

## GENERAL SPECIFICATIONS FOR INSTALLING AND ADJUSTING RING GEAR AND PINION SETS

### Maintenance

Proper maintenance is essential to achieve the maximum life of a drive axle. The most important element of maintenance is proper lubrication, since incorrect or lack of lubrication can cause serious damage to the drive axle parts. It is always recommended to use the proper lube, change it at specified intervals and maintain the lube level.

### Rebuilding and adjusting

Proper reassembly and replacement of all damaged or defective parts are extremely important in order to achieve good life from an axle overhaul. Cleaning and close inspection of parts is vital. To achieve maximum value from a rebuild, replace lower-costs items such as thrust washers, seals and bushings as well as the worn and damaged major parts. Always follow the instructions for correctly adjusting bearing pre-load. The procedure for adjusting bearing pre-load can be very different according to the axle make and model, therefore it is always recommended to refer to the service manual of the original manufacturer.

### Recommended backlash

Backlash is the space that must be left between the teeth of the ring gear and the pinion, and it has to be measured perpendicularly to the teeth surface. This parameter is very important: too low a value might result in gear seizure, otherwise too high a value might result in gear noise and subsequently failure. To measure the backlash, position a dial indicator so that the pointer is perpendicular on the side of a ring gear tooth near to the heel (the large end of the tooth) as shown in Figure 3. Slightly move the crown wheel forward and backward, preventing the pinion from rotating: the swing of the needle will give the actual value of backlash. Adjust the backlash by means of the bearing adjusters or shims until the value recommended by the axle service manual is achieved. In the event of your not being in possession of the service manual, the recommended backlash value can be obtained using the following practical procedure:

1. Measure the outer diameter of the ring gear (dimension "D" in Figure 2)
2. Count the number of teeth on ring gear "Z"
3. The ratio between the outer diameter "D" (expressed in millimetres) and the number of ring gear teeth "Z" is the approximate value of module "M":  $M = D/Z$   
If the diameter D has been measured in inches, multiply by 25.4 to convert into millimetres.
4. Obtain the recommended backlash value from the table below.

Module millimetres	Recommended Backlash		Module millimetres	Recommended Backlash	
	millimetres	inches		millimetres	inches
from 20.32 to 25.40	0.508-0.762	0.020-0.030	from 7.26 to 8.47	0.203-0.279	0.008-0.011
from 16.93 to 20.32	0.457-0.660	0.018-0.026	from 6.35 to 7.26	0.178-0.229	0.007-0.009
from 14.51 to 16.93	0.406-0.559	0.016-0.022	from 5.08 to 6.35	0.152-0.203	0.006-0.008
from 12.70 to 14.51	0.356-0.457	0.014-0.018	from 4.23 to 5.08	0.127-0.178	0.005-0.007
from 10.16 to 12.70	0.305-0.406	0.012-0.016	from 3.18 to 4.23	0.102-0.152	0.004-0.006
from 8.47 to 10.16	0.254-0.330	0.010-0.013	from 2.54 to 3.18	0.076-0.127	0.003-0.005

### Adjust tooth contact pattern

To make the tooth contact pattern visible, apply a thin layer of white or yellow paint on about a quarter of the circumference of the ring gear (Figure 1). Turn the pinion in both directions, braking the ring gear. In order to grant the gear set long life and noiselessness, the contact pattern should result centered on the tooth surface, as shown in Figure 4. Always check tooth contact pattern on the drive side of the gear teeth (convex side). The position of the contact pattern can be adjusted by changing the distance between the pinion and the ring gear centre. This position is determined by the size of the taper roller bearing shim pack. Please note that no general rule exists in this phase: some axles are designed so that adding shims moves the drive pinion toward the ring gear, and removing shims moves the drive pinion away from the ring gear, while for some other axle models it is true the opposite. Below are some practical indications on how to correct wrong tooth contact pattern by adjusting the pinion shim pack. Remember that after changing the pinion axial position it is always necessary to restore the gear set backlash.

#### Figure 5 - Low contact pattern

Move the drive pinion away from the ring gear (A), then restore the backlash by moving the ring gear toward the drive pinion (B).

#### Figure 6 - High contact pattern

Move the drive pinion toward the ring gear (A), then restore the backlash by moving the ring gear away from the drive pinion (B).

#### Figure 7 - Contact on the toe of the tooth

This incorrect pattern is due to a "not enough backlash" condition. Move the ring gear away from the drive pinion to increase backlash. Do not exceed maximum allowable backlash.

#### Figure 8 - Contact on the heel of the tooth

This incorrect pattern is due to a "too much backlash" condition. Move the ring gear toward the drive pinion to reduce backlash, but maintain minimum backlash.

