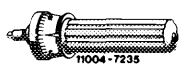
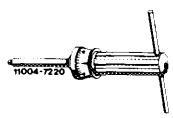
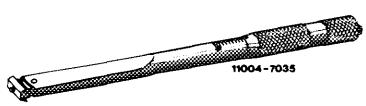
Data

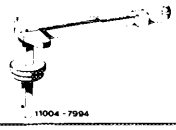
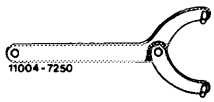
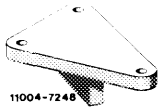
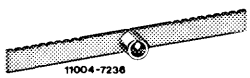
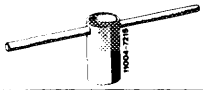
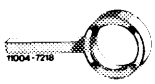
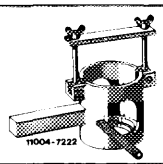
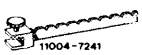
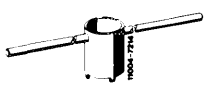
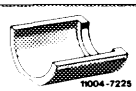
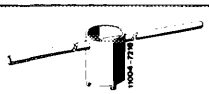
Number of balls in ball circuit	24

Adjusting data	Ncm	(kpcm)
Friction torque of steering worm in bearing cap prior to preloading of bearing insert	⩽ 12	(⩽ 1.2)
Extra friction torque of steering worm after preloading of bearing insert	5–7	(0.5–0.7)
Friction torque of steering nut in power piston	6–10	(0.6–1.0)
Friction torque of ball circuit steering worm – steering nut	40–60	(4–6)
Total friction torque	120–160	(12–16)

Tightening torques	Nm	(kpm)
Slot nut to bearing cap	140–160	(14–16)
Slot nut in power piston	200–240	(20–24)
Hex. screw for attaching ball guide tube	12–16	(1.2–1.6)
Hex. screws for attaching bearing cap to steering housing	70–75	(7–7.5)
Hex. screws for attaching housing cover to steering housing	30–35	(3–3.5)
Self-locking hex. nut on adjusting screw (SEAL-LOCK collar nut)	60–70	(6–7)
Self-locking hex. nut on adjusting screw (polystop hex. nut)	30–35	(3–3.5)

Special tools

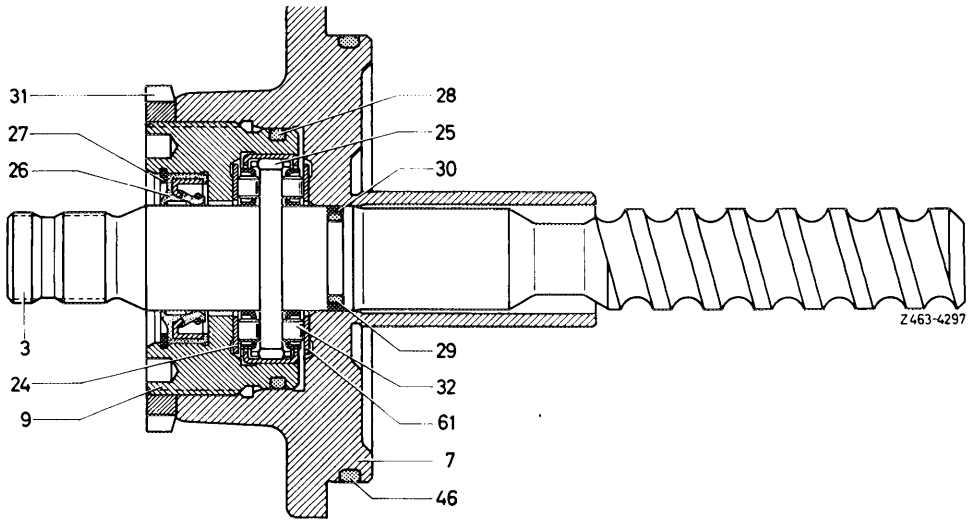
Torque screw driver 1/4" square 15–65 Ncm (1.5–6.5 kpcm)	 11004-7235	001 589 09 21 00
Torque screw driver 1/4" square 150–500 Ncm (15–50 kpcm)	 11004-7220	000 589 87 21 00
Torque wrench handle 20–100 Nm (2–10 kpm)	 11004-7035	001 589 35 21 00

Torque measuring wrench 1/2" square 0–400 Ncm (0–40 kpcm)		123 589 02 21 00
Torque measuring instrument 1/2" square 0.3–6 Nm (3–60 kpcm)		001 589 49 21 00
Splined insert 1/4" square for measuring friction torque		112 589 00 08 00
Special wrench, adjustable		000 589 00 05 00
Assembly fixture		116 589 01 59 00
Installation tool for sealing ring in bearing insert		116 589 08 43 00
Adjusting tool for friction torque of steering worm in steering nut		116 589 03 21 00
Socket wrench 46 mm for screw cover		116 589 00 09 00
Assembly tool for bearing cap		116 589 03 59 00
Assembly tool for screw cover and power piston		116 589 04 59 00
Adjusting tool for steering nut in power piston		116 589 02 21 00
Special wrench for slot nut of power piston		116 589 00 07 00
Assembly tray for power piston with steering nut		116 589 02 59 00
Special wrench for slot nut of bearing cap		116 589 01 07 00
Installation tool for sealing ring in housing cover		116 589 07 43 00

Conventional tool

Attachable box wrench 19 mm for torque wrench handle 001 589 35 21 00	e.g. made by Hahn u. Kolb, D-7000 Stuttgart order No. 522 51/190

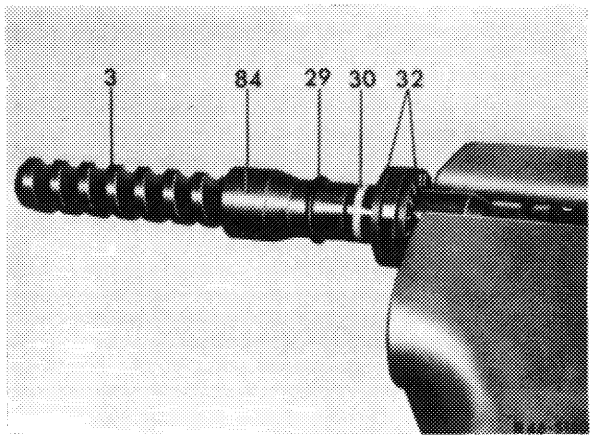
3 Steering worm
7 Bearing cap
9 Bearing insert
24 Axial washer
25 Needle sleeve
26 Radial sealing ring
27 Locking ring
28 O-ring
29 O-ring
30 Sealing ring (Teflon)
31 Slot nut
32 Axial cyl. roller cage
46 O-ring
61 Axial washer



Steering worm

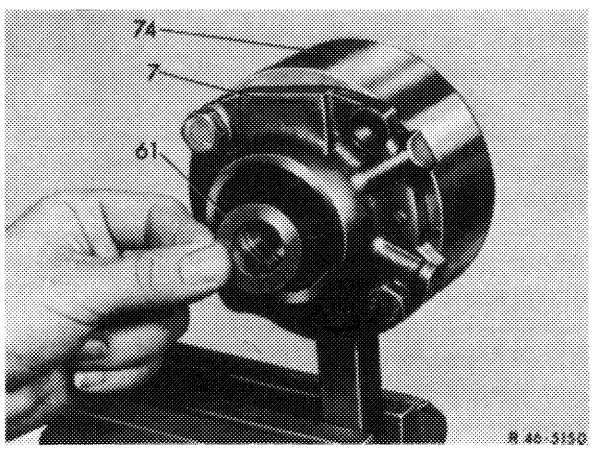
1 Place lower axial cyl. roller cage (32) on steering worm (3).

2 Slip assembly sleeve (84) on steering worm (3) and then mount O-ring (29), followed by sealing ring (30).

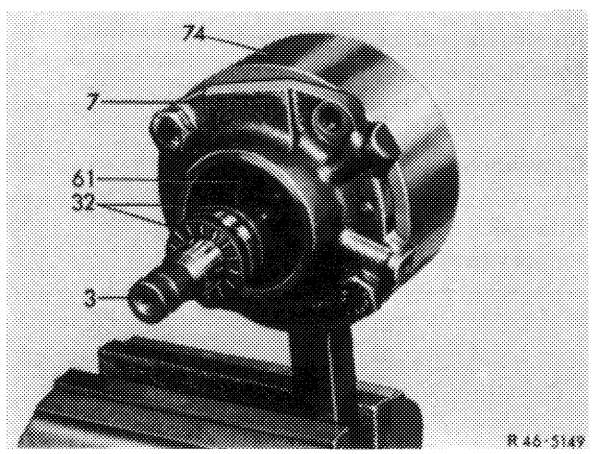


Bearing cap

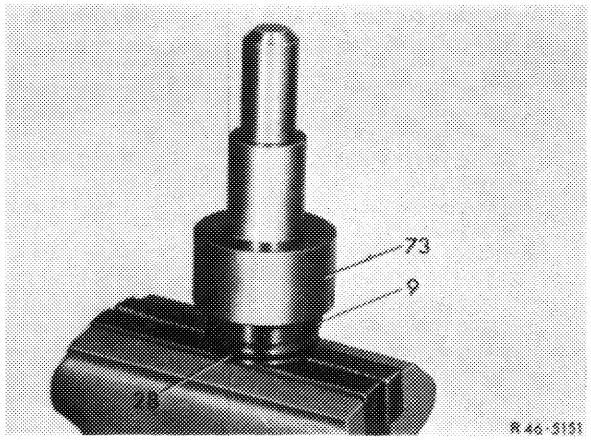
3 Attach bearing cap (7) to fixture (74), insert axial washer (61) and then steering worm (3) into bearing cap.



4 Place upper axial cyl. roller cage (32) on steering worm.

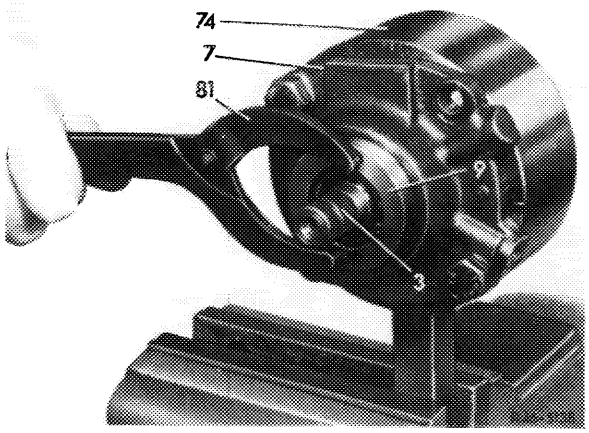


5 Press radial sealing ring with installation tool (73) into bearing insert (9). Fill space between both sealing lips with grease and insert locking ring.

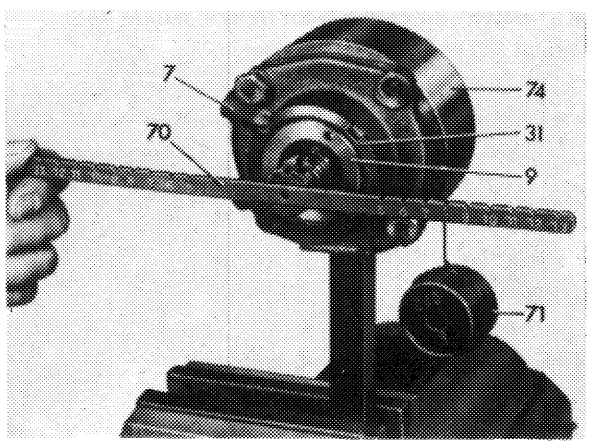


Bearing cap and steering worm

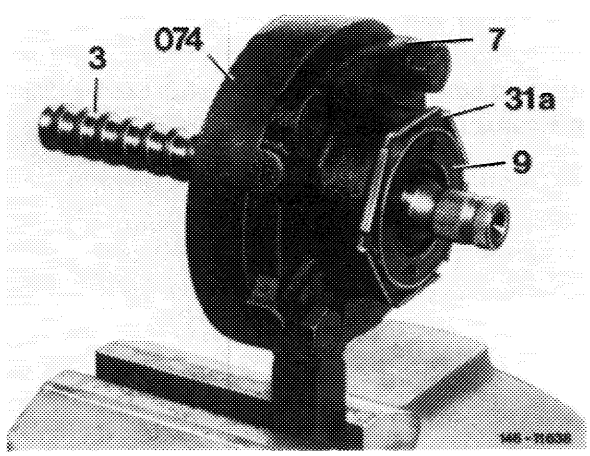
6 Screw bearing insert (9) into bearing cap (7) and tighten slightly. Screw slot nut on bearing insert.



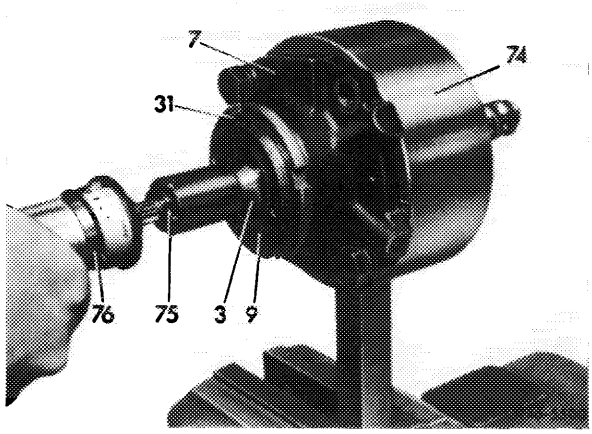
7 Measure friction torque of steering worm in bearing cap (sealing parts only) by placing measuring device (70) on splining of steering worm. Friction torque should be ⩽ 12 Ncm (⩽ 1.2 kpcm) = 200 g in notch "6" of measuring device. Then tighten bearing insert (9) with special wrench until an additional friction torque of 4–7 Ncm (0.4–0.7 kpcm) is available. Then tighten slot nut to 140–160 Nm (14–16 kpm) and check friction torque once again.



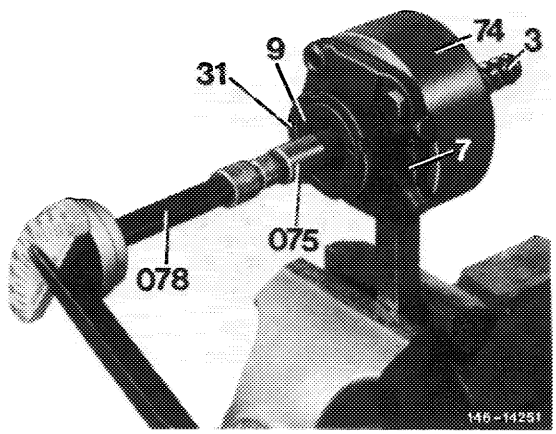
Note: Instead of slot nut, the bearing cap can also be secured with sheet metal nut (31a), width between flats 65 mm.



8 The friction torque can also be measured with the following measuring tools in combination with splined insert (75).

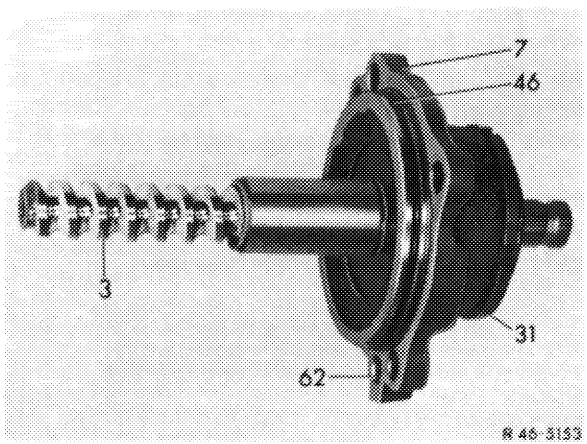


Measuring with torque screw driver



Measuring with torque wrench

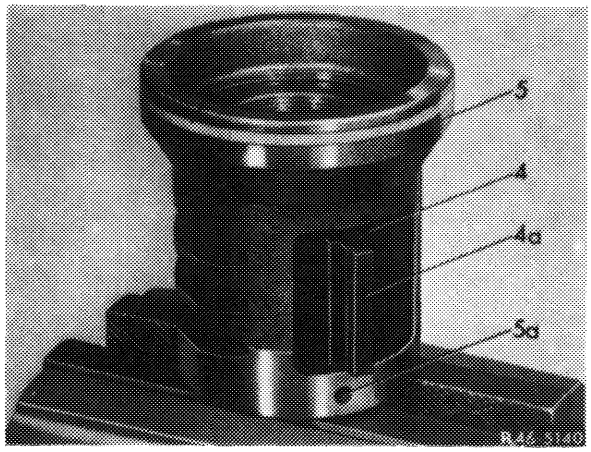
9 Remove bearing cap from fixture, mount both O-rings (46 and 62).



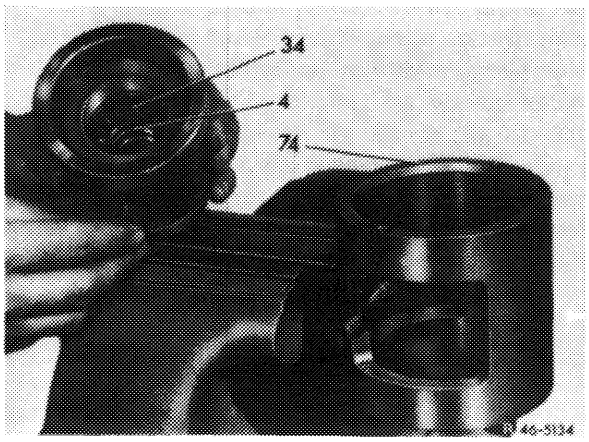
Power piston and steering nut

10 Press outer race of axial tapered ball bearing (33) into power piston (5). Mount ball race.

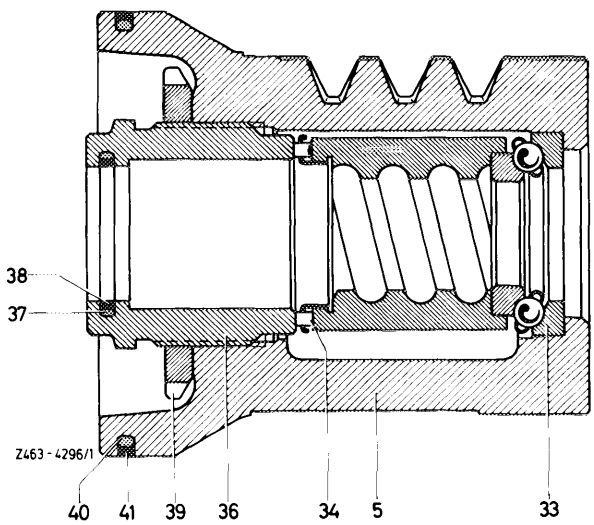
11 Insert steering nut (4) into power piston.



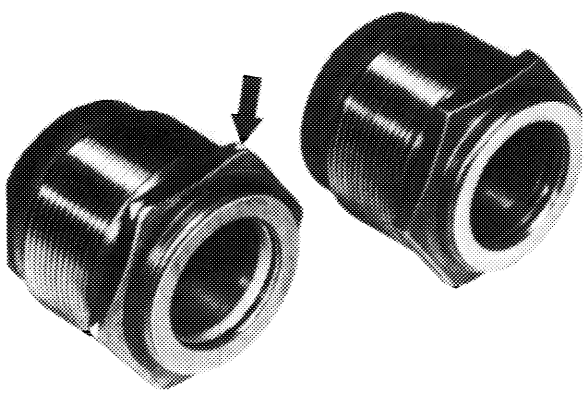
12 Insert axial cyl. roller cage (34) into power piston (5) in such a manner that the sheet metal guide on roller cage enters steering nut (4).



13 Insert O-ring (37) and sealing ring (38) into screw cover (36).

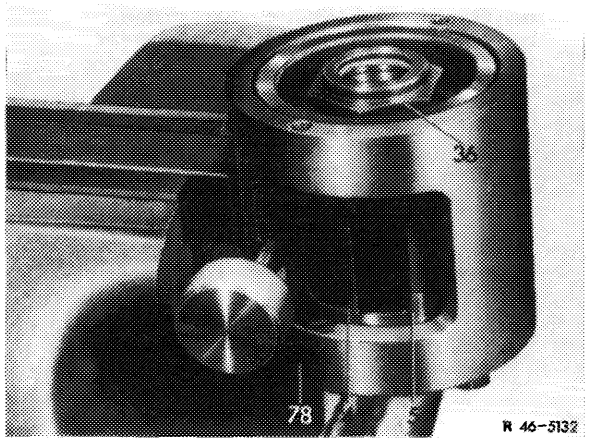


Attention!
Depth of recess in screw cover for sealing ring and O-ring has been reduced. This screw cover **is provided with notches** (refer to arrow). The seals for both screw cover versions are contained in repair kit part No. 107 586 02 46. Refer to note in repair kit.

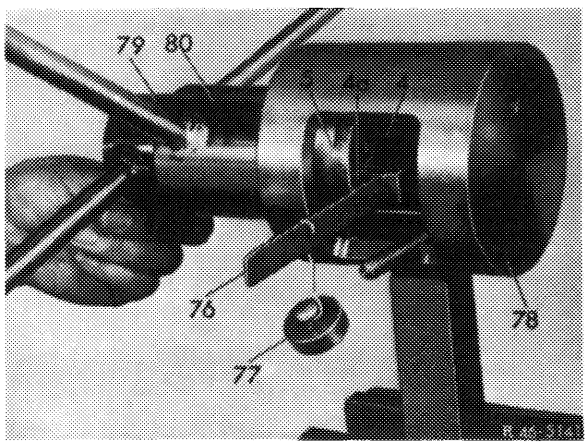


146-9658

14 Screw slot nut (39) on screw cover and screw cover (36) into power piston (5) and tighten slightly.



15 Clamp power piston (5) into fixture (78) and adjust friction torque of steering nut in power piston, while placing measuring device (76) on straightedge (4a) of steering nut. The friction torque is 6–10 Ncm (0.6–1.0 kpcm = 100 g in notch "6" to "10" of measuring device). Then tighten screw cover until weight on measuring device is just barely turning steering nut. Secure screw cover with slot nut, tightening torque 200–240 Nm (20–24 kpm).

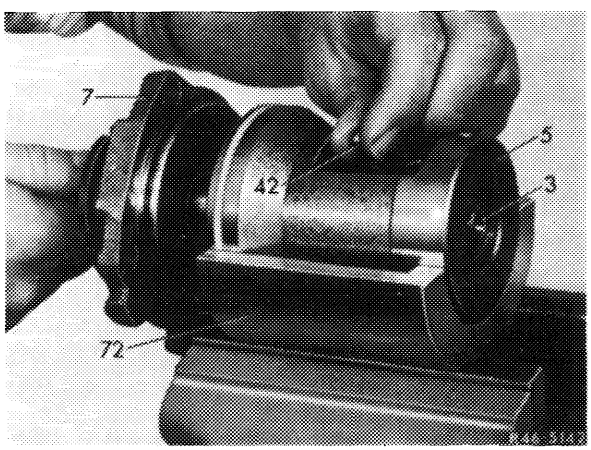


16 Unclamp power piston from fixture and place into assembly tray (72).

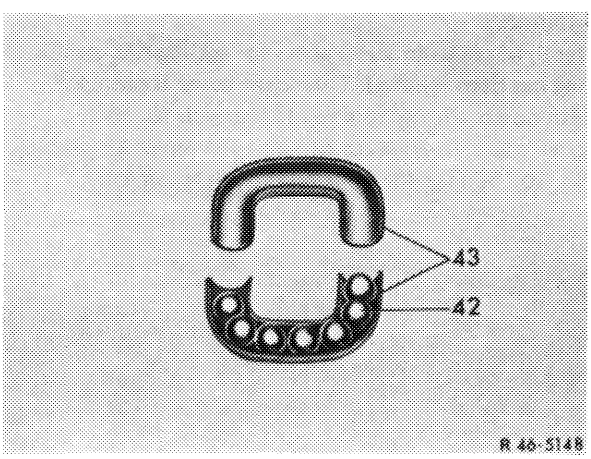
Steering worm, steering nut

17 Introduce steering worm (3) into steering nut until one ball circuit can be clearly seen through bore (for balls) in steering nut.

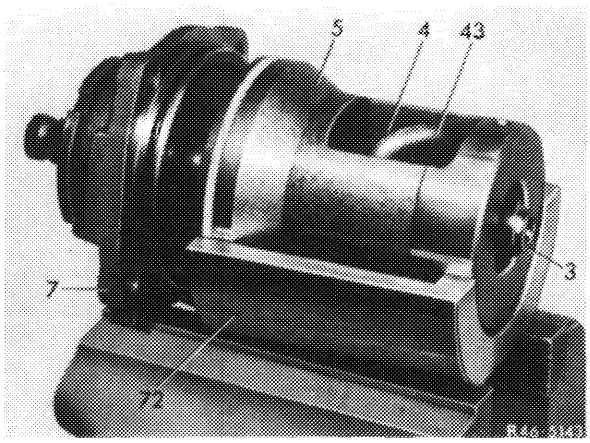
18 Keep turning steering worm slowly in clockwise direction and insert 17 balls into ball circuit.



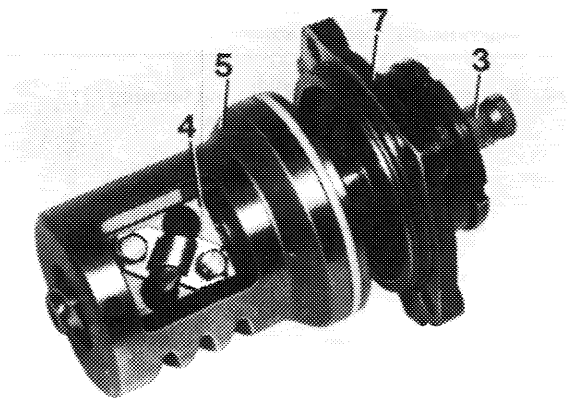
19 Fill one ball guide half (43) with grease and insert the remaining 7 balls (42) into this guide half. Then mount the other ball guide half and close both openings with grease.



20 Insert ball guide halves (43) into steering nut.



21 Place fastening clip with locking plate on steering nut (4), screw-in hex. screws and tighten to 12–16 Nm (1.2–1.6 kpm). Secure hex. screws.



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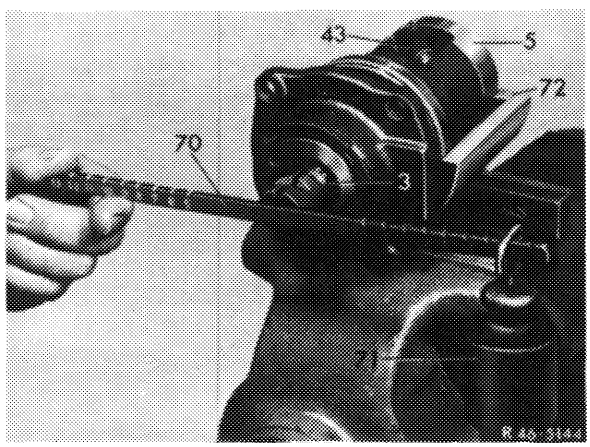
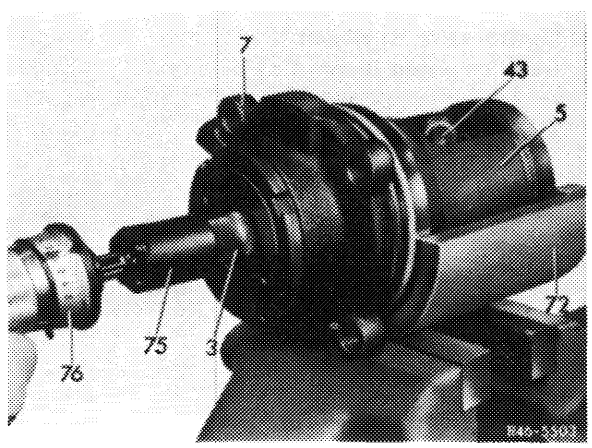
22 Place measuring device (70) on splining of steering worm (3) and measure friction torque of ball circuit.

Friction torque of steering nut – steering worm should amount to 30–60 Ncm (3–6 kpcm = 500 g in notch "6" up to "12" of measuring device).

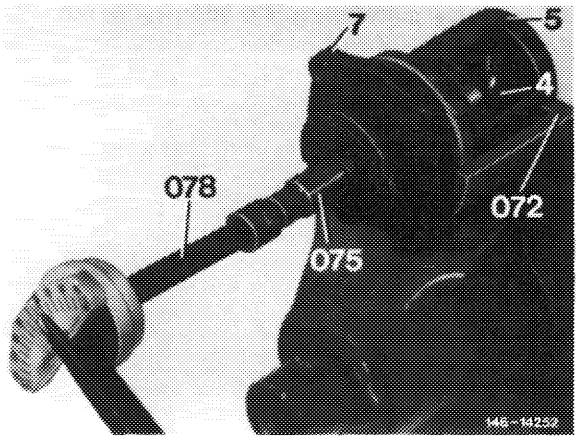
If the friction torque is not within this tolerance, replace steering.



23 The friction torque can also be measured with the following measuring tools in combination with splined insert (75).



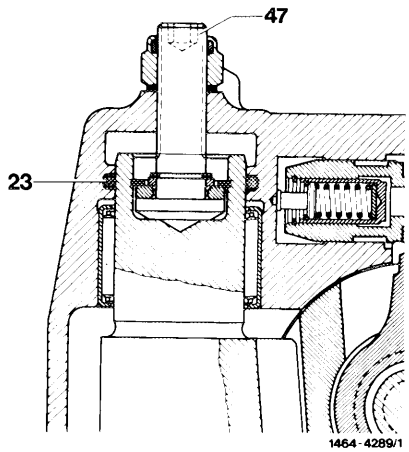
Measuring with torque screw driver



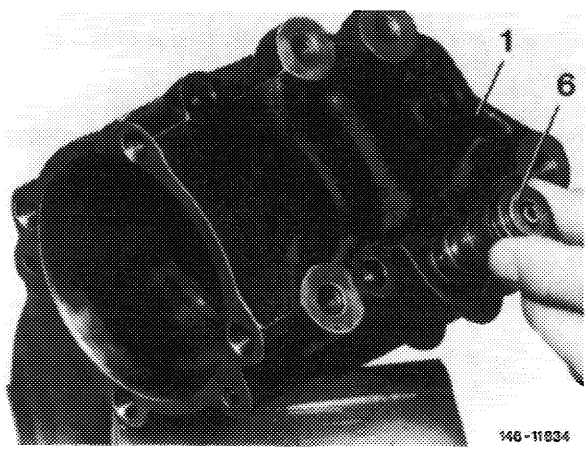
Measuring with torque wrench

Steering housing, control valve

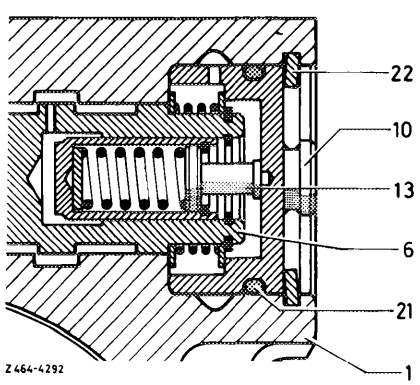
24 Replace O-ring (23) in steering housing (1).



25 Place control valve (6) into steering housing, making sure that the spring bolts or springs are not dropping out of control valve.



a) Control valve 1st version
(reaction piston 10 mm dia.)

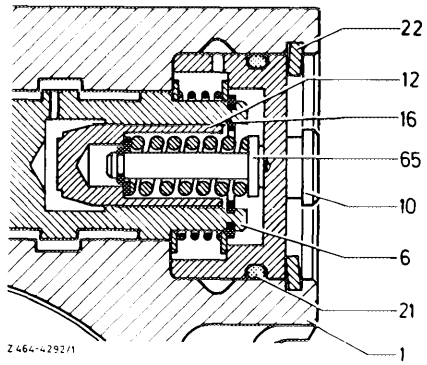


1 Steering housing
6 Control valve
10 Closing cover
13 Supporting bolt
21 O-ring
22 Locking ring

b) Control valve 2nd version
(reaction piston 10 mm dia.)

Note: Grease spring bolt (65) to prevent falling out when control valve is installed.

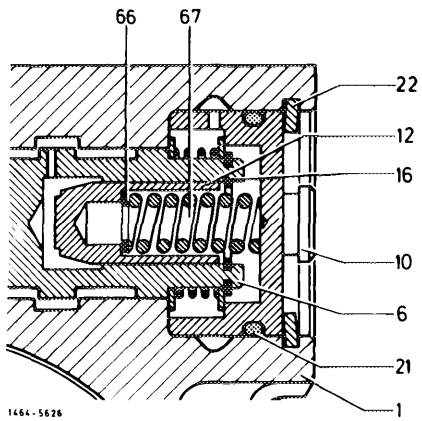
1 Steering housing
6 Control valve
10 Closing cover
12 Reaction piston
21 O-ring
22 Locking ring
65 Spring bolt



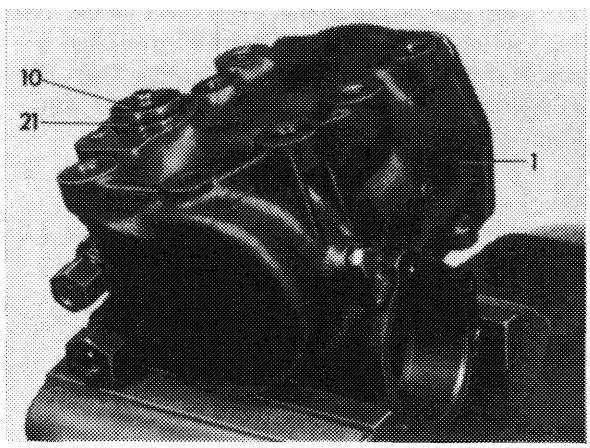
c) Control valve 3rd and 4th version
(reaction piston 11 or 11.5 mm dia.)

Note: Grease spring (67) to prevent falling out when control valve is installed.

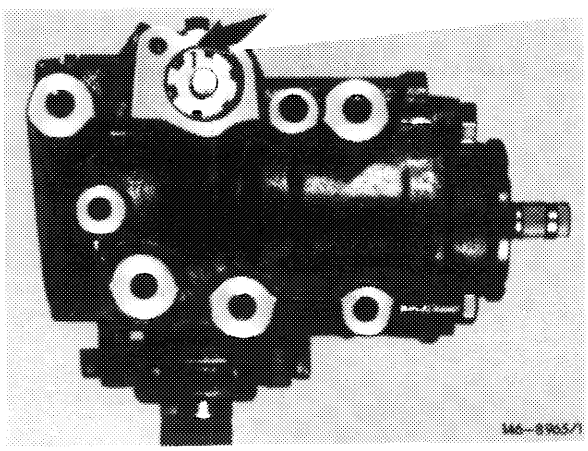
1 Steering housing
6 Control valve
10 Closing cover
12 Reaction piston
16 Locking ring
21 O-ring
22 Locking ring
66 Compensating washer
67 Spring



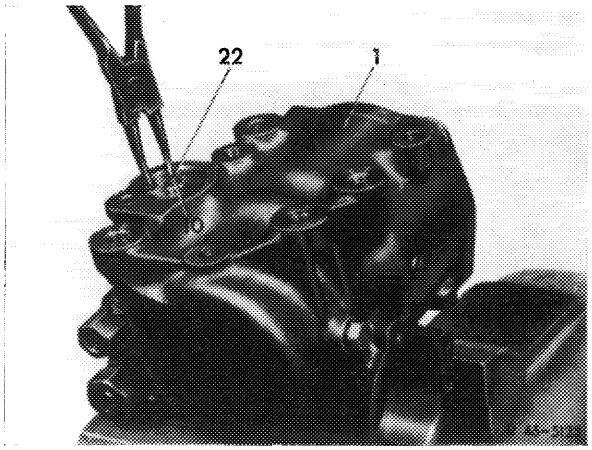
67 Replace O-ring (21) on closing cover (10), then knock closing cover into steering housing by means of a plastic hammer. Make sure that bore in cover points upwards (to threaded bore in steering housing for adjusting screw).



Note: The punched-in code No. in closing cover indicates dia. of reaction piston (11 or 11.5 mm). The cover should therefore be marked with code No. "1".



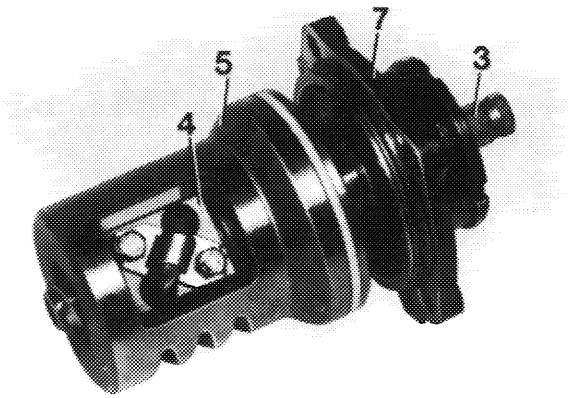
27 Insert locking ring (22) into steering housing (1) in such a manner that the lugs of the ring are pushing against closing cover (10). If required, knock-in locking ring lightly with a mandrel until it is correctly seated in groove of steering housing.



Steering housing, power piston

28 Carefully install power piston (5) complete with steering worm (3), steering nut (4) and bearing cap (7) into steering housing, while introducing straight-edge of steering nut into groove of control valve.

Caution!
Do not use force.



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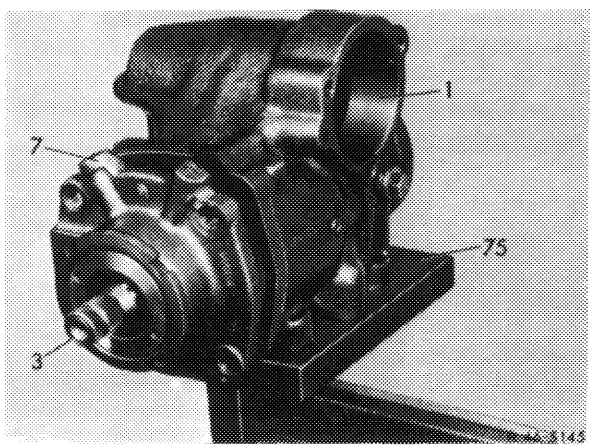
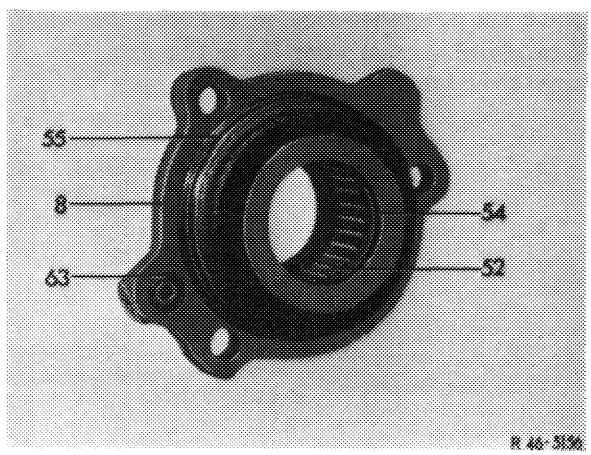
29 Turn bearing cap so that the oil duct on the steering housing is in alignment with oil bore on bearing cap. Watch out for correct seat of O-rings. Then screw-in hex. screws without snap rings and washers and tighten to 70-75 Nm (7-7.5 kpm).

30 Turn steering worm until center tooth gap on power piston is in center of steering housing.

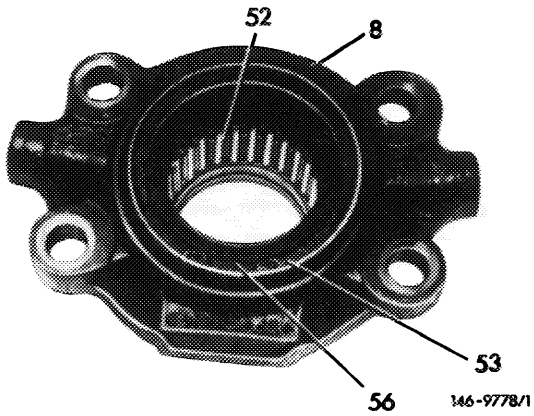


Pitman shaft, housing cover

31 Insert O-rings (54, 55 and 63) into housing cover (8).

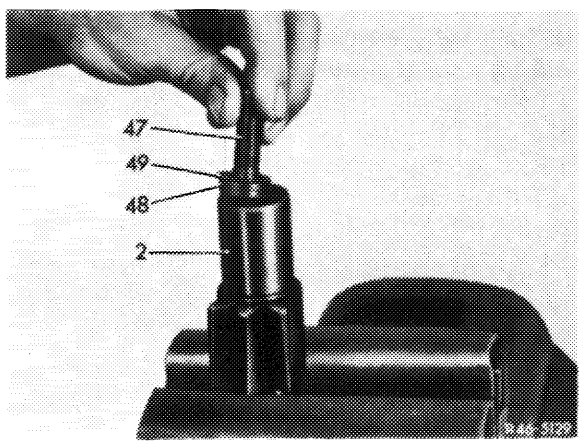


32 Press radial sealing ring (56) into housing cover (8) and insert locking ring.

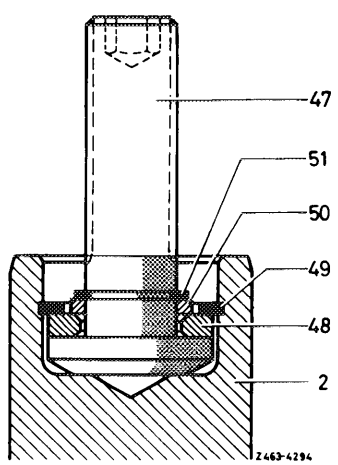


33 Place adjusting screw (47) including thrust washer (48) and locking ring (49) into pitman shaft (2). Watch out for correct seat of locking ring.

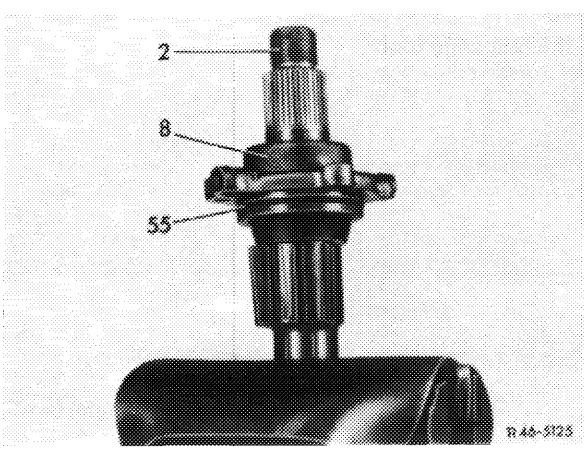
Note: The adjusting screw should be mounted in steering shaft as much as possible free of play. For this purpose, thrust washers 2.65 - 2.70 - 2.75 - 2.80 - 2.85 - 2.90 - 2.95 - 3.00 - 3.05 - 3.10 mm thick are available.



34 Place thrust ring (50) on adjusting screw (47) and insert locking ring (51).



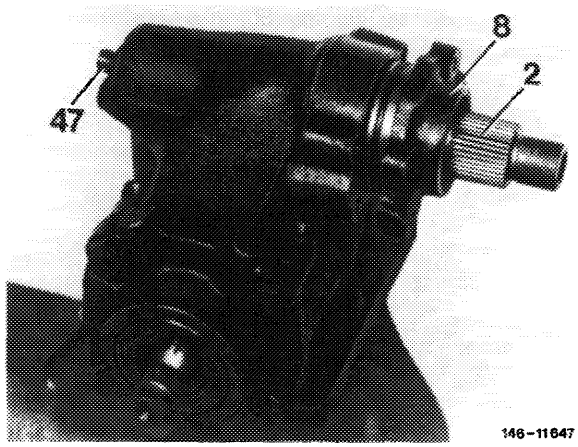
35 Place housing cover (8) on pitman shaft (2), then insert pitman shaft into steering housing. Make sure that the center tooth of the pitman shaft enters the center tooth gap of the power piston and that the O-rings are correctly seated.



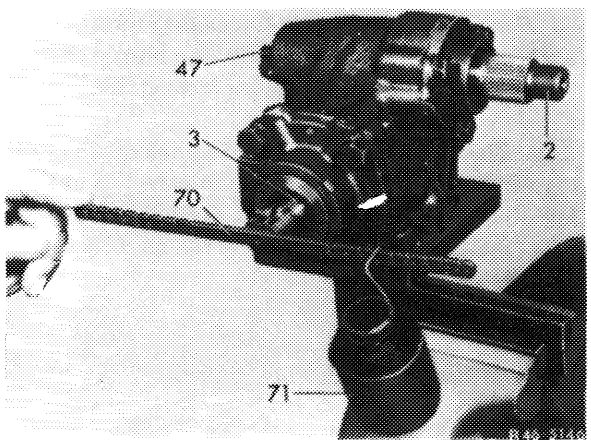
36 Screw adjusting screw (47) into steering housing until screw is hard to move.

37 Turn housing cover (8) so that both oil ducts are one above the other. Then screw-in **new** plastic-coated hex. screws and tighten to 30-35 Nm (3-3.5 kpm).

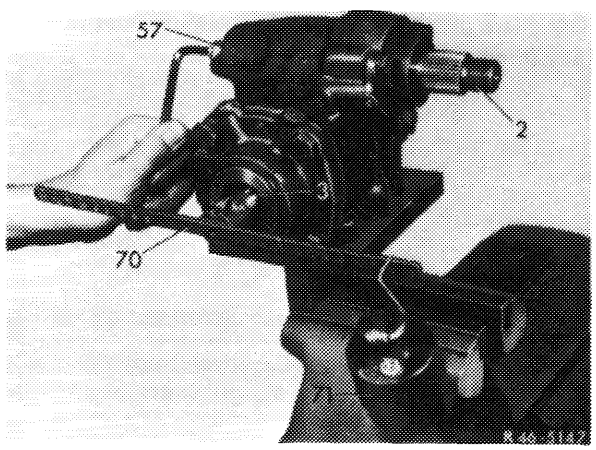
Note: Housing cover on 1st version is attached with 3 hex. screws, and 2nd version with 4.



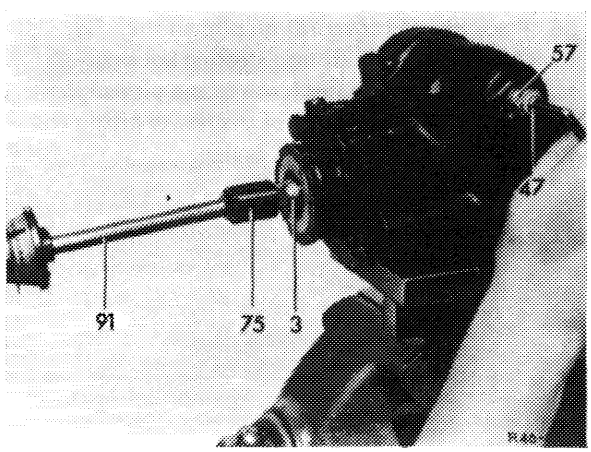
38 Loosen adjusting screw (47) until steering worm (3) turns easily, then measure friction torque of steering worm and write down value.



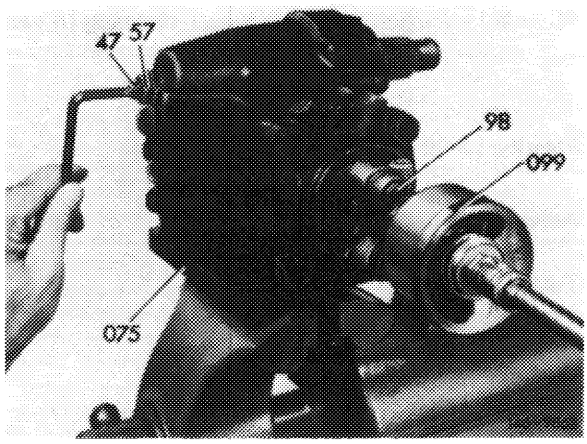
39 Adjust pressure device in pitman shaft by turning adjusting screw (47) to the left until the friction torque has increased by 40-60 Ncm (4-6 kpcm).



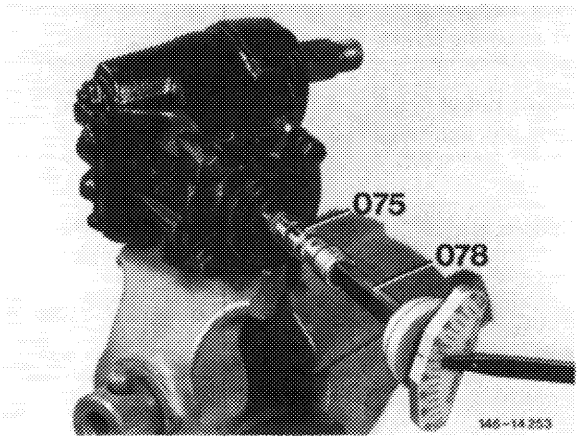
40 The friction torque can also be measured with the following tools:



Check friction torque with torque screw driver

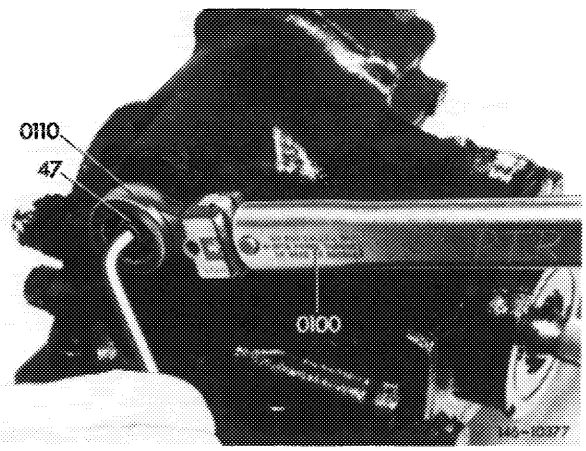


Checking friction torque with torque measuring instrument



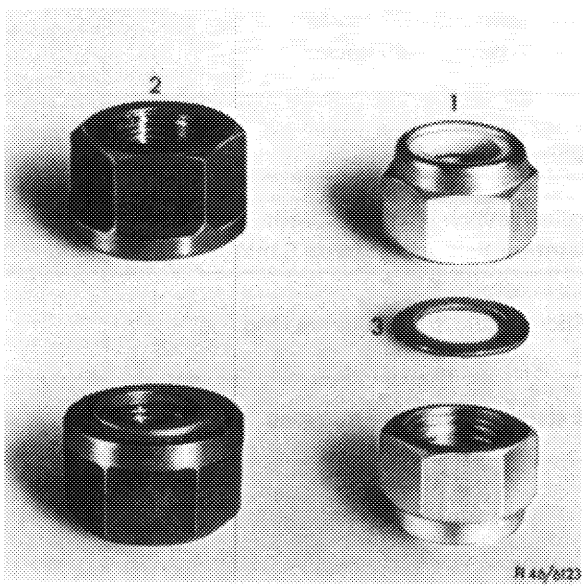
Checking friction torque with torque wrench

41 Screw SEAL-Lock collar nut on adjusting screw (47) and tighten to 60-70 Nm (6-7 kpm) while applying counterhold to adjusting screw.



Attention!
When using polystop nut, place copper sealing ring on adjusting screw and tighten polystop nut to 30-35 Nm (3-3.5 kpm) while applying counterhold to adjusting screw.

42 Check total friction torque once again, which should amount to 120-160 Ncm (12-16 kpcm = 2000 g in notch "6" to "8" of measuring device).



1 Polystop hex. nut
2 SEAL-Lock counternut
3 Copper sealing ring