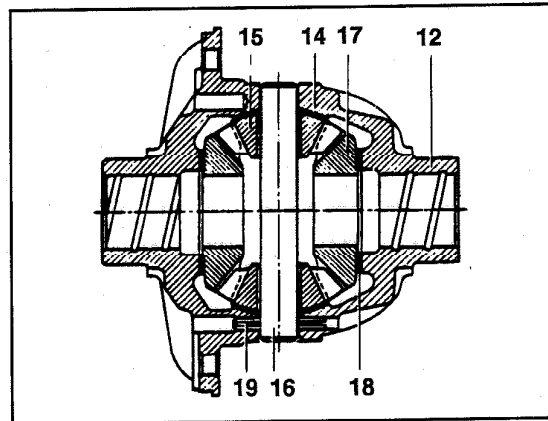
P35-2413-13

2 Press clamping sleeve (19) for differential pinion shaft (16) out of differential case (12) with correct size punch, press in.

### Installation note

Replace clamping sleeve.

3 Knock out differential pinion shaft (16) with punch 123 589 06 15 00 for rear axle differential case with 185 mm dia. ring gear and punch 126 589 02 15 00 for 210 mm dia. ring gear.



P35-0192-13

### Installation note

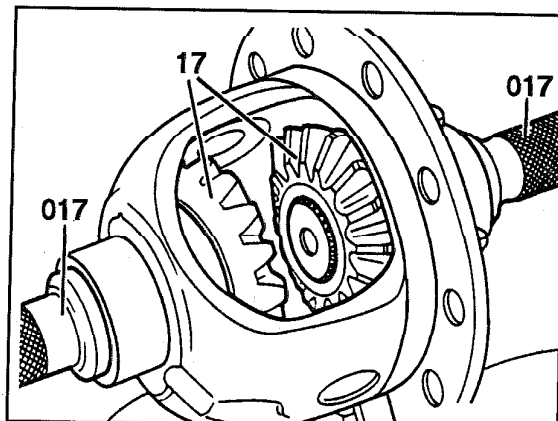
When knocking in differential pinion shaft (16) pay attention to bore for clamping sleeve (19).

4 Remove differential gears (15), rear axle shaft gears (17), thrust washers (18) and ball washers (14).

## 35-560 Reconditioning differential

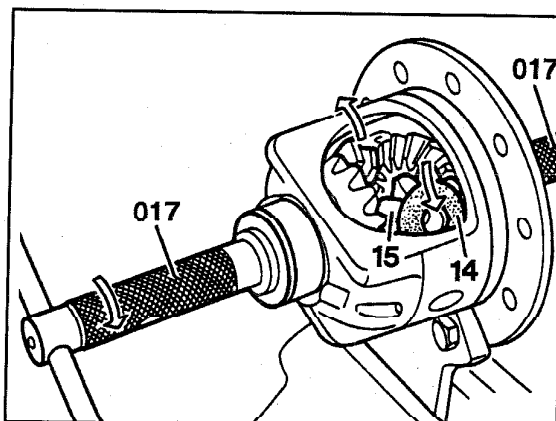
### Installation note

Insert installation punches (017)  
116 589 18 61 00 into bores in differential case.  
Position both rear axle shaft gears (17) with  
thrust washers on installation punches in  
differential case.



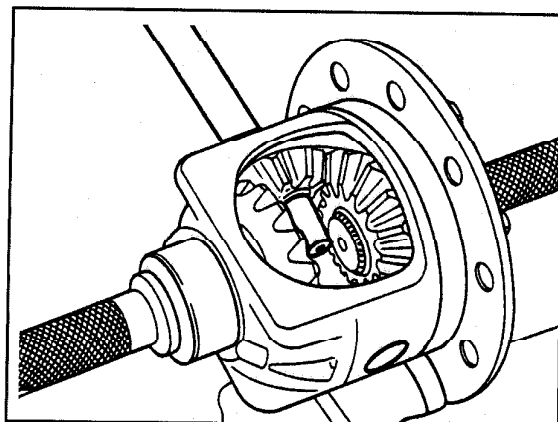
P35-2395-13

Screw both differential gears (15) and ball  
washers (14) together into differential case with  
installation punch (017).



P35-2396-13

Insert installation punch 123 589 06 15 00 for  
185 mm dia. ring gear or 126 589 02 15 00 for  
210 mm dia. ring gear into differential case  
instead of differential pinion shaft to locate  
differential gears and ball washers in differential  
case.

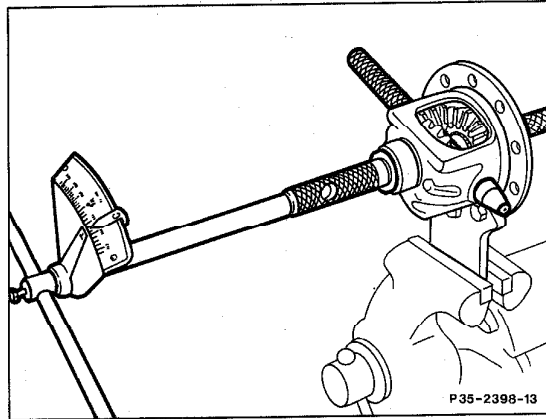


P35-2397-13

5 Check frictional torque.

**Note**

Select thrust washers for rear axle shaft gears so that the frictional torque after assembly is 40-90 Nm; up to 100 Nm at high friction points.

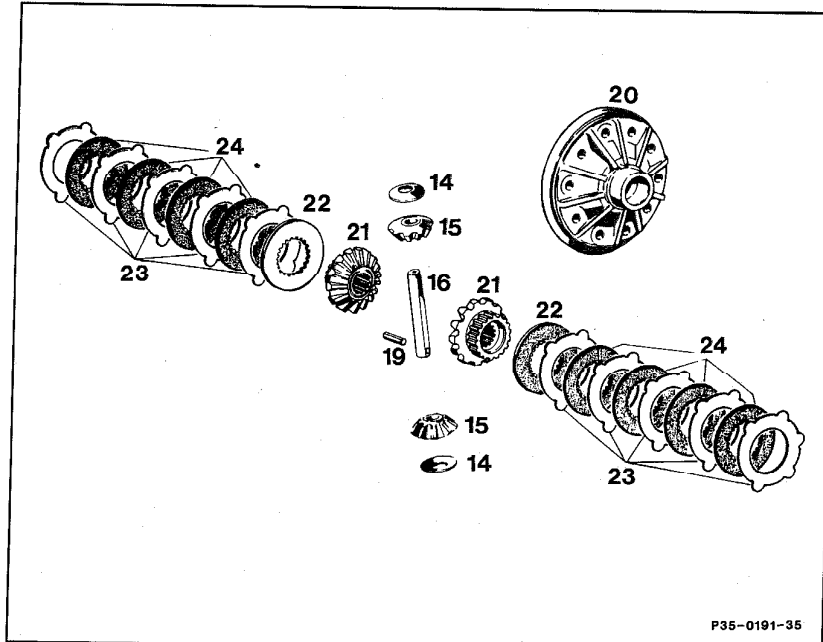


6 Check individual parts for reusability. Always replace all differential gears, thrust washers and ball washers which have run hot or are scored.

7 Check bores in differential case. Check fit and contact surfaces for ring gear for vertical and lateral runout.

# 35-560 Reconditioning differential

## B. Limited slip differential, ring gear diameter 210 mm



P35-0191-35

P35-0191-35

Differential .....	clamp, unclamp. Clamping tool 201 589 02 31 00.
Clamping sleeve (19) .....	drive out, drive in, replace.
Differential pinion gear (16) .....	press out, press in. Insert installation punches 116 589 18 61 00 into rear axle shaft gears. To assemble first fix differential gears (15) and ball washers (14) with installation punch 126 589 02 15 00 and <b>check frictional torque</b> (nominal value 80-160 Nm, steps 3-6). Remove installation punch.
Differential gears (15), ball washers (14) .....	screw out, screw in.
Right rear axle shaft gear (21) with friction disks (22, 23, 24) .....	remove, install.
Left rear axle shaft gear (21) with friction disks (22, 23, 24) .....	remove, install. Installation punch 116 589 18 61 00.
Check .....	all parts for reusability (steps 9-10).

## 35-560 Reconditioning differential

### Adjustment of differential gears

Friction torque when rotating complete differential	80-160 Nm
---	-----------

### Differential

Permissible vertical runout of differential case on fit for ring gear	0.02
---	------

Permissible lateral runout of differential case on flange surface for ring gear	0.02
---	------

### Thickness of friction disks

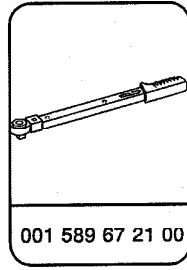
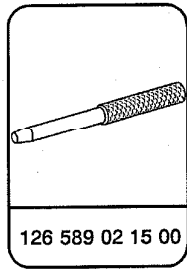
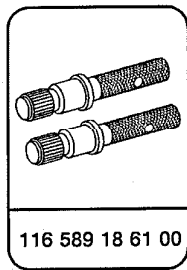
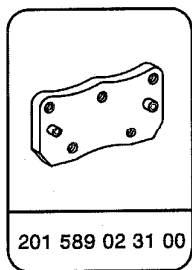
Without lining	1.1
----------------	-----

With lining on both sides	1.8
---------------------------	-----

With lining on one side	Thickness	2.8-3.6 and 4.0
	Increments	0.1 to 0.1 and 0.4

Clamping sleeve	6 × 45
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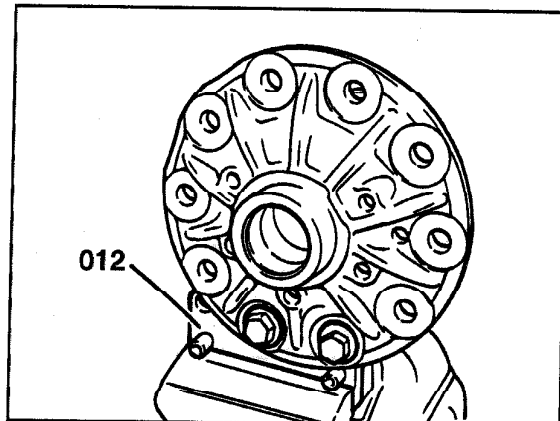
### Special tools



## 35-560 Reconditioning differential

### Disassembly, assembly

- 1 Clamp differential onto clamping tool (012)  
201 589 02 31 00, unclamp.



P35-2413-13

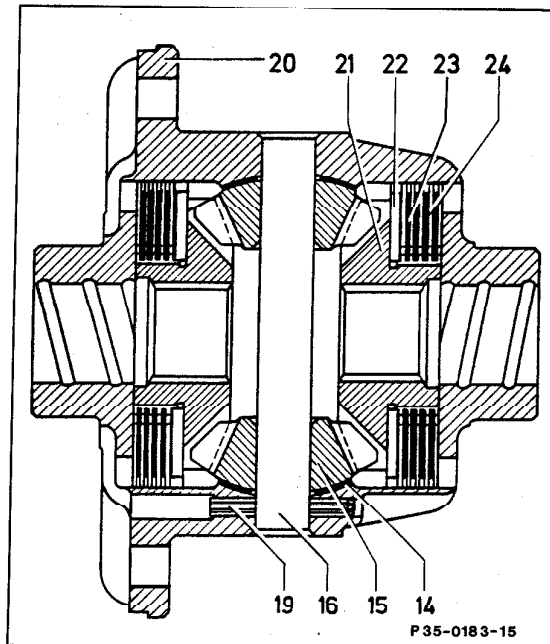
- 2 Press clamping sleeve (19) for differential pinion shaft (16) out of differential case (12) with correct size punch, press in.

#### Installation note

Replace clamping sleeve.

- 3 Knock out differential pinion shaft (16) with punch 126 589 02 15 00.

- 14 Ball washer
- 15 Differential gear
- 16 Differential pinion shaft
- 19 Clamping sleeve
- 20 Differential case
- 21 Rear axle shaft gear
- 22 Friction disk with lining on one side
- 23 Friction disk without lining
- 24 Friction disk with lining on both sides



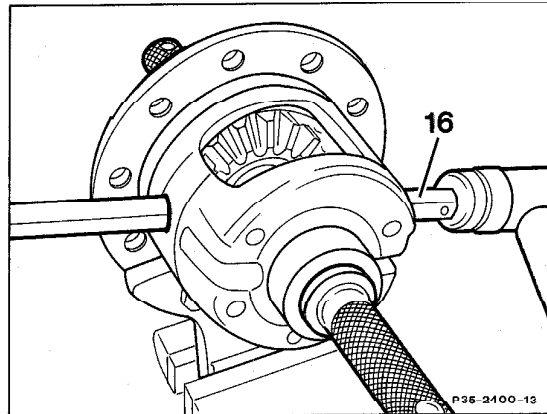
P 35-0183-15

P35-0183-15

## 35-560 Reconditioning differential

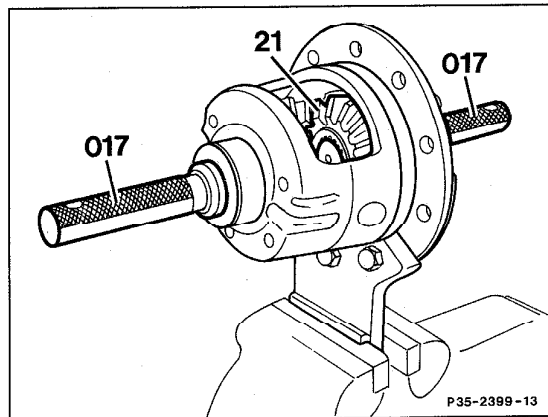
### Installation note

When knocking in differential pinion shaft (16) pay attention to bore for clamping sleeve.  
Remove installation punch.



P35-2400-13

- 4 Insert installation punches (017)  
116 589 18 61 00 for guiding rear axle shaft  
gears (21).

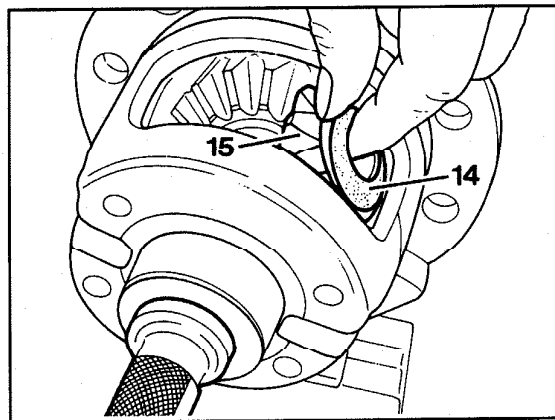


P35-2399-13

- 5 Screw out differential gears (15) with ball  
washers (14) and remove.

### Installation note

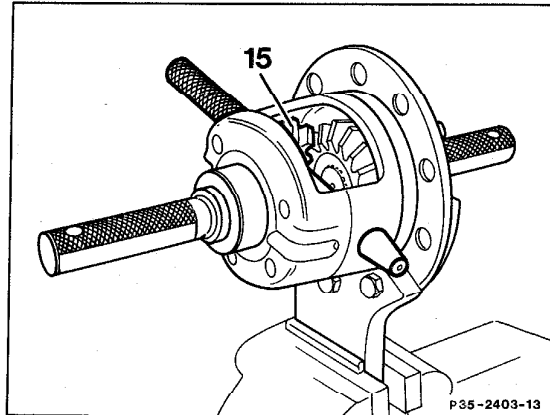
Insert differential gears (15) with ball washers  
(14) one after another and screw in until the  
bores in the differential gears and differential  
case coincide.



P35-2402-13

## 35-560 Reconditioning differential

Insert installation punch 126 589 02 15 00 in place of differential pinion shaft for fixing differential gears (15) and washers.



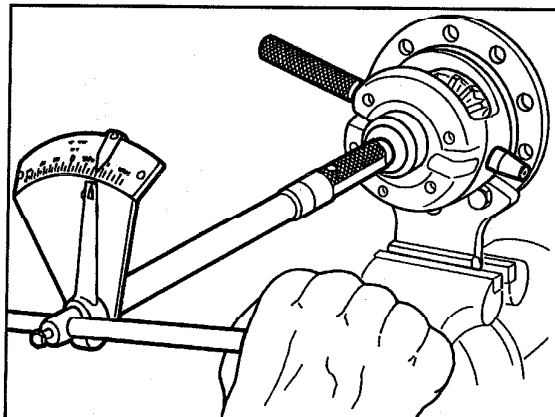
P35-2403-13

P35-2403-13

6 Check frictional torque.

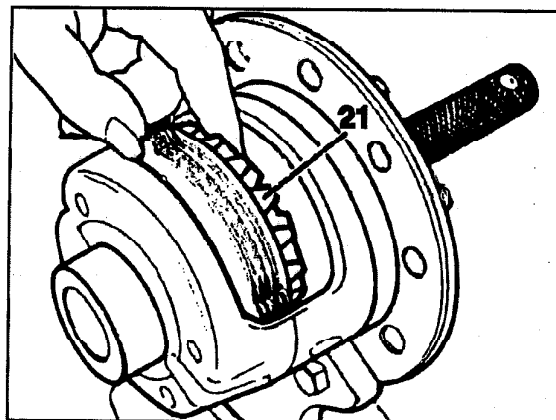
### Note

Select friction disks with lining on one side for rear axle shaft gears so that the frictional torque after assembly is 80-160 Nm.



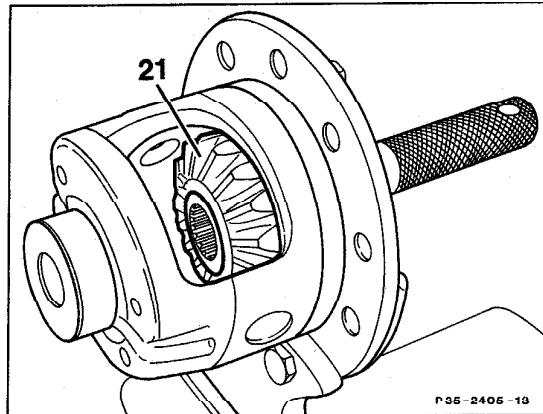
P35-2401-13

7 First remove right rear axle shaft gear (21) with friction disks.



P35-2404-13

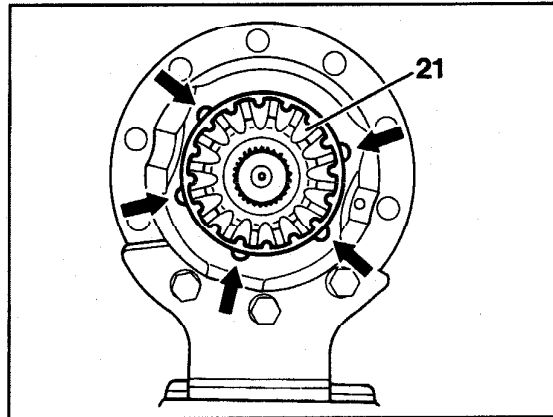
8 Remove left rear axle shaft gear (21) with friction disks.



P35-2405-13

### Installation note

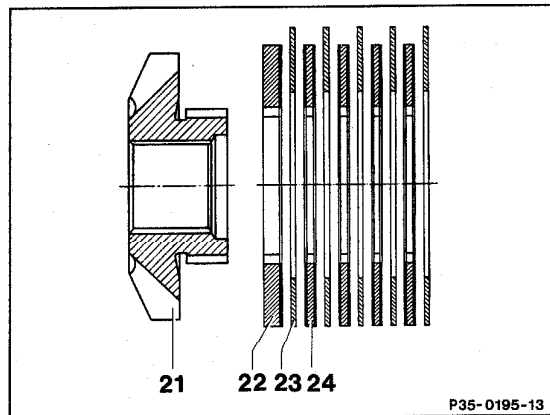
First install left, then right rear axle shaft gear (21, ring gear side) with friction disks, and insert installation punch 116 589 18 61 00, while paying attention to lugs on friction disks without lining (arrows).



P35-2406-13

If new friction disks are installed, it is most practical to measure the friction disks with lining on one side (22) removed previously and install new friction disks of the same thickness.

Install friction disks on both rear axle shaft gears in proper order and coat friction disks with lining (22 and 24) well with hypoid gear oil (refer to Factory Approved Service Products list).



P35-0195-13

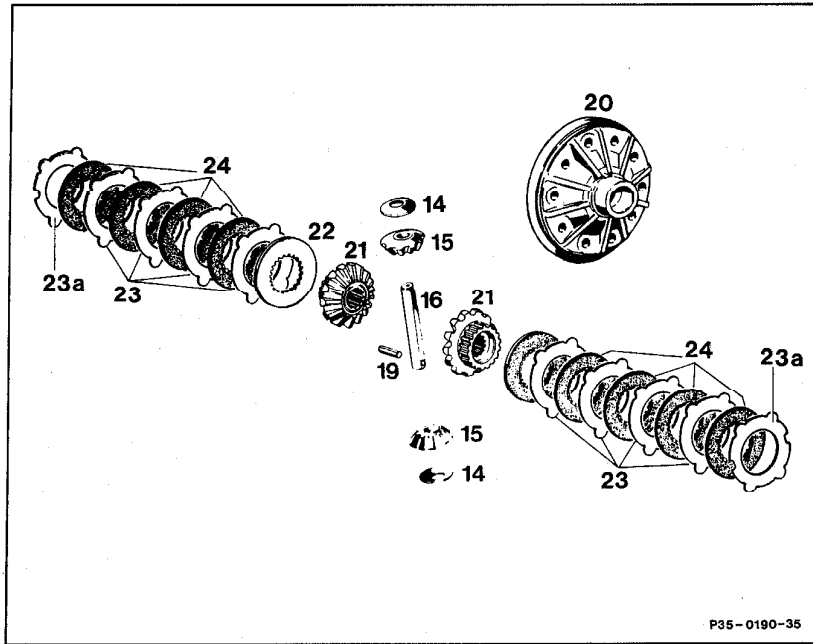
## 35-560 Reconditioning differential

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9 Check individual parts for reusability and replace, if required.

10 Check bores in differential case. Check vertical runout of fit for ring gear and lateral runout of contact surfaces.

C. Differential with ASD, ring gear diameter 185 mm



P35-0190-35

P35-0190-35

## 35-560 Reconditioning differential

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Differential .....	clamp, unclamp. Clamping tool 201 589 02 31 00.
Clamping sleeve (19) .....	drive out, drive in, replace.
Differential pinion gear (16) .....	press out, press in. Insert installation punches 116 589 18 61 00 into rear axle shaft gears. To assemble first fix differential gears (15) and ball washers (14) with installation punch 123 589 06 15 00 and <b>check frictional torque</b> (nominal value 80-160 Nm, steps 3-6). Remove installation punch.
Differential gears (15), ball washers (14) .....	screw out, screw in (step 5).
Right rear axle shaft gear (21) with friction disks (22, 23, 23a, 24) .....	remove, install. Installation punch 116 589 18 61 00 (step 6).
Left rear axle shaft gear (21) with friction disks (22, 23, 23a, 24) .....	remove, install. Installation punch 116 589 18 61 00 (step 7).
Check .....	all parts for reusability (step 9).

### Adjustment of differential gears

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Friction torque when rotating complete differential	80-160 Nm
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### Differential

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Permissible vertical runout of differential case on fit for ring gear	0.02
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Permissible lateral runout of differential case on flange surface for ring gear	0.02
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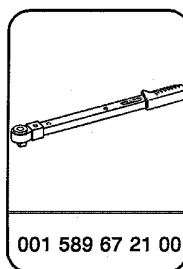
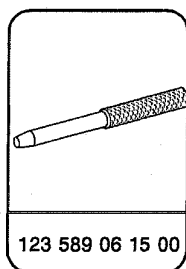
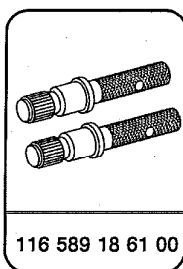
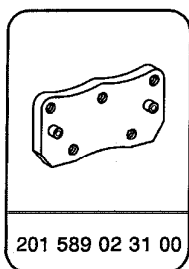
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## 35-560 Reconditioning differential

### Thickness of friction disks

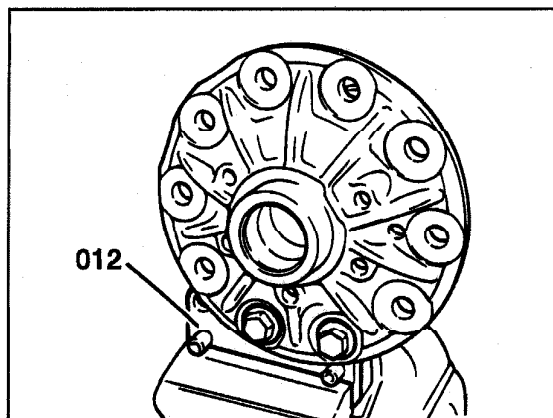
Without lining with 5 tabs (4 per side)		1.0
Without lining with 4 tabs and 2 grooves (1 per side)		
With lining on both sides		1.8
With lining on one side	Thickness	2.8-3.6 and 4.0
	Increments	0.1 to 0.1 and 0.2
Clamping sleeve		6 × 40

### Special tools



### Disassembly, assembly

- 1 Clamp differential onto clamping tool (012)  
201 589 02 31 00, unclamp.



P35-2413-13

## 35-560 Reconditioning differential

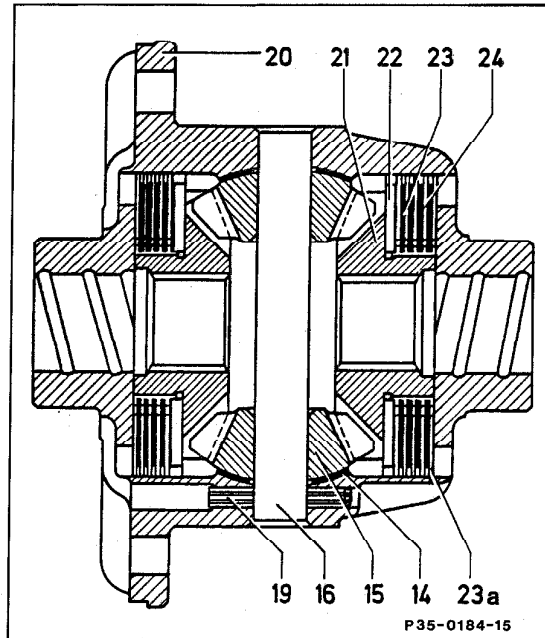
2 Press clamping sleeve (19) for differential pinion shaft (16) out of differential case (20) with correct size punch, press in.

### Installation note

Replace clamping sleeve.

3 Knock out differential pinion shaft (16) with punch 123 589 06 15 00.

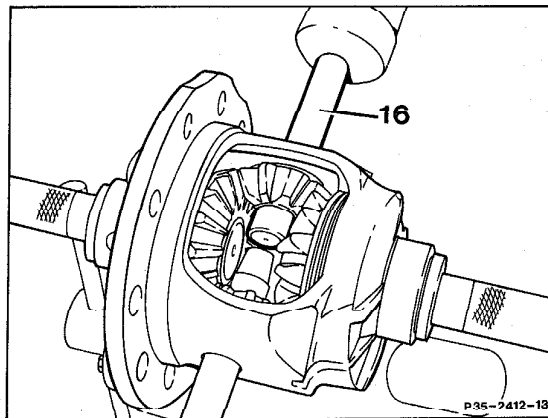
- 14 Ball washer
- 15 Differential gear
- 16 Differential pinion shaft
- 19 Clamping sleeve
- 20 Differential case
- 21 Rear axle shaft gear
- 22 Friction disk with lining on one side
- 23 Friction disks without lining with 5 tabs
- 23a Friction disk without lining with 4 tabs and 2 grooves
- 24 Friction disks with lining on both sides



P35-0184-15

### Installation note

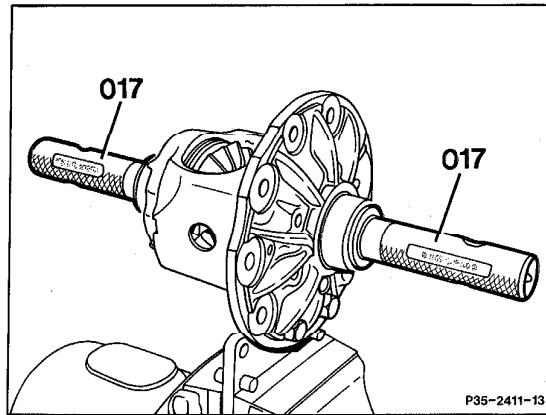
When knocking in differential pinion shaft (16) pay attention to bore for clamping sleeve.  
Remove installation punch



P35-2412-13

## 35-560 Reconditioning differential

4 Insert installation punches (017) 116 589 18 61 00 for guiding rear axle shaft gears.

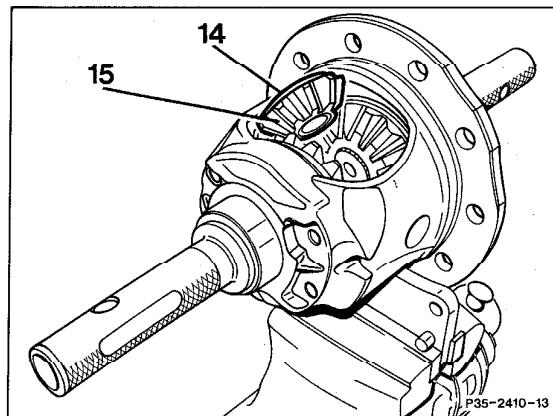


P35-2411-13

5 Screw out differential gears (15) with ball washers (14) and remove.

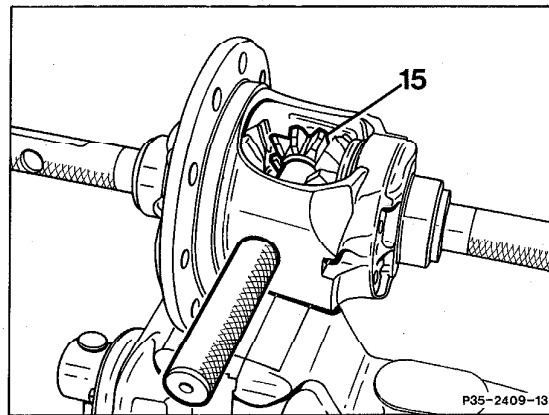
### Installation note

Insert differential gears (15) with ball washers (14) one after another and screw in until the bores in the differential gears and differential case coincide.



P35-2410-13

Insert installation punch 123 589 06 15 00 in place of differential pinion shaft for fixing differential gears (15) and washers.



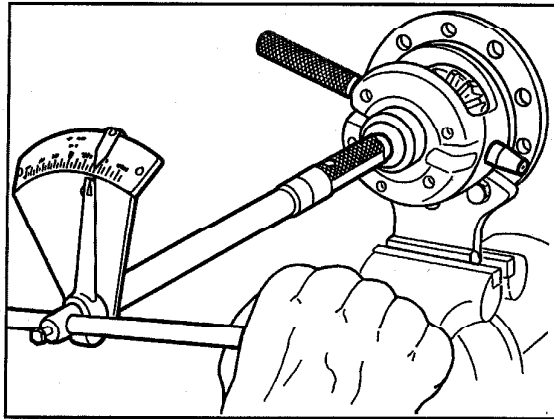
P35-2409-13

## 35-560 Reconditioning differential

6 Check frictional torque.

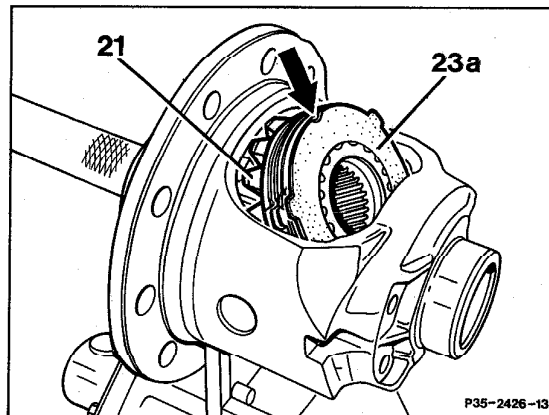
### Note

Select friction disks with lining on one side for rear axle shaft gears so that the frictional torque after assembly is 80-160 Nm.



P35-2401-13

7 First remove right rear axle shaft gear (21) with friction disks.



P35-2426-13

P35-2426-13

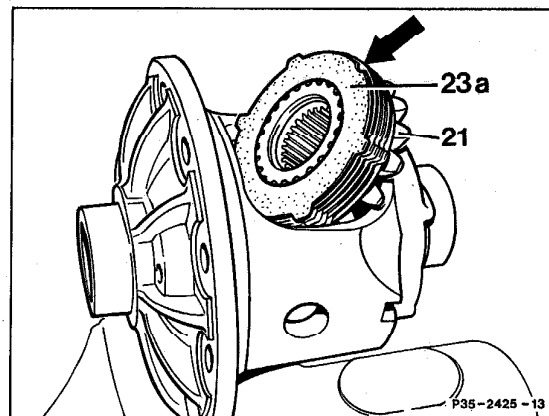
8 Remove left rear axle shaft gear (21) with friction disks.

### Installation note

First install left, then right rear axle shaft gear (21, ring gear side) with friction disks, and insert installation punch 116 589 18 61 00.



Install friction disk (23a) without lining with two grooves (arrow) as final friction disk (observe installation position).



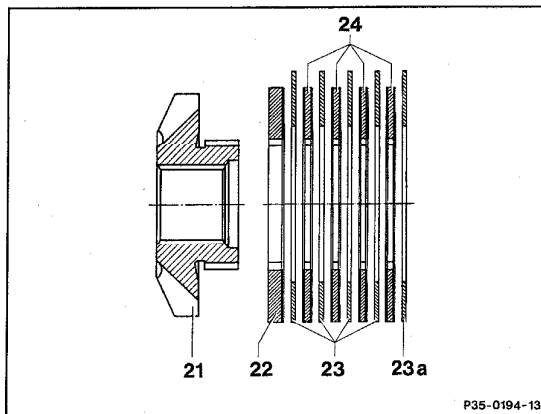
P35-2425-13

P35-2425-13

## 35-560 Reconditioning differential

If new friction disks are installed, it is most practical to measure the friction disks with lining on one side (22) removed previously and install new friction disks of the same thickness.

Install friction disks on both rear axle shaft gears in proper order and coat friction disks with lining (22 and 24) well with hypoid gear oil (see Specifications for Service Products page No. 235.3).



- 21 Rear axle shaft gear
- 22 Friction disk with lining on one side
- 23 Friction disks without lining with 5 tabs
- 23a Friction disk without lining with 4 tabs and 2 grooves
- 24 Friction disks with lining on both sides

9 Check individual parts for reusability and replace, if required.

10 Check bores in differential case. Check vertical runout of fit for ring gear and lateral runout of contact surfaces.