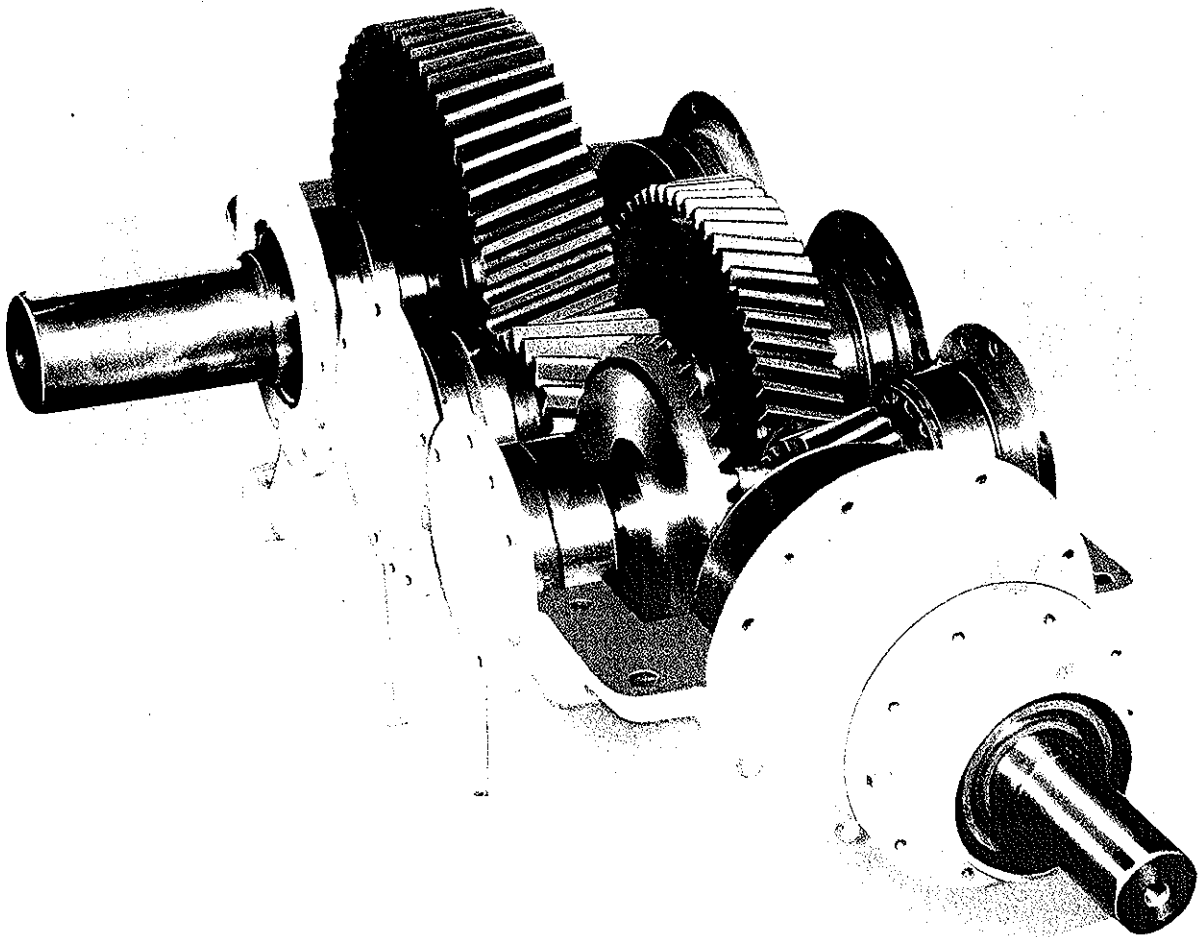
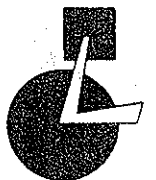


“BEWGEAR”

Installation & Maintenance of Compact Spiral Bevel/Helical Speed Reducers



BENONI ENGINEERING WORKS & STEEL FOUNDRY (PTY) LTD.





CONTENTS

	PAGE
GENERAL DESCRIPTION	1
APPROVED LUBRICANTS & MAXIMUM OPERATING TEMPERATURE	2
INSTALLATION OF SPIRAL BEVEL/HELICAL TYPE GEARUNIT	3
INSTALLATION OF SHAFT MOUNTED GEARUNIT	4
INSTALLATION OF FLANGE MOUNTED GEARUNIT	5
MAINTENANCE OF SPIRAL BEVEL/HELICAL TYPE GEARUNIT	6
SPARE PARTS OF BDA/BDCB/BDB GEARBOX	11
SPARE PARTS OF BTA/BTCB GEARBOX	12
SPARE PARTS OF BTB GEARBOX	13

NOTE:

A KEY PLAN DRAWING WILL BE ISSUED ON REQUEST FOR A PARTICULAR SIZE AND TYPE OF GEARBOX. BEARING AND OIL SEAL SIZES WILL BE STATED ON THESE DRAWINGS.

DISCLAIMER

Whilst care has been taken to ensure the completeness and correctness of information given in this technical manual, Benoni Engineering Works (Pty) Limited accepts no liability for any damage or consequential loss to equipment, nor to injury to personnel which may arise during or after the performance of procedures contained herein.

The specifications, performances and other figures given in this technical manual are a guide only and cannot be taken as contractual.



GENERAL DESCRIPTION

GEARS

The gears are manufactured from carburising high quality alloy steel. The single helical teeth are case hardened and precision profile ground. The case hardened spiral bevel gears are lapped in pairs ensuring high efficiency, quietness of operation and maximum power to mass ratio.

BEARINGS

Tapered and Spherical Roller Bearings are used throughout. Designed to accommodate all internal journal and thrust loads with ample margin to ensure long life.

GEARCASE

The housings are of best quality close grained cast iron to BS 1452 GRADE 14, generously proportioned to ensure rigidity and for maximum cooling surface area. The case is split on the centre line of the shafts, the two halves being symmetrical to give optional right or left hand assembly arrangements. (Bi-Handed). Inspection covers, oil level dipstick, breather and drain plugs are provided. The housing is machined on both top and bottom faces and is provided with holding down bolt holes.

COOLING

Auxiliary cooling when required is effected either by:

- (1) Fitting one or two fans as required, or
- (2) Supplying a forced feed lubrication system incorporating, an independent oil cooling tank and/or a suitable radiator with fan air/oil cooler.

HOLDBACKS

A holdback if fitted is grease lubricated and is mounted externally on a special extended shaft. It is provided with a bolt on type torque arm anchored to the gearcase.

BEDPLATES

If required a combination bedplate of rigid cast steel or fabricated mild steel construction is provided. The bedplate is designed to accommodate the gearbox, motor, high speed coupling and brake as required. All Shaft Mount or Bikon Flange Mount units are supplied with a resilient torque arm.

GUARANTEE

All "BEWGEAR" gearunits are guaranteed for replacement or repair of defective parts due to faulty design, materials or workmanship, subject to proper use, for a period of 12 months from date of delivery unless otherwise agreed upon.

REPLACEMENT PARTS

When ordering parts the SERIAL NUMBER which is stamped on the reducer nameplate must be specified.



APPROVED LUBRICANTS & MAXIMUM OPERATING TEMPERATURE

All gearboxes are supplied without oil. Prior to start up, gearboxes are to be filled to the correct oil levels, as indicated by the markings on dipsticks. Overfilling can cause overheating and leakage.

If the gearbox is to be stored for more than two months, fill with CASTROL ALPHA ZN 150 or equivalent. Rotate the input shaft rapidly at least once a month.

CAUTION: Before commissioning fill the gearunit with the recommended grade of oil.

Correct lubricant is most important and it should be noted that EP oils are recommended in all instances. For recommended grade of lubricant refer to the nameplate on the reducer. From the table of 'Approved Lubricants' a suitable equivalent can be selected.

Lubrications listed are suitable for normal ambient temperatures and operating duties. For unusual conditions, full details to be supplied to our Technical Department.

All gearboxes in this range are designed to operate under full load at a maximum temperature of 100 °C.

AGMA Grade Ref No.	1	2EP	3EP	4EP	5EP	6EP	7EP	8EP	ABOVE
Kinematic, viscosity in centistokes at 40 °C	46	68	100	150	220	320	460	680	1000
B.P.	Energol HLP 46 (ISO)	Energol HLP 68 (ISO)	Energol GR 100-XP (ISO)	Energol GR 150-XP (ISO)	Energol GR 220-XP (ISO)	Energol GR 320-XP (ISO)	Energol GR 460-XP (ISO)	Energol GR 680-XP (ISO)	Energol GR 1000-XP (ISO)
CALTEX	Rando Oil HD 46	Meropa Lubricant 68	Blend from Meropa Lub. 68 & 150	Meropa Lubricant 150	Meropa Lubricant 220	Meropa Lubricant 320	Meropa Lubricant 460	Meropa Lubricant 680	Meropa Lubricant 1000
CASTROL	Hyspin AWS 46	Alpha SP 68	Alpha SP 100	Alpha SP 150	Alpha SP 220	Alpha SP 320	Alpha SP 460	Alpha SP 680	Alpha 1000
ESSO	Nuto H46	Spartan EP 68	Spartan EP 100	Spartan EP 150	Spartan 220	Spartan EP 320	Spartan EP 460	Spartan EP 680	Cylisso 1000
MOBIL		Gear 626	Gear 627	Gear 629	Gear 630	Gear 632	Gear 634	Gear 636	
SHELL		Omala 68	Omala 100	Omala 150	Omala 220	Omala 320	Omala 460	Omala 680	Omala 1000
TOTAL	Totalube HV 215 (Non EP)	Totalube GS 315	Totalube GS 315	Totalube GS 700	Totalube GS 1000H	Totalube GS 2150L	Totalube GS 2150L	Totalube GS 3150	Totalube GS 4650
TREK	Turbine Oil 46 (ISO)		Gear Oil EP 100 (ISO)	Gear Oil EP 150 (ISO)	Gear Oil EP 220 (ISO)	Gear Oil EP 320 (ISO)	Gear Oil EP 460 (ISO)	Gear Oil EP 680 (ISO)	



INSTALLATION OF SPIRAL BEVEL/HELICAL TYPE GEARUNIT

The installation and lining up of the gearunit has a pronounced effect on its subsequent behaviour, for if the installation is poor and the lining up carelessly done, the life of the gears will be adversely affected.

To prevent misalignment of the gears at installation in the case of foot mounted gearunits the following points should be adhered to:

- (a) A firm concrete foundation or a heavy rigid steel structure must be established.
- (b) Foundation or holding down bolts must not be tightened until the area under each bolt has been checked to ensure no gap is present between bedplate/gearbox and foundation.
- (c) Should shimming be required between gearbox/bedplate and the foundation these should be placed next to the holding down bolt.

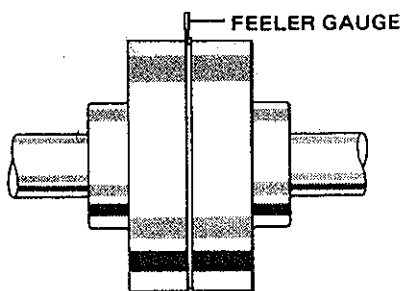
NOTE: Do not shim between gearbox and bedplate.

- (d) Where possible, tooth markings should be checked to ensure that contact across at least 90 % of the full face is obtained.

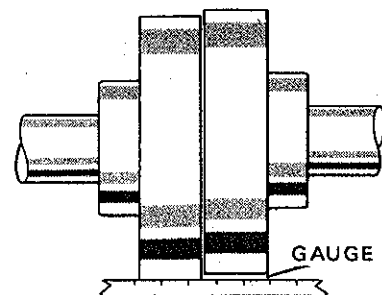
ALIGNMENT OF SHAFTS

Although a small amount of axial and angular mis-alignment is permissible, it is important to note that such mis-alignment appreciably reduces the useful life of the coupling rubbers and imposes unnecessary loads on the adjacent gearbox bearings.

To prevent mis-alignment it is recommended that the following procedure be adopted. Recommended coupling gaps for flexible pin type couplings should be adhered to. In order to avoid angular mis-alignment this gap must be checked on the coupling at top dead centre, the coupling should then be rotated to bottom dead centre, then to 90° on either side of these points, and the gap checked in each position. It is important that the checking be done at the same point on the periphery of the coupling in each of the above positions. Errors due to lateral and vertical displacement are detected by placing a rule or a straight-edge against the diameter of one half of the coupling, and checking the gap, if any, between the rule and the diameter of the adjacent half.



ANGULAR MAL-ALIGNMENT



LATERAL DIAL-ALIGNMENT

Parallel and angular alignments are to be within 0,05 mm per 305 mm diameter.

If a gearunit is fitted with a fluid type coupling, please refer to the applicable supplier's manual for fitting and maintenance instructions.

PRE-RUN INSTRUCTIONS

Before running the gearunit, the gearbox sump is to be filled with the recommended grade of oil to the required level, indicated on the dipstick. The joint and cover bolts to be checked for tightness (tighten if necessary) and motor/gearbox alignment to be checked. See Page 2 for approved lubricants.

TRIAL RUN

It is recommended that the unit be run for a period of ± 24 hours under light load, checking occasionally for oil leaks, excessive noise and abnormal high temperature (max. 100 °C at input end of gearbox). After this trial run period do a routine inspection.



INSTALLATION OF SHAFT MOUNTED GEARUNIT

Shrink Discs are supplied with all shaft mounted gearboxes. The following procedure should be followed when mounting or removing gearboxes from driven shafts.

MOUNTING PROCEDURE

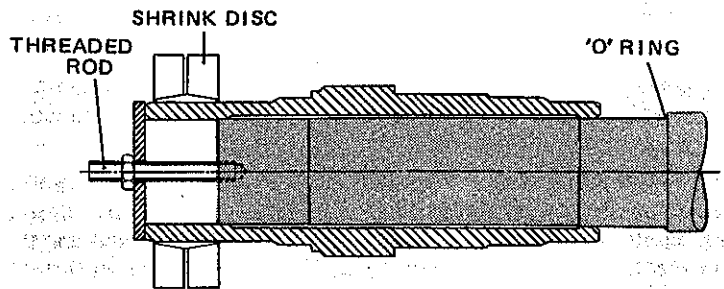
- 1) Release locking screws on Shrink Disc progressively, a quarter turn each initially.

NOTE: Shrink Discs need not be taken apart or lubricated prior to installation. Only a dirty Shrink Disc should be cleaned and tapered surfaces should be lubricated with Molykote 321R or similar.

- 2) Clean and degrease locating diameters of gearunit hollow shaft, driven shaft and shrink disc locating diameter on hollow shaft extension if Shrink Disc was removed.
- 3) Place 'O'-ring which is supplied with the gearbox onto the driven shaft.
- 4) Screw a threaded rod (for thread size see Table 1) into driven shaft and using a nut, draw the gearbox onto the shaft.
- 5) Tighten all locking screws progressively to required torque (for torque value see Table 1).

NOTE: Do Not tighten in a diametrically opposite sequence.

- 6) Fit protective cover.
- 7) Connect torque arm, ensuring that the gearunit is level, use machined pads on top of the gearbox for levelling.
- 8) For Alignment of Shafts, Pre-Run Instructions and Trail Run see Page 3.



REMOVAL

- 1) Remove protecting cover.
 - 2) Release locking screws on Shrink Disc progressively, a quarter turn each initially.
- NOTE:** Do Not remove locking screws completely.
- 3) Using a jacking screw (for thread size see Table 1), remove the gearbox from the driven shaft.

NOTE: Use a metal disc between the jacking screw and shaft to protect the thread in the shaft.

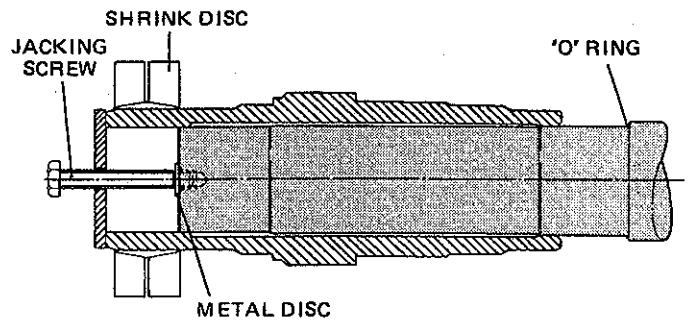


TABLE 1

UNIT SIZE	ROD THREAD FOR MOUNTING	JACKING SCREW THREAD FOR REMOVAL	SHRINK DISC	LOCKING SCREWS	TIGHTENING TORQUE, NM
200	M24	M30	110/72	M10	58
230	M24	M30	125/72	M10	58
260	M24	M30	165/71	M16	240
320	M30	M36	185/71	M16	240
380	M30	M36	220/71	M16	240
440	M36	M42	260/71	M20	470
500	M36	M42	280/71	M20	470



INSTALLATION OF FLANGE MOUNTED GEAR UNIT

MOUNTING PROCEDURE

The gearunit is supplied with the driving half of the flange mount coupling mounted onto the gearbox output shaft, the driven half is supplied loose. The following procedure is recommended to mount the driven half of the Bikon flange coupling onto the driven shaft.

- 1) Ensure that all surfaces and threads are well lubricated (do not use oils containing MSO₂ (Molybdenum Disulphide).
- 2) Assemble clamping rings 'x' and 'z' onto hub 'y', then insert an equal number of bolts into
 - (a) Front ring 'x' release threads
 - (b) Hub 'y' release threads
 - (c) Back ring 'z' locking threads
 (a) and (b) are used as jacking screws to ensure clearance between the tapers and (c) holds the assembly together.
- 3) Fit assembly as stage '2' into flange half then assemble flange half to shaft. Remove bolts 2a and 2b and complete 2c.
- 4) Tighten bolts 2c to approximately 90 % of required torque (see Table 2) in 3 or 4 gradual steps. Initially diagonally opposite to ensure parallelism and then progressively until bolts do not turn further.

Flange runout must now be checked.

Maximum runout must not exceed 0,01 mm per 100 mm of flange diameter i.e. 400 dia flange runout must be less than 0,04 mm.

Flange can be set true within limits by tightening bolts adjacent to the high point to full torque first.

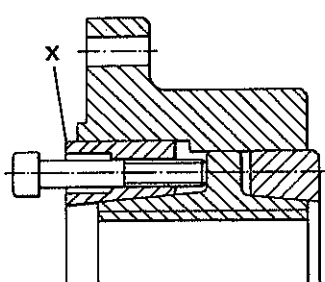
- 5) Mount gearunit onto the driven flange, tighten flange bolts in a diametrically opposite sequence.
- 6) Connect torque arm, ensuring that the gearunit is level, use machined pads on top of the gearbox for levelling.
- 7) For Alignment of Shafts, Pre-Run Instructions and Trail Run see Page 3.

REMOVAL OF HALF COUPLING

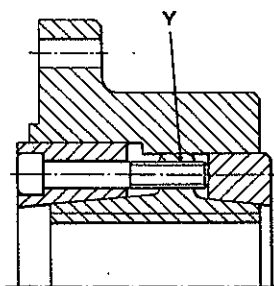
- 1) Unscrew all locking bolts a few turns and transfer bolts to same arrangement as installation procedure 2a, b and c.
- 2) Release taper by progressive, even, diagonally alternating tightening of the bolts in the release threads until the rings are separated.
- 3) Remove flange assembly.

TABLE 2

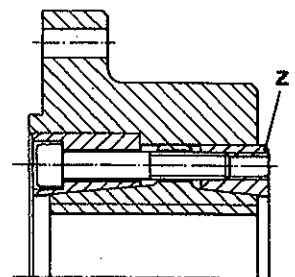
Size of Unit	200	230	260	320	380	440	500
Required Tightening Torque Nm	83	230	230	230	355	355	355



2(a)



2(b)



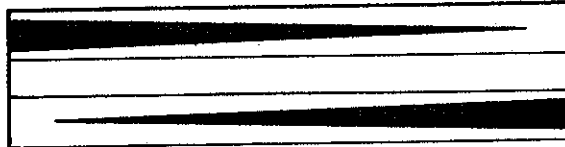
2(c)



MAINTENANCE OF SPIRAL BEVEL/HELICAL TYPE GEARBOX

ROUTINE INSPECTION

Remove inspection covers and inspect gears for bearing pattern on teeth.



This shows the helical tooth contact produced when the shafts are parallel but due to a distorted/twisted gear casing they are forced out of plane. Tooth markings should be checked to make sure contact across at least 90 % of the full face of helical gears is obtained. For Bevel Gear contact see Page 9.

Check cover and joint bolts for tightness, tighten if necessary. Check oil level, top up with recommended grade of oil if necessary.

LUBRICATION MAINTENANCE

It is recommended that users adhere to the reducer manufacturers lubrication maintenance schedule. All gear oils deteriorate with age and temperature. A deteriorated or contaminated gear oil may lead to ultimate failure of the speed reducer.

The lubricant in a new gearbox should be drained after the first 6 months or 2 500 hours of operation, whichever comes first. The gearcase should be thoroughly cleaned with a flushing oil. The original lubricant can be used for refilling if it has been filtered through a filter of 100 microns or less, otherwise new lubricant must be used.

Lubricants should not be filtered through Fullers Earth or other types of filters which remove lubricant additives.

Under normal operating conditions the lubricant should be periodically tested by the lubricant supplier, this service is usually free. The lubricant supplier will advise on lubricant renewal intervals, otherwise the lubricant should be renewed every 3 years or 10 000 hours operation whichever comes first.

DISASSEMBLY

- 1) Drain Oil.
- 2) Clean external surfaces of housing before removing any bearing covers to prevent dirt from falling into gearbox.
- 3) Remove bearing covers by removing the setscrews holding the covers. Jack off covers by inserting two of the setscrews into the tapped holes provided.

CAUTION: When removing open bearing covers, seal lips must be protected from sharp edges of keyways.

NOTE: Wire or tie all shims to their respective bearing covers/cartridge for reference when re-assembling.

- 4) Lift gearbox top straight up slowly.
- 5) Remove gearwheel assemblies by threading a wire rope sling through a hole in the gearwheel.
- 6) Remove spiral bevel wheel and pinion assembly using a 50 mm wide nylon rope sling.
- 7) Remove spiral bevel pinion shaft from cartridge.

BEARINGS

- 1) Wash the bearings in diesoline, then dry. Do not spin bearings for they may score due to lack of lubricant.
- 2) Inspect bearings and replace all that are worn.
- 3) Use a wheel puller or press to remove bearings. Apply force to the inner race only, not to the bearing cage. To ease the removal, heat may be applied to the bearing cone. If the bearing is to be re-used, do not exceed 100 °C.



MAINTENANCE OF SPIRAL BEVEL/HELICAL TYPE GEARBOX

- 4) To replace new or used bearings, heat them in an oil bath or an oven to a maximum of 100 °C and then slide or press them tight against the shaft shoulder. When heating bearings do not apply flame directly to bearings or rest bearings on bottom of heated container.
- 5) Thoroughly coat all bearings with lubricating oil.

CAUTION: If the high speed bearing is a double row tapered roller with spacer, this must be replaced as a complete assembly.

OIL SEALS

- 1) Remove worn oil seals.
- 2) Install oil seal with garter spring towards inside. Carefully work the seal into position on seal bore. Place a square ended cylindrical tool against the seal and press or drive seal to final position.

BEVEL AND HELICAL GEAR REPLACEMENT

- 1) Wash all gears in diesoline and then dry.
- 2) Inspect all gears carefully and replace if any damaged teeth are found.

CAUTION: Replace spiral bevel gears as a complete set if any damaged teeth are found. When replacing bevels, the match number on the pinion and gear must be the same.

- 3) Use copper slip when assembling wheels to shafts.

CARTRIDGE ASSEMBLY

There are two types of bearing arrangements.

TYPE A. Tapered roller bearing either side normally used on BTA gearunits with ratio from 20/1 to 45/1.

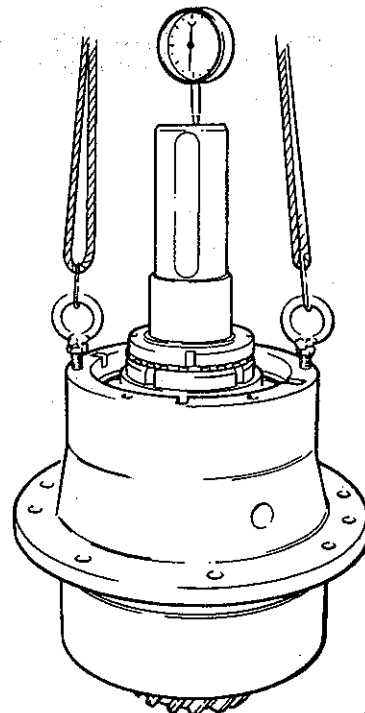
TYPE B. A double row tapered roller bearing with a spacer built to specific clearance specifications on the input side and a spherical roller bearing on the pinion side.

ASSEMBLY OF TYPE A.

- 1) Install Nilos ring and both cones into the cartridge and ensure that they seat tight against the locating shoulders.
Check with a feeler gauge to see that there is no clearance.
- 2) Mount cone nearest to pinion and assemble shaft to cartridge.
- 3) Mount cone nearest to shaft input.
- 4) Tighten locknut nearest to bearing until a clearance of .15 mm is reached.

NOTE: Always rotate cartridge back and forth before reading dial indicator.

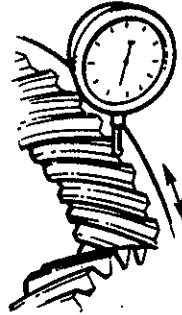
- 5) Set dial indicator to zero. Lift cartridge from table. Difference in readings will be the clearance. See Table 3 for allowable end play on shafts.
- 6) Install lockwasher and remaining locknut and tighten. Check clearance.
- 7) Knock over tab on lockwasher.
- 8) Install oil shield.





MAINTENANCE OF SPIRAL BEVEL/HELICAL TYPE GEARBOX

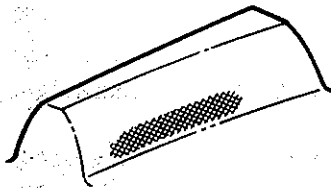
NOTE: Backlash is measured at the outer cone.



11) Apply a coat of Mechanics Blue to the pinion teeth, then rotate pinion. The Mechanics Blue will be transferred to the gear teeth which will show the tooth contact condition on the wheel.

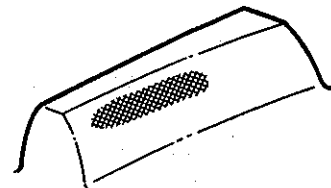
NOTE: The tooth contact condition is very important for noise and strength of gears. Do not spoil the tooth contact condition to obtain proper backlash.

12) Using jacking screws adjust position of bevel wheel and pinion to obtain correct tooth bearing position and rectify as follows:



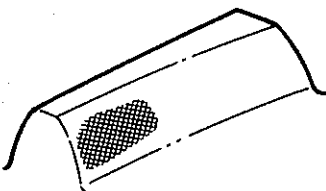
CAUSE Mounting distance of pinion is too short.

CORRECTION Extend the pinion mounting distance.



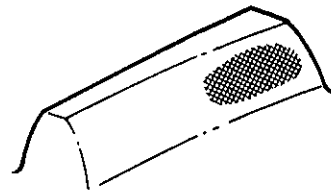
CAUSE Mounting distance of pinion is too large.

CORRECTION Shorten the pinion mounting distance.



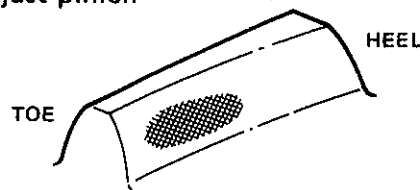
CAUSE Mounting distance of gear is too short.

CORRECTION Extend the mounting distance of the gear. If contact becomes narrower adjust pinion again.



CAUSE The mounting distance of the gear is too long.

CORRECTION Shorten the mounting distance of the gear. If contact becomes narrower adjust pinion again.



CORRECT POSITION OF TOOTH BEARING
Concave and convex side.



MAINTENANCE OF SPIRAL BEVEL/HELICAL TYPE GEARBOX

- 13) Remove all bearing covers.
- 14) Apply Hylomar rubber seal to gearcase flanges and to bearing cover joint faces.
- 15) Replace gearbox top.
- 16) Replace all bearing covers with the same precaution as Step 3.
- 17) Tighten bearing cover setscrews first to align gearcase top and then slacken slightly.
- 18) Torque gearbox bolts and then finally torque bearing cover setscrews to values shown in Table 4.

TABLE 3 – TOTAL ALLOWABLE END PLAY ON SHAFTS

TYPE BD GEARBOXES

UNIT SIZE	INPUT TYPES A to FB	INTERM	OUTPUT	
			TYPE A	TYPE B
200	.05/.10	0.04/0.09	0.16/0.26	0.08/0.11
230	.06/.12	0.05/0.10	0.18/0.28	0.06/0.09
260	.10/.14	0.06/0.11	0.21/0.31	0.09/0.13
320	.10/.14	0.09/0.14	0.26/0.36	0.09/0.13
380	.12/.16	0.11/0.16	0.30/0.40	0.12/0.18
440	.12/.16	0.11/0.16	0.34/0.44	0.15/0.22
500	.14/.18	0.13/0.19	0.38/0.48	0.14/0.21
550	.16/.20	0.14/0.20	0.43/0.53	0.15/0.22

TYPE BT GEARBOXES

UNIT SIZE	INPUT		1st INTERM	2nd INTERM	OUTPUT	
	TYPES A to FB RATIO 45 to 1 and BELOW	TYPES A to FB RATIO 50 to 1 and ABOVE			TYPE A	TYPE B
200	.05/.10	.05/.10	0.04/0.09	0.17/0.27	0.16/0.26	0.08/0.11
230	.05/.10	.05/.10	0.05/0.10	0.19/0.29	0.18/0.28	0.06/0.09
260	.05/.10	.05/.10	0.06/0.11	0.22/0.32	0.21/0.31	0.09/0.13
320	.05/.10	.06/.12	0.08/0.13	0.26/0.36	0.26/0.36	0.09/0.13
380	.05/.10	.10/.14	0.09/0.14	0.31/0.41	0.30/0.40	0.12/0.18
440	.05/.10	.10/.14	0.10/0.15	0.34/0.44	0.34/0.44	0.15/0.22
500	.05/.10	.12/.16	0.12/0.17	0.40/0.50	0.38/0.48	0.14/0.21
550	.05/.10	.12/.16	0.13/0.18	0.44/0.54	0.43/0.53	0.15/0.22
600	.05/.10	.12/.16	0.15/0.21	0.50/0.60	0.47/0.57	0.20/0.29

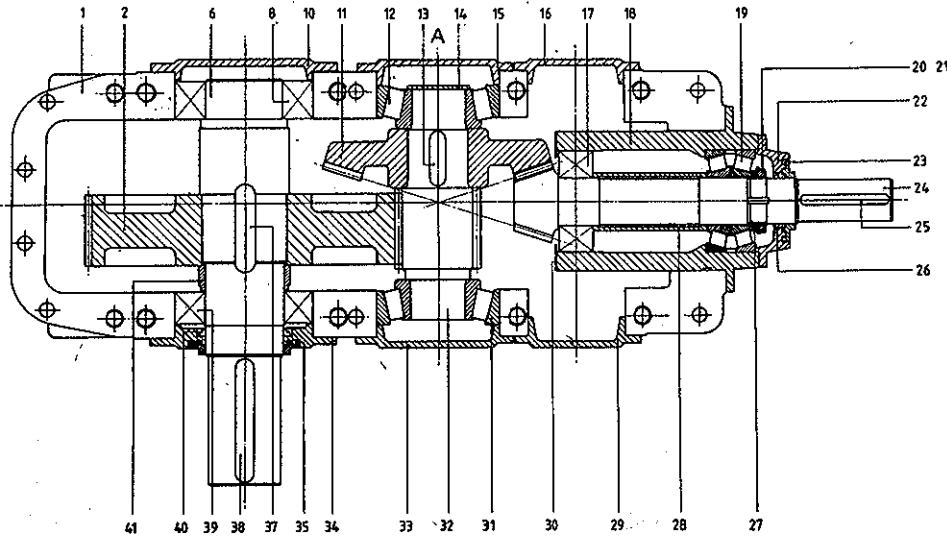
■ DENOTES AXIAL CLEARANCE IN PAIRED BEARINGS BEFORE FITTING.

TABLE 4

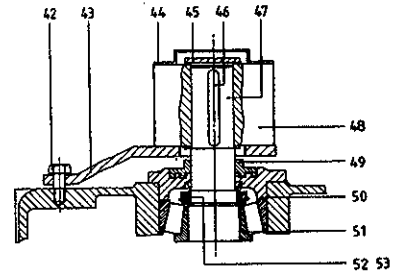
Nominal Size	M10	M12	M16	M20	M24	M30	M36	M42
Pitch	1,50	1,75	2,00	2,50	3,00	3,50	4,00	4,50
Across Flats	17	19	24	30	36	46	55	65
Torque Nm	22	38	95	185	320	630	1100	1700



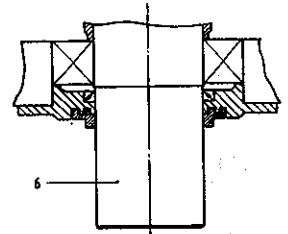
SPARE PARTS OF BDA/BDCB/BDB GEARBOX



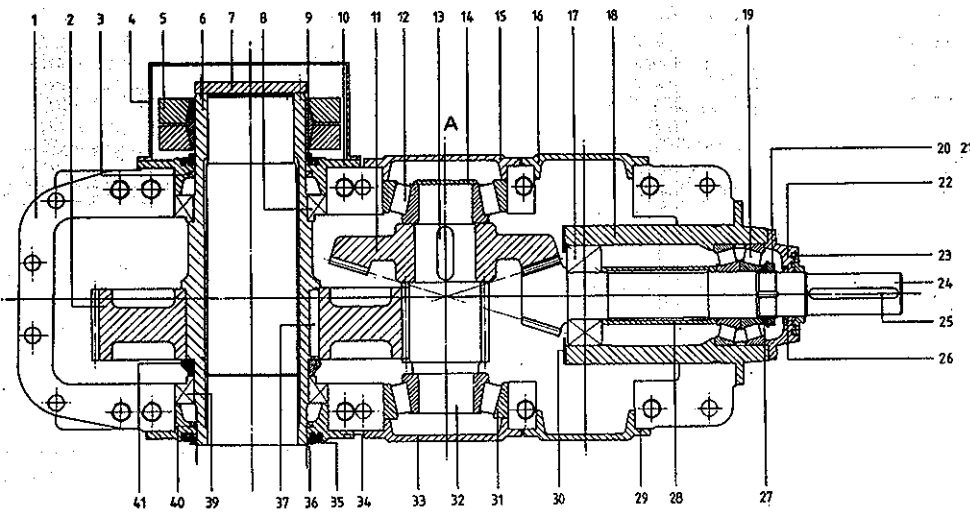
BDA GEARBOX



**GEARBOX WITH HOLDBACK
FITTED AT POSITION A**



**OUTPUT SHAFT OF BDCB
GEARBOX ALL OTHER PARTS
AS BDA GEARBOX**



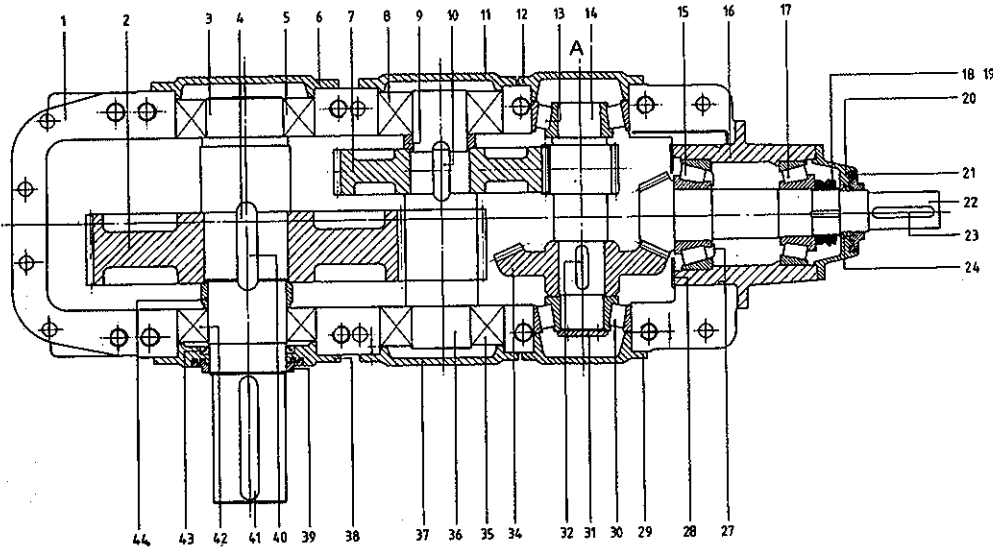
BDB GEARBOX

- | | | | |
|------------------------|------------------------|----------------------------|----------------------------|
| 1. GEARCASE | 15. BEARING COVER | 29. COVER | 43. TORQUE ARM |
| 2. GEARWHEEL, Output | 16. COVER | 30. OIL SHIELD | 44. SPRAG COVER |
| 3. OIL SEAL | 17. BEARING | 31. BEARING | 45. KEEP PLATE |
| 4. COVER, Shrink disc | 18. BEARING CARTRIDGE | 32. PINION SHAFT, 2nd Redn | 46. KEY |
| 5. SHRINK DISC | 19. BEARING | 33. BEARING COVER | 47. PINION SHAFT, 2nd Redn |
| 6. OUTPUT SHAFT OR HUB | 20. LOCKWASHER | 34. BEARING COVER | 48. SPRAG HOLDBACK |
| 7. KEEP PLATE | 21. LOCKNUT | 35. LABYRINTH | 49. LABYRINTH |
| 8. BEARING | 22. BEARING COVER | 36. 'O' RING | 50. BEARING COVER |
| 9. LABYRINTH | 23. LABYRINTH | 37. KEY | 51. OIL SEAL |
| 10. BEARING COVER | 24. INPUT PINION SHAFT | 38. KEY | 52. LOCKWASHER |
| 11. BEVEL GEAR | 25. KEY | 39. BEARING | 53. LOCKNUT |
| 12. BEARING | 26. OIL SEAL | 40. OIL SEAL | |
| 13. KEY | 27. WASHER | 41. SPACER | |
| 14. KEEP PLATE | 28. SPACER | 42. ANCHOR PIN | |

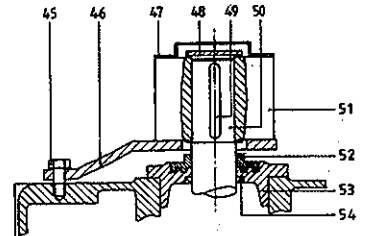
When ordering spares the part numbers and the gearbox serial number must be stated.



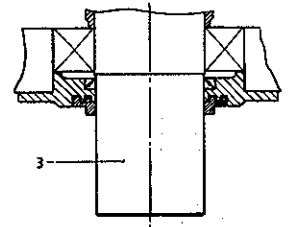
SPARE PARTS OF BTA/BTCB GEARBOX



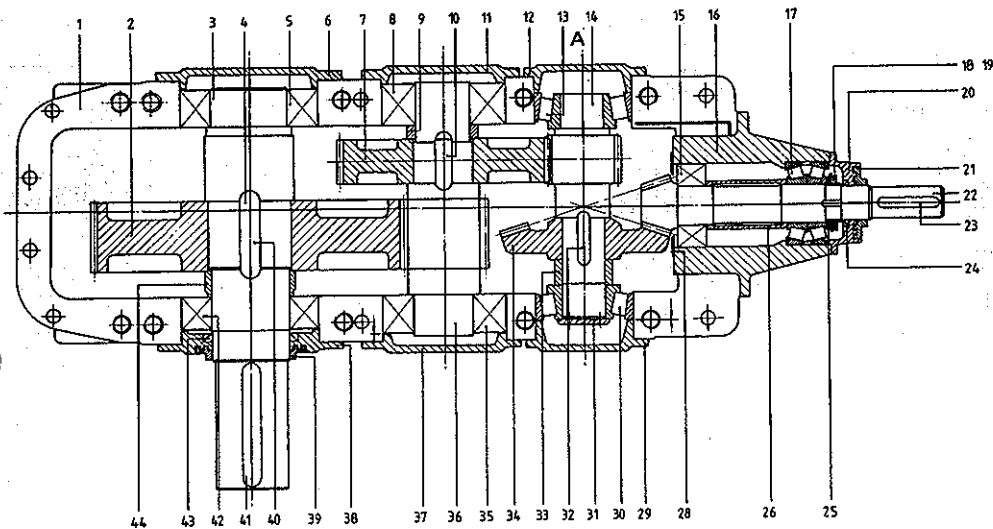
BTA GEARBOX RATIO 20/1 TO 45/1



GEARBOX WITH HOLDBACK FITTED AT POSITION A



OUTPUT SHAFT OF BTCB GEARBOX ALL OTHER PARTS AS BTA GEARBOX



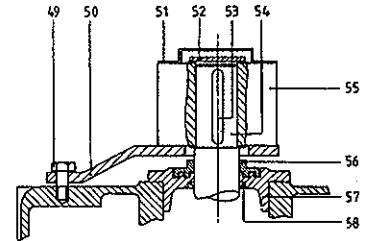
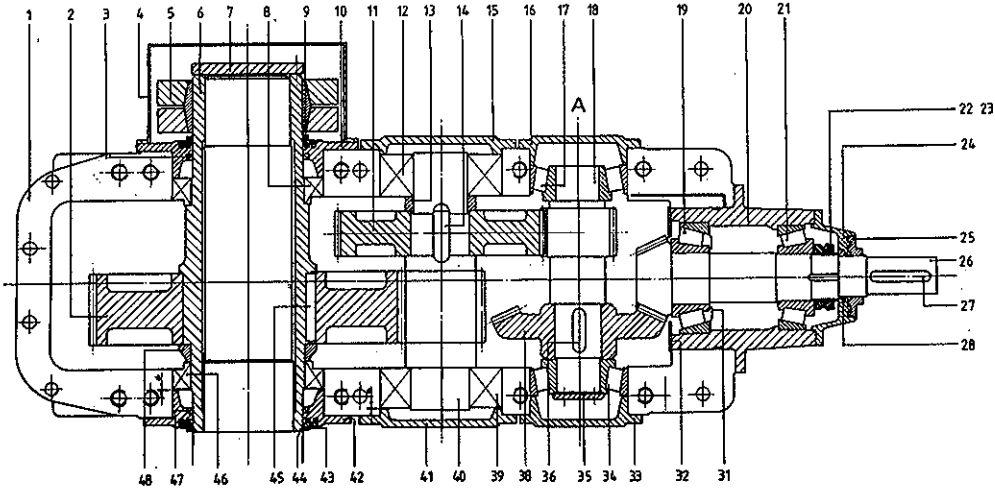
BTA GEARBOX RATIO 50/1 TO 80/1

- | | | | |
|----------------------------|------------------------|----------------------------|----------------------------|
| 1. GEARCASE | 15. BEARING | 29. BEARING COVER | 43. OIL SEAL |
| 2. GEARWHEEL, Output | 16. BEARING CARTRIDGE | 30. BEARING | 44. SPACER |
| 3. OUTPUT SHAFT | 17. BEARING | 31. KEEP PLATE | 45. ANCHOR PIN |
| 4. KEY | 18. LOCKWASHER | 32. KEY | 46. TORQUE ARM |
| 5. BEARING | 19. LOCKNUT | 33. SPACER | 47. SPRAG COVER |
| 6. BEARING COVER | 20. BEARING COVER | 34. BEVEL GEAR | 48. KEEP PLATE |
| 7. GEARWHEEL, 2nd Redn | 21. LABYRINTH | 35. BEARING | 49. KEY |
| 8. BEARING | 22. INPUT PINION SHAFT | 36. PINION SHAFT, 3rd Redn | 50. PINION SHAFT, 2nd Redn |
| 9. SPACER | 23. KEY | 37. BEARING COVER | 51. SPRAG HOLDBACK |
| 10. KEY | 24. OIL SEAL | 38. BEARING COVER | 52. LABYRINTH |
| 11. BEARING COVER | 25. WASHER | 39. LABYRINTH | 53. BEARING COVER |
| 12. BEARING COVER | 26. SPACER | 40. KEY | 54. OIL SEAL |
| 13. BEARING | 27. NILOS RING | 41. KEY | |
| 14. PINION SHAFT, 2nd Redn | 28. OIL SHIELD | 42. BEARING | |

When ordering spares the part numbers and the gearbox serial number must be stated.

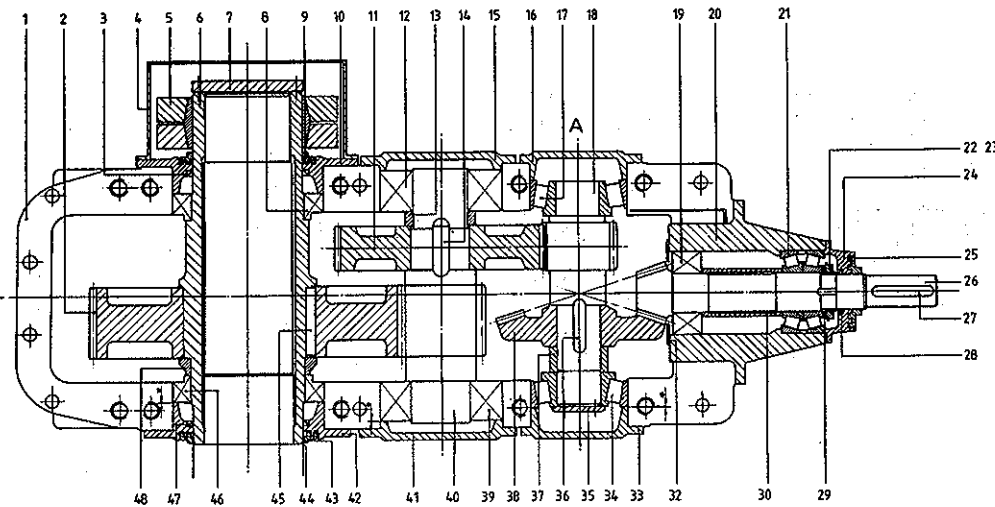


SPARE PARTS OF BTB GEARBOX



GEARBOX WITH HOLDBACK FITTED AT POSITION A

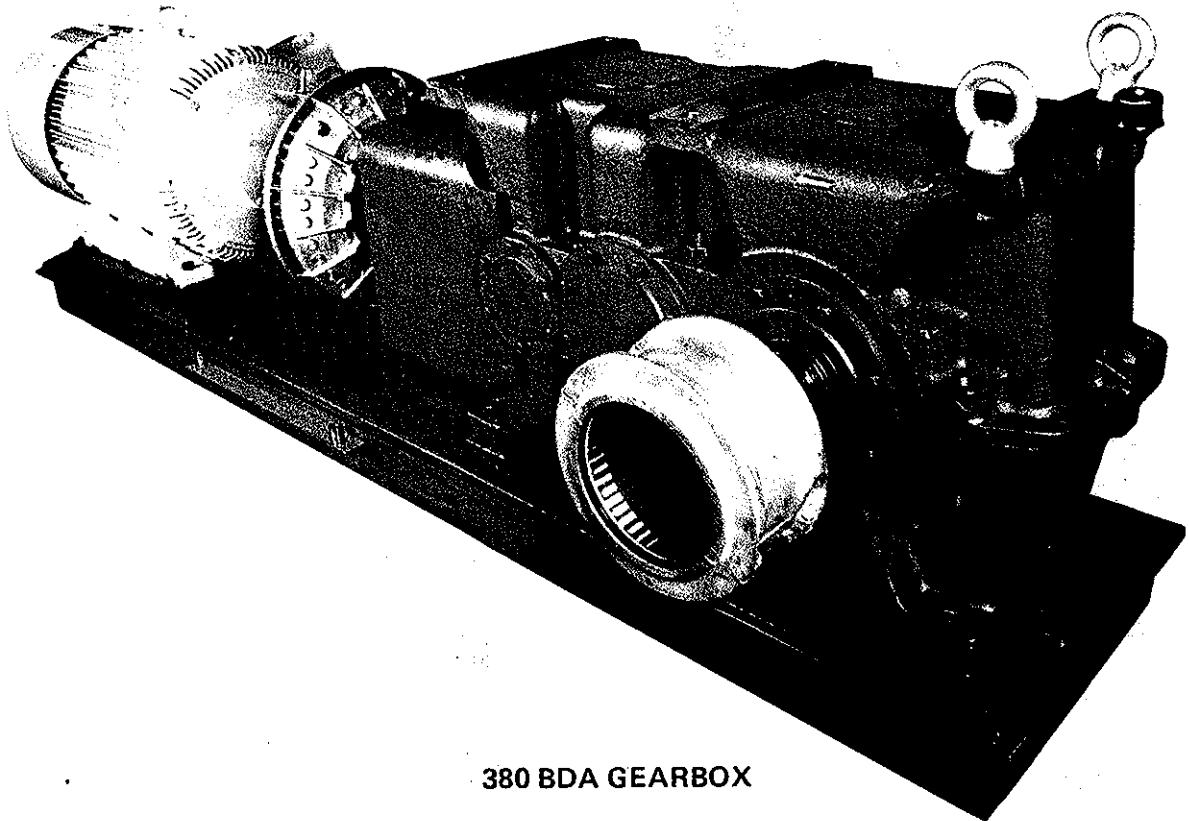
BTB GEARBOX RATIO 20/1 TO 45/1



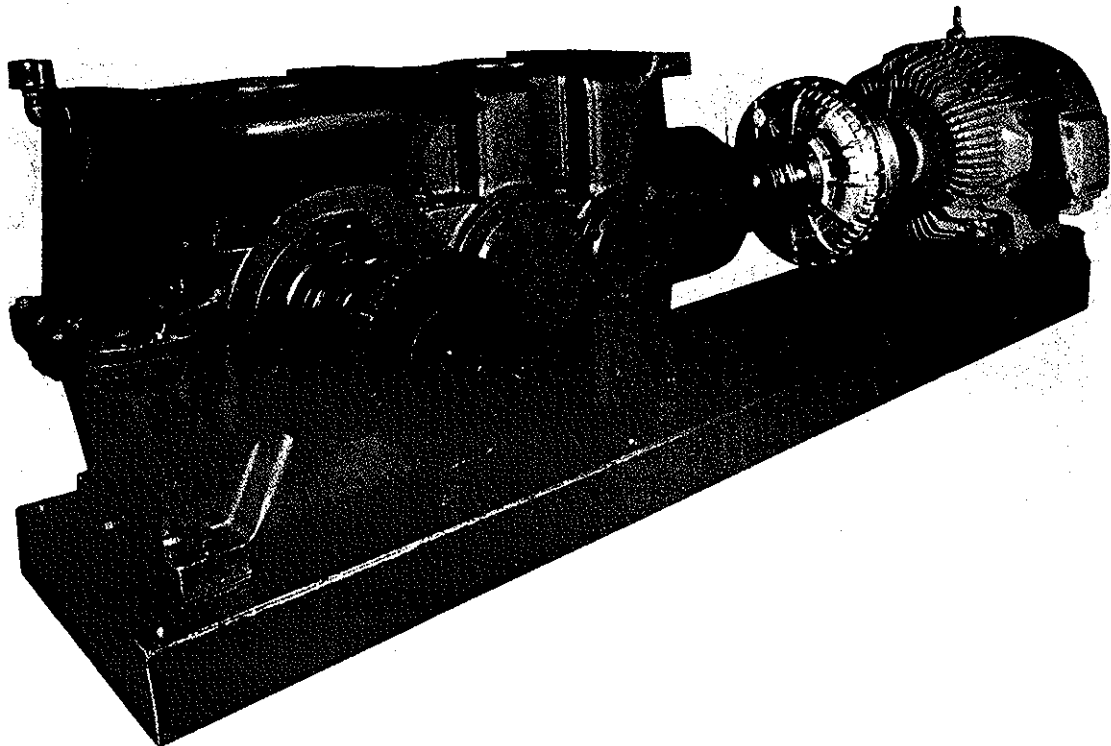
BTB GEARBOX RATIO 50/1 TO 80/1

- | | | | |
|-------------------------|-----------------------------|----------------------------|----------------------------|
| 1. GEARCASE | 16. BEARING COVER | 31. NILOS RING | 46. BEARING |
| 2. GEARWHEEL, Output | 17. BEARING | 32. OIL SHIELD | 47. OIL SEAL |
| 3. OIL SEAL | 18. PINION, SHAFT, 2nd Redn | 33. BEARING COVER | 48. SPACER |
| 4. COVER, Shrink disc | 19. BEARING | 34. BEARING | 49. ANCHOR PIN |
| 5. SHRINK DISC | 20. BEARING CARTRIDGE | 35. KEEP PLATE | 50. TORQUE ARM |
| 6. HUB, Output | 21. BEARING | 36. KEY | 51. SPRAG COVER |
| 7. KEEP PLATE | 22. LOCKWASHER | 37. SPACER | 52. KEEP PLATE |
| 8. BEARING | 23. LOCKNUT | 38. BEVEL GEAR | 53. KEY |
| 9. LABYRINTH | 24. BEARING COVER | 39. BEARING | 54. PINION SHAFT, 2nd Redn |
| 10. BEARING COVER | 25. LABYRINTH | 40. PINION SHAFT, 3rd Redn | 55. SPRAG HOLDBACK |
| 11. GEARWHEEL, 2nd Redn | 26. INPUT PINION SHAFT | 41. BEARING COVER | 56. LABYRINTH |
| 12. BEARING | 27. KEY | 42. BEARING COVER | 57. BEARING COVER |
| 13. SPACER | 28. OIL SEAL | 43. LABYRINTH | 58. OIL SEAL |
| 14. KEY | 29. WASHER | 44. 'O' RING | |
| 15. BEARING COVER | 30. SPACER | 45. KEY | |

When ordering spares the part numbers and the gearbox serial number must be stated.



380 BDA GEARBOX



380 BTA GEARBOX



FOR TECHNICAL INFORMATION CONTACT

BENONI ENGINEERING WORKS & STEEL FOUNDRY (PTY) LTD.

P.O. Box 5039 Benoni South 1502, Moore Avenue, Benoni.
Telephone 422-4430/35 Telex 4-212148

