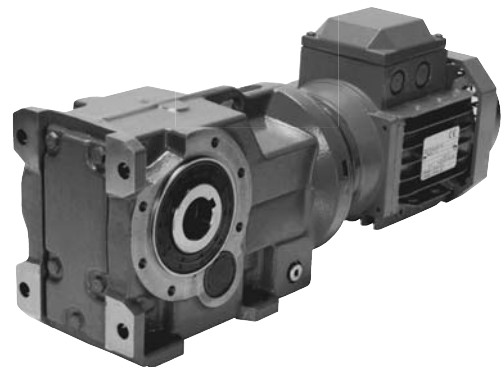
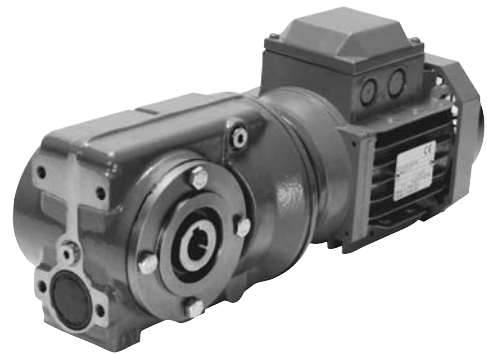
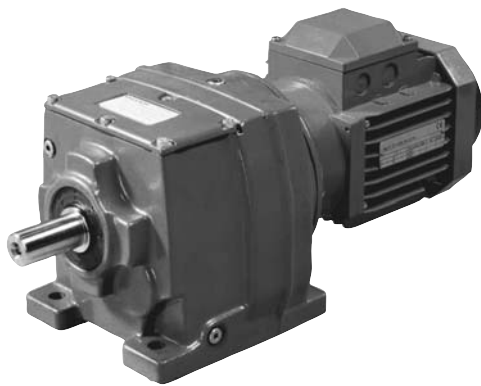


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Series M. C. F. K - Geared Motors
Kit Assembly Instructions



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ENG- 07-01-013 Rev.10

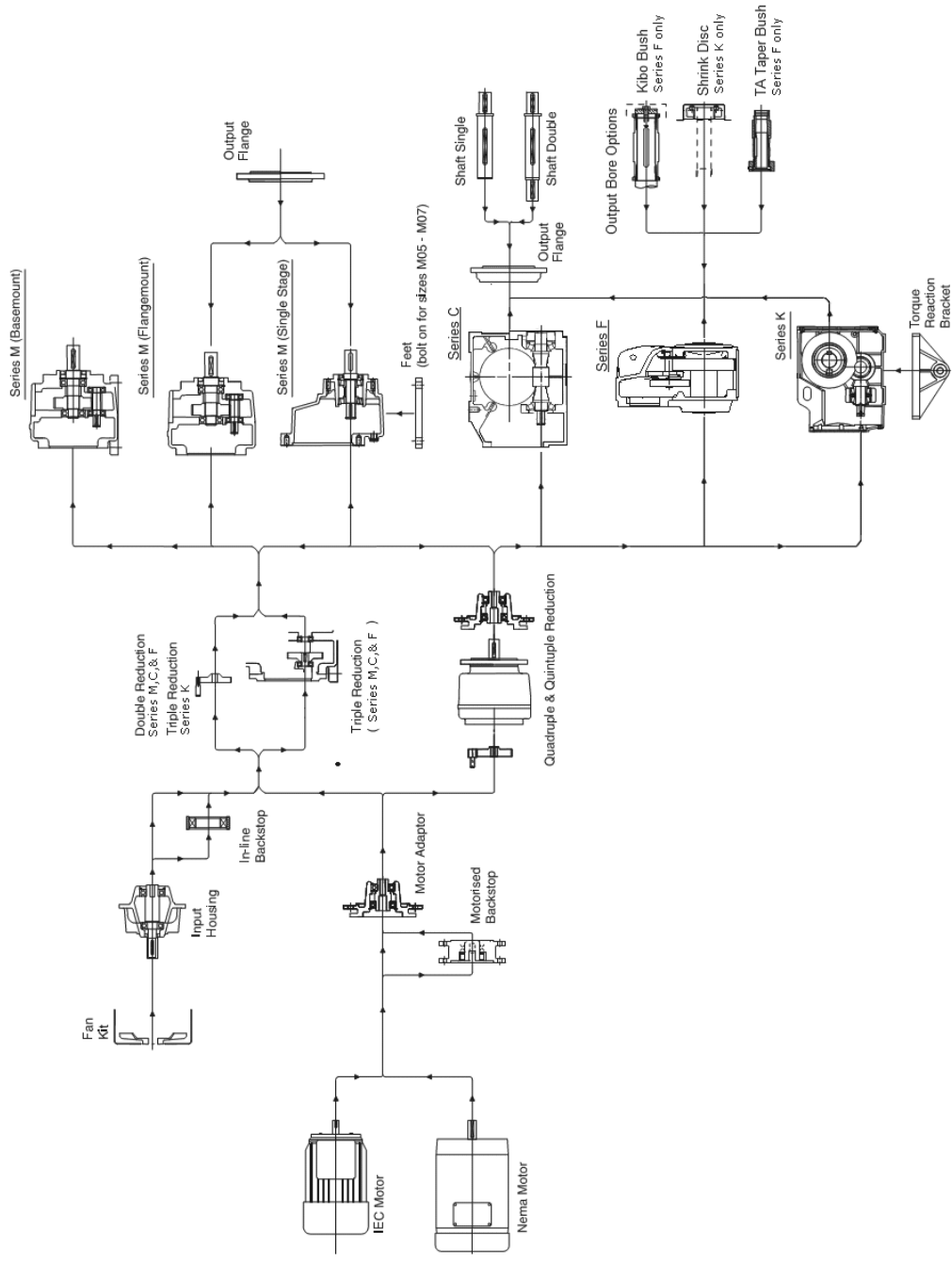
REVISION HISTORY

Issue.	Date	Details of change
1	April 2002	
2	May 2002	Lubrication & mounting positions added. Instructions for fitting oilseal to motor adaptors added
3	June 2002	Sealing method described in 7.3.12 revised.
4	July 2002	Notes on fitting loose pinion added for gear units up to & including size 8
5	Sept 2002	Additional oil level shown for sizes C07-10 mounting position W, X & Y
6	Oct 2002	Fastening method revised in 5.2 for M07 triple Fastening method revised in 6.7 for M07 triple
7	Dec 2002	Tooling numbers, ST000026 was 157137ST, ST000027 was added, ST000028 was 157101ST
8	Jan 2004	Tooling numbers added for fitting intermediate pinion shaft, Tooling number ST000144 was 161482ST, ST000145 was 161481ST, Gamma seal position was reversed
9	July 2007	General Update Series F(2) Added Belt and Disk Variators Removed Oil Fill Quantities Modified
10	Jan 2010	Tooling reduced for fitting of primary pinions into input adaptors Instructions for assembling F0832 added Lubrication notes updated

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KIT ASSEMBLY INSTRUCTIONS ENG-07-01-013



1. GENERAL NOTES

1.1. WORKING AREA

1.1.1. The working area to be kept clean at all times.

1.2. BEARINGS

1.2.1. Bearing mounting tackle to be kept scrupulously clean at all times.

1.2.2. Bearings to be unwrapped just prior to mounting.

1.2.3. Bearings may be cleaned using suitable solvent (e.g. Lowtox) but should be re-lubricated with Shell Ensis Engine Oil 30.

NOTE:- Shielded bearings must never be washed. Suspect shielded bearings to be placed in the material non-conformity area for investigation / disposal.

Bearings are supplied grease packed however should it require to grease pack a bearing i.e. in the case of a special lubricant being used, then the volume of grease used should be equal to 33% to 50% of the free volume space of the bearing.

1.2.4. Mounting of bearing to be carried out using designated tooling only.

NOTE:-On no account should they be struck directly with a hammer or drift.

1.3. PRESSING COMPONENTS

1.3.1. The force to press gears and/or bearings into position should be noted and compared to ensure that it is above the minimum specified. (Values given in the appropriate section).

1.4. HAND FITTING COMPONENTS

1.4.1. When fitting any component part and it fails to meet requirements i.e. keys cannot be tapped into keyways, wheel gears will not push onto shafts, they should be placed in the material non-conformity area for investigation / disposal.

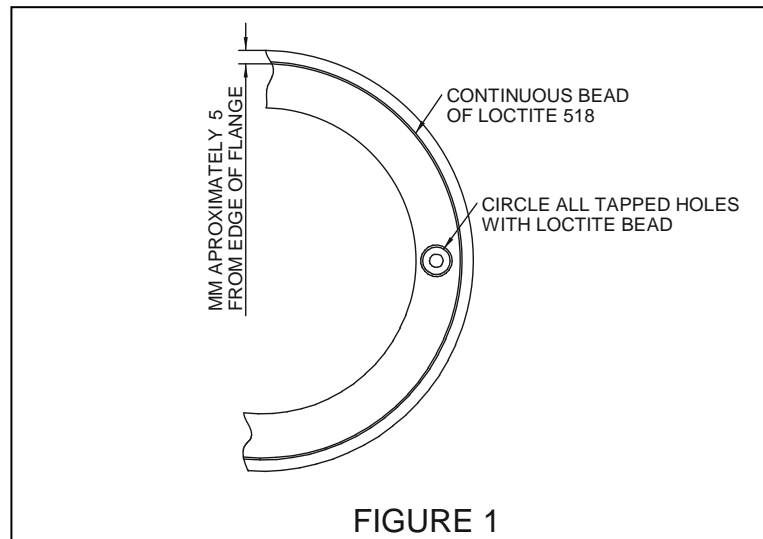
1.4.2. Rectification of component parts using files, hand grinders etc. is strictly forbidden. Such tools are to be excluded totally from the assembly area.

1.4.3. Care should be taken when fitting circlips to ensure that these are not over strained. NOTE:- Usage of hammers is restricted to the dead blow type (Nylon) for the fitting of oilseals using a guide and the tapping of keys into keyways.

1.5. SEALING

- 1.5.1. Liquid gasket material must be applied to clean faces. Any doubt then the face must be cleaned with a suitable solvent (Lowtox or Loctite 7063 Superclean).

The liquid gasket material must be applied to faces in an area outside of any possible leakage path in a continuous bead circlip the fastener holes (see Figure 1).



Copper washers should be inserted under the cap head screws on motor adaptors and when called for.

- 1.5.2. Oilseals should be fitted using the guides called for in the procedure and tapped into position using a dead blow type (Nylon) hammer.

1.6. LUBRICANT

- 1.6.1. Lubricant quantities for the mounting position requested must be strictly adhered to.

1.7. ALTERNATIVE MATERIALS

- 1.7.1. Throughout the following instructions the sealants, adhesives etc in current use at the time of writing are specified. However, alternative materials are available. See the approved suppliers list for further information.

1.8. PROTECTION

- 1.8.1. Reference must be made to Process Spec RP.05.02 for standard protection procedures for gear units, loose gears, and components for storage and/or dispatch.

1.9. TIGHTENING TORQUES

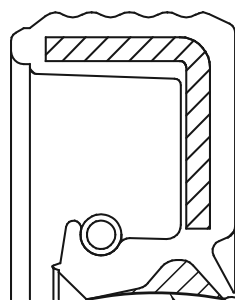
1.9.1. Unless stated otherwise, all fasteners must be tightened to the following torque values.

BOLT SIZE	TIGHTENING TORQUES	
	Nm	Lbs.ins
M6	10	90
M8	25	220
M10	50	440
M12	85	750
M16	200	1770
M20	350	3098

TIGHTENING TORQUES FOR DRAIN PLUGS	
PLUG SIZE	Specified Torque
M10	12 Nm
M12	20 Nm
M14	26 Nm
M16	34 Nm
M22	65 Nm

1.10. OIL SEAL FITTING

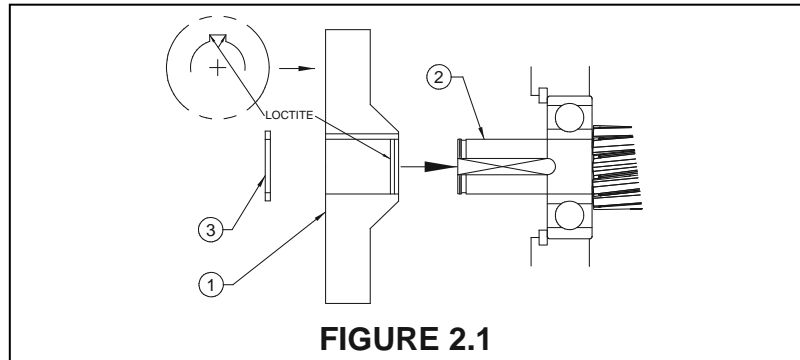
1.10.1. Oil seals must be lubricated with an approved high temperature grease (see lubrication catalogue). Particular attention must be made to lubricating the seal lip as detailed below.



FILL THIS AREA WITH
 HIGH TEMPERATURE GREASE

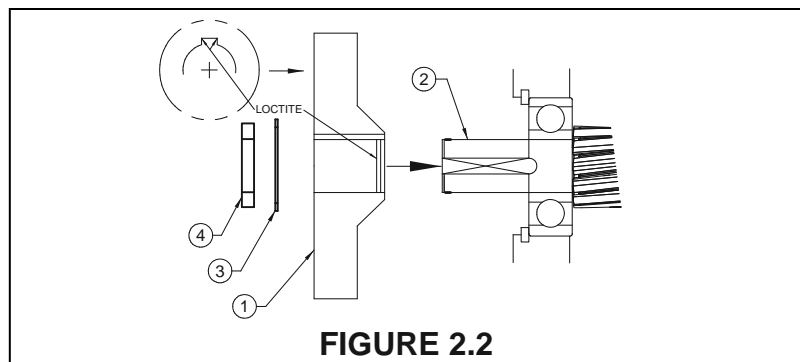
2. PRIMARY WHEEL FITTING (ALL UNITS)

2.1. For units with circlip:



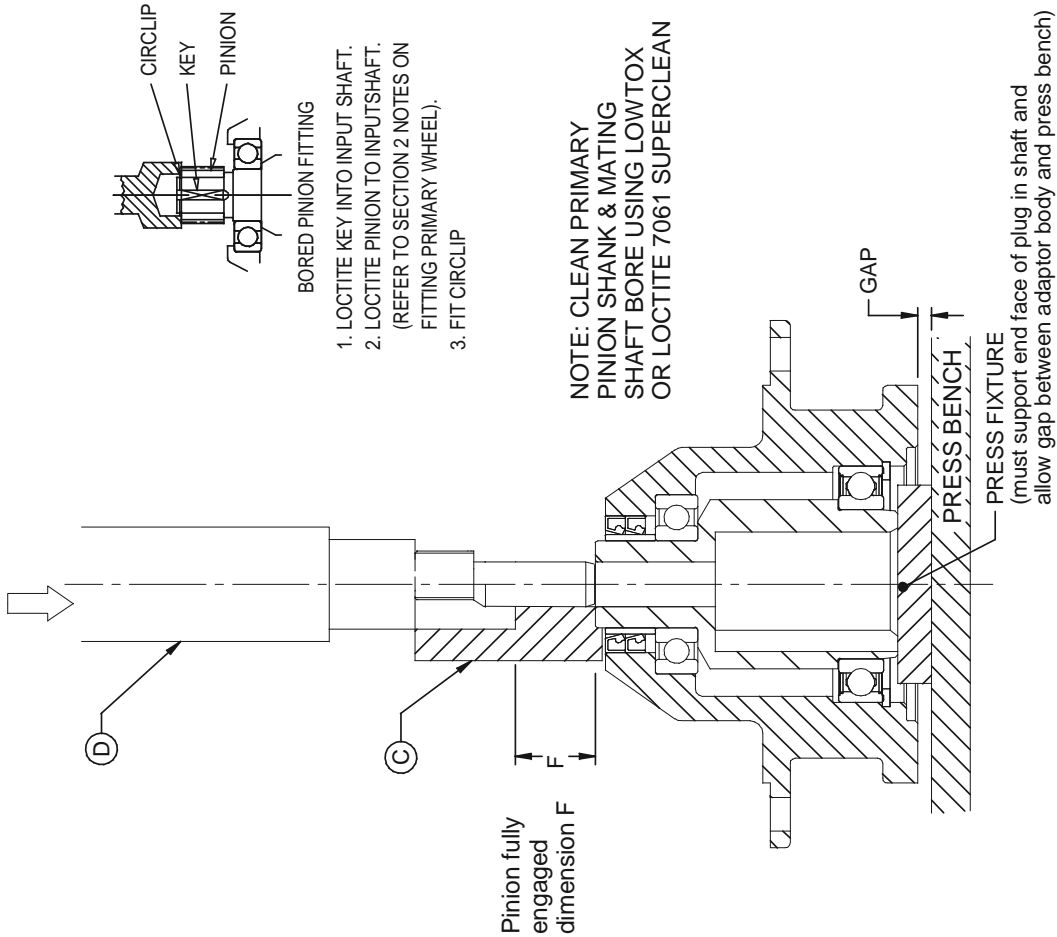
- 2.1.1. Clean the primary wheel bore (1) & mating shaft (2) thoroughly using Lowtox or Loctite 7063 superclean.
- 2.1.2. Apply Loctite 648 as shown in Figure 2.1 to the wheel bore (boss end) and to the keyway roots.
- 2.1.3. Fit wheel to shaft, and clean away any excess adhesive, then fit circlip (3). It is imperative that any excess Loctite is cleaned away, and not allowed to enter into the bearings etc.

2.2. For units with locknut:



- 2.2.1. Clean the primary wheel bore (1) & mating shaft (2) thoroughly using Lowtox or Loctite 7063 superclean.
- 2.2.2. Apply Loctite 648 as shown in Figure 2.2 to the wheel bore (boss end) and to the keyway roots, then fit wheel to shaft.
- 2.2.3. Clean away any excess adhesive then fit lockwasher (3) and locknut (4). It is imperative that any excess Loctite is cleaned away, and not allowed to enter into the bearings etc.
- 2.2.4. Anchor shaft to stop it rotating & tighten locknut (4) to torque value (140 Nm). Turn down lockwasher tab into locknut cut out.

3. PRIMARY PINION FITTING



IEC MOTORS and CONNECTING KITS

Motor Size	Adaptor Kit Number	Assembly Tooling	Dimension F		Min Press Up Force	
			mm	Inches		
63	M01F	S1000027	* 15/17	.59/67	1.1	
	M06V	-	24	0.94	1.7	
	M01G	M01H	S1000027	* 15/17	.59/67	1.1
	M06D	-	24	0.94	1.7	
71	CON01-03-10	CON01-03-10N	* 15/17	.59/67	1.1	
	M01B	M01K	S1000027	* 15/17	.59/67	1.1
	M01A	M01J	S1000027	* 15/17	.59/67	1.1
	M05G	-	157226ST	24	0.94	1.7
	M06F	-	157235ST	24	0.94	1.7
	M06W	-	157226ST	24	0.94	2.0
	M07F/1	M07G/1	-	29	1.14	2.6
	M08D	-	157226ST	36	1.42	2.6
80	CON03-05-15	CON03-05-15N	157226ST	24	0.94	1.7
	CON03-07-18	CON03-07-18N	-	29	1.14	2.6
	CON05-08-18	CON05-08-18N	-	36	1.42	2.6
	M01D	M01R	S1000027	* 15/17	.59/67	1.1
	M01C	M01Q	S1000027	* 15/17	.59/67	1.1
	M05J	M05H	157235ST	24	0.94	1.7
	M06Y	M06Z	157226ST	24	0.94	2.0
	M07H/1	M07J/1	-	29	1.14	2.6
90	M08E	-	36	1.42	2.6	
	M01E	M01S	S1000027	* 15/17	.59/67	1.1
	M05A	M05B	-	24	0.94	2.0
	M05K	M05L	161433ST	24	0.94	1.7
	M07A/1	M07B/1	Loose Pinion	-	-	-
	M07K/1	M07L/1	-	29	1.14	2.6
	M08A	-	Loose Pinion	-	-	-
	M08F	-	157226ST	36	1.42	2.6
100	M08V/1	-	24	0.94	2.0	
	M06P/1	-	157226ST	24	0.94	1.7
	M07C	M07D/1	Loose Pinion	-	-	-
	M07M	-	157225ST	29	1.14	2.6
	M07N	M07N/1	161434ST	29	1.14	2.6
	M08B	-	Loose Pinion	-	-	-
	M08G	-	157226ST	36	1.42	2.6
	M07E	-	Loose Pinion	-	-	-
132	M07P	-	36	1.42	2.6	
	M08C	-	-	-	-	
	M08H	-	157226ST	36	1.42	2.6
	M08I	-	157226ST	36	1.42	2.6

For Gear Units Up to & Including Size 8

* Dimension F dependant on primary gearing size: 36 Centres 15mm, and 47 Centres 17mm

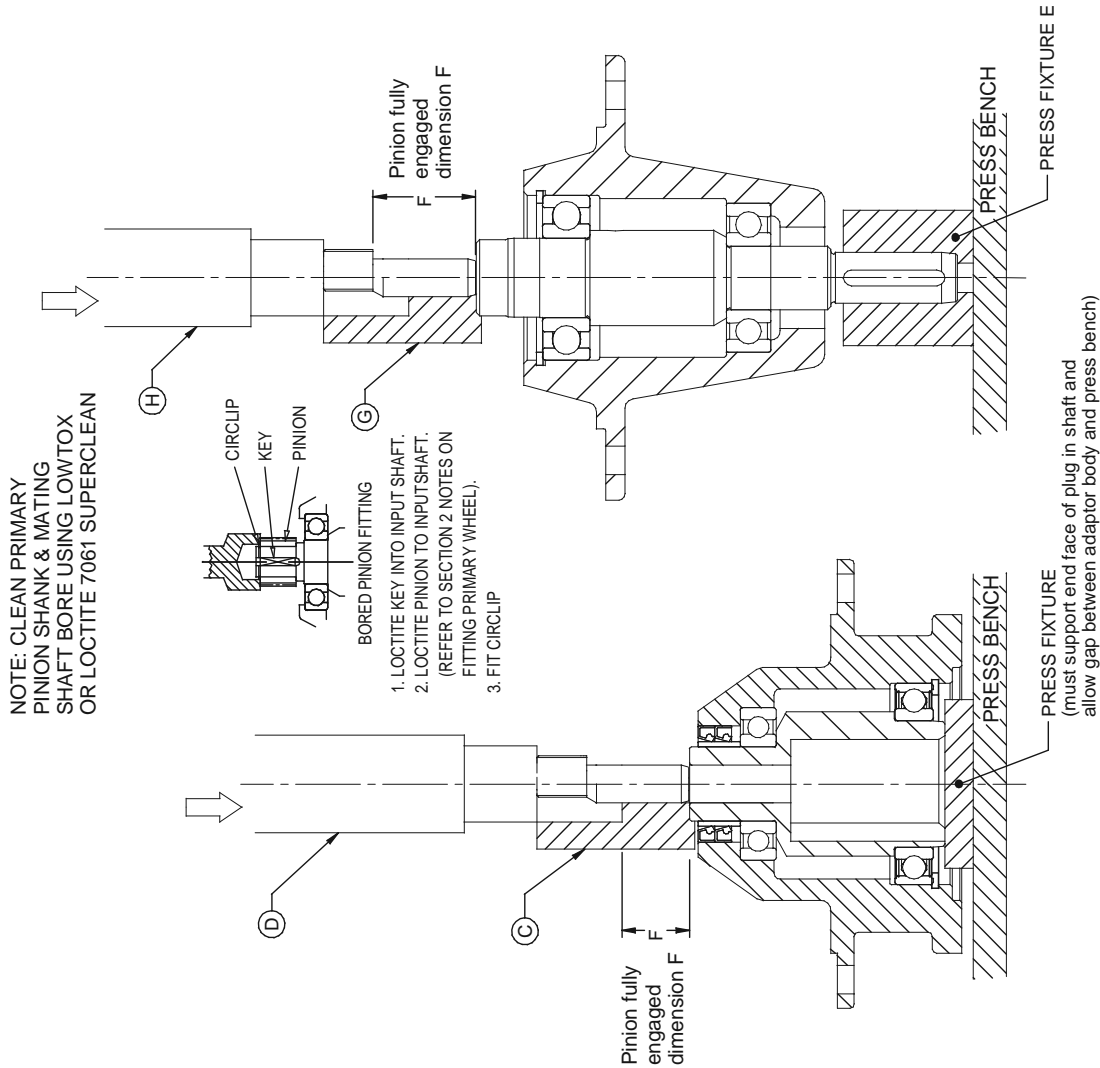
KIT ASSEMBLY INSTRUCTIONS ENG-07-01-013

NEMA MOTORS

Motor Size	Adaptor Kit Number	Assembly Tooling		Dimension F		Min Press Up Force	
		C	D	mm	Inches	Tonnes	Lbf
56C	M01T M01U	ST0000Z7	ST0000Z8	* 15 / 17	* .59 / .67	1.1	2426
	M05Q	157226ST	157228ST	29	0.94	1.7	3749
	M07Q1	157229ST	157226ST	29	1.14	2.6	5733
	M08M	157327ST	157226ST	36	1.42	2.6	5733
143/145TC	M01V M01W	ST0000Z7	ST0000Z8	* 15 / 17	* .59 / .67	1.1	2426
	M05R	157236ST	157228ST	24	0.94	1.7	3749
182/184TC	M07R1	-	157226ST	29	1.14	2.6	5733
	M08N	-	157226ST	36	1.42	2.6	5733
	M0304X/1	ST0000Z7	ST0000Z8	* 15 / 17	* .59 / .67	1.1	2426
	M05S	-	157226ST	24	0.94	2.0	4410
213/215TC	M05T	157227ST	157228ST	24	0.94	1.7	3749
	M07S/1	Loose Friction	-	-	-	-	-
254/256TC	M07T/1	157226ST	157226ST	29	1.14	2.6	5733
	M08J	Loose Friction	-	-	-	-	-
	M08P	157327ST	157226ST	36	1.42	2.6	5733
	M06U	157226ST	157226ST	24	0.94	2.0	4410
213/215TC	M07U/1	Loose Friction	-	-	-	-	-
	M07V/1	157226ST	157226ST	29	1.14	2.6	5733
254/256TC	M08K	Loose Friction	-	-	-	-	-
	M08Q	157327ST	157226ST	36	1.42	2.6	5733
256TC	M07W	Loose Friction	-	-	-	-	-
	M08L	Loose Friction	-	-	-	-	-
256TC	M08U	157327ST	157226ST	36	1.42	2.6	5733

INLINE HOUSINGS

Housing Kit Number	Assembly Tooling		Dimension F		Min Press Up Force	
	E	G H	mm	Inches	Tonnes	Lbf
M0122-T M0122-U	157136ST	-	* 15 / 17	* .59 / .67	1.1	2426
M0122-X M0122-Y	-	ST0000Z8	24	0.94	2.0	4410
M0522-T M0522-X	157276ST	-	157228ST	157228ST	1.7	3749
M0622-TB M0622-XB	-	-	-	-	-	-
M0622-U M0622-Y	157276ST	157236ST	24	0.94	1.7	3749
M0622-LB M0622-YB	-	-	-	-	-	-
M0720-T M0720-X	157276ST	Loose Friction	-	-	-	-
M0720-TB M0720-XB	-	-	-	-	-	-
M0720-U M0720-Y	157276ST	157245ST	29	1.14	2.6	5733
M0720-LB M0720-YB	-	-	-	-	-	-
M0820-T M0820-X	157146ST	Loose Friction	-	-	-	-
M0820-TB M0820-XB	-	-	-	-	-	-
M0820-U M0820-Y	157146ST	157327ST	36	1.42	2.6	5733
M0820-LB M0820-XB	-	-	-	-	-	-

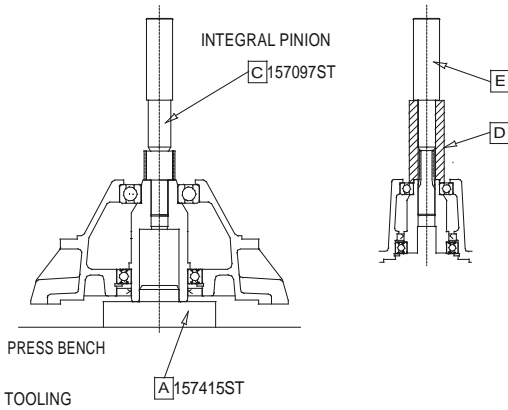


For Gear Units Up to & Including Size 8

* Dimension F dependant on primary gearing size: 36 Centres 15mm, and 47 Centres 17mm

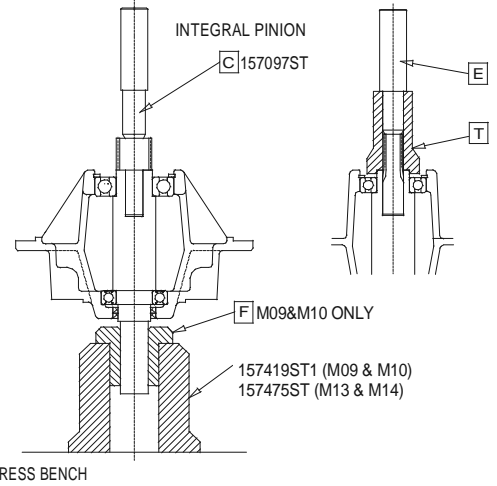
KIT ASSEMBLY INSTRUCTIONS ENG-07-01-013

MOTOR ADAPTOR



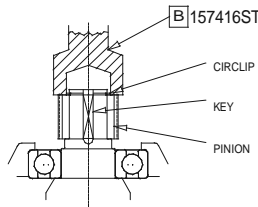
NOTE - CLEAN PRIMARY PINION SHANK & MATING SHAFT BORE USING LOWTOX OR LOCTITE 7061 SUPERCLEAN

INPUT HOUSING



IEC MOTORS

Kit No.	Assembly tooling		Min Press Up Force	
	Item D	Item E	Tonnes	Lb/ft
CON05-09-26 CON05-09-26N	157386ST	157364ST	4.0	8816
M93L M93M M93N	157385ST	157364ST	4.0	8816
M09E M09F M09G M09H	157386ST	157364ST	4.0	8816
M09J M09K M09L M09M	157417ST	157364ST	4.0	8816
CON07-10-26 CON07-10-26N	157386ST	157364ST	5.3	11681
M10E M10F	157386ST	157364ST	5.3	11681
M10G M10H M10J M10K	157417ST	157364ST	5.3	11681
ALL M13 KITS EXCEPT WITH LOOSE PINION	157471ST	N/A	8.1	17852
ALL M14 KITS EXCEPT WITH LOOSE PINION	157472ST	N/A	8.1	17852



BORED PINION FITTING

1. LOCTITE KEY INTO INPUT SHAFT.
2. LOCTITE PINION TO INPUTSHAFT. (REFER TO SECTION 2 NOTES ON FITTING PRIMARY WHEEL).
3. FIT CIRCLIP

THE FOLLOWING KITS USE THIS METHOD

M09A M09B M09C M09D
M10A M10B M10C M10D
M1320GA M1330GA M1320GB
M1330GB M1320GC M1330GC
M1320GD M1330GD M1320GE
M1330GE M1320GF M1330GF
M1420GA M1430GA M1420GB
M1430GB M1420GC M1430GC
M1420GD M1430GD M1420GE
M1430GE M1420GF M1430GF

TOOL F (NOT USED ON M13 & M14)	TO SUIT UNIT
157419ST2	M09 TRIPLE
157419ST3	M09 AM TR
157419ST4	M09 STD, M10 STD TR
157419ST5	M09 AM, M10 AM TR
157419ST6	M10 STD
157419ST7	M10 AM

INPUT HOUSING KIT
FITTING PRIMARY PINION

TOOLING

UNIT SIZE	T	E
M0920	157417ST	157364ST
M0930	157386ST	157364ST
M1020	157417ST	157364ST
M1030	157417ST	157364ST
M1320	157471ST	N/A
M1330	157471ST	N/A
M1420	157472ST	N/A
M1430	157472ST	N/A

MINIMUM PRESS FORCE (tonne)
(INTEGRAL PINION)

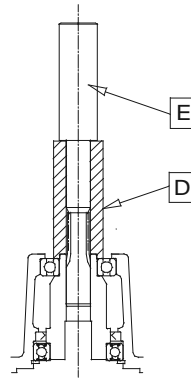
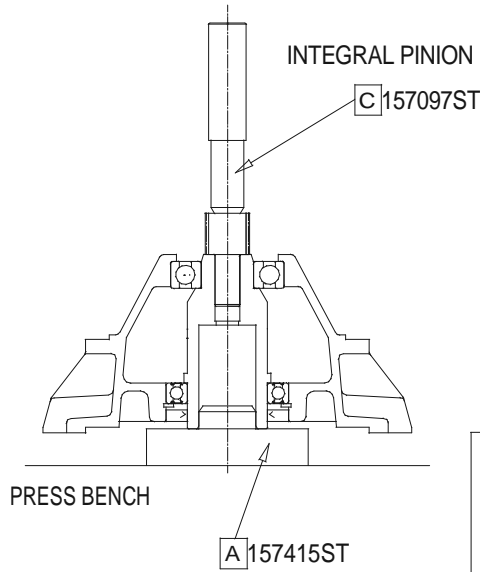
M09	M10	M13	M14
4.0	5.3	8.1	8.1

1 tonne = 2204.62 lbs

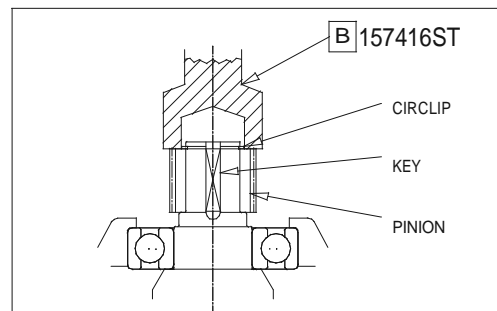
For Gear Units Size 9 & Above

KIT ASSEMBLY INSTRUCTIONS ENG-07-01-013

MOTOR ADAPTOR



NOTE - CLEAN PRIMARY PINION SHANK & MATING SHAFT BORE USING LOWTOX OR LOCTITE 7061 SUPERCLEAN



BORED PINION FITTING

1. LOCTITE KEY INTO INPUT SHAFT.
2. LOCTITE PINION TO INPUTSHAFT. (REFER TO SECTION 2 NOTES ON FITTING PRIMARY WHEEL).
3. FIT CIRCLIP

THE FOLLOWING KITS USE THIS METHOD

M09P	M09Q	M09R
M10L	M10M	M10N
M1320AF	M1330AF	M1320AG
M1330AG	M1320AH	M1330AH
M1320AJ	M1330AJ	M1320AK
M1330AK		
M1420AE	M1430AF	M1420AF
M1430AG	M1420AG	M1430AJ
M1420AJ	M1430AK	M1420AH
M1430AH		

NEMA MOTORS

Kit No.	Assembly tooling		Min Press Up Force	
	Item D	Item E	Tonnes	Lb/ft
M09X M09Y M09Z	157385ST	157364ST	4.0	8816
M09S M09T	157386ST	157364ST	4.0	8816
M10P M10Q	157386ST	157364ST	5.3	11681
M09U M09V M09W	157417ST	157364ST	4.0	8816
M10R M10S M10T	157417ST	157364ST	5.3	11681
ALL M13 KITS EXCEPT WITH LOOSE PINION	157471ST	NA	8.1	17852
ALL M14 KITS EXCEPT WITH LOOSE PINION	157472ST	NA	8.1	17852

For Gear Units Size 9 & Above

4. FITTING ELECTRIC MOTOR DRIVING KEY.

4.1. For motors using Nylon sleeve:

- 4.1.1. Ensure the key supplied with the motor is fitted correctly.
- 4.1.2. Spray motor shaft with Rocol DFSM prior to assembly.

4.2. For motors using Carbon Fibre Key:

- 4.2.1. Remove and discard the metal key provided with the motor.
- 4.2.2. Shorten the Carbon Fibre Key to maximum length to suit the motor keyway. (The discarded key can be used as a length measure).
- 4.2.3. Secure the Carbon Fibre Key in the motor shaft keyway using Loctite Prism 454.

5. FITTING MOTOR ADAPTOR / INPUT HSG. TO GEAR UNIT.

- 5.1. Apply liquid gasket material (Loctite 518) to the gearhead flange face as detailed in section 1.5.
- 5.2. Engage the primary pinion into the primary wheel, and then secure the adaptor / housing to the gearhead with the fasteners provided. For M0732 units use studs & nuts to secure the adaptor / housing to the unit. Torque tighten to the specified values.
- 5.3. Fit the motor adaptor flange (if supplied) to the motor adaptor and secure with the setscrews provided. Torque tighten to the specified values.

If motorized:

- 5.4. Spray plug-in shaft bore with Rocol DFSM.
- 5.5. Fit the electric motor to motor adaptor using fasteners provided. Torque tighten to the specified values.

BOLT SIZE	TIGHTENING TORQUES	
	Nm	Lbs.ins
M6	10	90
M8	25	220
M10	50	440
M12	85	750
M16	200	1770
M20	350	3098

6. ASSEMBLY OF M01-M07 and F02-F07 TRIPLE REDUCTION UNIT

TIGHTENING TORQUES FOR DRAIN PLUGS	
Size of Unit	Specified Torque
M04/M05/M06	15 Nm
M07	32 Nm

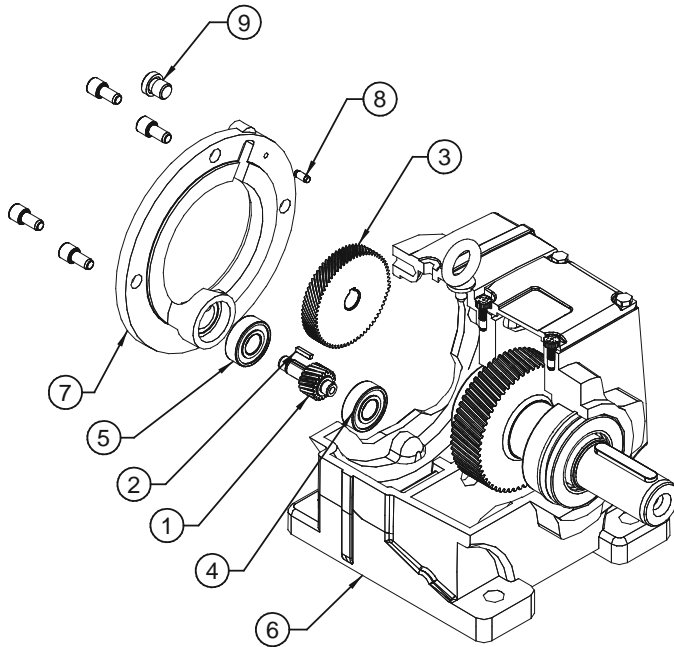


Fig 1

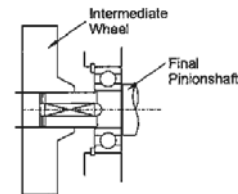
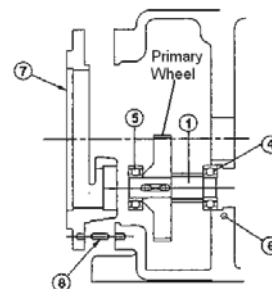
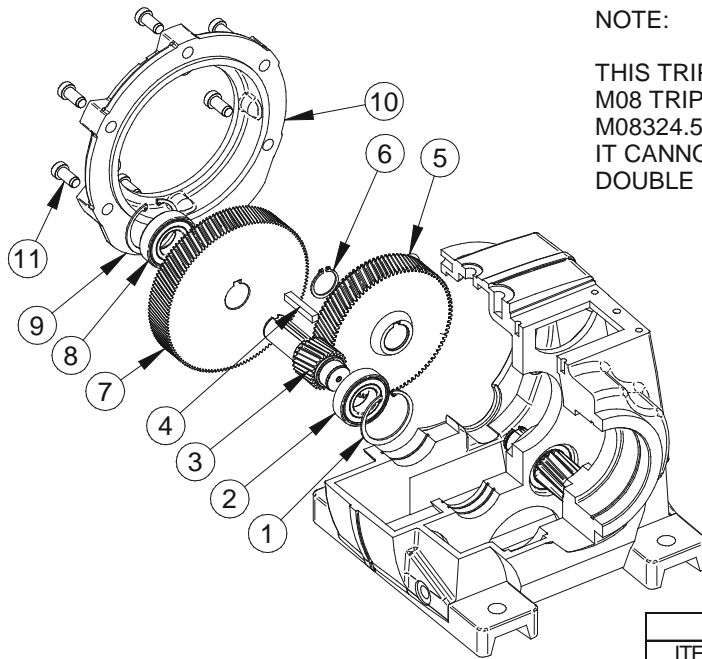


Fig 2



- 6.1. Fit the intermediate wheel (3) onto final pinionshaft (use Loctite 648 – see section 2 'Fitting Primary Wheel'). Slide wheel only partway on shaft (see Fig 1).
- 6.2. Apply Loctite 648 to roots of intermediate pinionshaft keyway (1) & fit key (2).
- 6.3. Press primary wheel and bearings (4&5) onto intermediate pinion shaft (1). (Ensure wheel is assembled with boss towards bearing. See Fig 2)
- 6.4. Fit intermediate pinion shaft, wheel and bearings assembly into housing (6). Carefully mesh pinion with intermediate wheel, rotate the wheel to line up bearing (4) with bore in housing (6). Carefully slide intermediate pinionshaft assembly and intermediate wheel into its working position. Wipe off excess Loctite from intermediate wheel and fit circlip to final pinionshaft.
- 6.5. IMPORTANT – fit dowel (8) into flange facing.
- 6.6. Apply liquid gasket (Loctite 518) to mating flange facings (see Fig 2). Align triple housing (7) bearing bore with bearing (5). Slide housing (7) into position. Check dowel (8) locates with hole in gearcase housing (6).
- 6.7. Secure to gear case housing (6) with fasteners provided and torque tighten. For M07 use studs & nuts to secure the motor adaptor/reducer housing to the unit.
- 6.8. M0432, M0532, M0632 & M0732 only: fit plug (9) or ventilator for mounting position 5.

7. ASSEMBLY OF M08 TRIPLE REDUCTION UNIT



NOTE:

THIS TRIPLE UNIT MUST BE BUILT FROM A M08 TRIPLE KIT. (KIT No's M08324.5F-C, M08324.5B-C, M08324.5F-N & M08324.5B-N) IT CANNOT BE BUILT BY CONVERTING A DOUBLE REDUCTION UNIT.

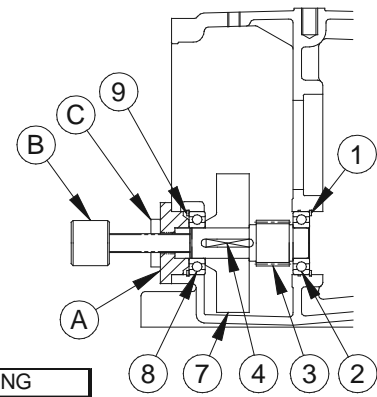


FIGURE 1

TOOLING	
ITEM	SIZE 08
A	ST000158
B	ST000156
C	ST000157

- 7.1.1. Clean the intermediate pinion shaft keyway (3) and key (4) using Lowtox or Loctite 7063 superclean and then apply adhesive (Loctite 648) to roots of intermediate pinionshaft keyway (3) & fit key (4). Clean away any excess adhesive.
- 7.1.2. Press bearing (2) onto intermediate pinion shaft (3), then slide this sub-assembly through the intermediate shaft bores into the output end of the gearcase.
- 7.1.3. Fit the intermediate wheel (5) on the final pinionshaft. (Use Loctite 648 – see section 2 'Fitting Primary Wheel') and secure with circlip (6).
- 7.1.4. Fit bearing (8) and circlip (9) into case bore, then secure thrust block (A) to gear case.
- 7.1.5. Position primary wheel (7) in gearcase. Screw jacking screw (B) into the intermediate pinion, then turn the jacking nut (C), to draw the intermediate pinion shaft sub assembly into position. Take care to align the primary wheel keyway with intermediate pinion shaft key (4) and also that the intermediate pinion and wheel 'mesh'. Rotate the intermediate wheel if necessary.
- 7.1.6. Fit circlip (1) into case bore to secure the intermediate pinion line.

7.2. OUTPUT SHAFT SUB-ASSEMBLY

7.2.1. Preheat bearing (6) in the bearing heater. **WARNING!** Bearings must not be heated above 100°C. If grease is seen weeping from the bearings, then they **must be discarded**.

7.2.2. Position the bearing (6) on the output shaft (3) when ready as shown in Figure 7.2 and leave to cool in position.

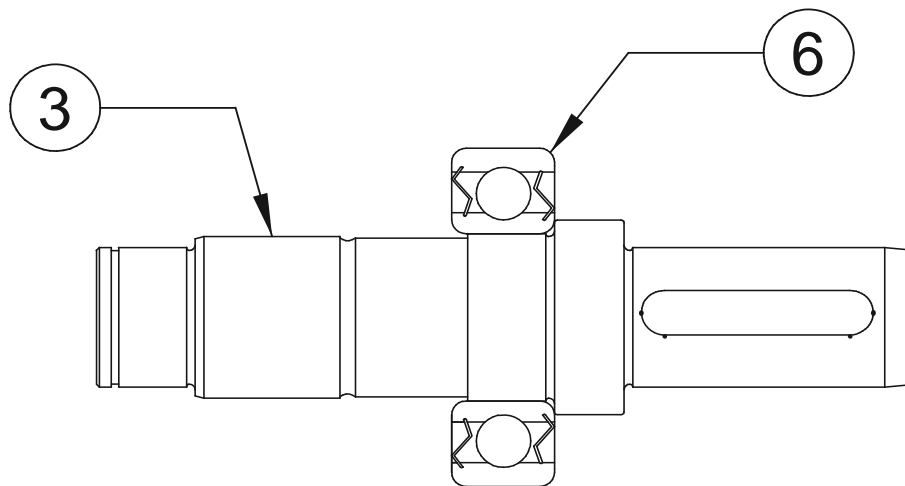


FIGURE 7.2

7.2.3. Ensure output shaft sub-assembly is put in a clean location until required.

7.3. ASSEMBLY OF OUTPUT SHAFT SUB-ASSEMBLY INTO THE GEAR UNIT

7.3.1. Attach the tooling listed in Figure 7.3B to the gearhead, and then lift gear unit and turn through 90° and place on the press so that the dummy shaft is pointing upwards (see Figure 7.3B).

7.3.2. Position bearing (12) in inner central housing (see Figure 7.3A).

NOTE:- Clean the final wheel bore (5) the mating portion of the output shaft (3) and dummy output shaft (A) using Lowtox or Loctite 7063 Superclean.

7.3.3. Post the final wheel (5) through the inspection cover opening, and carefully mesh with the final pinion shaft (10), see Figure 7.3A. Simultaneously introduce the dummy output shaft (A) through the output bore housing locating the final wheel and the inner bearing.

7.3.4. Carefully withdraw the dummy output shaft.

ITEM	SIZE 08
A (DUMMY OUTPUT SHAFT)	161347ST

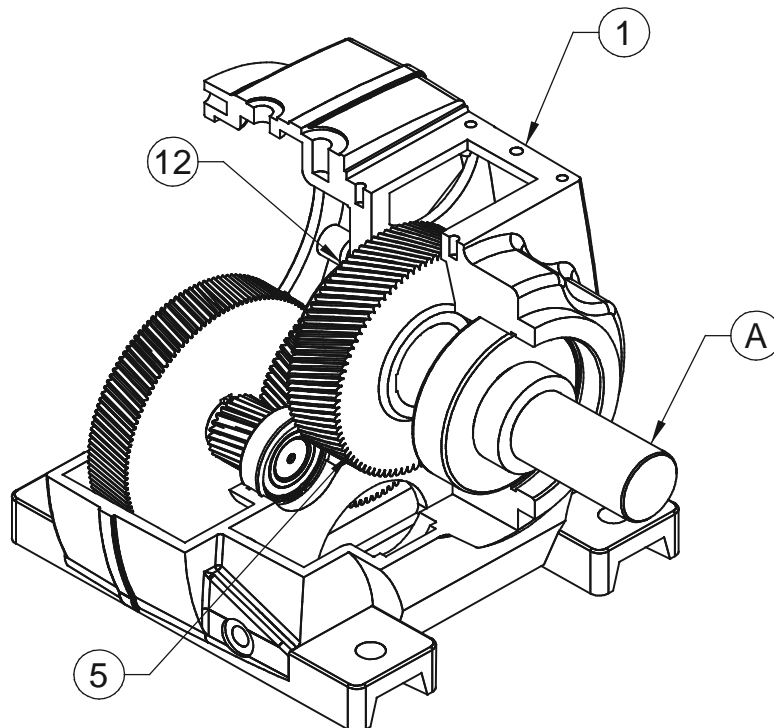


FIGURE 7.3A

7.3.5. Place distance piece (4) on the output shaft sub-assembly and also apply Loctite 645 adhesive to the root of output shaft keyway (18) and apply activator to key (18) and locate key in output shaft.

7.3.6. Place mounting dolly on the output shaft (3) and press into position through final wheel (5) and bearing (12).

NOTE:- Align shaft key (18) and wheel keyway prior to pressing.

ITEM	SIZE 08
A	ST000144
B	ST000145

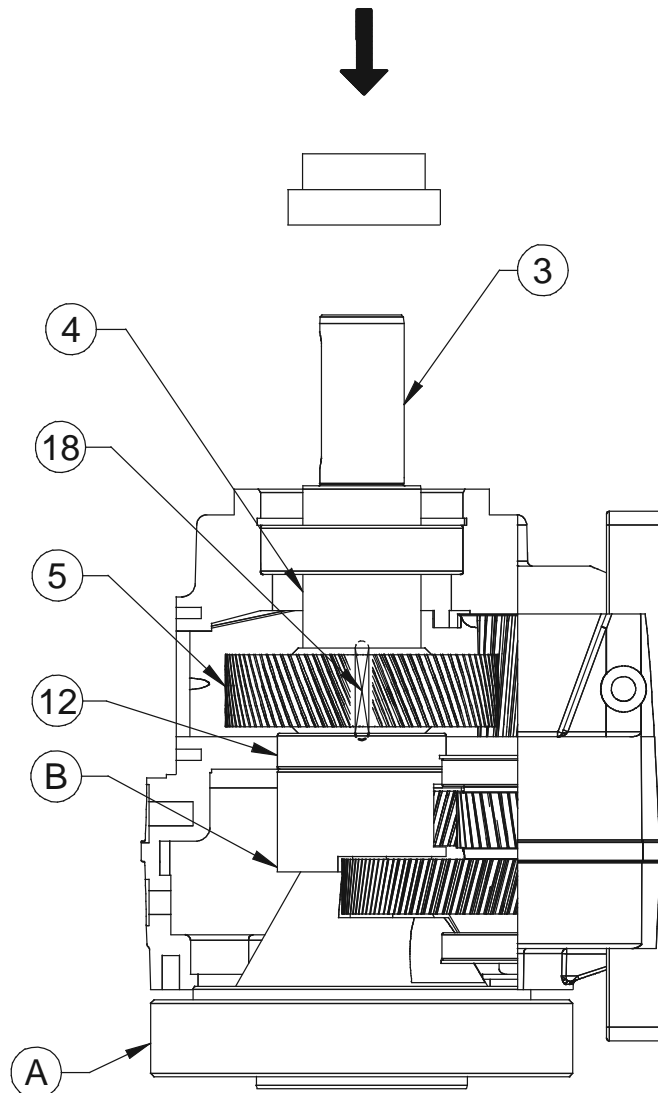


FIGURE 7.3B

7.3.7. Remove dolly and fit circlip (7) see figure 7.3C.

7.3.8. Remove gear unit from press fixture and with the unit horizontal fit circlip (13), see Figure 7.3C

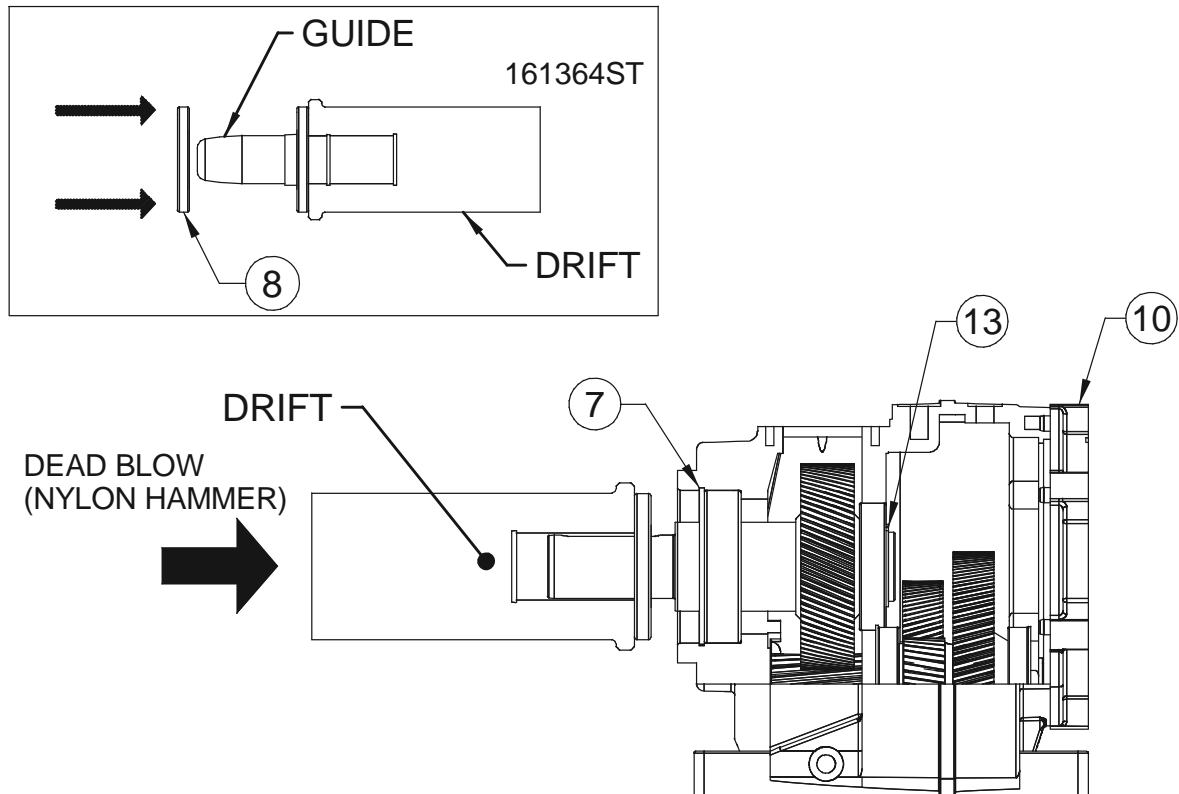


FIGURE 7.3C

7.3.9. Clean the mating faces of the triple housing (10) and the gearcase using Lowtox or Loctite 7063 Superclean. Apply liquid gasket Loctite 518 to mating flange faces. Fit triple housing (10) to gearcase and secure with fasteners provided and torque tighten.

7.3.10. Smear the inner lip of the oil seal with grease (Shell Albida R2 or other approved grease – see lubrication catalogue) and position the oil seal and the drift using the guide, see Figure 3.5C. Remove guide and fit oil seal, see Figure 9.0C.

NOTE:- Double oil seal arrangement may be required, check order details.

7.3.11. Tap output shaft extension key (16) into keyway.

7.3.12. Fit inspection cover to gear case. Seal with Loctite 518 and torque tighten fasteners (21) according to table in Figure 7.3D.

BOLT SIZE	TIGHTENING TORQUES	
	Nm	Lbs.ins
M6	10	90
M8	25	220
M10	50	440
M12	85	750
M16	200	1770
M20	350	3098
DRAIN PLUGS		
Size of Unit	Specified Torque	
M08	45 Nm	

FIGURE 7.3D

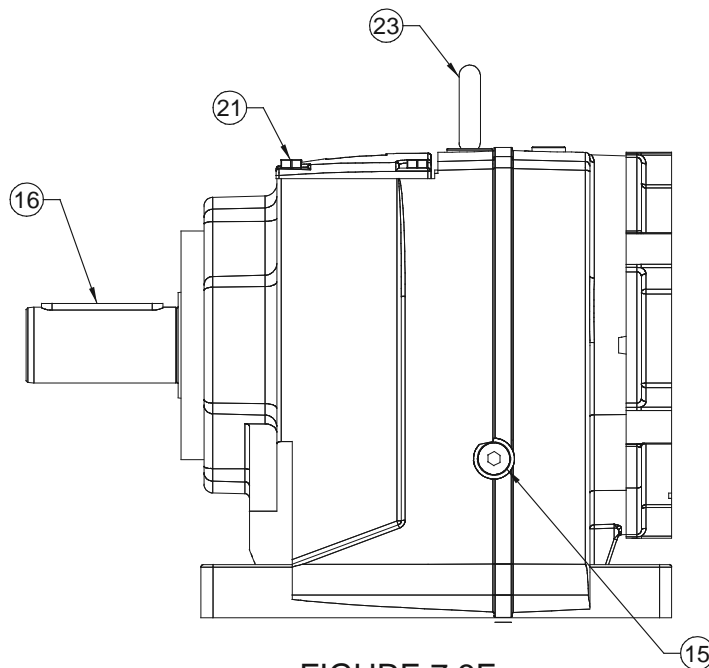


FIGURE 7.3E

7.3.13. Fit eye bolt (23) where applicable.

7.3.14. Fit drain plugs (15) in all positions and torque tighten drain plugs according to table in figure 7.3D

7.3.15. Secure adhesive pad (22) in recess.

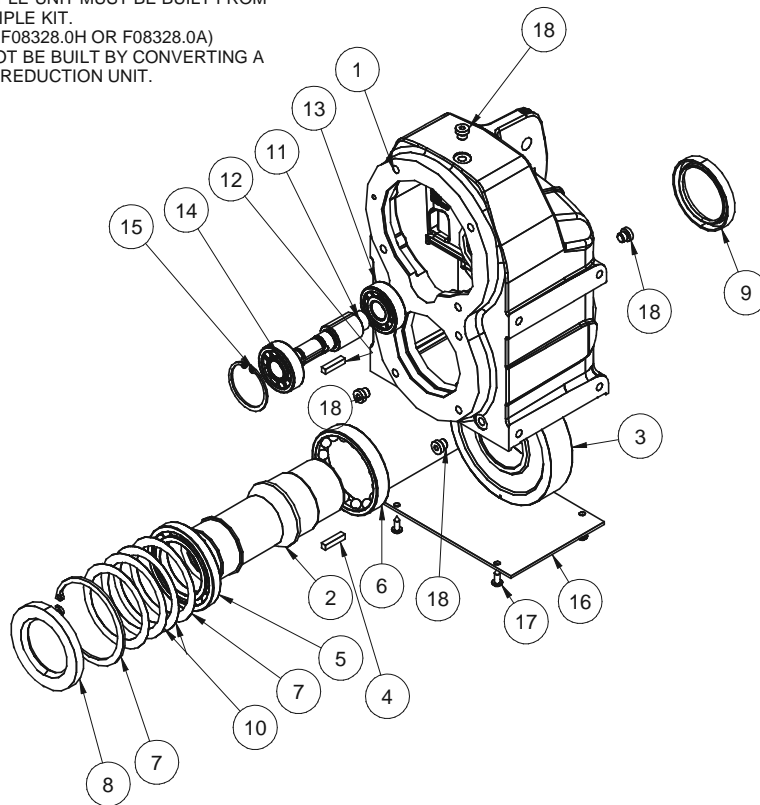
7.3.16. Periodically inspect to check that the axial shaft end floats of the gearhead are in accordance with the table below.

SIZE OF UNIT	FINAL PINION SHAFT END FLOAT	OUTPUT SHAFT END FLOAT
M08	0.08 / 0.7MM	0.08 / 0.4MM

7.3.17. The triple assembly is now complete.

8. ASSEMBLY OF F08 TRIPLE REDUCTION UNIT

NOTE:
THIS TRIPLE UNIT MUST BE BUILT FROM
A F08 TRIPLE KIT.
(KIT No's F08328.0H OR F08328.0A)
IT CANNOT BE BUILT BY CONVERTING A
DOUBLE REDUCTION UNIT.



Basic layout of unit (triple gearing not shown - see section 8.2 for arrangement)

8.1 FINAL PINION SHAFT SUB-ASSEMBLY

- 8.1.1. Press the inner rings of the bearings (13) and (14) onto the final pinion shaft (11)
Note shoulder end of bearing rings must be adjacent to the shaft shoulder (see figure 8.1)
- 8.1.2. Clean the final pinion shaft keyway (11) and key (12) using Lowtox or Loctite 7063 superclean and then apply adhesive (Loctite 648) to roots of final pinionshaft keyway (11) & fit key (12). Clean away any excess adhesive. Ensure the bearings run smoothly and clean off any excess adhesive.

Tooling	Fixture A	Dolly A
F0832	D00694-1	D00694-2

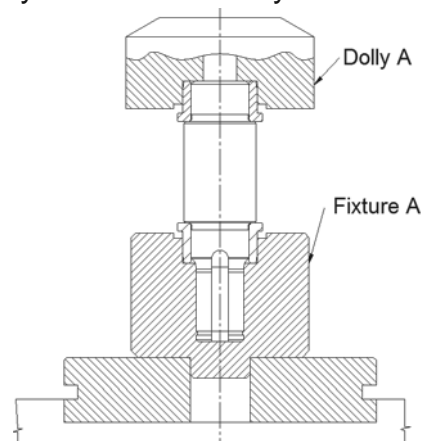


Figure 8.1

8.1.3. Fit the bearing outer ring (13) into the case lower bearing bore. Locate the final pinion shaft assembly (11) inner bearing into the outer ring (13) and then fit the top bearing outer ring (14) into the case. Secure the pinion shaft by means of circlip (15) (see figure 8.2).

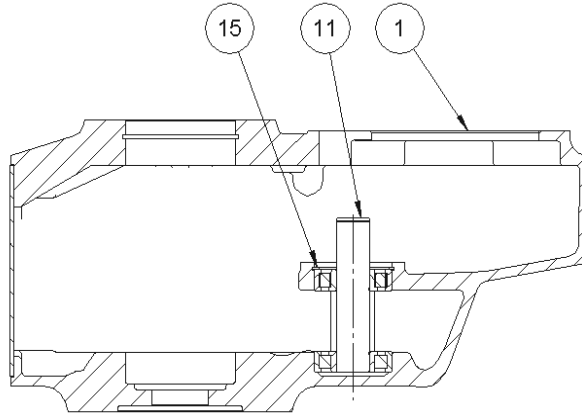


Figure 8.2

8.2. TRIPLE REDUCTION GEARING ASSEMBLY

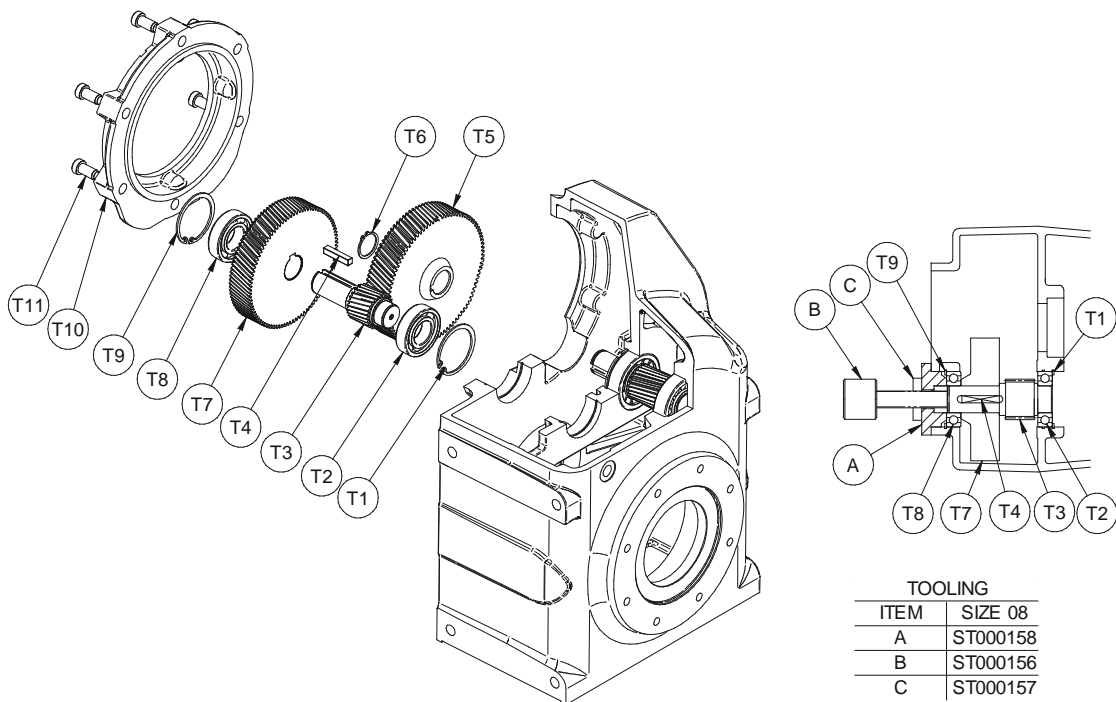


Figure 8.3

8.2.1. Clean the intermediate pinion shaft keyway (T3) and key (T4) using Lowtox or Loctite 7063 superclean and then apply adhesive (Loctite 648) to roots of intermediate pinionshaft keyway (T3) & fit key (T4). Clean away any excess adhesive.

- 8.2.2. Press bearing (T2) onto intermediate pinion shaft (T3), then slide this sub-assembly through the intermediate shaft bores into the output end of the gearcase.
- 8.2.3. Fit the intermediate wheel (T5) on the final pinionshaft. (Use Loctite 648 – see section 2 'Fitting Primary Wheel') and secure with circlip (T6).
- 8.2.4. Fit bearing (T8) and circlip (T9) into case bore, then secure thrust block (A) to gear case.
- 8.2.5. Position primary wheel (T7) in gearcase. Screw jacking screw (B) into the intermediate pinion, then turn the jacking nut (C), to draw the intermediate pinion shaft sub assembly into position. Take care to align the primary wheel keyway with intermediate pinion shaft key (T4) and also that the intermediate pinion and wheel 'mesh'. Rotate the intermediate wheel if necessary.
- 8.2.6. Fit circlip (T1) into case bore to secure the intermediate pinion line.

8.3. HOLLOW SHAFT ASSEMBLY

- 8.3.1. Clean the hollow shaft keyway (2) and key (4) using Lowtox or Loctite 7063 superclean and then apply adhesive (Loctite 648) to roots of hollow shaft keyway (2) & fit key (4). Clean away any excess adhesive.
- 8.3.2. Assemble the bearing (6) into position in gear housing.
- 8.3.3. Clean the gear wheel bore (3) with suitable approved solvent. Place the wheel (3) into the gear case with the groove on the wheel facing downwards, position the wheel so that it meshes with the pinion shaft (11) and the wheel bore aligns with the bearing bore (6)
- 8.3.4. Clean the gear wheel seating on the hollow shaft (2) with suitable approved solvent. Apply a thin band of Loctite 648 around the hollow shaft as shown on figure 8.4. Clean away any excess Loctite.

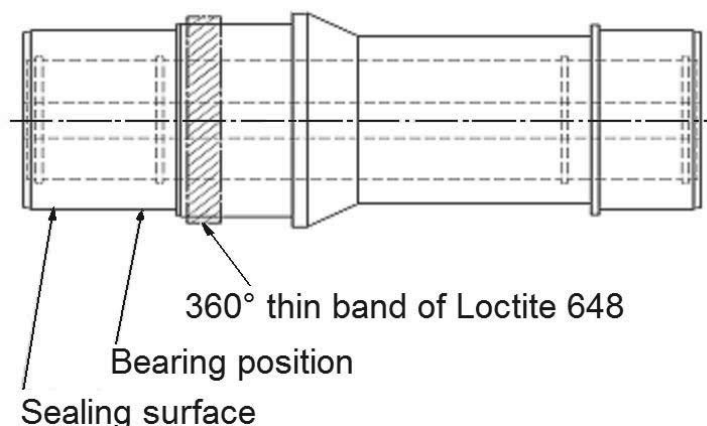


Figure 8.4
How to apply adhesive to the hollow shaft

- 8.3.5. Place the hollow shaft in position through the wheel. Ensure shaft key (4) is aligned with the keyway in the wheel. Avoid damage to, or any contact with the adhesive on the sealing surface.
- 8.3.6. Press the hollow shaft (2) into the gear wheel (3) and lower bearing (6) using the tooling shown in figure 8.5 (Dolly B).
- 8.3.7. Position the upper bearing inner ring (5) on to the hollow shaft (2).
- 8.3.8. Press upper bearing inner ring (5) into position using the tooling shown in figure 8.5 (Dolly C)
- 8.3.9. Place the bearing outer ring and support ring (10) into the bearing bore, rotate shaft to seat the bearings and secure with into the housing with circlip, (7)
- 8.3.10. Check and adjust axial clearance setting with shims as detailed in section 8.4

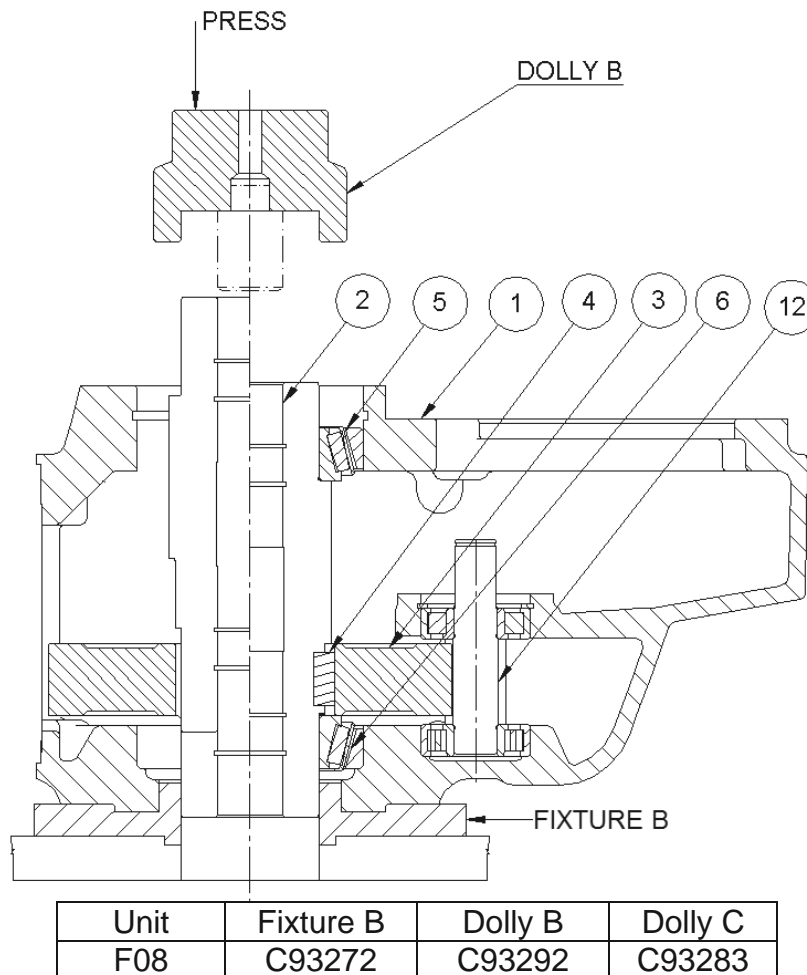


Figure 8.5

8.4. AXIAL CLEARANCE ADJUSTMENT

- 8.4.1. Place a dial gauge to the hollow shaft facing and set to zero (see figure 8.6)
 Lift the hollow shaft and note the axial play.
- 8.4.2. Remove the circlip (7) and support ring (10) Fit appropriate a shims between the bearing (5) and the support ring (10) to reduce the float to between: **0.03 and 0.06 mm.**
- 8.4.3. Refit the support ring and circlip. Re-Check the axial float, re-adjust if necessary.

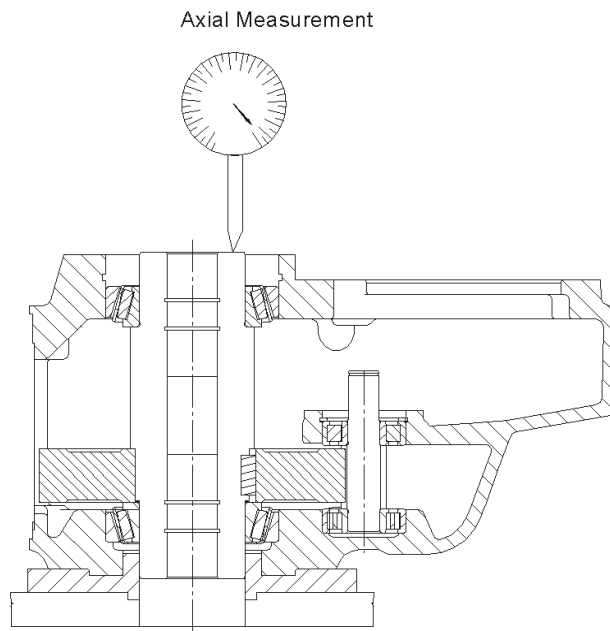


Figure 8.6

8.5. OIL SEAL ASSEMBLY (PRIMARY FLANGE SIDE)

- 8.5.1. Smear the seal ring lip (8) with bearing grease (Shell Albida R2 or equivalent).
 Fit the oil seal ring into the upper (primary flange) side of the housing using the seal assembly tooling as listed below:

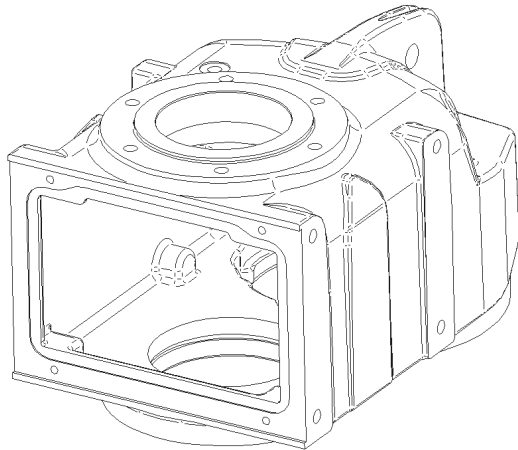
	Primary side (Motor side)			
Unit	Standard	Kibo	Inch	TA
F08	D00594	D00614	D00594	D00634

- 8.5.2. Position the bearing (6) on the output shaft (3) when ready as shown in Figure 7.2 and leave to cool in position.

8.6. BASE COVER / TRIPLE HOUSING ASSEMBLY

8.6.1. Clean the mating faces of the base cover plate (16) and the gearcase using Lowtox or Loctite 7063 Superclean. Apply Loctite 518 to the machined surface at the base of the unit.

8.6.2. Fit the base cover plate (16) secure with the cover fasteners (17) and torque tighten (see figure 8.7)



BOLT SIZE	TIGHTENING TORQUES	
	Nm	Lbs.ins
M6	10	90
M8	25	220
M10	50	440
M12	85	750
M16	200	1770
M20	350	3098
DRAIN PLUGS		
Size of Unit	Specified Torque	
F08	45 Nm	

FIGURE 8.7

8.6.3. Clean the mating faces of the triple housing (T10) and the gearcase using Lowtox or Loctite 7063 Superclean. Apply liquid gasket Loctite 518 to mating flange faces.

8.6.4. Fit triple housing (T10) to gearcase and secure with fasteners (T11) and torque tighten.

8.7. FINAL OILSEAL AND PLUG ASSEMBLY

8.7.1. Smear the seal ring lip (9) with bearing grease (Shell Albida R2 or equivalent). Fit the oil seal ring into the upper (primary flange) side of the housing using the seal assembly tooling as listed below:

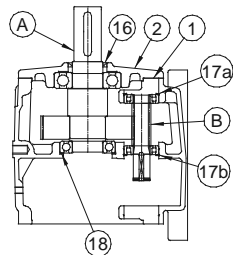
Unit	Secondary side (Machine side)			
	Standard	Kibo	Inch	TA
F08	D00604	D00624	D00604	D00644-1, -2

8.7.2. Fit all drain plugs (18) where applicable, and torque tighten, see figure 8.7; do not over tighten as this can damage the plug seal.

9. ASSEMBLY OF M09 & M10 TRIPLE REDUCTION UNIT

Follow the instructions shown to convert either a double reduction unit into a triple reduction unit, or to build a triple unit from a triple gearhead sub assembly.

- 1** REMOVE BEARING HOUSING (2) FROM GEARCASE.
REMOVE OUTPUT SHAFT ASSEMBLY (A). USE HOIST.
REMOVE SHIM (18)
- IF CONVERTING A DOUBLE TO A TRIPLE GEARHEAD:
REMOVE CIRCLIPS (17a) AND (17b)
REMOVE FINAL PINION SHAFT ASSEMBLY (B)
(BASEMOUNT UNIT ONLY, FLANGE MOUNT IS OK)



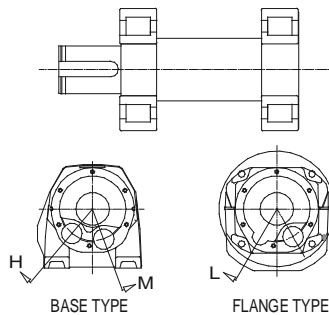
CLEAN GASKET FROM BEARING HOUSING FACE (2) & GEAR CASE FLANGE FACE (1). (USE LOCTITE 'CHISEL' GASKET REMOVER)

REMOVE OIL SEAL (16) FROM BEARING HOUSING (2)

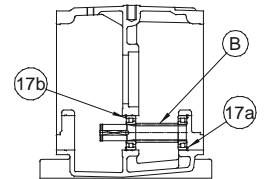
- 2** IF FINAL PINION SHAFT WAS REMOVED IN STEP 1 THEN:
FIT FINAL PINION SHAFT ASSEMBLY (B) INTO CASE BORE AS SHOWN.
(BASE MOUNT ONLY)

	FLANGE	BASE
DOUBLE	L	H
TRIPLE	L	M

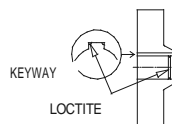
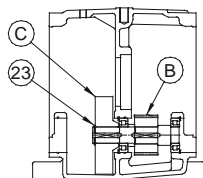
LOCATE WITH CIRCLIPS (17a & 17b)



NOTE:
ROLLER BEARINGS.
ENSURE THAT BEARINGS ARE ASSEMBLED CORRECTLY. (ie SHOULDER TO GEAR FACE)



- 3** CLEAN GEAR WHEEL BORE & MATING SHAFT END (USE LOWTOX, OR LOCTITE 7061 SUPERCLEAN).
APPLY BEAD OF LOCTITE 648 AS SHOWN (IN WHEEL BORE BOSS END & KEYWAY ROOTS)
FIT INTERMEDIATE WHEEL (C) TO FINAL PINION SHAFT (B)
WIPE OFF EXCESS LOCTITE, RETAIN WITH CIRCLIP (23)



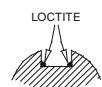
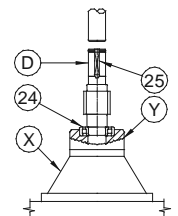
- 4** PRESS BEARING (24) ONTO INTERMEDIATE PINION SHAFT (D). LOCTITE KEY (25) INTO INTERMEDIATE PINION SHAFT (D).

TOOLING

UNIT	M09	M10
X	157336ST	157336ST
Y	157382ST	157383ST

KEY FITTING

CLEAN KEYWAY & KEY (LOWTOX, OR LOCTITE 7061 SUPERCLEAN).
APPLY ADHESIVE (LOCTITE 648) IN ROOT OF KEYWAY (USE PLENTY, MUST RUN UP SIDES OF KEY WHEN FITTED).
APPLY ACTIVATOR TO KEY
TAP THE KEY INTO THE KEYWAY (CLEAN OFF ANY EXCESS ADHESIVE).
CHECK FOR PROPER KEY SEATING WITH A DUMMY WHEEL.



Cont/

5

FIT BEARING (25) IN CASE BORE, BORE 'H' FOR BASE MOUNT OR BORE 'K' FOR FLANGE MOUNT.

FIT REACTION BUSH (P) & FIX TO CASE. (2 SCREWS)

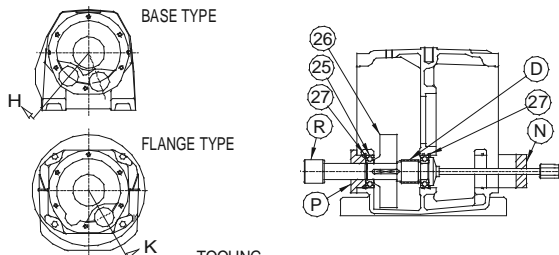
POSITION PRIMARY WHEEL (26), LOCATE WITH GUIDE SHAFT (R).

PASS INTERMEDIATE PINION SHAFT (D) THROUGH CASE BORE & LOCATE IN PRIMARY WHEEL. (ALIGN KEY WITH KEYWAY).

FIX THRUST BLOCK (N) TO CASE. (2 SCREWS)

TURN THRUST SCREW TO PRESS ASSEMBLY TOGETHER.

REMOVE TOOLS AND FIT CIRCLIPS (27)



TOOLING

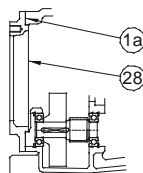
UNIT	M09	M10
P	157411ST	157413ST
N	157370ST	157378ST
R	157412ST	157414ST

6

APPLY LIQUID GASKET MATERIAL (LOCTITE 518) TO THE FLANGE OF THE GEARCASE (1a)

FIT THE TRIPLE ADAPTOR (28) AND SECURE TO UNIT WITH THE FASTENERS PROVIDED.

TORQUE TIGHTEN TO THE SPECIFIED VALUES.



TIGHTEN SCREWS TO :-

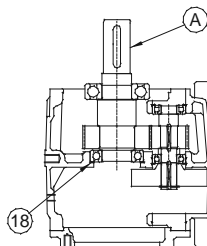
SCREW SIZE	TORQUE Nm	(LB.INS)
M10	50	(440)
M12	85	(750)
M16	200	(1770)

7

POSITION GEAR CASE IN VERTICAL ATTITUDE

FIT SHIM (18) INTO BEARING BORE.

LOWER OUTPUT SHAFT ASSEMBLY (A) INTO POSITION. (USE HOIST)

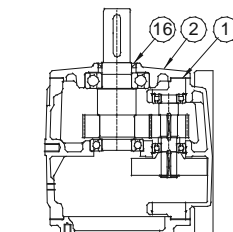


8

APPLY LIQUID GASKET MATERIAL (LOCTITE 518) TO THE FLANGE FACE OF THE GEARCASE (1)

FIT THE BEARING HOUSING (2) TO THE GEARCASE AND SECURE WITH THE FASTENERS PROVIDED.

TORQUE TIGHTEN TO THE SPECIFIED VALUES.



TIGHTEN SCREWS TO :-

SCREW SIZE	TORQUE Nm	(LB.INS)
M10	50	(440)
M12	85	(750)
M16	200	(1770)

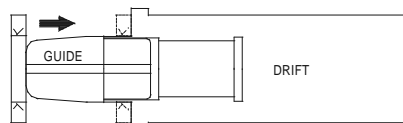
9

PACK OIL SEAL WITH GREASE (SHELL ALBIDA R2) OR APPROVED GREASE FROM LUBRICATION CATALOGUE

POSITION OIL SEAL ON THE DRIFT USING THE GUIDE:-

M09	M10
157392ST	157393ST

FIT OIL SEAL (16) USING DRIFT TOOL, INTO BEARING HOUSING (2)

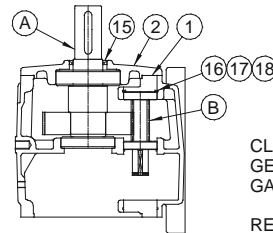


FOR DOUBLE OUTPUT SEALS REPEAT OPERATION

10. ASSEMBLY OF M13 & M14 TRIPLE REDUCTION UNIT

Follow the instructions shown to convert either a double reduction unit into a triple reduction unit, or to build a triple unit from a triple gearhead sub assembly.

- 1** REMOVE BEARING HOUSING (2) FROM GEARCASE.
 REMOVE OUTPUT SHAFT ASSEMBLY (A). USE HOIST.
 IF CONVERTING A DOUBLE TO A TRIPLE GEARHEAD:
 REMOVE CIRCLIP (16), SUPPORT WASHER (17) &
 SHIMS (18)
 REMOVE FINAL PINION SHAFT ASSEMBLY (B)
 (BASEMOUNT UNIT ONLY, FLANGE MOUNT IS OK)



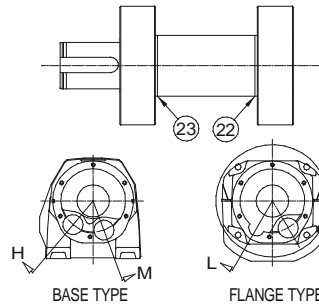
CLEAN GASKET FROM BEARING HOUSING FACE (2) &
 GEAR CASE FLANGE FACE (1). (USE LOCTITE 'CHISEL'
 GASKET REMOVER)

REMOVE OIL SEAL (15) FROM BEARING HOUSING (2)

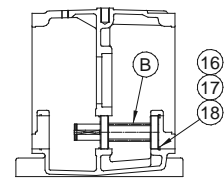
- 2** IF FINAL PINION SHAFT WAS REMOVED IN
 STEP 1 THEN:
 FIT FINAL PINION SHAFT ASSEMBLY (B)
 INTO CASE BORE AS SHOWN.
 (BASE MOUNT ONLY)

	FLANGE	BASE
DOUBLE	L	H
TRIPLE	L	M

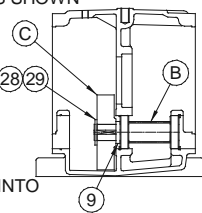
REFIT SHIMS SUPPORT WASHER
 AND CIRCLIP. (ITEMS (16), (17) & (18))



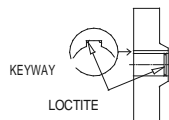
NOTE:
 5.6:1 RATIO M14 FINAL PINION.
 FIT SPACERS (22) & (23)
 BEFORE FITTING BEARINGS.



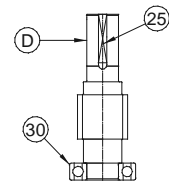
- 3** CLEAN GEAR WHEEL BORE & MATING
 SHAFT END (USE LOWTOX, OR LOCTITE
 7061 SUPERCLEAN).
 APPLY BEAD OF LOCTITE 648 AS SHOWN
 (IN WHEEL BORE BOSS END
 & KEYWAY ROOTS).
 FIT SPACER (9)
 FIT INTERMEDIATE WHEEL (C) (28/29)
 TO FINAL PINION SHAFT (B)
 WIPE OFF EXCESS LOCTITE,
 FIT TAB WASHER (28), THEN FIT
 LOCKNUT (29) AND TIGHTEN.
 TURN DOWN COUPLE OF TABS INTO
 NEAREST SLOT.



LOCKNUT TORQUE 140 Nm

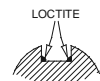


- 4** FIT BEARING (30) ONTO INTERMEDIATE PINION
 SHAFT (D) (USE BEARING HEATER).
 LOCTITE KEY (25) INTO INTERMEDIATE PINION
 SHAFT (D).



KEY FITTING

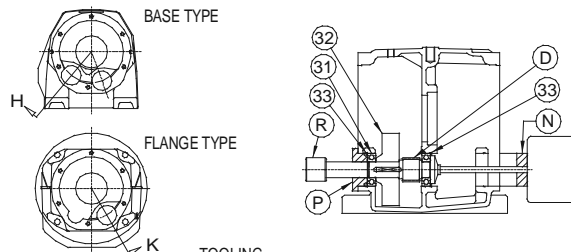
CLEAN KEYWAY & KEY (LOWTOX, OR
 LOCTITE 7061 SUPERCLEAN).
 APPLY ADHESIVE (LOCTITE 648) IN ROOT OF
 KEYWAY (USE PLENTY, MUST RUN UP SIDES
 OF KEY WHEN FITTED).
 APPLY ACTIVATOR TO KEY
 TAP THE KEY INTO THE KEYWAY (CLEAN OFF
 ANY EXCESS ADHESIVE).
 CHECK FOR PROPER KEY SEATING WITH A
 DUMMY WHEEL.



Cont/

5

FIT BEARING (31) IN CASE BORE, BORE 'H' FOR BASE MOUNT OR BORE 'K' FOR FLANGE MOUNT.
FIT REACTION BUSH (P) & FIX TO CASE. (2 SCREWS)
POSITION PRIMARY WHEEL (32), LOCATE WITH GUIDE SHAFT (R).
PASS INTERMEDIATE PINION SHAFT (D) THROUGH CASE BORE & LOCATE IN PRIMARY WHEEL. (ALIGN KEY WITH KEYWAY).
FIX THRUST BLOCK (N) TO CASE. (2 SCREWS)
WITH HYDRAULIC CYLINDER & HAND PUMP PUSH SHAFT (D) THROUGH WHEEL (32).
REMOVE TOOLS AND FIT CIRCLIPS (33)

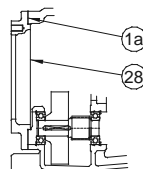


TOOLING

UNIT	M13	M14
P	157489ST	157492ST
N	157488ST	157491ST
R	157490ST	157493ST

6

APPLY LIQUID GASKET MATERIAL (LOCTITE 518) TO THE FLANGE OF THE GEARCASE (1a)
FIT THE TRIPLE ADAPTOR (28) AND SECURE TO UNIT WITH THE FASTENERS PROVIDED.
TORQUE TIGHTEN TO THE SPECIFIED VALUES.

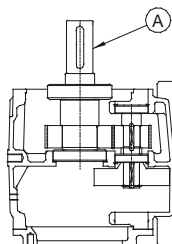


TIGHTEN SCREWS TO :-

SCREW SIZE	TORQUE Nm	(LB.INS)
M10	50	(440)
M12	85	(750)
M16	200	(1770)
M20	350	(3098)

7

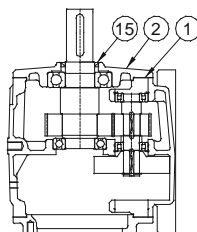
POSITION GEAR CASE IN VERTICAL ATTITUDE
LOWER OUTPUT SHAFT ASSEMBLY (A) INTO POSITION. (USE HOIST)



8

APPLY LIQUID GASKET MATERIAL (LOCTITE 518) TO THE FLANGE FACE OF THE GEARCASE (1)
FIT THE BEARING HOUSING (2) TO THE GEARCASE AND SECURE WITH THE FASTENERS PROVIDED.
TORQUE TIGHTEN TO THE SPECIFIED VALUES.
CHECK ENDFLOAT.

ENDFLOAT 0.16/0.21mm (0.006"/0.008")



TIGHTEN SCREWS TO :-

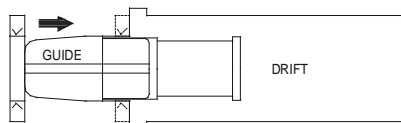
SCREW SIZE	TORQUE Nm	(LB.INS)
M10	50	(440)
M12	85	(750)
M16	200	(1770)
M20	350	(3098)

9

PACK OIL SEAL WITH GREASE (SHELL ALBIDA R2) OR APPROVED GREASE FROM LUBRICATION CATALOGUE
POSITION OIL SEAL ON THE DRIFT USING THE GUIDE:-

M13	M14
157468ST	157469ST

FIT OIL SEAL (15) USING DRIFT TOOL, INTO BEARING HOUSING (2)



FOR DOUBLE OUTPUT SEALS REPEAT OPERATION

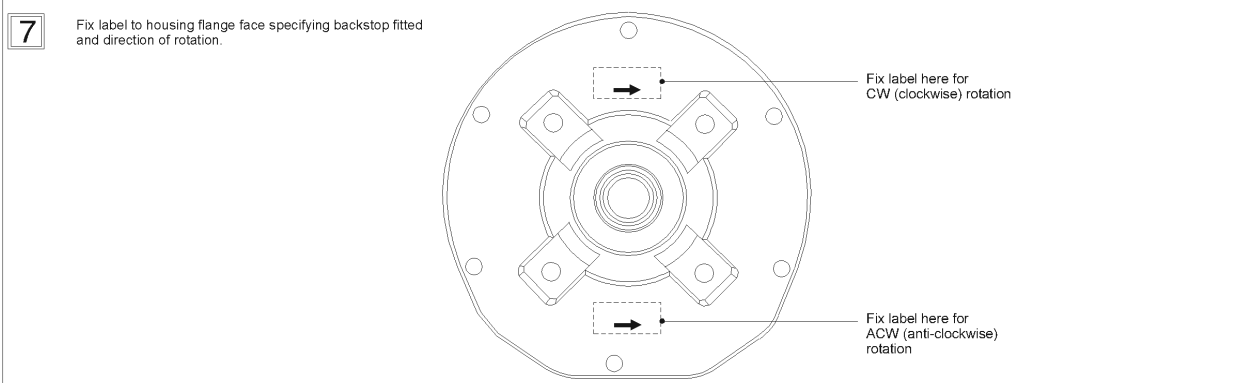
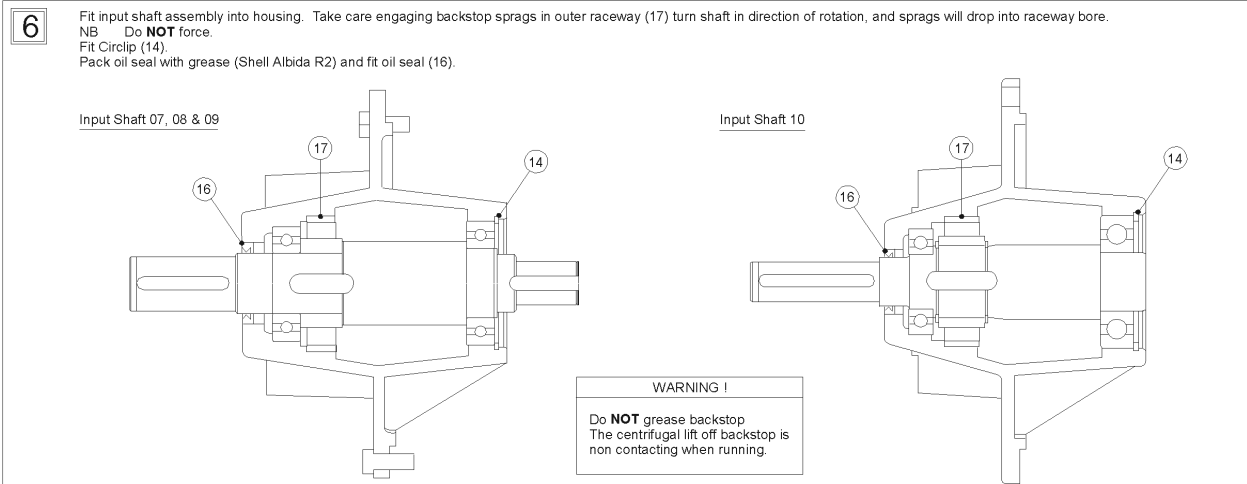
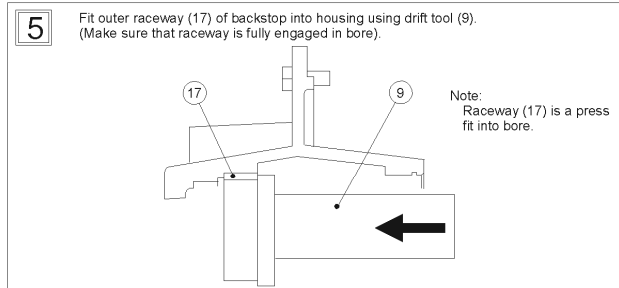
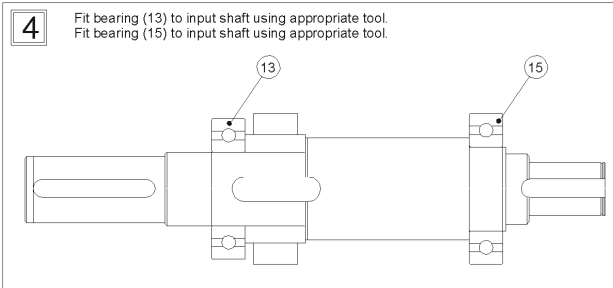
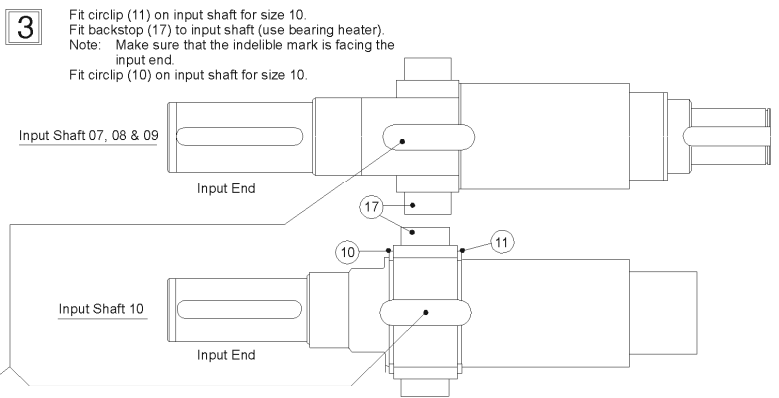
11. ASSEMBLY OF INLINE REDUCER HOUSING FITTED WITH BACKSTOP.

Follow the instructions shown to assemble an inline reducer housing with backstop, for gearunits up to and including size 10.

1 Preparation - Check Backstop Free Wheel Direction Pre Fitting
 a) Hold backstop outer raceway in one hand facing you and turn inner raceway in direction of rotation of input shaft.
 b) If inner raceway rotates freely put indelible mark on face facing you (ie this face must face towards input when fitted).
 c) If inner raceway will not rotate, turn backstop so that opposite end is now facing you. Repeat a) and b).
 d) Remove outer raceway for separate fitting into housing.

2 INPUT SHAFT BACKSTOP KEY
 Fit backstop key to input shaft:
 1) Clean keyway and key (Lowtox or Loctite 7061).
 2) Apply adhesive (Loctite 648) in root of keyway.
 3) Apply activator to key.
 4) Tap the key into the keyway (clean off any excess adhesive).

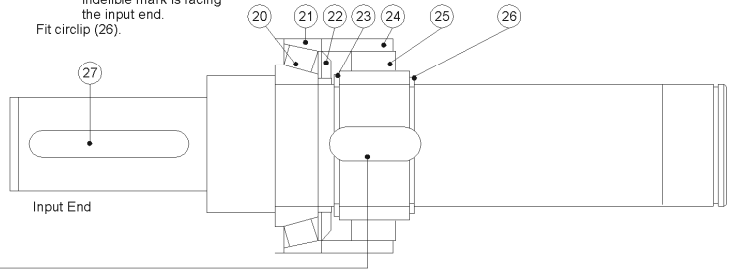
Loctite
 Note: Use plenty, it must run up sides of key when fitted. Ensure Loctite does not get into bearing.



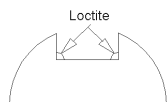
Follow the instructions shown to assemble an inline reducer housing with backstop, for gearunits from size 12 to size 14.

1 Preparation:- Check Backstop Free Wheel Direction Pre Fitting
 a) Hold backstop outer raceway in one hand facing you and turn inner raceway in direction of rotation of input shaft.
 b) If inner race way rotates freely put indelible mark on face facing you (ie this face must face towards input when fitted).
 c) If inner raceway will not rotate, turn backstop so that opposite end is now facing you. Repeat a) and b).

2 Fit bearing cone (20) to shaft (27) (use bearing heater).
 Fit bearing cup (21).
 Fit Nilos ring (22).
 Fit circlip (23).
 Fit backstop key as per section 3.
 Fit backstop (24/25) (use bearing heater).
 Note: Make sure that the indelible mark is facing the input end.
 Fit circlip (26).

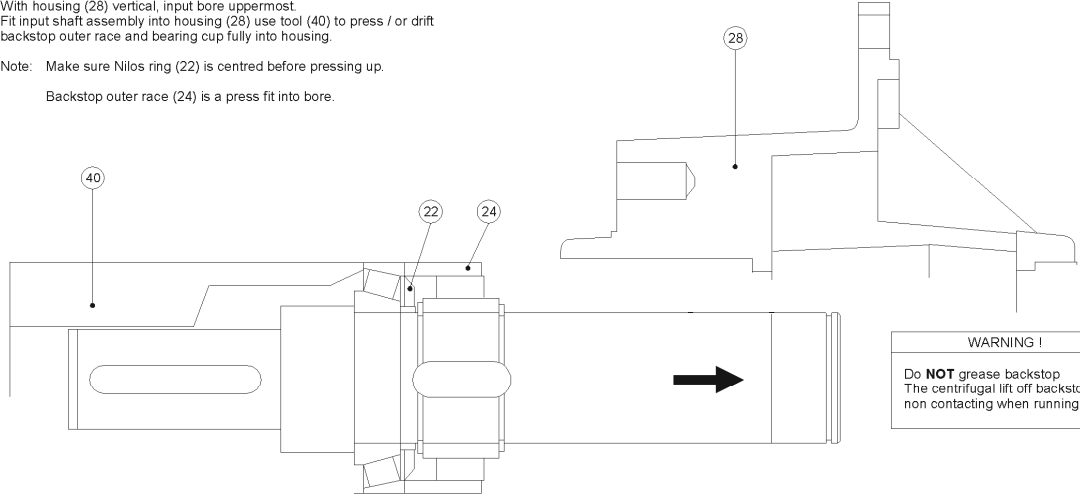


3 INPUT SHAFT BACKSTOP KEY
 Fit backstop key to input shaft:
 1) Clean keyway and key (Lowtox or Loctite 7061).
 2) Apply adhesive (Loctite 648) in root of keyway.
 3) Apply activator to key.
 4) Tap the key into the keyway (clean off any excess adhesive).



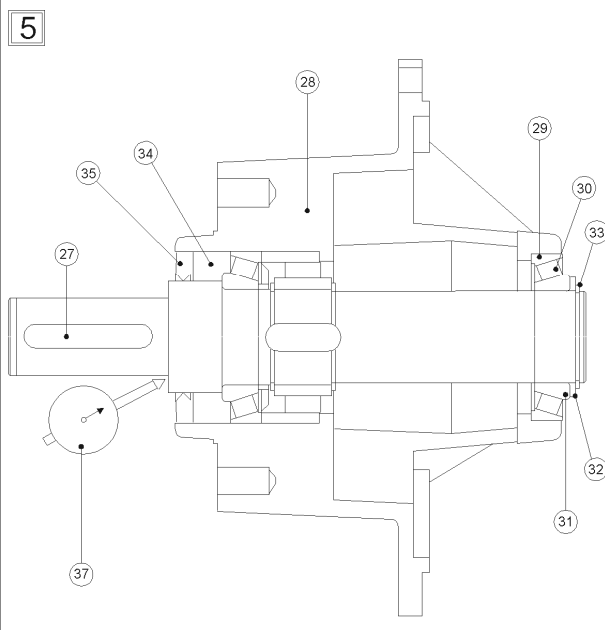
Note:
Use plenty, it must run up sides of key when fitted. Ensure Loctite does not get into bearing.

4 With housing (28) vertical, input bore uppermost.
 Fit input shaft assembly into housing (28) use tool (40) to press / or drift backstop outer race and bearing cup fully into housing.
 Note: Make sure Nilos ring (22) is centred before pressing up.
 Backstop outer race (24) is a press fit into bore.



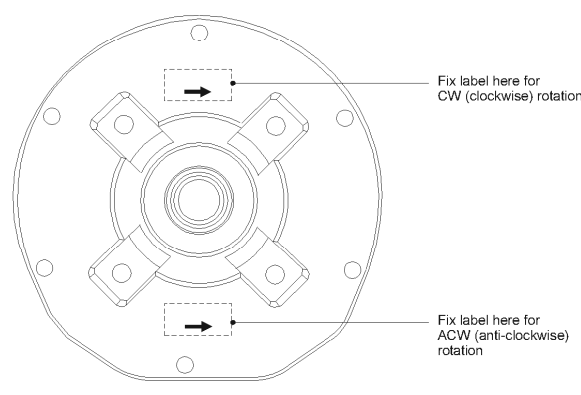
WARNING !
 Do **NOT** grease backstop
 The centrifugal lift off backstop is non contacting when running.

5



Fit bearing cup (29) into housing (28).
 Fit bearing cone (30) onto shaft (27) (use bearing heater).
 Fit spacer (32) and circlip (33).
 Check end float and record (37).
 Fit shims (31) to achieve desired end float (ie 0.05mm - 0.1mm (0.002" - 0.004")).
 Pack bearing and cavity (34) with grease, two thirds full (Shell Albida R2).
 Pack seal (35) with grease (Shell Albida R2), also smear lip.
 Fit seal (35).

6 - Fix label to housing flange face specifying backstop fitted and direction of rotation.



Fix label here for CW (clockwise) rotation

Fix label here for ACW (anti-clockwise) rotation

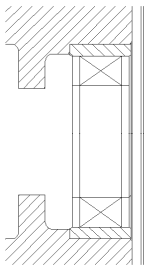
12. ASSEMBLY OF MOTORISED BACKSTOP MODULE.

Follow the instructions shown to assemble the motorised backstop module.

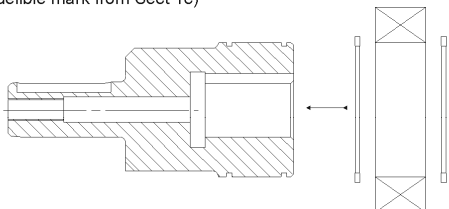
1 Check gear units shaft rotations to determine the required direction of free rotation

Preparation:- Check Backstop Free Wheel Direction Pre Fitting

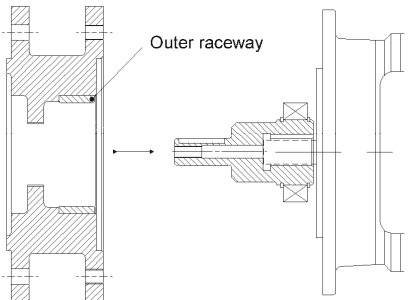
- Check backstop unit in housing for correct rotation
- If free rotation is wrong, backstop should be turned and placed opposite way round
- Put indelible mark on backstop to indicate backstop free rotation
- Remove backstop from housing to assemble on to the shaft, see Section 2



2 Assemble sprag onto shaft using 2 circlips (make sure the free rotation direction will be correct using the indelible mark from Sect 1c)

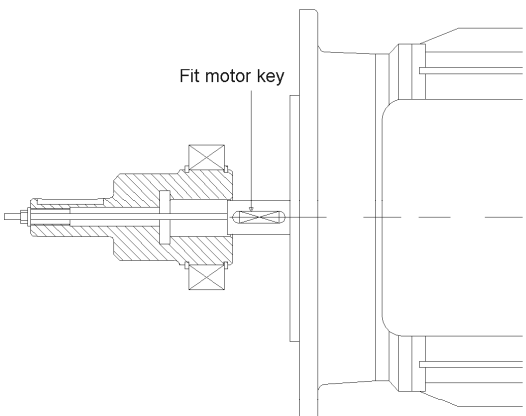


4 Fit housing to backstop. Take care engaging backstop sprags in outer raceway. Rotate motor shaft by hand in direction of free rotation and sprags will drop into raceway bore



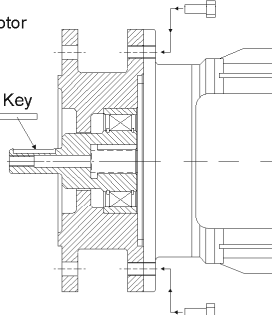
Outer raceway

3 a) Fit motor shaft key
 b) Pull backstop module on to motor using a puller as shown **



Fit motor key

5 a) Bolt backstop module to motor
 b) Fit key



Key

IEC B5 FLANGE

Motor Frame Size	Kit Number	Shaft End Tappings *
100/112	MB100/112D	M10 x 1.5
132	MB132D	M12 x 1.75
160	MB160D	M16 x 2
180	MB180D	M16 x 2
200	MB200D	M20 x 2.5

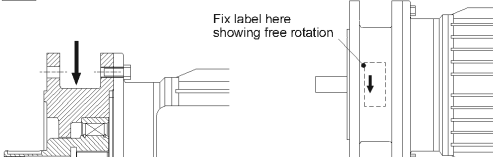
** Alternatively backstop module may be pressed on
 Note:
 non-drive end of motor must be supported

NEMA C FLANGE

Motor Frame Size	Kit Number	Shaft End Tappings *
182TC / 184TC	MB182/4TC	3/8" UNF
213TC / 215TC	MB213/5TC	1/2" UNF
254TC / 256TC	MB254/6TC	5/8" UNF
284TC / 286TC	MB284/6TC	5/8" UNF
324TC / 326TC	MB324/6TC	5/8" UNF

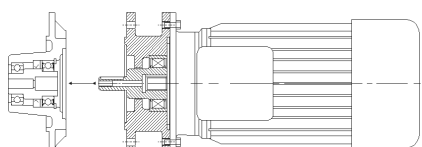
* Please check as shaft end tapping can vary between different motor manufactures

6 - Fit label to backstop module specifying backstop fitted and direction of free rotation



Fix label here showing free rotation

7 - Assemble backstop and motor assembly to motor adaptor and gear unit following standard motor assembly instructions



INSTALLATION AND MAINTENANCE

Under normal running conditions no maintenance will be required

WARNING

DO NOT REMOVE MOTOR OR BACKSTOP MODULE UNTIL ALL DRIVEN MACHINERY IS FULLY SECURED AND MADE SAFE

13. FITTING INSTRUCTIONS FOR 'ANCILLARY' ITEMS.

This section covers the following items:

1. Series M bolt on feet kit (Sizes M05-M07 single reduction)
2. Series M output flange kit.
3. Series K output flange kit.
4. Series K torque arm bracket.
5. Series C output flange kit.
6. Series C torque arm bracket.
7. Series F output flange kit.

13.1. Thoroughly clean the mating faces of the gear unit and the ancillary item to be fitted, using Lowtox or Loctite 7063 Superclean.

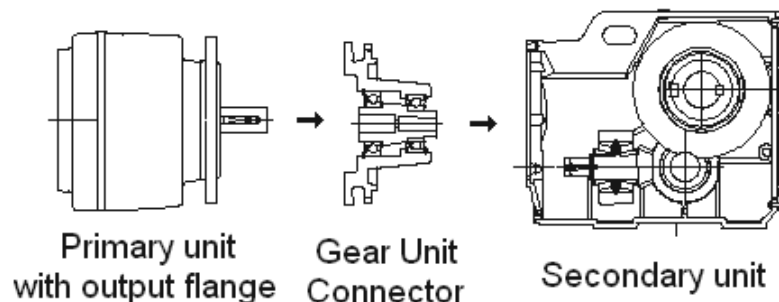
13.2. Allow the components to dry prior to assembly.

13.3. Fit to the gearcase with the fasteners provided, and torque tighten to the values in the table below.

BOLT SIZE	TIGHTENING TORQUES	
	Nm	Lbs.ins
M6	10	90
M8	25	220
M10	50	440
M12	85	750
M16	200	1770
M20	350	3098

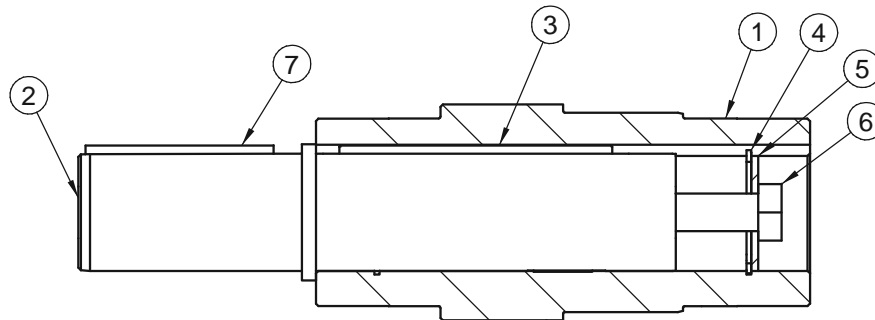
14. ASSEMBLY OF QUADRUPLE & QUINTUPLE UNITS.

- 14.1. Fit the primary wheel to the secondary unit as described in Section 2.
- 14.2. Fit the primary pinion into the gear unit connector, refer to Section 3 for fitting method and assembly tooling
- 14.3. Clean the mating flange faces of the secondary unit, and the gear unit connector using Lowtox or Loctite 7063 Superclean.
- 14.4. Apply liquid gasket material (Loctite 518) to the secondary unit flange face as detailed in section 1.5.
- 14.5. Engage the primary pinion into the primary wheel, and then secure the gear unit connector to the secondary unit with the fasteners provided. Torque tighten to the specified values.
- 14.6. Clean the mating flange faces of the primary unit, and the output flange using Lowtox or Loctite 7063 Superclean.
- 14.7. Fit the output flange to the primary unit and secure with the fasteners provided. Torque tighten to the specified values.
- 14.8. Spray plug-in shaft bore and primary unit output shaft with Rocol DFMSM.
- 14.9. Fit the primary unit sub-assembly to the gear unit connector, taking care to line up the primary unit output shaft key, with the keyway in the gear unit connector.
- 14.10. Secure with the fasteners provided and torque tighten to the specified values.



BOLT SIZE	TIGHTENING TORQUES	
	Nm	Lbs.ins
M6	10	90
M8	25	220
M10	50	440
M12	85	750
M16	200	1770
M20	350	3098

15. ASSEMBLY OF OUTPUTSHAFT INTO THE OUTPUT SLEEVE.



15.1. Spray the hollow shaft bore and mating diameter of output shaft with Rocol DFMSM

15.2. For single extension shaft:

15.2.1. Fit the shaft to hollow bore location key (3) in position in the output shaft.

15.2.2. Fit the circlip (4) into the output sleeve.

15.2.3. Fit the output shaft into the output sleeve, taking care to line the key up with the keyway in the sleeve.

15.2.4. Secure in place with the washer (5) and bolt (6). Torque tighten to the values stated below.

15.2.5. Fit the output shaft extension key (7).

15.3. For double extension shaft:

15.3.1. Fit the shaft to hollow bore location key (3) in position in the output shaft.

15.3.2. Fit the output shaft into the output sleeve, taking care to line the key up with the keyway in the sleeve.

15.3.3. Fit the circlip to secure the output sleeve into the output sleeve.

15.3.4. Fit the output shaft extension keys (7).

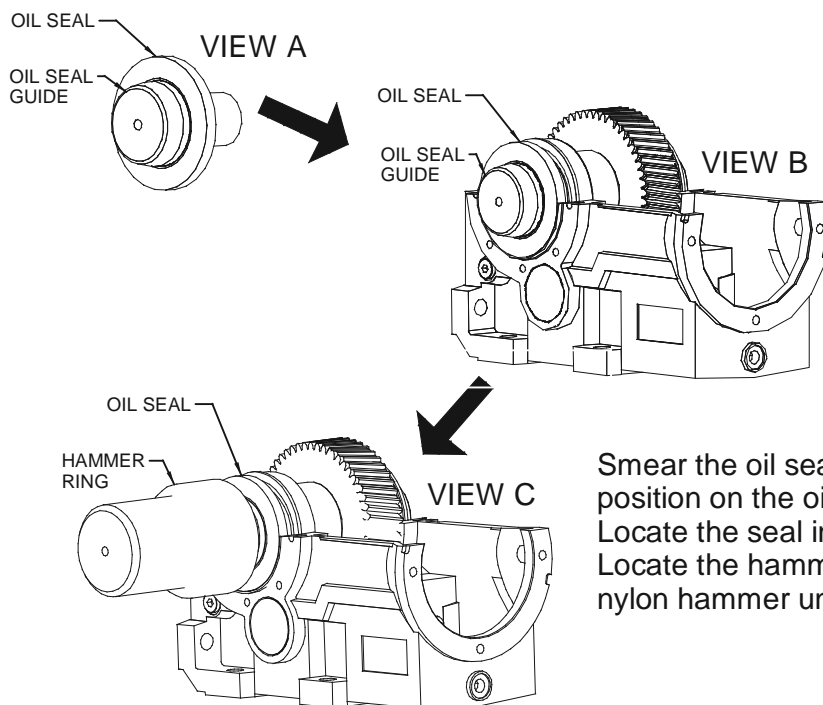
BOLT SIZE	TIGHTENING TORQUES Nm	BOLT SIZE	TIGHTENING TORQUES Lbs.ft
M10	15	3/8"UNF	12
M12	20	1/2"UNF	15
M16	45	5/8"UNF	35
M20	85	3/4"UNF	60
M24	200	1"UNF	160

16. FITTING DOUBLE OIL SEALS.

- 16.1. If the seal in the oil seal kit is of the single lip type, then the seal in the gearhead must be pushed deeper into it's housing, before fitting the secondary seal, by using the tooling listed in the following sections.
- 16.2. If the seal in the oil seal kit is of the double lip type, then the seals in the gearhead must be removed prior to fitting, and the new seal fitted by using the tooling listed in the following sections.
- 16.3. For input adaptors, the seal in the adaptor housing must be pushed deeper into the housing before fitting the secondary seal. Where a gamma seal is also fitted this must be removed prior to fitting the secondary seal, and then refitted once the secondary seal is in place. The secondary seal must be fitted by using the tooling listed at 15.8

16.4. Series K Oil Seal Tooling:

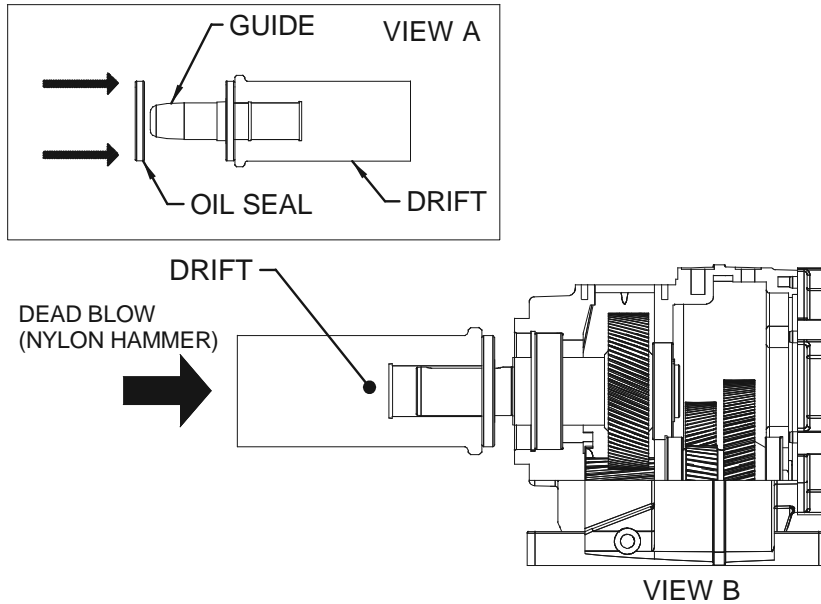
UNIT	HAMMER RING			GUIDE		
	METRIC	INCH	KIBO	METRIC	INCH	KIBO
K03	AP40489ST-1	AP40491ST-1	N/A	AP40488ST-1	AP40490ST-1	N/A
K04	AP40489ST-2	AP40491ST-2	N/A	AP40488ST-2	AP40490ST-2	N/A
K05	AP40489ST-3	AP40491ST-3	N/A	AP40488ST-3	AP40490ST-3	N/A
K06	AP40489ST-4	AP40491ST-4	N/A	AP40488ST-4	AP40490ST-4	N/A
K07	AP40489ST-5	AP40491ST-5	N/A	AP40488ST-5	AP40490ST-5	N/A
K08	A37484ST	A37484ST	A37484ST	A37484ST	A37484ST	A37484ST
K09	A37485ST	A37485ST	A37485ST	B37478ST	B37478ST	B37478ST
K10	A37486ST	A37486ST	A37486ST	B37480ST	B37480ST	B37480ST
K12	A37487ST	A37487ST	A37487ST	B37482ST	B37482ST	B37482ST



Smear the oil seal with an approved grease and position on the oil seal guide. - View A.
 Locate the seal in output bore of gearcase. - View B.
 Locate the hammer ring over the seal and tap with nylon hammer until seal is fully home. - View C.

16.5. Series M Oil Seal Tooling:

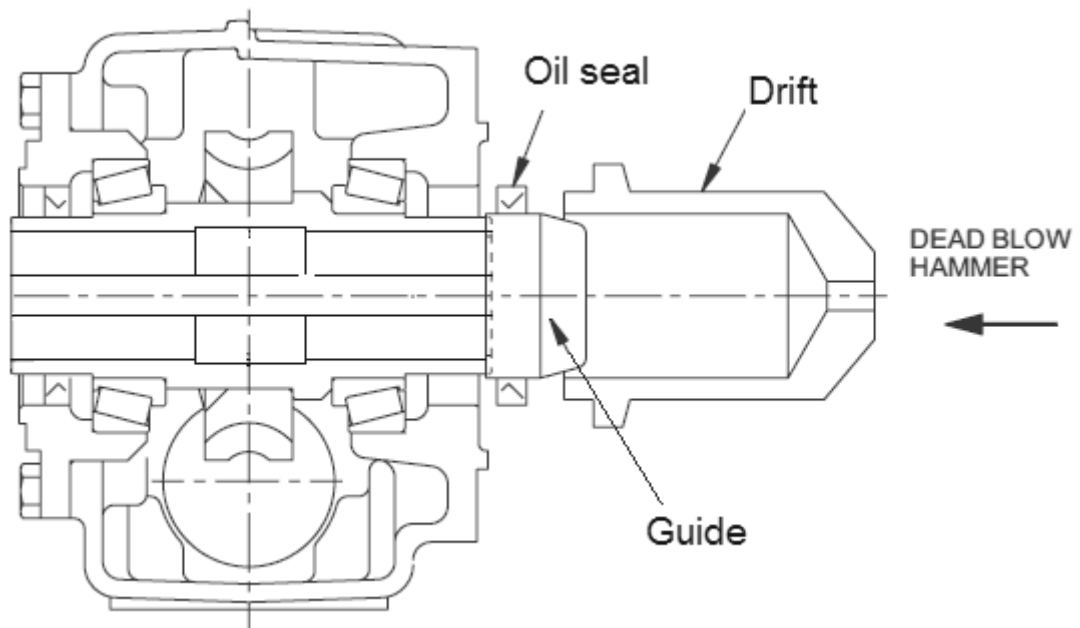
ITEM	M01	M02 / M03	M04 / M05	M06 / M07	M08	M09	M10	M13	M14
GUIDE & DRIFT	161367ST	161368ST	161369ST	161370ST	161364ST	157392ST	157393ST	157468ST	157469ST



Smear the oil seal with an approved grease and position on the drift using the oil seal guide. - View A.
 Remove the guide and fit the oil seal in output bore of gearcase. - View B.

16.6. Series C Oil Seal Tooling:

UNIT	C03	AC03	C04	AC04	C05	AC05	C06	AC06
GUIDE	B36509ST/1A	B36509ST/2A	B36509ST/3A	B36509ST/4A	B36509ST/5A	B36509ST/5A	B36509ST/6A	B36509ST/6A
DRIFT	B36509ST/1B	B36509ST/2B	B36509ST/3B	B36509ST/4B	B36509ST/5B	B36509ST/5B	B36509ST/6B	B36509ST/7B
BORE SIZE	20mm	3/4"	30mm	1.1/4"	35mm	1.3/8"	45mm	1.1/2"
UNIT	C07	AC07	C08	AC08	C09	AC09	C10	AC10
GUIDE	A36818ST	A36819ST	A36820ST	A36821ST	A26822ST	A36823ST	A36824ST	A36825ST
DRIFT	A36830ST		A36831ST		A36832ST		A36833ST	
BORE SIZE	60mm	2.0"	70mm	2.3/8"	90mm	2.3/4"	100mm	3.1/4"
UNIT	C04Z	C05Z	C06Z	C07Z	C08Z	C09Z	C10Z	
GUIDE	B37523ST/8B	B37524ST/9B	B37525ST/10B	A40183ST	A40345ST	A40346ST	A40347ST	
DRIFT	B37523ST/8B	B37524ST/9B	B37525ST/10B	A36830ST	A36831ST	A36832ST	A36833ST	
BORE SIZE	25mm	30mm	40mm	50mm	60mm	70mm	80mm	



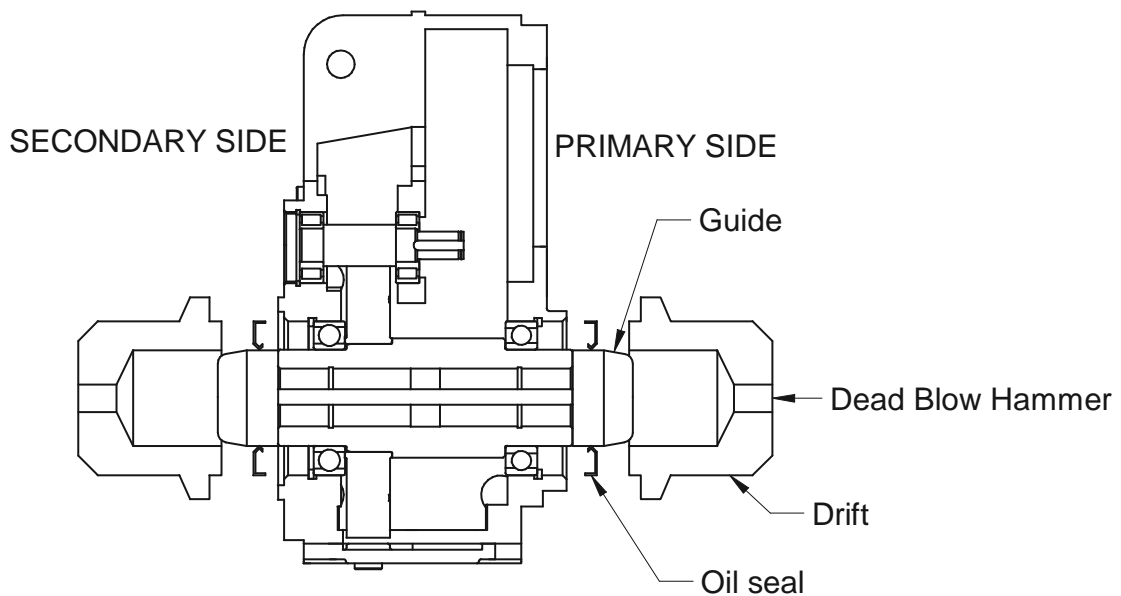
Smear the oil seal with an approved grease and position on the oil seal guide.
 Fit the seal into the bore by using the guide in conjunction with the drift as shown.

16.7. Series F Oil Seal Tooling

UNIT	F02	F03	F04	F05	F06	F07	F08	F09	F10
PRIMARY SIDE TOOLING	D00254	D00274	D00314	D00374	D00454	D00534	D00594	B37321ST	B37323ST
SECONDARY SIDE TOOLING	D00264	D00284	D00324	D00384	D00464	D00544	D00604	B37317ST	B37318ST
BORE SIZE	25mm	30mm	35mm	40mm	40mm	50mm	60mm	B37320ST	B37322ST
								B37317ST	B37318ST
								70mm	80mm

UNIT	F02 Inch	F03 Inch	F04 Inch	F05 Inch	F06 Inch	F07 Inch	F08 Inch	F09 Inch	F10 Inch
PRIMARY SIDE TOOLING	D00254	D00294	D00314	D00394	D00474	D00534	D00594	B37478ST	B37480ST
SECONDARY SIDE TOOLING	D00264	D00304	D00324	D00404	D00484	D00544	D00604	B37317ST	B37318ST
BORE SIZE	1.00"	1.1/4"	1.3/8"	1.1/2"	1.1/2"	2.00"	2.3/8"	B37478ST	B37480ST
								B37317ST	B37318ST
								2.7/8"	3.5/8"

UNIT	F04 Kibo	F05 Kibo	F06 Kibo	F07 Kibo	F08 Kibo	F09 Kibo	F10 Kibo
PRIMARY SIDE TOOLING	D00334	D00414	D00494	D00554	D00614	B37478ST	B37480ST
SECONDARY SIDE TOOLING	D00344	D00424	D00504	D00564	D00624	B37317ST	B37318ST
						B37478ST	B37480ST
						B37317ST	B37318ST

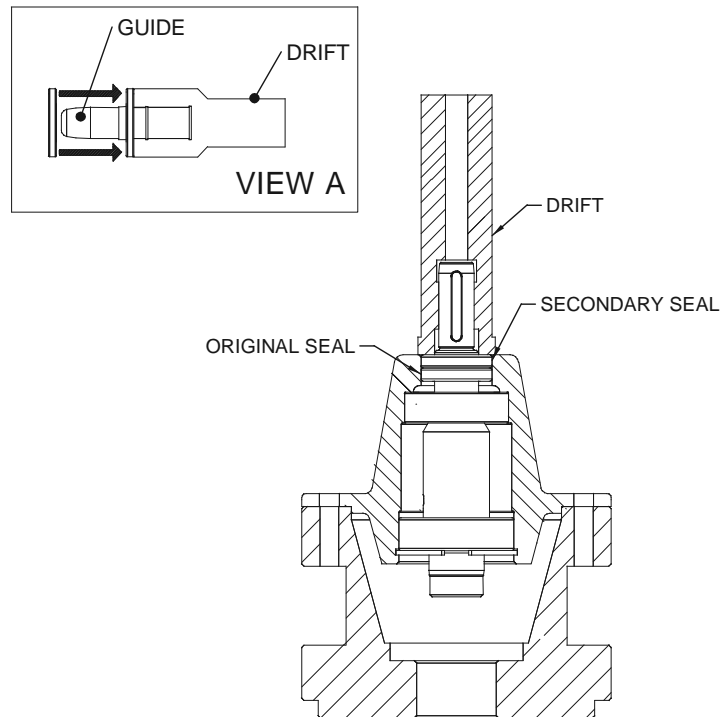


Note: Tooling differs at each side of unit

Smear the oil seal with an approved grease and position on the oil seal guide.
Fit the seal into the bore by using the guide in conjunction with the drift as shown.

16.8. Input Housings

KIT No.	M0122-T, M0122-U M0122-X, M0122-Y	M0522-T, M0522-U M0522-X, M0522-Y	M0720-T, M0720-U M0720-X, M0720-Y
DRIFT & GUIDE	157111ST	157285ST	157248ST
KIT No.	M0820-T, M0820-U M0820-X, M0820-Y	M0920-T, M0920-U M0920-X, M0920-Y	M1020-T, M1020-U M1020-X, M1020-Y
DRIFT & GUIDE	157330ST	157376ST	157375ST
KIT No.	M1320-T, M1320-U, M1320-W, M1320-X, M1320-Y, M1320-Z M1420-T, M1420-U, M1420-W, M1420-X, M1420-Y, M1420-Z		
DRIFT & GUIDE	157476ST		



Smear the oil seal with an approved grease and position on the drift using the oil seal guide. - View A.
 Remove the guide and fit the oil seal in housing bore.

Section 17 - Lubrication

Approved Lubrication.

Type E Mineral oil containing industrial EP additives. These have a high load carrying capacity.

SUPPLIER	LUBRICANT TYPE	5E	6E	7E
Batoyle Freedom Group	Remus	220 (-2)	320 (-2)	460 (-2)
Boxer Services / Millers Oils	Indus	220 (-10)	320 (-10)	460 (-10)
BP Oil International Limited	Energol GR-XF	220 (-16)	320 (-13)	460 (-1)
	Energol GR-XP	220 (-15)	320 (-10)	460 (-7)
Caltex	Meropa	220 (-4)	320 (-4)	460 (-4)
	RPM Borate EP Lubricant	220 (-7)	320 (-4)	460 (-7)
Carl Bechem GmbH	Berugear GS BM	220 (-20)	320 (-13)	460 (-10)
	Staroil G	220 (-13)	320 (-13)	460 (-10)
Castrol International	Alpha Max	220 (-19)	320 (-13)	460 (-10)
	Alpha SP	220 (-16)	320 (-16)	460 (-1)
Chevron International Oil Company Limited	Gear Comp EP (USA ver)	220 (-16)	320 (-13)	460 (-10)
	Gear Comp EP (Eastern ver)	220 (-13)	320 (-13)	460 (-13)
	Ultra Gear	220 (-10)	320 (-7)	460 (-7)
Eko-Elda Abee	Eko Gearlub	220 (-13)	320 (-10)	460 (-1)
Engen Petroleum Limited	Gengear	220 (-15)	320 (-12)	460 (-3)
Esso/Exxon	Spartan EP	220 (-12)	320 (-12)	460 (-4)
Fuchs Lubricants	Powergear		P/Gear (-16)	M460 (-4)
	Renogear V	220EP (-13)	320EP (-4)	460EP (-4)
	Renogear WE	220 (-7)	320 (-4)	400 (-4)
	Renolin CLPF Super	6 (-13)	8 (-10)	10 (-10)
Klüber Lubrication	Klüberoil GEM1	220 (-5)	320 (-5)	460 (-5)
Kuwait Petroleum International	Q8 Goya	220 (-16)	320 (-13)	460 (-10)
Lubrication Engineers Inc.	Almasol Vari-Purpose Gear	607 (-18)	605 (-13)	608 (-10)
Mobil Oil Company Limited	Mobil gear 600 series	630 (-13)	632 (-13)	634 (-1)
	Mobil gear XMP	220 (-19)	320 (-13)	460 (-7)
Omega Manufacturing Division	Omega 690		85w/140 (-15)	
Optimal Ölwerke GmbH	Optigear BM	220 (-11)	320 (-10)	460 (-7)
	Optigear	220 (-18)	320 (-9)	460 (-7)
Pertamina (Indonesia)	Masri	220 (-4)	320 (-4)	460 (-7)
Petro-Canada	Ultima EP	220 (-22)	320 (-16)	460 (-10)
Rocol	Sapphire Hi-Torque	220 (-13)	320 (-13)	460 (-13)
Sasol Oil (Pty) Limited	Cobalt	220 (-4)	320 (-1)	460 (-4)
	Hemat	220 (-10)	320 (-7)	460 (-4)
Saudi Arabian Lubr. Oil Co.	Gear Lube EP	EP220 (-1)	EP320 (0)	EP460 (0)
Shell Oils	Omala	220 (-4)	320 (-4)	460 (-4)
	Omala F	220 (-13)	320 (-10)	460 (-4)
Texaco Limited	Meropa	220 (-16)	320 (-16)	460 (-10)
	Meropa WM	220 (-19)	320 (-16)	460 (-11)
Total	Carter EP	220 (-7)	320 (-7)	460 (-4)
	CarterVP/CS	220 (-16)	320 (-13)	460 (-7)
Tribol GmbH	Molub-Alloy Gear Oil	90 (-18)	690 (-16)	140 (-13)
	Tribol 1100	220 (-20)	320 (-18)	460 (-16)

DANGER: Numbers in brackets indicate the minimum pour point temperature of the specified oil in °C

THE UNIT MUST NOT BE RUN BELOW THIS TEMPERATURE

Approved Lubrication.

Type G Polyglycol based synthetic lubricants with Anti-Wear or EP additives.
These have a medium to high load carrying capacity. (see +)

SUPPLIER	LUBRICANT TYPE	5G	6G	7G	8G	9G
Boxer Services / Millers Oils	Boxergear W	220 (-31)	320 (-31)	460 (-28)		
BP Oil International Limited	Energyn SG-XP	220 (-31)		460 (-34)	680 (-28)	
Caltex	Synlube CLP	220 (-34)	320 (-31)	460 (-28)	680 (-31)	
Carl Bechem GmbH	Berupsynth EP	220 (-25)	320 (-25)	460 (-25)	680 (-28)	1000 (-28)
Castrol International	Alphasyn PG	220 (-34)	320 (-31)	460 (-28)		
Esso/Exxon	Glycolube	220 (-25)	320 (-25)	460 (-23)		
Fuchs Lubricants	Renolin PG	220 (-34)	320 (-34)	460 (-34)	680 (-28)	1000 (-28)
Klüber Lubrication	Klübersynth GH6	220 (-25)	320 (-25)	460 (-20)	680 (-20)	1000 (-28)
	Klübersynth UH1 6	220 (-30)	320 (-25)	460 (-25)		
Kuwait Petroleum International	Q8 Gade	220 (-22)	320 (-22)	460 (-22)		
Laporte Performance Chemicals Limited	Berox Industrial Lubricant SW	220 (-25)	320 (-25)	460 (-23)	680 (-20)	1000 (-28)
	Berox SL Range	220 (-40)	320 (-37)	460 (-23)		
	Berox Oil Soluble Industrial Lube x	220 (-23)				
Mobil Oil Company Limited	Glygoyle	HE220 (-22)	HE320 (-37)	HE460 (-35)		
Optimal Ölwerke GmbH	Optiflex A +	220 (-28)	320 (-28)	460 (-28)	680 (-28)	1000 (-25)
Shell Oils	Tivela	SB (-25)	SC (-25)	SD (-23)		
	Tivela S	220 (-34)	320 (-34)	460 (-34)		
Texaco Limited	Synlube CLP	220 (-34)	320 (-31)	460 (-10)	680 (-31)	
Total	Carter SY	220 (-25)	320 (-28)	460 (-22)		
Tribol GmbH	Tribol 800	220 (-27)	320 (-25)	460 (-25)	680 (-25)	1000 (-23)

+ NOT SUITABLE FOR APPLICATIONS REQUIRING INDUSTRIAL EP ADDITIVES

x THIS PARTICULAR LUBRICANT IS COMPATIBLE WITH TYPES M, A, E, AND H

NOTE: TYPE G LUBRICANTS WILL AFFECT CERTAIN GEARCASE PAINTS AND SHRINK CERTAIN SEALS, CONTACT OUR SALES OFFICE BEFORE USE.

DANGER: Numbers in brackets indicate the minimum pour point temperature of the specified oil in °C
THE UNIT MUST NOT BE RUN BELOW THIS TEMPERATURE.

KIT ASSEMBLY INSTRUCTIONS
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Approved Lubrication.

Type H Polyalphaolefin based synthetic lubricants with Anti-Wear or EP additives.
These have a medium to high load carrying capacity.

SUPPLIER	LUBRICANT TYPE	5H	6H
Batoyle Freedom Group	Titan	220 (-31)	320 (-28)
Boxer Services / Millers Oils	Silkgear	220 (-35)	320 (-35)
BP Oil International Limited	Energyn EPX	-	320 (-28)
Caltex	Pinnacle EP	220 (-43)	320 (-43)
Carl Bechem GmbH	Berusynth GP	220 (-38)	320 (-35)
Castrol International	Alphasyn EP	220 (-37)	320 (-31)
	Alphasyn T	220 (-31)	320 (-28)
Chevron International Oil Co	Tegra	220 (-46)	320 (-33)
Esso/Exxon	Spartan Synthetic EP	220 (-46)	320 (-43)
Fuchs Lubricants	Renogear SG	220 (-32)	320 (-30)
	Renolin Unisyn CLP	220 (-37)	320 (-34)
Klüber Lubrication	Klübersynth GEM4	220 (-30)	320 (-25)
Kuwait Petroleum International	Q8 EI Greco	220 (-22)	320 (-19)
Lubrication Engineers Inc.	Synolec Gear Lubricant	220 (-40)	-
Mobil Oil Company Limited	Mobilgear SHC	220 (-40)	320 (-37)
	Mobil gear XMP	220 (-40)	320 (-33)
Optimal Ölwerke GmbH	Optigear Synthetic A	220 (-31)	320 (-31)
Petro-Canada	Super Gear Fluid	220 (-43)	320 (-37)
Shell Oils	Omala HD	220 (-43)	320 (-40)
Texaco Limited	Pinnacle EP	220 (-43)	320 (-43)
	Pinnacle WM	220 (-43)	320 (-40)
Total	Carter EP/HT	220 (-34)	320 (-31)
Tribol GmbH	Tribol 1510	220 (-36)	320 (-33)

DANGER: Numbers in brackets indicate the minimum pour point temperature of the specified oil in °C
THE UNIT MUST NOT BE RUN BELOW THIS TEMPERATURE.

Series C Lubrication

1. **C03 to C06** are supplied factory filled with a quantity of polyglycol synthetic oil (Grade 6G) appropriate to the mounting position – If the gear unit is drained for any reason it must be re-filled with the correct grade and quantity of lubricant as shown in the table below.
2. **C07 to C10** are supplied without lubricant and must be filled via the ventilator position with polyglycol synthetic oil (Grade 6G) until the oil escapes through the level plug hole – see table below for approximate lubricant quantity,
3. **C07 to C10** Oil levels for some units are dependant on mounting position and speed of operation.
Level 1 (L-1) for output speeds below 100 rpm
Level 2 (L-2) for output speeds 100 rpm and above
4. **Maintenance:**
 - Oil levels for C07 to C10 can be checked and maintained by filling via the ventilator position until oil escapes through the level plug hole,
 - C03 to C06 these units must be fully drained and re-filled with the correct quantity of lubricant

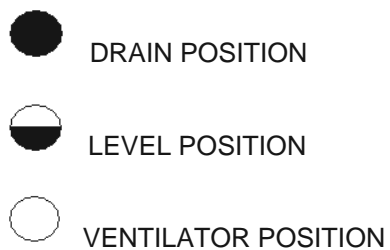
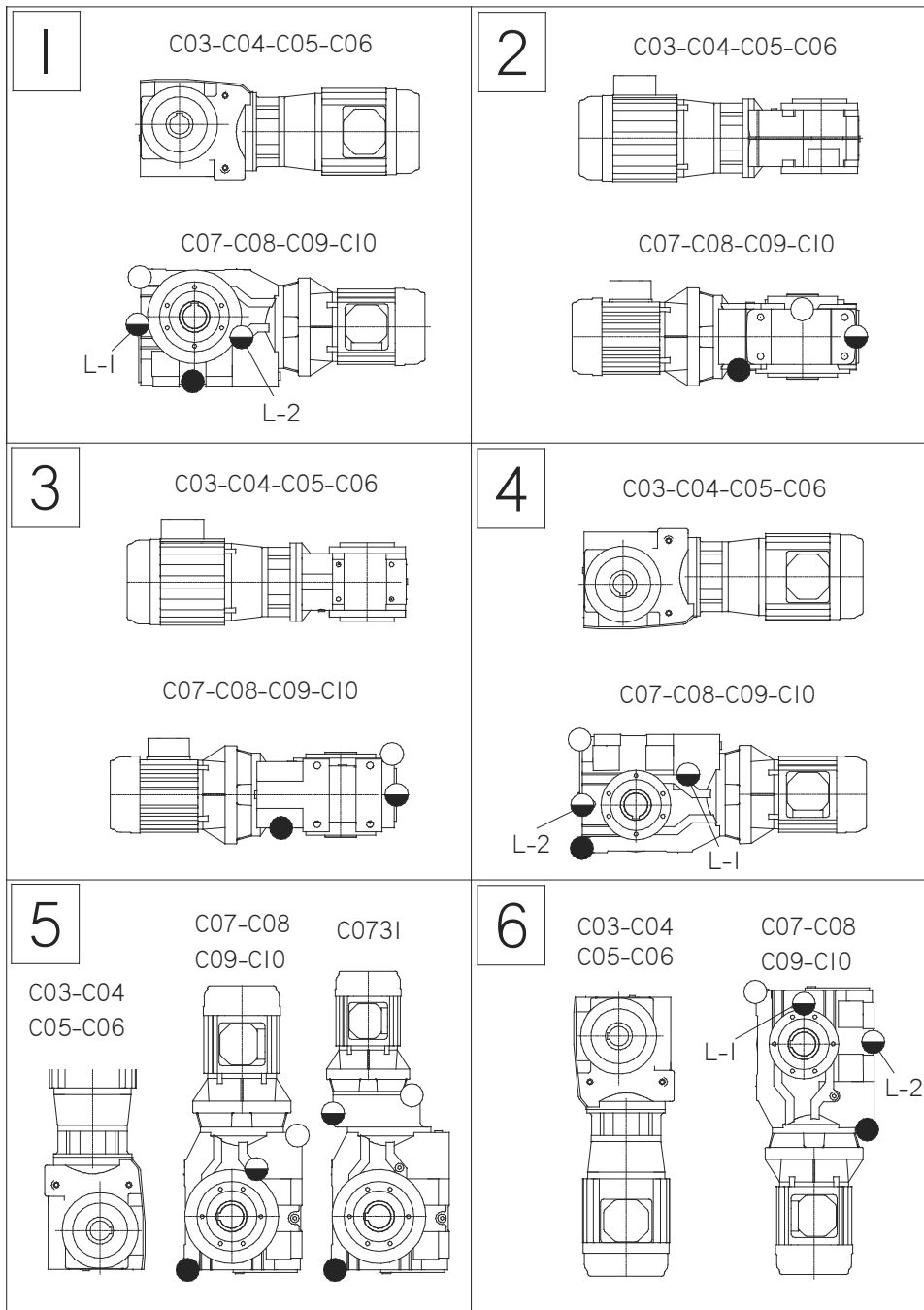
Lubricant Quantities (Litres)

Posn	Level	C0321	C0421	C0521	C0621	C0721	C0821	C0921	C1021
1	L-1	0.3	0.4	0.7	1.5	4.5	7.1	17	28
	L-2	-	-	-	-	3.0	5.9	11	17
2	-	0.5	0.7	1.0	2.3	3.5	6.2	12	21
3	-	0.5	0.7	1.0	2.3	3.5	6.2	12	21
4	L-1	0.7	1.0	1.4	3.1	5.1	9.5	17	26
	L-2	-	-	-	-	3.0	4.8	8.3	14
5	-	0.6	0.9	1.4	3.0	5.6	9.6	18	31
6	L-1	0.7	1.0	1.4	3.2	7.4	12	25	42
	L-2	-	-	-	-	5.1	9.5	17	28

Posn	Level	C0331	C0431	C0531	C0631	C0731
1	L-1	0.4	0.5	0.9	2.1	4.8
	L-2	-	-	-	-	3.8
2	-	0.8	0.9	1.4	2.5	3.7
3	-	0.8	0.9	1.4	2.5	3.7
4	L-1	1.2	1.5	2.1	4.0	5.9
	L-2	-	-	-	-	3.6
5	-	1.0	1.3	2.0	4.6	6.6
6	L-1	1.2	1.5	1.9	4.0	9.2
	L-2	-	-	-	-	6.9

5. **C07 to C10** Fit the ventilator plug in the position appropriate to the mounting position. **C03 to C06** do not require a ventilator
6. **Quadruple Reduction Units** consist of a Series M primary unit flange mounted onto the Series C unit, see Series M lubrication data for details appropriate to the primary unit, both units should checked for oil type and quantity.

Series C Mounting Positions and Lubrication fill levels



Series F Lubrication

1. **F02 to F07** are supplied factory filled with a quantity of EP mineral oil (Grade 6E) appropriate to the mounting position. If the gear unit is drained for any reason it must be re-filled with the correct grade and quantity of lubricant as shown in the table below.
2. **F08 to F12** are supplied without lubricant and must be filled via the ventilator position with EP mineral oil (Grade 6E) until oil escapes through the level plug hole – see *table below for approximate quantity of lubricant*.
3. **Maintenance:**
 - Oil levels for F05 to F12 can be checked and maintained by filling via the ventilator position until oil escapes through the level plug hole,
 - F02, F03 and F04 These units must be fully drained and re-filled with the correct quantity of lubricant.

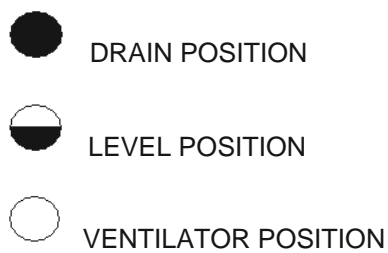
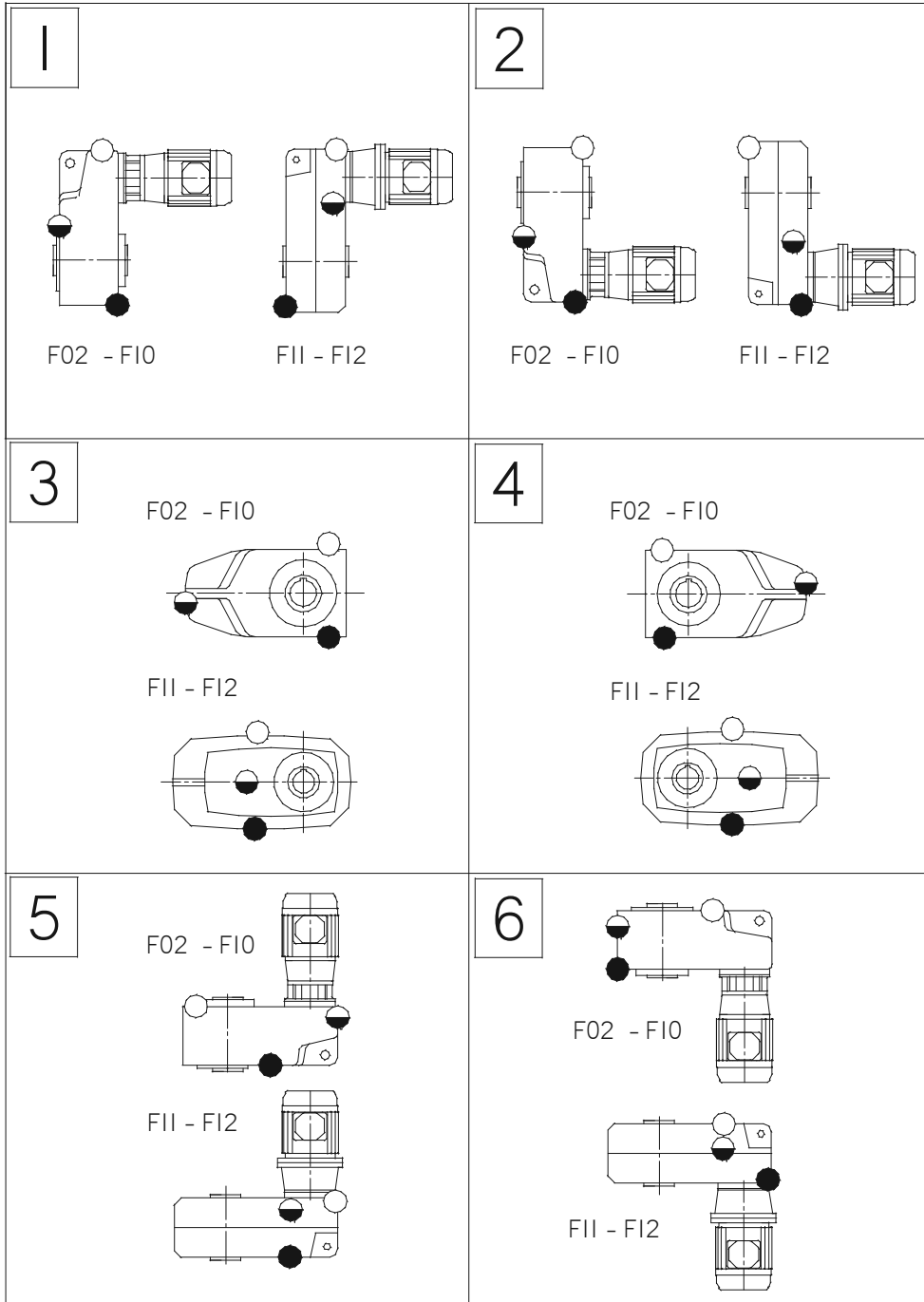
Lubricant Quantities (Litres)

Posn	F0222	F0322	F0422	F0522	F0622	F0722	F0822	F0921	F1021	F1121	F1221
1	0.8	1.3	1.3	2.1	3.5	6.3	10.7	19	34	28	47
2	0.4	0.8	0.8	1.4	2.3	3.5	7.1	13	22	17	27
3	0.4	1.1	1.1	1.4	2.3	3.4	8.8	17	28	22	36
4	0.5	0.8	0.8	1.8	3.0	5.0	4.7	15	27	24	40
5	1.1	1.2	1.2	2.8	4.5	8.0	9.7	24	43	34	56
6	1.3	2.0	2.0	3.2	5.2	9.0	17.2	25	43	30	50

Posn	F0232	F0332	F0432	F0532	F0632	F0732	F0832	F0931	F1031	F1131	F1231
1	0.8	1.2	1.2	2.1	3.5	6.3	10.4	19	34	27	45
2	0.4	0.8	0.8	1.4	2.3	3.5	7.3	15	24	16	25
3	0.4	1.1	1.1	1.4	2.3	3.4	9.2	17	28	21	34
4	0.5	0.8	0.8	1.8	3.0	5.0	5.3	16	27	23	38
5	1.1	1.2	1.2	2.8	4.5	8.0	9.7	24	43	33	53
6	1.3	2.0	2.0	3.2	5.2	9.0	17.4	25	43	29	48

4. **F09 to F12** units only, fit the ventilator plug in the position appropriate to the mounting position. **F02 to F08** units do not require a ventilator
5. **Quadruple Reduction Units** consist of a Series M primary unit flange mounted onto the Series F unit, see Series M lubrication data for details appropriate to the primary unit, both units should be checked for oil type and quantity.

Series F – Mounting Positions and Lubrication Fill Levels



Series K Lubrication

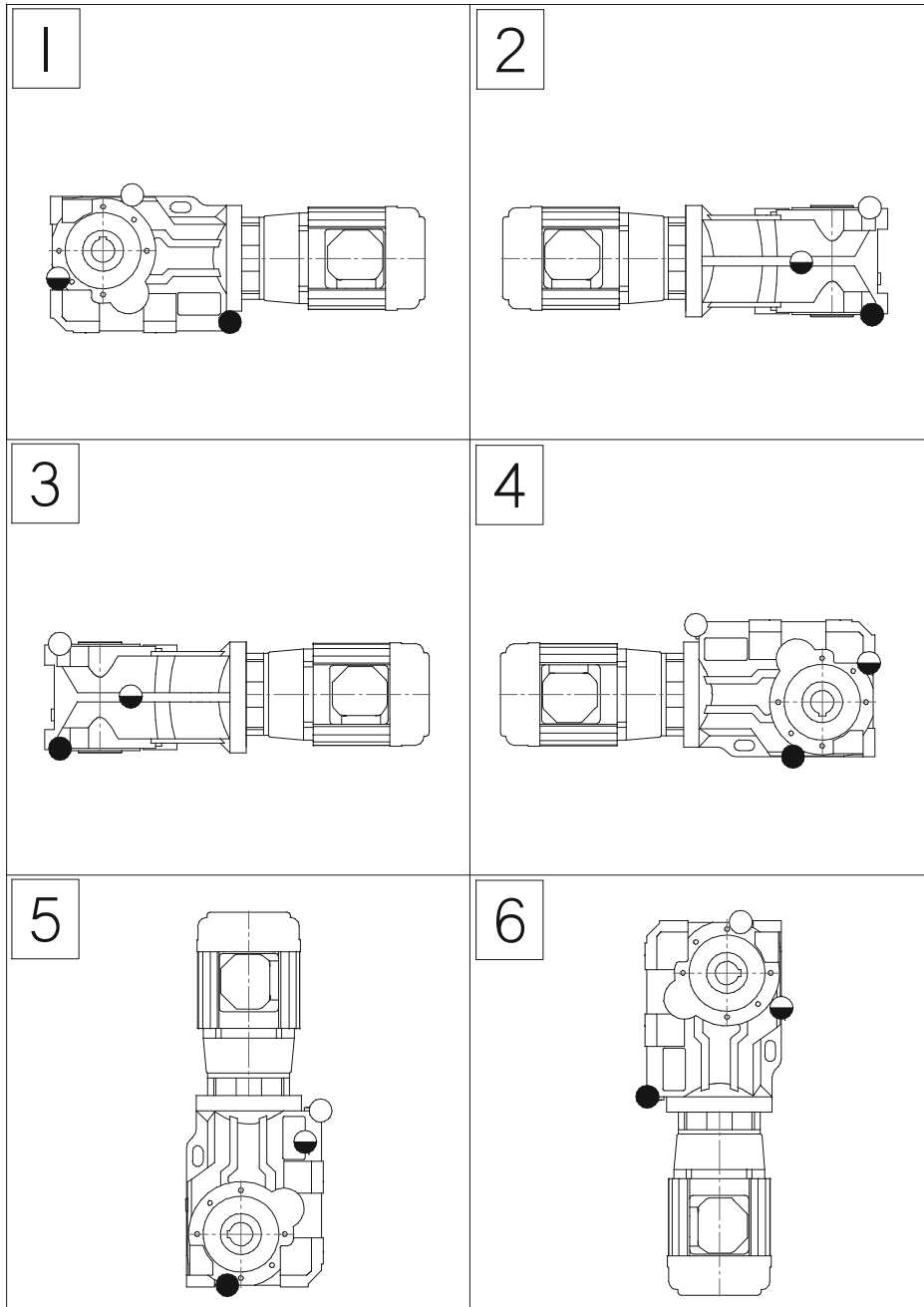
1. **K03 to K07** are supplied factory filled with a quantity of EP mineral oil (Grade 6E) appropriate to the mounting position – If the gear unit is drained for any reason it must be re-filled with the correct grade and quantity of lubricant as shown in the table below.
2. **K08 to K12** are supplied without lubricant and must be filled via the ventilator position with EP mineral oil (Grade 6E) until oil escapes through the level plug hole – see table below for approximate lubricant quantity,
3. **Maintenance:**
 - Oil levels for K06 to K12 can be checked and maintained by filling via the ventilator position until oil escapes through the level plug hole,
 - K03, K04 and K05 These units must be fully drained and re-filled with the correct quantity of lubricant.




Lubricant Quantities (Litres)

Posn	K0332	K0432	K0532	K0632	K0732	K0832	K0931	K1031	K1231
1	0.5	0.7	1.1	1.5	2.7	4.4	9.3	15	23
2	0.7	0.9	1.5	1.8	3.6	3.7	8.3	15	27
3	0.8	1.1	1.7	2.8	4.0	7.6	18	28	33
4	1.0	1.3	1.9	2.7	4.5	7.5	17	30	39
5	1.2	1.7	2.5	3.6	5.7	9.6	21	34	50
6	0.9	1.2	2.0	2.6	4.5	7.6	16	25	35

4. **K06 to K12** units only, fit the ventilator plug in the position appropriate to the mounting position. **K03 to K05** units do not require a ventilator.
5. **Quintuple Reduction Units** consist of a Series M primary unit flange mounted onto the Series K unit, see Series M lubrication data for details appropriate to the primary unit, both units should be checked for oil type and quantity.

Series K – Mounting Positions and Lubrication Fill Levels



-  DRAIN POSITION
-  LEVEL POSITION
-  VENTILATOR POSITION

Series M Lubrication

1. **M01 to M07** are supplied factory filled with a quantity of EP mineral oil (Grade 6E) appropriate to the mounting position – If the gear unit is drained for any reason it must be re-filled with the correct grade and quantity of lubricant as shown in the table below.
2. **M08 to M14** are supplied without lubricant and must be filled via the ventilator position with EP mineral oil (Grade 6E) until oil escapes through the level plug hole – see table below for approximate lubricant quantity,
3. **Maintenance:**
 - a. Oil levels for M04 to M14 can be checked and maintained by filling via the ventilator position until oil escapes through the level plug hole,
 - b. These units M01, M02 and M03 must be fully drained and re-filled with the correct quantity of lubricant.

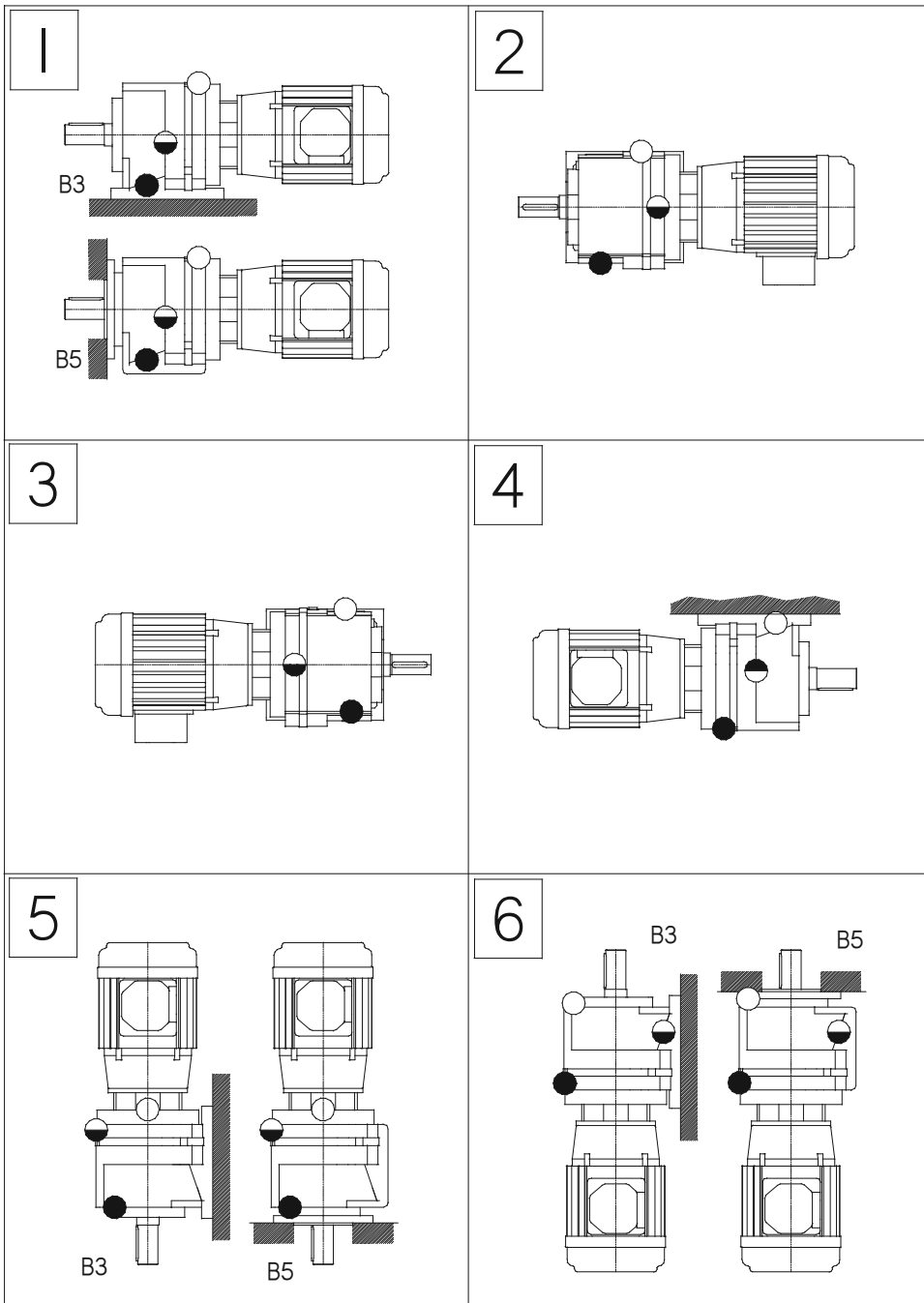
Lubricant Quantities (Litres)




Posn	M0122	M0222	M0322	M0422	M0522	M0622	M0722	M0822	M0921	M1021	M1321	M1421
1	0.5	0.8	0.8	1.5	1.5	2.0	2.6	4.2	10.5	14	17	24
2	0.8	1.2	1.2	1.8	1.8	2.0	2.9	6.3	12.0	22	31	49
3	0.6	0.7	0.7	1.6	1.6	1.9	2.7	5.4	12.0	22	31	49
4	0.8	1.2	1.2	1.8	1.8	1.7	3.0	7.3	12.0	19	28	41
5	0.7	1.1	1.1	2.0	2.0	2.2	3.2	6.8	16.8	32	47	72
6	1.0	1.4	1.4	2.6	2.6	2.8	4.7	9.3	16.4	26	38	65

Posn	M0132	M0232	M0332	M0432	M0532	M0632	M0732	M0832	M0931	M1031	M1331	M1431
1	0.6	0.8	0.8	1.6	1.6	2.1	2.7	4.4	11.5	14	18	25
2	0.9	1.3	1.3	1.9	1.9	2.1	3.0	6.5	12.0	24	33	50
3	0.7	0.7	0.7	1.7	1.7	2.0	2.8	5.6	12.0	24	33	50
4	0.9	1.2	1.2	1.9	1.9	1.8	3.1	7.5	12.0	21	30	43
5	0.7	1.1	1.1	2.1	2.1	2.3	3.3	6.8	16.8	32	47	72
6	1.1	1.6	1.6	2.7	2.7	2.9	4.8	9.7	16.5	28	40	67

6. **M04 to M14** units only, fit the ventilator plug in the position appropriate to the mounting position. **M01 to M03** units do not require a ventilator.
7. **Quintuple Reduction Units** consist of a smaller Series M primary unit flange mounted onto the main Series M gear unit, both units should be checked for oil type and quantity.

Series M – Mounting Positions and Lubrication Fill Levels



-  DRAIN POSITION
-  LEVEL POSITION
-  VENTILATOR POSITION