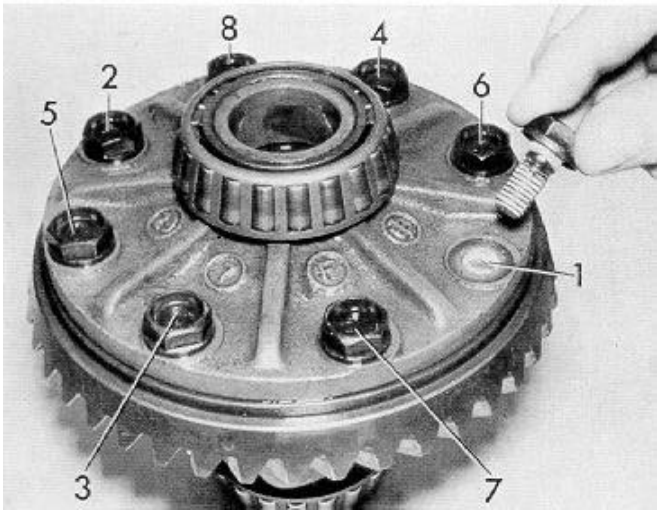
33 12 551 - Renewing input bevel pinion with crownwheel

- Final drive removed -
Remove complete differential housing 33 13 510.
Remove input bevel pinion 33 12 510.
The number of teeth contained in the crown wheel set is stamped on the housing.

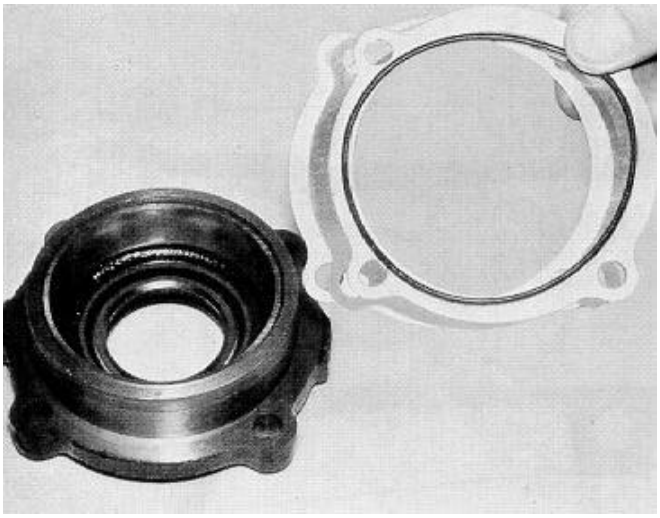
-> 33 13 510

-> 33 12 510

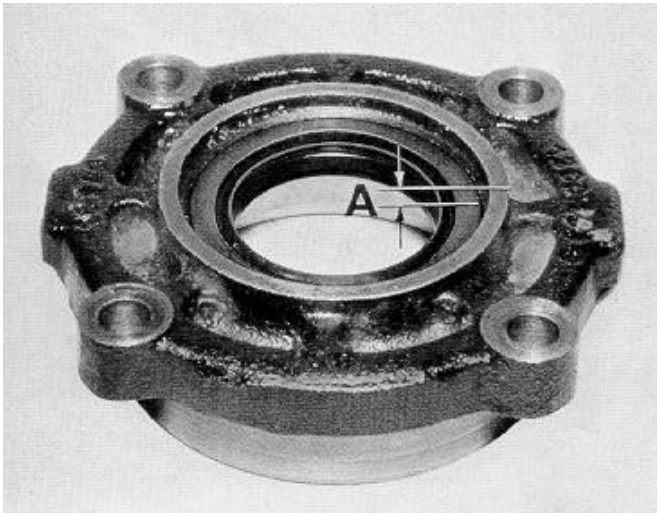


Draw out tapered all bearing with Rollex LM 503 349.
Installation instructions: Press on tapered ball bearing (cold).

Remove O-ring and compensating rings from bearing cover.
Check shaft seals and if necessary renew.

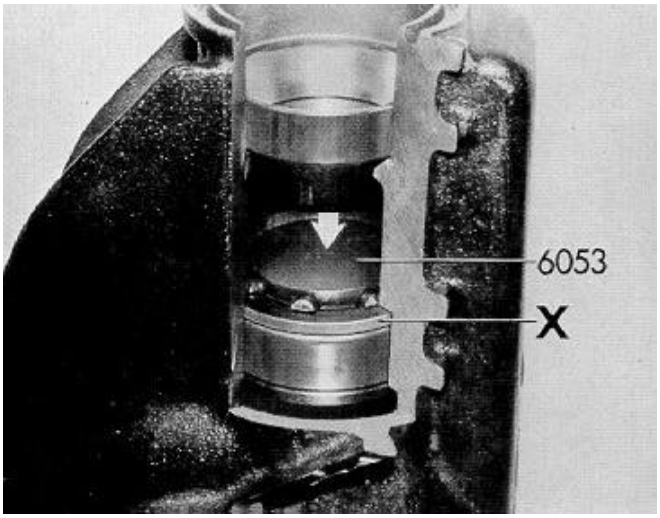


Install shaft seals in the new bearing cover.
Note installation depth - A about 4 mm (0.158 in.).
Fill groove between both seal lips with grease.

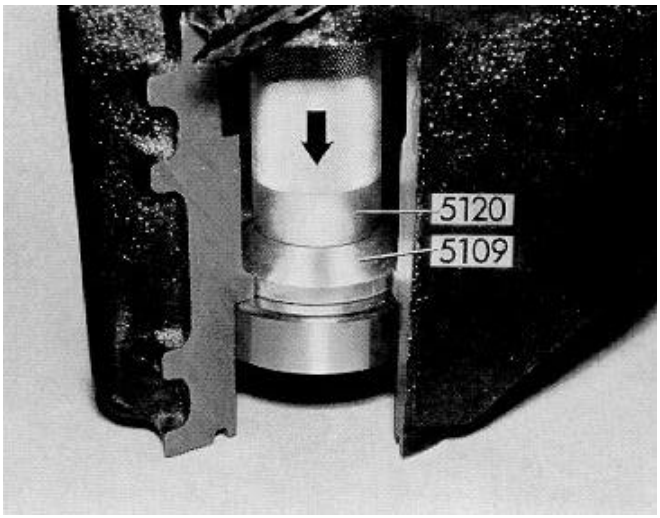


Place the stop place with the collar contacting the screw heads of the extractor star. Extractor star and stop plate are parts of extractor and inserted tool 6053.

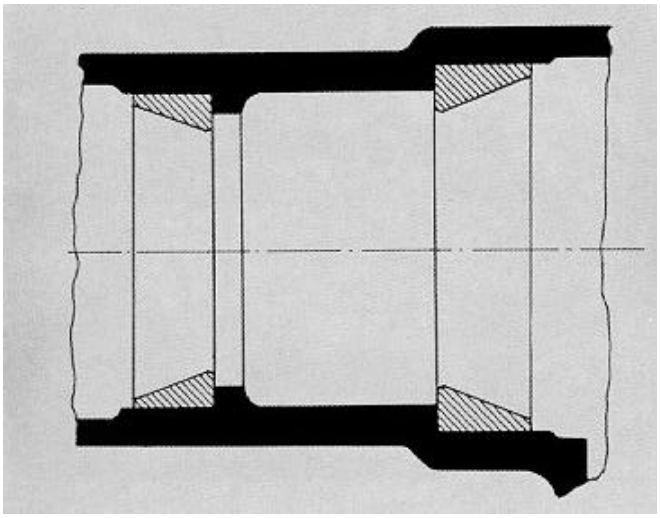
Press extractor star 6053 right up to the stop in the bearing outer ring.
Press bearing outer ring and shim (X) out of the neck of the drive.



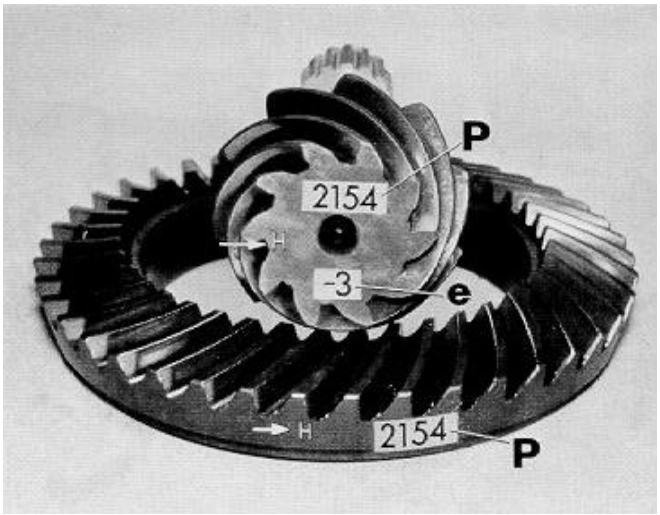
Press out front outer ring of the bearing from the neck of the drive using tools 5109 and 51120 or a suitable tube.
Installation instructions: Press in the bearing outer ring using a suitable tube.



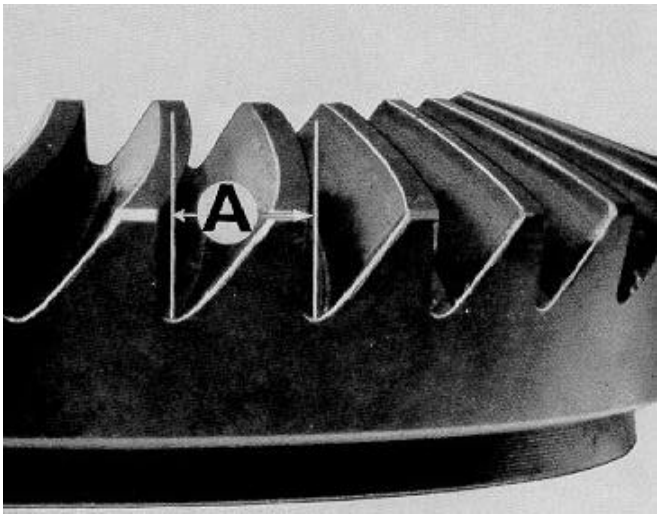
Long neck final drive only:
First press out the smaller diameter bearing outer bush.



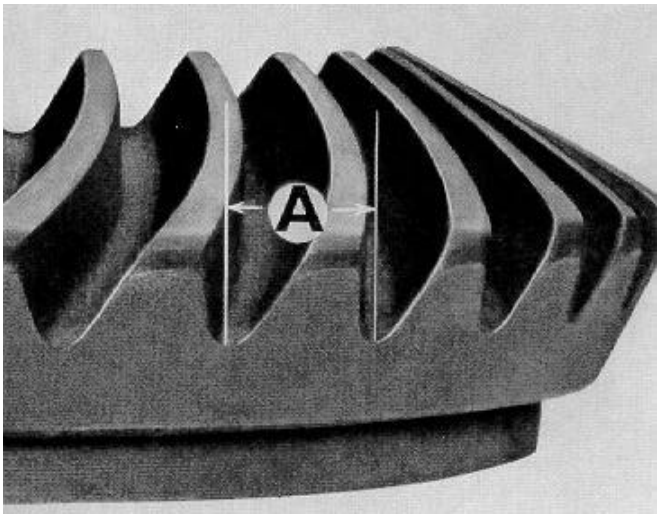
The input pinion and crown wheel are mated using special machines to keep noise to a minimum. The mating number (P) is inscribed electrically on the input pinion and crown wheel.
Sets with different mating numbers must not be installed.
Numbers having a plus or minus sign (e) show the deviation from the original setting dimension (D) in hundredths of millimetre and are necessary to determine the shim dimensions (X).
Stamp letters H, F or K indicate the type of teeth
H or F = Gleason teeth.
K = Klingelnberg teeth.



Wheel sets not marked with letters for teeth identification can be identified by means of the shape of the teeth.
Klingelnberg teeth.
The height of the teeth and teeth backs are constant.
When checking with a bent welding filler rod of 2 mm (0.079 in.) dia. distance (A) must be the same at both the inner and outer diameters.

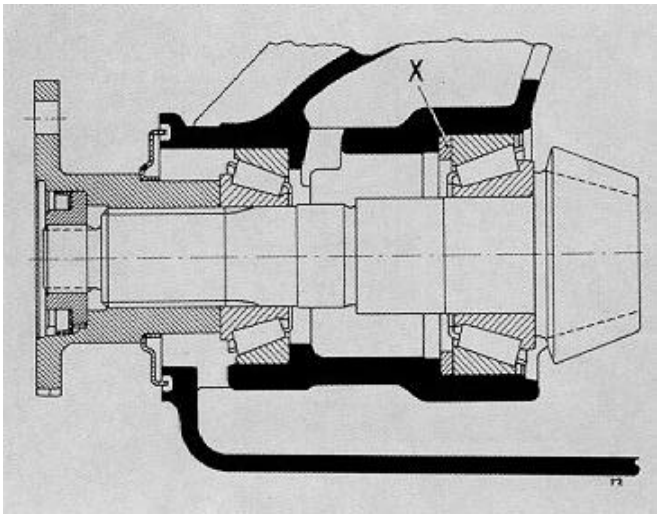


Gleason teeth:
The back of the tooth higher and wider at the outside than the inside.
When checking with a bent welding filler rod 2 mm (0.079 in.) dia., distance (A) at the outer diameter must be greater than that of the inside diameter.



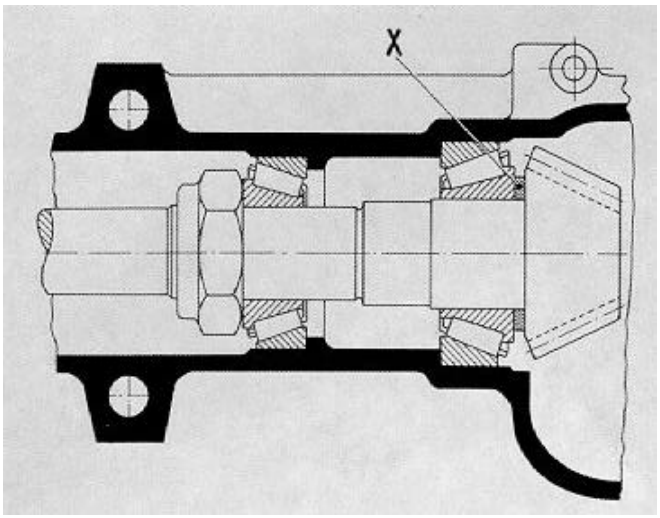
To ascertain the setting of the crown wheel more quickly install the removed shim X and the new bearing outer ring and input bevel pinion without the clamp bush.
Adjust the friction moment[1]) of the input bevel pinion bush.

-> [1]) See specifications

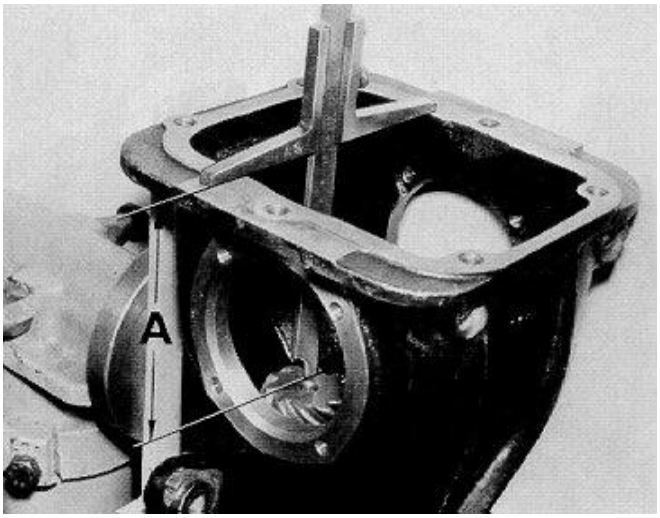


Long neck final drive only:
Install shim X between the bevel pinion and the bevel pinion bush without the clamp bushing.
Adjust the friction moment[1]) of the input bevel pinion bush with the lock nut.

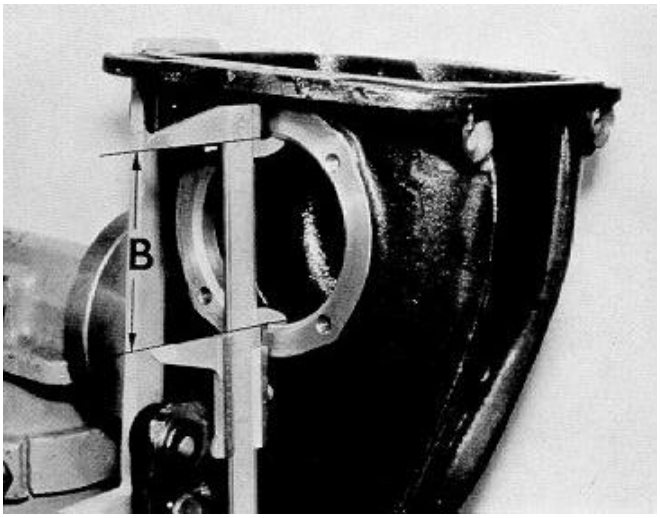
-> [1]) See specifications



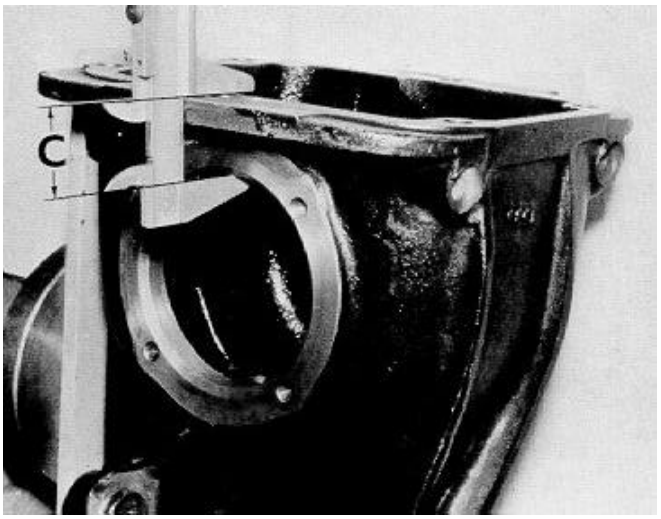
Check distance (A) from the surface of the housing seal to the face of the input bevel pinion.



Determine aperture diameter (B) for attaching the side cover plate.
Divide this value by two.
Example: 83.0 mm - 2 = 41.50 mm
(3.268 in.) = (1.6339 in.).



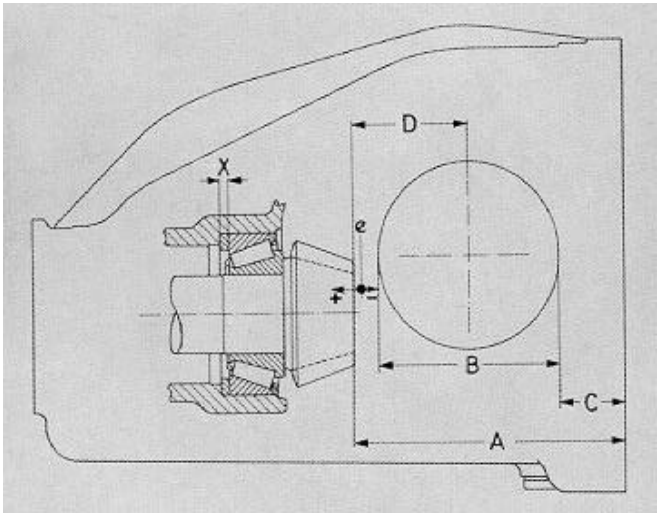
Measure narrowest point (C) between the side aperture and the seal surface of the housing.



Taking into account original setting dimensions (D) determine dimensions of shim X.
Original setting dimensions D for Gleason and Klingelnberg teeth = 52.52 mm (2.0677 in.).

1. B - 2 41,50 mm (1.6339 in.) 3. D 52,52 mm
. (2.0677 in.).
+ C 29,90 mm (1.1771 in.) -- e 0,18 mm
. (0.0071 in.).
---
y 71,40 mm (2.811o in.) D required 52.34 mm
. (2.0606 in.).
---
2. A 123,90 mm (4,8779 in.) 4. D actual 52,50 mm
. (2.0669 in.)
-- y 71,40 mm (2.8110 in.) D required 52,34 mm
. (2.0606 in.)

D-ist 52,50 mm (2.0669 in.) x + 0,16 mm
. (0.0063 in.)



In this example the installed shim X must be exchanged for a 0.16 mm (0.0063 in.) ticker shim.

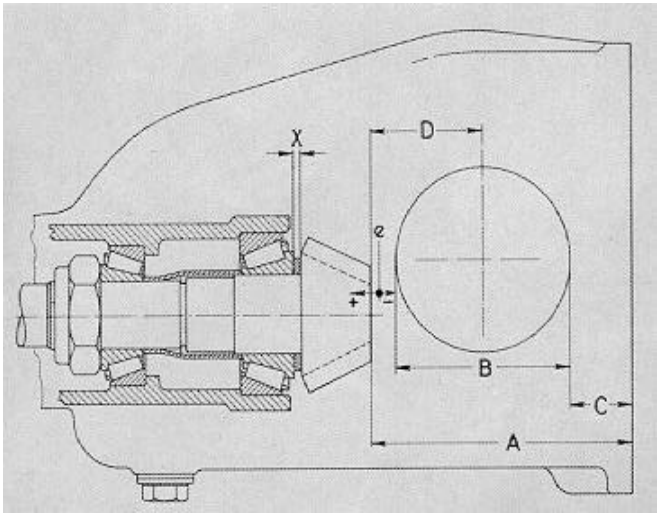
1. B - 2 41,50 mm (1.6339 in.) 3. D 52,52 mm (2.0677 in.)
+ C 29,50 mm (1.1771 in.) + e 0,25 mm (0.0098 in.)
---
y 71,40 mm (2.8110 in.) Drequired 52,77 mm (2.0775 in.)
---
2. A 123,90 mm (4.8479 in.) 4. D required 52,77 mm (2.0775 in.)
-- y 71,40 mm (2.8110 in.) D actual 52,50 mm (2.0669 in.)

D actual 52,50 mm (2.0669 in.) X-- 0,27 mm (0.0106 in.)

In this example the installed shim X must be exchanged for a 0.29 mm (0.010 in.) thinner shim.

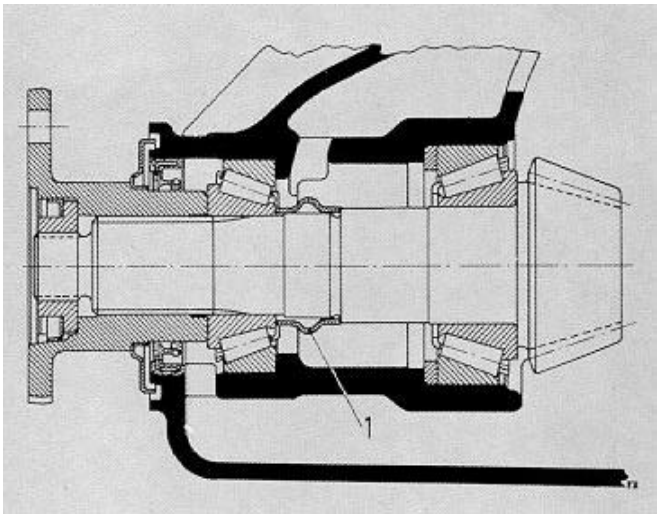
Principle: If D-required is larger than D-actual, X must be subtracted from shim X.
If D-required is smaller than D-actual, X must be added to shim X.

Layout of shim X for lang neck final drive.

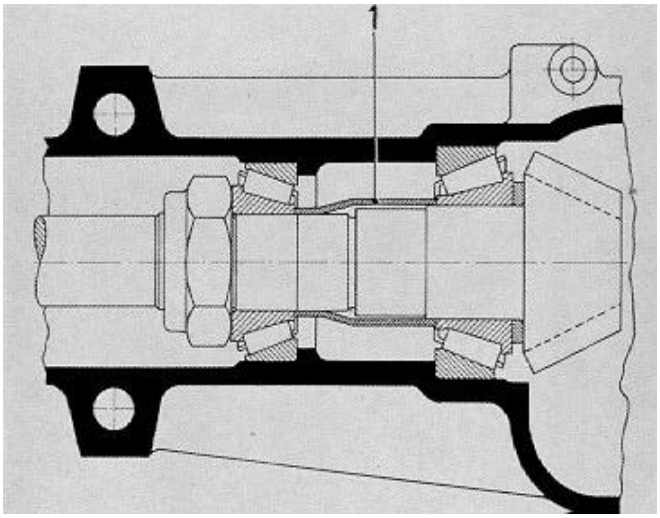


Remove input bevel pinion.
Install correct sized shim X.
Install input bevel pinion with a new clamp bush (1) and press the front tapered ball bearing onto the input bevel pinion.
Insert the shaft seal and attach input flange.
Adjust friction moment[1]) of the input bevel pinion bush.
Secure lock nut.
Warning: If the friction moment is exceedet the clamp bush must be renewed and the process repeated.

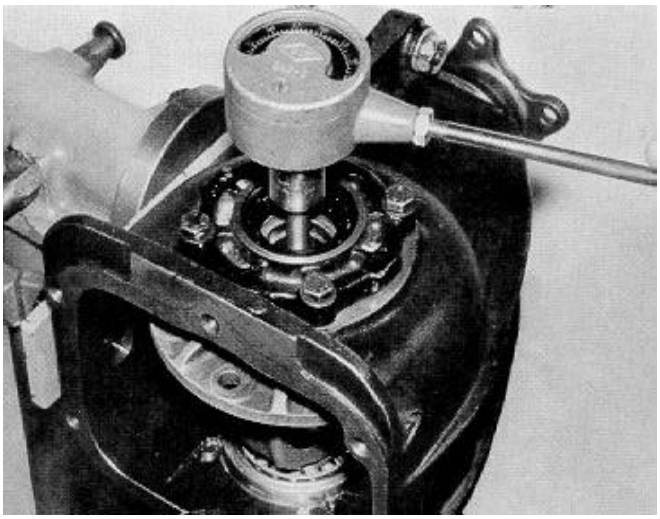
-> [1]) See specifications



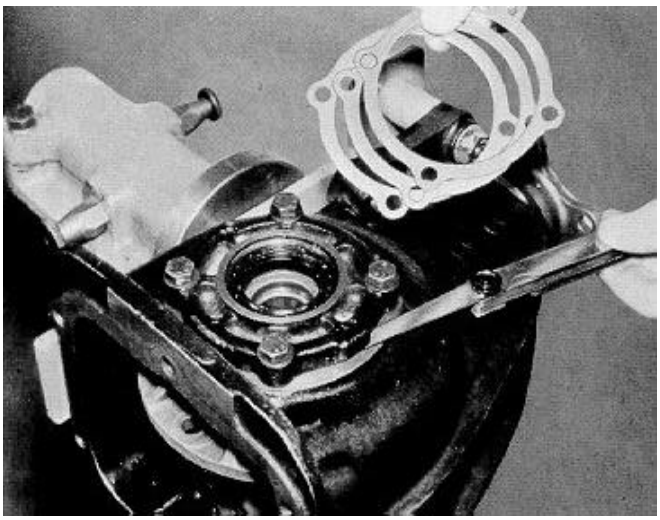
Long neck final drive only:
Install correct size shim X and new clamp bush (1).
Adjust the input bevel pinion bush friction moment with the lock nut.
The lock nut can be tightened up to a maximum of 40 mkp (288 ft/lb).



Attach a cover plate less compensating rings to the housing.
Install differential housing less crown wheel.
Install the opposite cover plate less compensating rings.
Screw a bolt against the differential pinion shaft.
Tighten bolts for the cover plate uniformly until the friction moment is 20-28 cmkp (17.4 - 24.3 lb/in.).

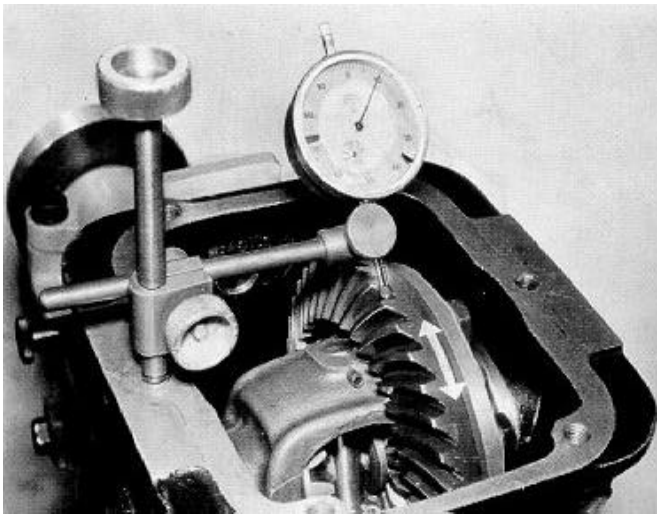


Measure the distance between the cover plate and housing using a feeler gauge and adjust to size using compensating rings.
Warning: Fit same number of compensating rings on both sides.
Example: Measured distance 1.8 mm (0.071 in.).
Install 0.09 mm (0.0035 in.) compensating rings at each cover plate.

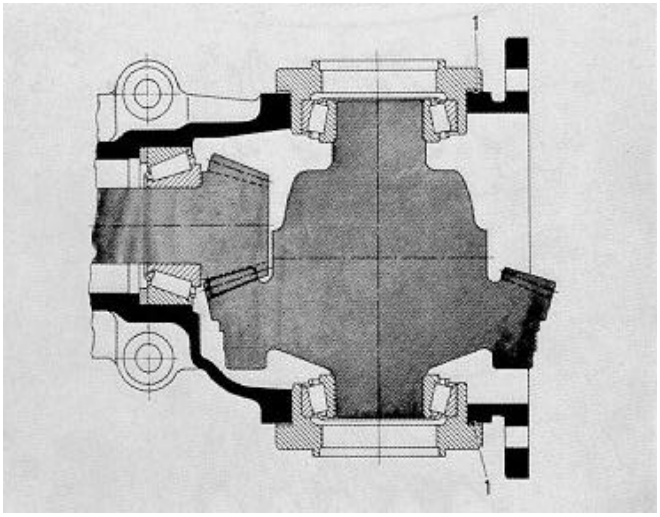


Install crown wheel.
Install differential housing and measure tooth backlash[1]).
Warning: Correct contact pattern is vital.

-> [1]) See specifications

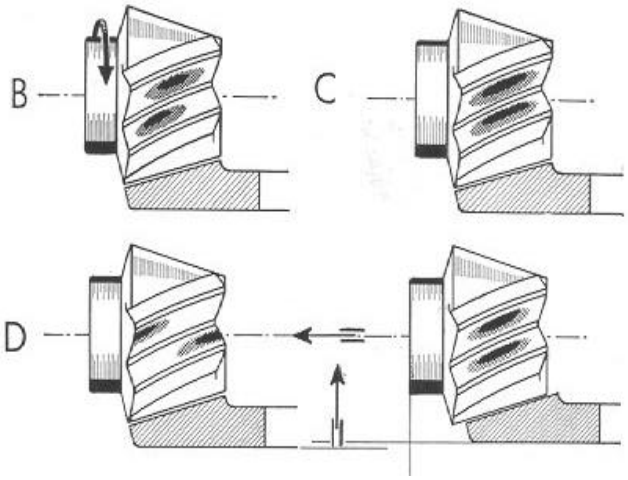


Correcting of the tooth backlash and contact pattern is done by changing the compensating rings (1) from one side to the other.
Warning: Under no circumstance must the overall thickness of the compensating rings be altered.

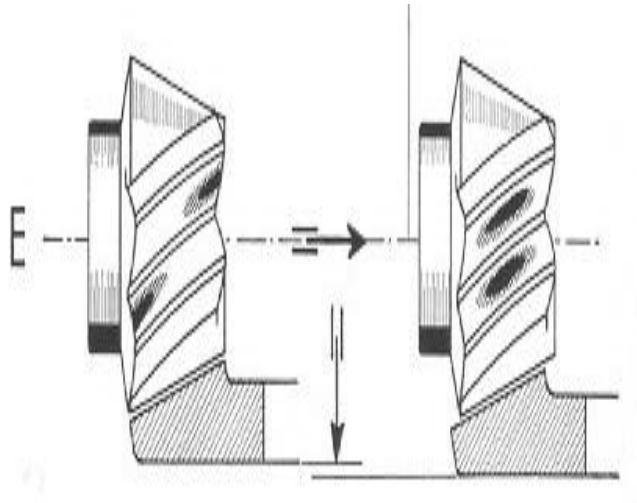


Klingelnberg gears

The contact pattern must be situated on the forward and rear flanks of the pinion at approximately the centre of the tooth length and height.
B Contact pattern without load.
C Contact pattern under load.
D By fitting a thicker shim "X" behind the pinion the contact pattern on the front flank moves towards the large pinion diameter, while on the back flank it moves toward the smaller pinion diameter.

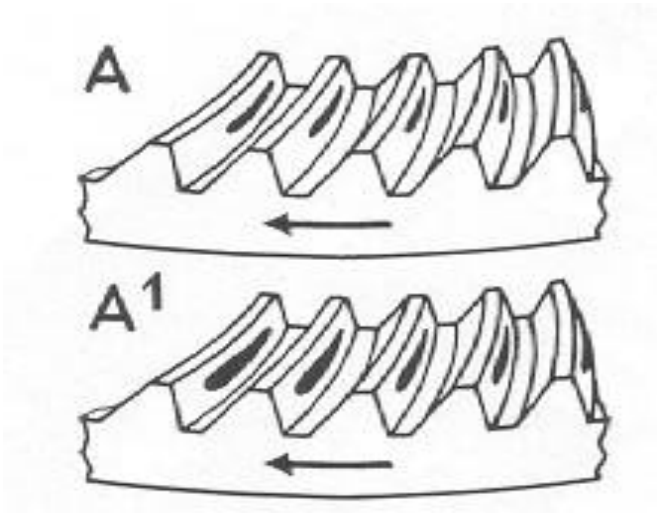


Additional alteration possibilities can be seen from Figure E.

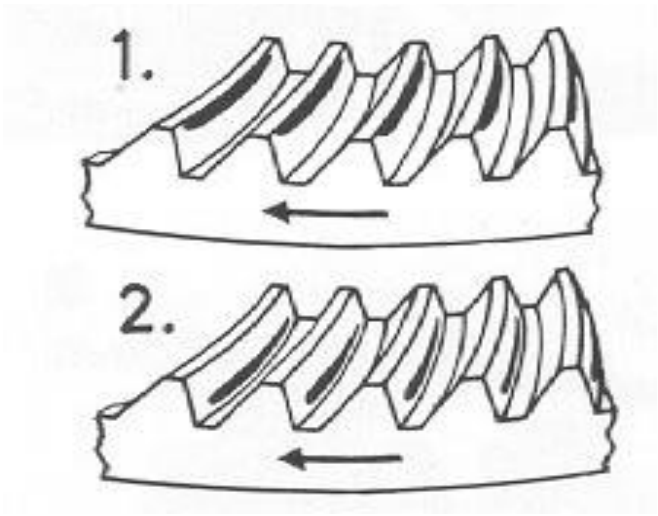


Gleason gearing

A
Correct engineering blue contact pattern without load.
A1
When subjected to load the contact pattern is displaced somewhat toward the outside.
Displacement of the crownwheel primarily changes the backlash and in addition the contact pattern is displaced in the axial direction of the teeth.
Displacement of the pinion primarily moves the contact pattern in the direction of the tooth height while the backlash changes only marginally. In addition note the four **basicallyfalse** contact patterns which usually occur jointly, but knowledge of which facilitates actual adjustment work.



1. High narrow contact pattern (tip contact) on crownwheel. **Move the pinion towards the crown wheel axis** and if necessary correct backlash by moving the crown wheel away from the pinion.
2. Low narrow contact pattern (root contact) on crown wheel. **Move the pinion away from the crown wheel axis** and if necessary correct backlash by moving the crownwheel closer.



3. Short contact pattern on the smallest tooth end (toe contact) of the crownwheel.
Move the crownwheel away from the pinion and if necessary move pinion closer to the crownwheel axis.
4. Short contact pattern on large tooth end (heel contact) of the crownwheel. **Move the crownwheel towards the pinion** and if necessary move the pinion away from the crownwheel axis.