35.1 Installation and Adjustment of Drive Pinion

Adjusting Data of Gear Assembly

Perm. tolerance of adjusting dimension "A" of drive pinion in minus direction		0.02
Adjustment of tapered roller bearings for drive pinion by measuring friction torque while turning drive pinion with friction wrench [1]	new tapered roller bearings	1.20–1.40 Nm (12–14 kpcm)
	used tapered roller bearings	0.50–1.00 Nm (5–10 kpcm)

1) For accurate adjustment of tapered roller bearings, tighten slot nut on universal flange until specified friction torque is attained when rotating drive pinion. For checking the friction torque when rotating drive pinion, the differential with ring gear may not be installed.

Compensating Washers for Adjusting Drive Pinion

Thickness	large center housing [2]	1.5 to 2.4
	small center housing [2]	1.5 to 1.8
Steps		0.1 mm each

Note: If required, grind a compensating washer to required thickness.

Special Tools

Measuring fixture for pinion bearing		116 589 07 21 00
Measuring fixture for height of pinion with bearing		116 589 00 23 00
Sleeve for pressing tapered roller bearing to drive pinion		116 589 06 43 00
Dial gauge holder		111 589 08 23 00
Adjusting gauge for adjustment of pinion		115 589 05 21 00
Measuring fixture for pinion height in rear axle housing	large center housing [2]	116 589 01 21 00
	small center housing [2]	115 589 00 21 00
Installing and removing tool for pinion		116 589 12 61 00
Holding wrench for three-legged flange		115 589 00 07 00
Slotted nut wrench		115 589 01 07 00
Assembly fixture for rear axle center piece		116 589 11 61 00
Installation tool for tapered roller bearing outer ring		116 589 00 59 00
Friction torque wrench		001 589 49 21 00
Reduction piece		100 589 02 59 00

2) Refer to installation survey rear axle center housing 35.1–500.

Note

Each drive pinion and ring gear for one gear assembly is identified by a consecutive number printed on both members. In addition, the distance of the gears in relation to each other to be set for the pertinent gear assembly is indicated on drive pinion (Fig. 1).

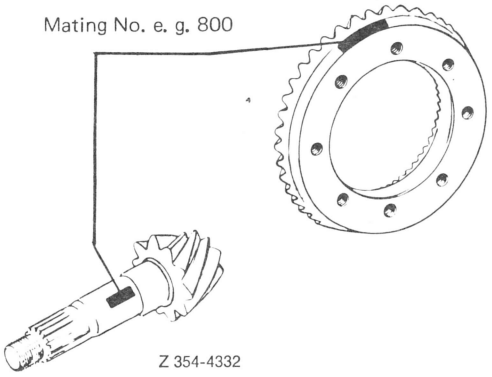


Fig. 1

For computing the thickness of the compensating washer required to adjust the drive pinion, always use a data sheet. **A sample data sheet is shown at the end of this job number.** The measuring and computing procedure of the sample shown is described in detail below.

Adjustment and Installation

1 Press rear tapered roller bearing on drive pinion with pressing-in sleeve (Fig. 2).

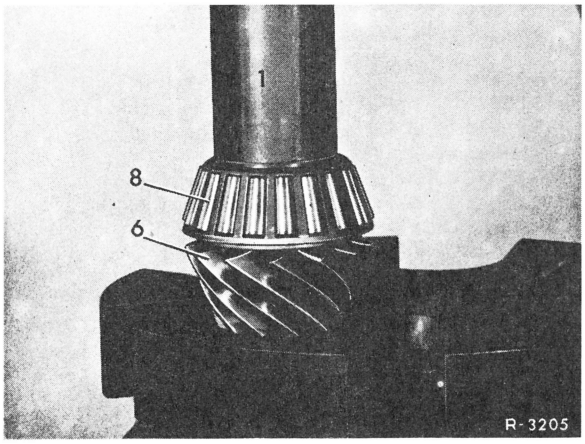


Fig. 2

1 Pressing-in sleeve 116 589 06 43 00
6 Drive pinion
8 Rear tapered roller bearing

Note: No compensating washer is placed between the head of the drive pinion and the tapered roller bearing. The compensating washer is inserted between the **outer** bearing race of the rear tapered roller bearing and the face end of the bearing seat in the rear axle housing.

2 Set dial gauge first to 0 under approx. 3 mm preload (Fig. 3).

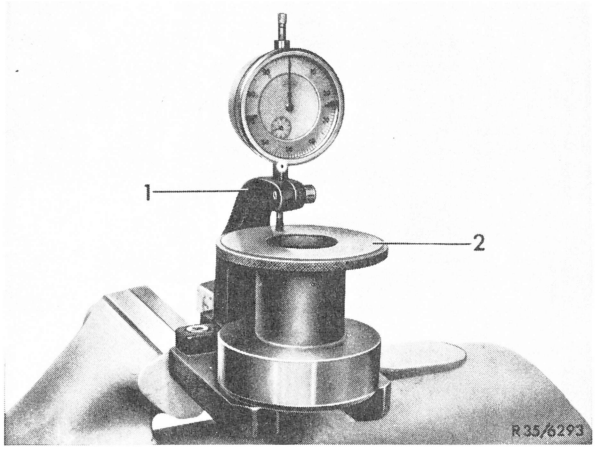


Fig. 3

1 Measuring device 116 589 00 23 00
2 Measuring body
116 589 07 21 00 Part 9 (large center housing)
116 589 07 21 00 Part 8 (small center housing)

3 Place outer bearing race on roller cage on drive pinion and **read** difference from height of measuring body "B1" to height of pinion with bearing + magnetic plate **(Fig. 4) and enter on dimension sheet under Item 1,** page R 550/7 (large center housing).

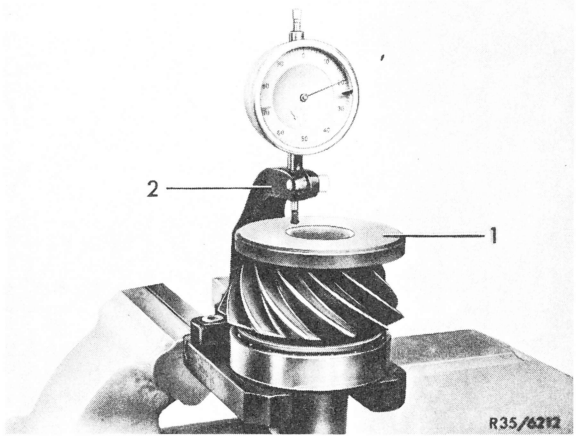


Fig. 4 (large center housing)

1 Magnetic plate 116 589 01 21 00 Part 4
2 Measuring device 116 589 00 23 00

3a Place outer bearing race on roller cage on drive pinion and **read** difference between measuring body height "B1" and pinion height with bearing **(Fig. 5) and enter under item 1 into data sheet,** page R 550/7 (small center housing).

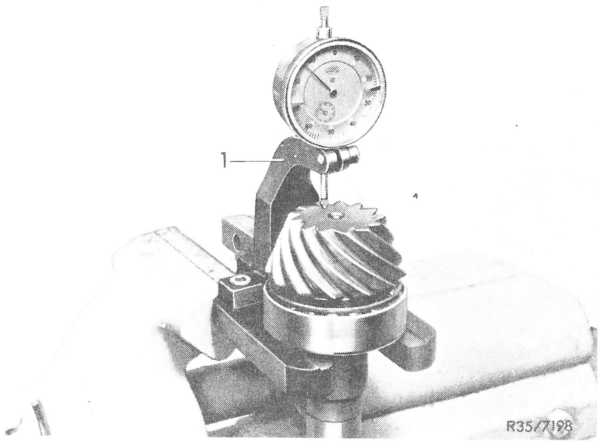


Fig. 5 (small center housing)
1 Measuring device 116 589 00 23 00

4 Enter the **deviation "a"** recorded on drive pinion with the likewise recorded prefix unter Item 2 on data sheet.

5 Add (+) or subtract (–) the values of Item 1 and Item 2.

6 Insert fixture with measuring body into rear axle housing and screw on measuring body (Fig. 6).

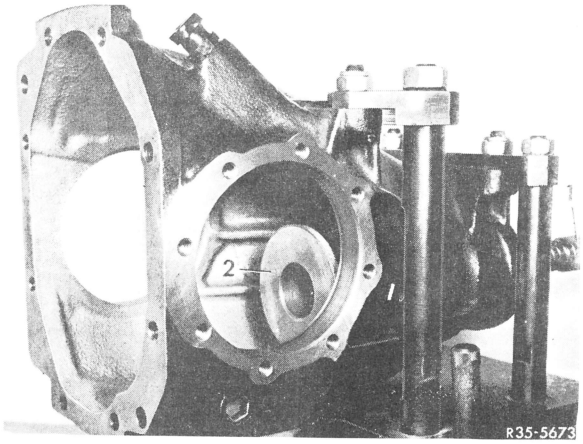


Fig. 6
1 Measuring device 116 589 07 21 00
2 Measuring body
116 589 07 21 00 Part 9 (large center housing)
116 589 07 21 00 Part 8 (small center housing)

7 Insert dial gauge with dial gauge holder into adjusting gauge and set dial gauge to zero under 3 mm preload (Fig. 7).

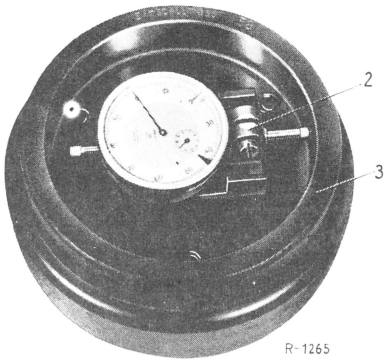


Fig. 7
2 Dial gauge holder 3 Adjusting gauge

8 Insert holding fixture together with dial gauge holder and dial gauge into righthand bore of rear axle housing and screw down (Fig. 8).

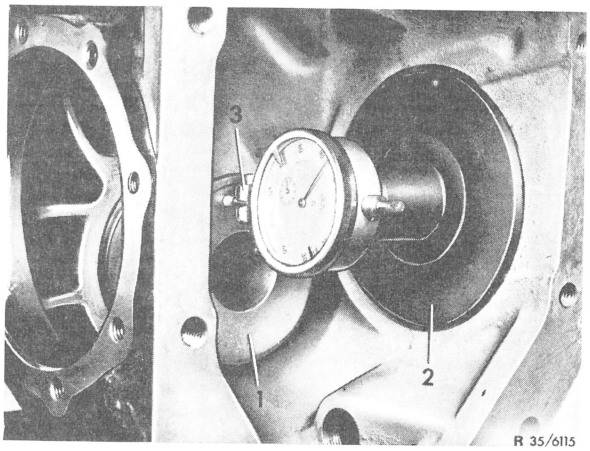


Fig. 8
1 Measuring body
116 589 07 21 00 Part 9 (large center housing)
116 589 07 21 00 Part 8 (small center housing)
2 Measuring device
116 589 01 21 00 Part 1 (large center housing)
115 589 00 21 00 Part 3 (small center housing)
3 Dial gauge holder

9 Read difference between adjusted dial gauge and measuring body face end and enter unter Item 3 on data sheet in + or – direction.

Note: The statement of the direction plus (+) or minus (–) refers to the direction of rotation of needle of dial gauge. An anti-clockwise deviation from zero position is therefore a minus direction, a clockwise deviation a plus direction.

10 Add subtotal of values from Item 1 and 2 as well as value from Item 3 (+) or subtract (−). This computed value indicates the thickness of the differential washer.

11 Remove holding fixture and measuring body from rear axle housing.

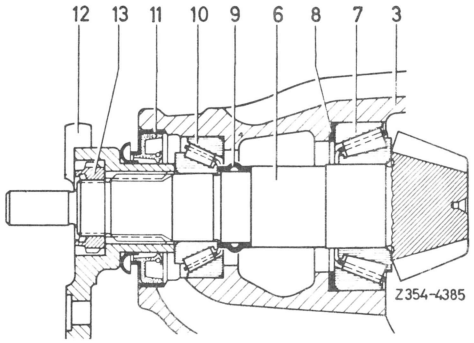


Fig. 9

3 Rear axle housing
6 Drive pinion
7 Tapered roller bearing
8 Compensating washer
9 Spacer sleeve
10 Tapered roller bearing
11 Sealing ring
12 Universal flange
13 Self-locking slotted nut

12 Insert compensating washer with computed washer thickness "S" in rear axle housing (Fig. 9 and data sheet).

Note: Only hardened compensating washers may be used; they are available in various degrees of thickness (refer to page 2). If required, grind one compensating washer down as needed.

13 Install outer races of front and rear tapered roller bearing in rear axle housing with installation tool (Fig. 10).

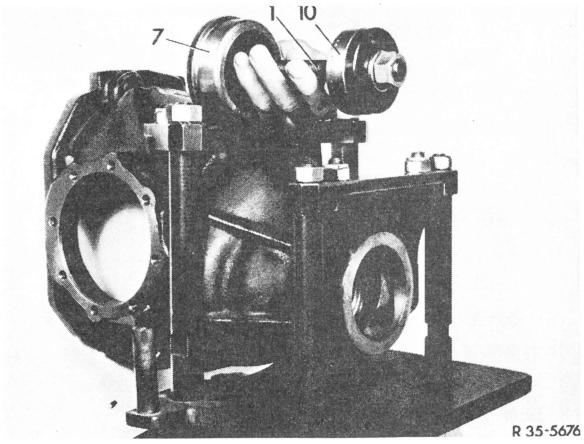


Fig. 10

1 Installation tool 116 589 11 61 00
7 Rear bearing outer race
10 Front bearing outer race

14 Insert drive pinion into rear axle housing with a **new** spacer sleeve and support with fixture (Fig. 11).

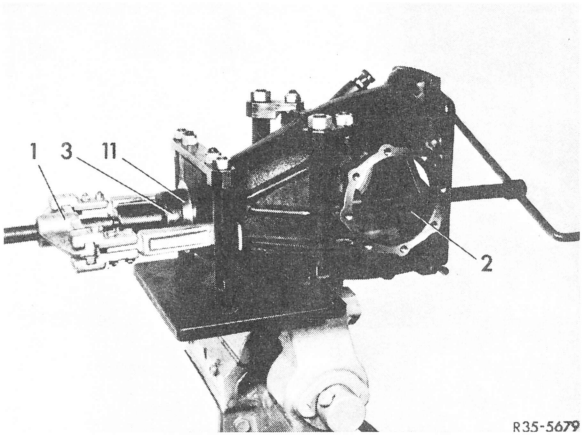


Fig. 10

1 Puller
2 Installing and removing tool 116 589 12 61 00
3 Thrust piece 116 589 12 61 00 part 1 and 2
11 Sealing ring

15 Coat sealing ring on OD with sealing compound and place on thrust piece, insert inner race of front tapered roller bearing and press in together with sealing ring (Fig. 11).

16 Coat running surface for sealing ring on universal flange with molybdenum disulphide paste and slide universal flange on drive pinion. Watch marking on universal flange and on drive pinion.

17 Remove fixture from rear axle housing.

18 Screw-on new self-locking slot nut. Position holding wrench on universal flange and **carefully** tighten slot nut with slot nut wrench until a friction torque of 1.2–1.4 Nm (12–14 kpcm) for new bearings and 0.5–1.0 Nm (5–10 kpcm) for old bearings is attained when turning drive pinion (Fig. 12).

Caution! When tightening the slotted nut, keep turning drive pinion and assure by means of light blows against the rear axle housing that the tapered rollers are well seated in the running surfaces of the races.

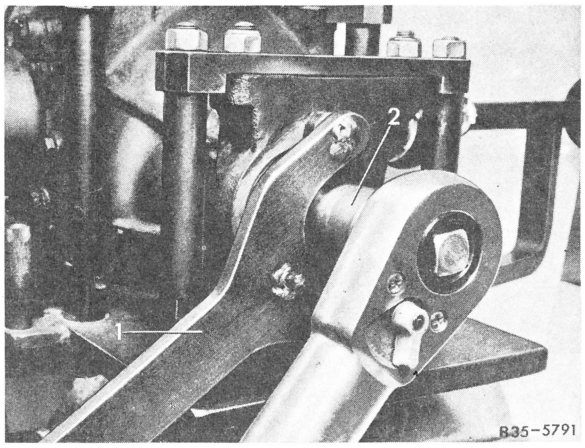


Fig. 12
1 Holding wrench 2 Slot nut wrench

19 To check, position friction torque wrench on slot nut wrench and turn drive pinion (Fig. 13).

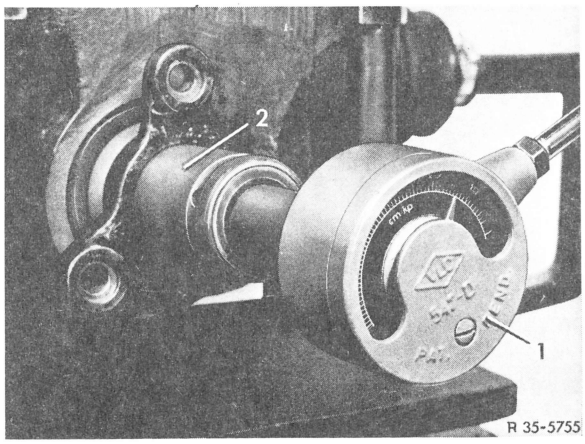


Fig. 13
1 Torque wrench 2 Slot nut wrench

Note: Install tapered roller bearings of the drive pinion with a certain preload. This preload is attained by the compression of the spacer sleeve located between the bearing inner race of the front tapered roller bearing and the drive pinion upon tightening of the slotted nut.

If the friction torque, that is, the preload of the tapered roller bearings, is too low when turning the drive pinion, tighten slot nut slightly more. If the specified friction torque has been exceeded, remove drive pinion once again and insert a new spacer sleeve. **Never reduce friction torque by loosening slot nut,** since the preload of the tapered roller bearings would then be too low. The resulting play of the drive pinion while driving the vehicle would then lead to rear axle noise.

20 Again insert measuring device together with dial gauge holder and dial gauge into righthand bore of rear axle housing to check adjustments. For measuring the adjusting dimension "A", place magnetic measuring plate on face of drive pinion (Fig. 14).

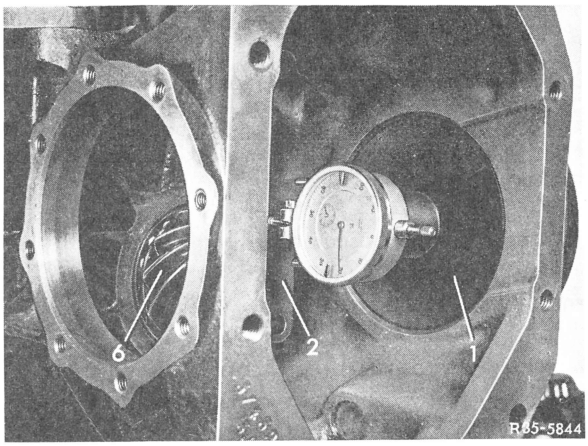


Fig. 14
1, 2 Measuring device
116 589 01 21 00 (large center housing)
115 589 00 21 00 (small center housing)
6 Drive pinion

On the gear assembly of the example shown the dial gauge should indicate a deviation of 0.20 mm from the basic dimension in plus direction, the same dimension which is written on the face of the drive pinion.

The permissible deviation of the adjusting dimension "A" should not exceed –0.02 mm.

If the deviation is higher, grind the installed compensating washer down or install a washer of the required thickness. But be sure to use a **new spacer sleeve** for the tapered roller bearing.

Data Sheet – Adjustment of Rear Axle Gear Assembly

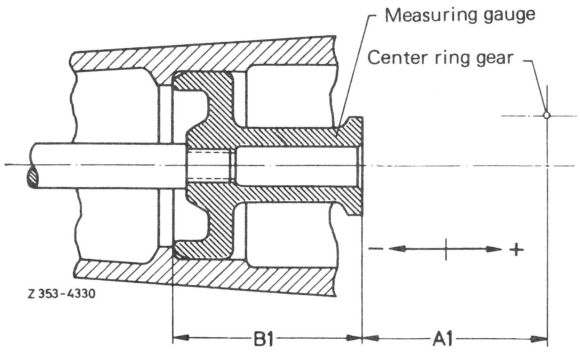
service

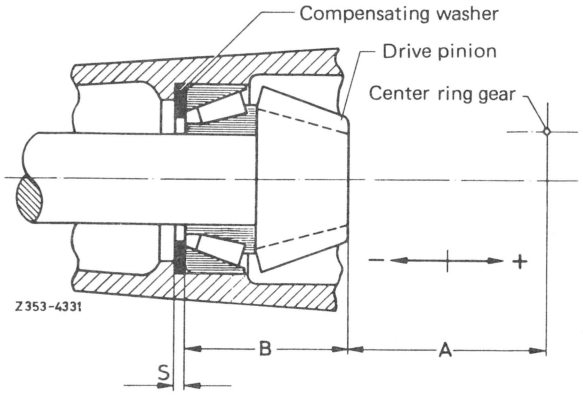
Branch/Representative

Customer

Measurements made: Date/Name

Model	Chassis No.	Initial Registration
Rep. Order No.	Engine No.	Speedometer reading: km/miles





A = Basic adjusting dimension
B = Addendum of pinion plus height of tapered roller bearing
A1 = Distance from face of measuring body to center of ring gear
B1 = Height of measuring body
S = Thickness of compensating washer

Computation of Washer Thickness "S"

1.	Difference from measuring body height "B1" to pinion addendum with bearing "B"		=
2.	Basic deviation "a" read on pinion (+ or –)		= + = –
Subtotal			=
3.	Difference between adjusting gauge dimension and depth of rear axle housing "A1"	Minus dir. Plus dir.	= + = –
	Thickness of compensating washer "S"		=

35.1 Data Sheet – Adjustment of Rear Axle Gear Assembly

Explanations and Instructions

a) Each drive pinion and ring gear of a gear assembly is identified by a consecutive number written on both parts.

b) Measure difference from measuring body height "B1" to addendum of pinion plus height of tapered roller bearing "B" and enter on table under Item 1.

c) Read basic deviation "a" on drive pinion and enter with pertinent prefix (+ or –) under Item 2.

d) Measure difference between adjusting gauge dimension and depth of rear axle housing "A1" and enter into pertinent column of table (+ or – direction) under Item 3.

The indication of the direction plus (+) or minus (–) refers to the direction of rotation of the dial gauge needle. A deviation from the zero position in anti-clockwise direction indicates the minus direction, while clockwise direction indicates the plus direction.

e) The basic adjusting dimension "A" is alone decisive for adjusting the drive pinion. When checking the basic adjusting dimension "A" the drive pinion must be installed complete with spacer sleeve and a friction torque of 1.2–1.4 Nm (12–14 cmkp) for new tapered roller bearings and of 0.5–1.0 Nm (5–10 cmkp) for used tapered roller bearings. If during this check a tolerance of 0.02 mm in minus direction from the basic adjusting dimension "A" is exceeded, grind compensating washer down or use another compensating washer of pertinent thickness. But be sure to use a new spacer sleeve.

Example for Computation of Washer Thickness "S"

1.	Difference from measuring body height "B1" to pinion addendum with bearing "B"		= 1.50
2.	Basic deviation "a" read on pinion (+ or –)		= + 0.20 = –
	Subtotal		1.70
3.	Difference between adjusting gauge dimension and depth of rear axle housing "A1"	Minus dir. Plus dir.	= – 0.06 = –
	Thickness of compensating washer "S"		= 1.76