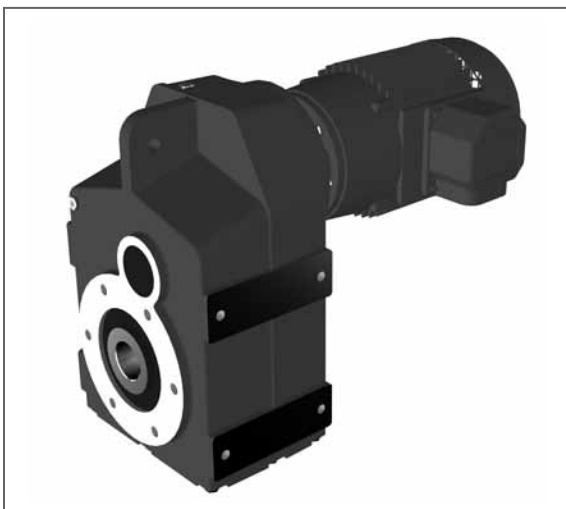


# ***RENOLD***

## **GEARED MOTOR UNITS**

R, S, F, K SERIES



**INSTALLATION & MAINTENANCE GUIDE**

## **Declaration of Conformity**

Products:

**R, S, F & K Series - Gear Units.**

Renold Gears hereby declares that products listed above have been designed in accordance with the following Directives and Standards.

- The Machinery Directive 2006/42/EC
- EN ISO 12100-1,2 The Safety of Machinery
- Conforms to all other harmonised standards, tests, and specifications, (In as much as they apply to our products)

## **Declaration of Incorporation**

We hereby declare that the above machinery is intended to be incorporated into other machinery & must not be put into service until the machinery it is to be incorporated into has been declared in conformity with the essential Health & Safety requirements of the Machinery Directives 2006/42/EC & CE marked. The machinery has been designed & manufactured in accordance with the following transposed harmonised European standards:-

**BS EN ISO 12100:2010** - Safety of machinery. General principles for design - Risk assessment and risk reduction

**BS EN ISO 13857:2008** - Safety of machinery. Safety distances to prevent hazard zones being reached by upper and lower limbs

**EN349: 1993+A1:2008** - Safety of Machinery. Minimum gaps to avoid crushing of parts of the human body.

**BS EN ISO 13850:2015** - Safety of machinery. Emergency stop function. Principles for design

**BS EN 60204-1:2006+A1:2009** - Safety of machinery. Electrical equipment of machines - General requirements

Other general requirements include:

**PD 5304:2014** - Guidance on safe use of machinery

***RENOLD***  
*Superior Gear Technology*


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## Safety Warning Symbols



**Electrical Hazard**  
Could result in death or serious injury



**Danger**  
Could result in serious, slight or minor injuries



**Danger (Touch Hazard)**  
Could result in death or serious injury



**Damaging Situation**  
Could result in damage to gear unit or driven machinery



Important notes on Explosion Protection



**Cleaning**  
Periodic cleaning necessary

## 1. General Information

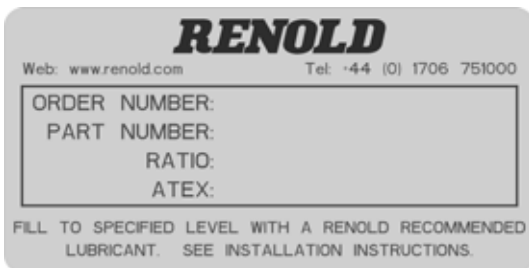
The following instructions will help you achieve a satisfactory installation of your gear unit, ensuring the best possible conditions for a long and trouble free operation.

All units are tested and checked prior to despatch, a great deal of care is taken in packing and shipping arrangements to ensure that the unit arrives at the customer in the approved condition.

## 2. External Protection

All R S F & K Series units are provided with protection against normal weather conditions. Where units are to operate in extreme conditions, or where they are to stand for long periods without running, e.g. during plant construction, consult our application engineers so that arrangements for adequate protection can be made.

## 3. Reading the Nameplate



### 3.1 Unit Identification



When requesting further information, or service support quote the following information from the nameplate:

- Order Number
- Part Number

### 3.2 Group/Category/Temperature Class

Only units specifically selected for use in a potentially explosive atmosphere will be factory marked with the Ex group, category and temperature class. Those items marked 'ATEX. Not applicable' are not suitable for use in a potentially explosive atmosphere.

## 4. The Marking

 Gear units with  marking are specifically selected for use as a component of an industrial system operating in a potentially explosive atmosphere

Provided the gear unit is correctly selected, Ex marked and installed in accordance with these instructions it will comply with the EU directive 94/9EC (ATEX 100a)

Units may be selected by our application engineers for use only in the following potentially explosive atmospheres:


Hazard Group II Cat 2 (zones 1 & 21) or Group II Cat 3 (zones 2 & 22)

Motors, couplings, or any other equipment fitted to the gear unit must also comply with this directive.

If the gear unit is supplied as a geared motor package it is important to check the nameplates of both the gear unit and the motor (or any other equipment fitted) corresponds with the classification of the potentially explosive atmosphere in which the unit is to be installed.

## 5. Installation

### 5.1 Safety Warning

|  |  |
|--|--|
| <p>WARNING!</p>  <p>CAUTION</p> | <p>The customer shall be responsible for the proper use of articles supplied by the company, particularly rotating shafts between the driving and driven members, and the provision of safety guarding.</p> <p>The company shall not be responsible for any injury or damage sustained as a result of the improper use of the articles supplied.</p> <p>Attention is hereby drawn to the danger of using naked lights in proximity to openings in gearboxes and gear units supplied by the company, and the company shall not be liable for any claim for injury or damage arising from any action in contravention of this warning.</p> |
|--|--|



### 5.2. Prior to Installation

- 5.2.1. Check gear unit has not been damaged.
- 5.2.2. Check the gear unit / motor nameplate matches the requirements of the machine the unit is to be installed on.
- 5.2.3. Thoroughly clean the shaft and mounting surfaces that are to be used of anti-corrosion agents using a commercially available solvent. Ensure solvent does not make contact with the oil seals.

### 5.3. Fitting of components to either the unit input or output shaft

- 5.3.1. Ensure shaft extensions, bores & keys etc are cleaned.
- 5.3.2. The input or output shaft extension diameter tolerance is to ISO tolerance k6 (for shaft diameter ≤ 50mm) and m6 (for shaft diameter > 50mm) and the fitted components should be to ISO tolerance M7 (for bore diameter ≤ 50mm) and K7 (for bore diameter > 50mm).
- 5.3.3. Items (such as gears, sprockets, couplings etc) should not be hammered onto these shafts since this would damage the shaft support bearings.
- 5.3.4. The item should be pushed onto the shaft using a screw jack device fitted into the threaded hole provided in the end of the shaft. See table 1 below.
- 5.3.5. Items being fitted may be heated to 80/100°C to aid assembly further.

**Table 1**

| Shaft Diameter | Threaded Hole |
|----------------|---------------|
| 13 - 16        | M5 x 0.8p     |
| 17 - 21        | M6 x 1.0p     |
| 22 - 24        | M8 x 1.25p    |
| 25 - 30        | M10 x 1.5p    |
| 31 - 38        | M12 x 1.75p   |
| 39 - 50        | M16 x 2.0p    |
| 51 - 85        | M20 x 2.5p    |
| 86 - 130       | M24 x 3.0p    |



## 5.4. Fitting the Motor

Follow these instructions only if the product is supplied without motor



- 5.4.1. Ensure motor bushing (if supplied) is correctly assembled into the gear unit plug-in shaft.
- 5.4.2. Fit the motor drive key or the special carbon fibre drive key (if supplied)  
*Note! The carbon fibre drive key may require shortening to suit certain motors.*
- 5.4.3. Spray the plug-in bore with anti-fretting compound (Rocol DFMS or equivalent)
- 5.4.4. Slide the motor shaft fully into the plug-in bore (do not hammer)
- 5.4.5. Secure motor flange to the gear unit with the fastenings provided
- 5.4.6. Torque tighten the bolts to value specified in Section 5.5 -Table 2, (Note! Bolt torques for aluminium flanged motors should be 75% of the values listed in Table 2)



## 5.5. Foot Mounted or Flange Mounted Units

- 5.5.1. Ensure the base foundation / flange mounting surface is flat<sup>1</sup>, vibration absorbing and torsionally rigid.  
(<sup>1</sup> Maximum permissible flatness error for the mounting surface is 0.12mm)
- 5.5.2. The gear unit must be installed in the specified mounting position. The maximum deviation from the designated mounting position is  $\pm 5^\circ$  (unless gear unit is suitably modified and approved for non standard mounting positions).
- 5.5.3. Align unit (see Appendix 1).

Note: It is important to ensure when aligning unit on a base plate that all machined mounting points are supported over their full area.

If steel packings are used, these should be placed either side of as close to the foundation bolt as possible.

During final bolting ensure the unit or base plate is not distorted as this would cause strains in the gear case resulting in errors of alignment of shafts and gearing.

Check all mounting points are fully supported and adjust if necessary by using steel packings.

Torque tighten the bolts to value specified in Table 2 except aluminium flange motors, Bolt torques for aluminium flanged motors should be 75% of the values listed below.

Note: Secure unit or base plate (if fitted) to a rigid foundation using heavy duty bolts to ISO grade 8.8 minimum.

**Table 2**

| Bolt Size | Torque  |
|-----------|---------|
| M6        | 10 Nm   |
| M8        | 25 Nm   |
| M10       | 50 Nm   |
| M12       | 85 Nm   |
| M16       | 200 Nm  |
| M20       | 350 Nm  |
| M24       | 610 Nm  |
| M30       | 1220 Nm |
| M36       | 2150 Nm |

- 5.5.4. Recommended fasteners for securing base mounted units (ISO Grade 8.8).

**Table 3**

|     |            |     |            |     |           |
|-----|------------|-----|------------|-----|-----------|
| R01 | M8 x 25L   | K03 | M10 x 25L  | S03 | M8 x 20L  |
| R02 | M8 x 30L   | K04 | M10 x 30L  | S04 | M10 x 30L |
| R03 | M8 x 30L   | K05 | M12 x 35L  | S05 | M10 x 30L |
| R04 | M12 x 40L  | K06 | M12 x 40L  | S06 | M12 x 40L |
| R05 | M12 x 40L  | K07 | M16 x 50L  | S07 | M16 x 50L |
| R06 | M12 x 40L  | K08 | M20 x 60L  | S08 | M20 x 65L |
| R07 | M16 x 45L  | K09 | M24 x 70L  | S09 | M24 x 75L |
| R08 | M16 x 60L  | K10 | M30 x 80L  | S10 | M24 x 80L |
| R09 | M20 x 70L  | K12 | M36 x 100L |     |           |
| R10 | M24 x 80L  |     |            |     |           |
| R13 | M30 x 90L  |     |            |     |           |
| R14 | M36 x 100L |     |            |     |           |



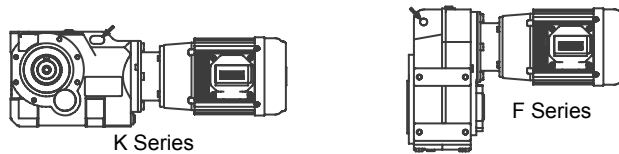
## 5.6. Installing Shaft mounted units

- 5.6.1. The gear unit must be installed in the specified mounting position.
- 5.6.2. Assembly of gear unit on to the machine shaft:  
There three assembly methods dependant on the gear unit type:
  - Standard straight bore with keyway. See Appendix 2A.
  - Unit fitted with KIBO® bushes. See Appendix 2B.
  - Unit fitted with shrink disc. See Appendix 2C.
- 5.6.3. Anchor gear unit to a secure point on the structure by means of a torque arm. (See Appendix 2D).

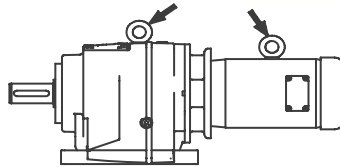


## 5.7. Lifting

- 5.7.1. Use only the lifting points provided.
- 5.7.2. F & K Series units have a lifting hole in the gear housing as indicated with the arrow.



- 5.7.3. Larger R & S Series units are supplied with a lifting eye.



- 5.7.4. If the motor is supplied with a lifting eye, the lifting point on the motor as well as the lifting point on the gear unit should be used.



## 5.8. Special Instructions for units to be used in a potentially explosive atmosphere

- 5.8.1. If the unit has been damaged in transit do not use. (Remove all transport fixtures and packings prior to start up)
- 5.8.2. Check nameplate of unit corresponds with the sites potentially explosive atmosphere classification.
- 5.8.3. Check ambient temperature falls within lubricant grade recommendations. (See Approved Lubricants in Appendix 4)
- 5.8.4. Make sure no potentially explosive atmosphere exists during installation.
- 5.8.5. Make sure that gear unit is sufficiently ventilated with no external heat input – cooling air temperature should not exceed 40°C
- 5.8.6. Ensure mounting position corresponds to that marked on the nameplate. (Note! ATEX approval is only valid for the mounting position specified on the nameplate)
- 5.8.7. Check motors, couplings or any other equipment to be fitted to the gear unit has ATEX approval. Check information listed on the nameplates correspond to the environmental conditions of the site.
- 5.8.8. Ensure gearbox is not subjected to any loading greater than those marked on the nameplate.
- 5.8.9. **For units operated with inverter drives**, check motor suitability for use with the inverter. Ensure that the inverter parameters do not exceed those of the motor.
- 5.8.10. **For belt driven units**, check all belts fitted are of sufficient electrical leakage resistance. (< 109 Ω).
- 5.8.11. Ensure the gear unit and other equipment fitted is electrically grounded (Earthed).
- 5.8.12. Check and adjust safety guards and covers so that there is no ignition source from sparks that may be thrown by moving parts making contact with guards etc.
- 5.8.13. Ensure safety guards and covers etc... are designed dust tight or designed to prevent a build up of dust deposits from forming when the unit is used in Zone 21 or Zone 22 classification areas.



## 6. Lubrication

### **6.1. General**

- 6.1.1. R F & K Series size 7 and below will be supplied factory filled with a quantity of EP mineral oil (Grade 6E) appropriate to the intended mounting position. However if, as requested, the gear unit is supplied without lubricant then the oil quantity required is obtained from Appendix 4.
- 6.1.2. R F & K Series size 8 and larger are supplied without lubricant (unless factory filled by request). Recommended lubricants are listed in our Approved Lubricants pages in Appendix 4.
- 6.1.3. S Series size 6 and below are supplied factory filled with synthetic lubricant (Grade 6G).
- 6.1.4. S Series size 7 and larger are supplied without lubricant (unless factory filled by request). Recommended lubricants are listed in our Approved Lubricants pages in Appendix 4.

### Temperature Limitations

The standard lubricant is suitable for operation in ambient temperatures of 0° to 35°C.  
For use outside of these temperatures consult Table L1 (below) or consult our application engineers.

**Table L1**

|                 | -5°C to 20°C (5E)<br>-30°C to 20°C (5G & 5H) | 0°C to 35°C              | 20°C to 50°C             |
|-----------------|--|--------------------------|--------------------------|
| <b>F Series</b> | 5E<br>ISO CLP(CC) VG 220                     | 6E<br>ISO CLP(CC) VG 320 | 7E<br>ISO CLP(CC) VG 460 |
| <b>K Series</b> |  |                          |                          |
| <b>R Series</b> | 5H<br>ISO CLP(HC) VG 220                     | 5H<br>ISO CLP(HC) VG 220 | 6H<br>ISO CLP(HC) VG 320 |
| <b>S Series</b> | 5G<br>ISO CLP(PG) VG 220                     | 6G<br>ISO CLP(PG) VG 320 | 7G<br>ISO CLP(PG) VG 460 |

### **6.2. Ventilator**

- 6.2.1. Clean & secure the ventilator (if supplied) in the correct location for the required mounting position. (See Appendix 4)

### **6.3. Oil Level:**

Always check that level, drain and ventilator positions are correct for the required mounting position and ensure that the oil level is correct by following the instructions below.



#### Units supplied without oil:

- 6.3.1. Fill gear unit with correct type of lubricant until oil escapes from level plug. See Appendix 4

#### Factory filled units:

- 6.3.2. If the unit is fitted with a level plug, (See Appendix 4) check oil level and top up with correct oil type as necessary.

WARNING Do not overfill as excess may cause overheating and leakage.

- 6.3.3. Re-fit plugs & tighten to correct torque figure – see notes in maintenance section. Clean away any oil spillage from the surface of the gear unit and driven machinery.



## 7. Motor Connections

To mains:



- 7.1. Connection of the electric motor to the mains supply should be made by a qualified person. The current rating of the motor will be identified on the motor plate, and correct sizing of the cables to electrical regulations is essential.

### Motor terminal connection:

- 7.2. The motor should be wired in accordance with the manufacturers instructions. (General circuit diagrams for 'Own Brand' motors are shown in Appendix 3)
- 7.3. If an alternative brand motor is supplied, it should always be wired in accordance with the manufacturers instructions.

## 8. Starting Up

### **8.1. Prior to starting up**



- 8.1.1. Ensure the ventilator is fitted (if supplied) see lubrication section 6.2

- 8.1.2. Check oil level, top up if necessary.



- 8.1.3. Ensure all safety devices are in place (i.e. guards fitted). Check and adjust guards and covers so that there is no ignition source from sparks that may be thrown by moving parts making contact with guards etc. Ensure coupling guards, covers etc are dust tight or are designed in such a way that a build up of dust deposits cannot form when the unit is used in Zone 21 & Zone 22 classification areas.

- 8.1.4. Remove any safety devices fitted to prevent machine rotation.

- 8.1.5. Starting up should only be performed or supervised by suitably qualified personnel.

Caution: Any deviation from normal operating conditions, (increased temperature, noise, vibrations, power consumption etc) suggest a malfunction, inform maintenance personnel immediately.

- 8.1.6. For units fitted with backstop device, ensure motor is correctly wired for free direction of rotation.

## 9. Operation

### **9.1. Noise**



The range of product satisfies a noise (sound pressure level) of 85dB(A) or less when measured at 1 metre from the unit surface. Measurements taken in accordance with B.S.7676 Pt1 : 1993 (ISO 8579-1 : 1993).

### **9.2. General Safety**



Potential hazards which can be encountered during installation, maintenance and operation of drives is covered in greater detail in the product safety page at the front of this booklet.

Advice is also given on sensible precautions which need to be taken to avoid injury or damage. **PLEASE READ!**

### **9.3. Gear units for use in a potentially explosive atmosphere**



After 3 hours of operation check the gear unit surface temperature. This temperature should not exceed 110°C. If temperature exceeds this limit, shut down immediately and contact our application engineers.

## 10. Maintenance

### 10.1. Prior to any maintenance operations



- 10.1.1. De-energise the drive and secure against un-intentional switch on.
- 10.1.2. Wait until the unit has cooled down – Danger of skin burns & pressure build up.

### 10.2. Oil plugs/ventilator



- 10.2.1. Prior to removing plugs, ensure that the unit has cooled sufficiently so that oil will not burn.
- 10.2.2. Remove ventilator plug prior to removing level and/or drain plug. Warning do not stand over ventilator plug whilst removing as pressure build up behind the valved ventilator may cause it to eject when removed.
- 10.2.3. Place a container under the oil drain plug to be removed. Note: it is recommended that the oil should be slightly warm, (40-50°C) when drained. (Cooler oil will be more difficult to drain correctly).
- 10.2.4. Top ups or refills should be done through the ventilator position.
- 10.2.5. Remember to refit all plugs and torque tighten to table M1 below.
- 10.2.6. Clean away any oil spillage.



**Table M1**

| Plug | Torque |
|------|--------|
| M10  | 12Nm   |
| M12  | 20Nm   |
| M14  | 26Nm   |
| M16  | 34Nm   |
| M22  | 65Nm   |



### 10.3. Lubrication

- 10.3.1. Periodic inspection.

For units fitted with level plug or other level indicating device. Check the oil level every 3000 hours or 6 months (whichever is sooner) and if necessary top up with the recommended type of lubricant.

- 10.3.2. Oil changes.

Smaller size units (without ventilator) are supplied factory filled and lubricated for life except for the following conditions:



- Mineral oil filled units operating at over 70°C surface temperature should be drained and refilled with the correct quantity of oil after 3 years operation.
- All units that are required to work in potentially explosive atmospheres (Group II category 2 zones 1 & 21 or category 3 zones 2 & 22) should be drained and refilled with correct quantity of lubricant in accordance with the schedule as listed in Table M2 - See Appendix 4 for correct oil quantity.

All larger size units (supplied with ventilator) should be drained and refilled with correct quantity of lubricant in accordance with the Tables M2 - See Appendix 4 for correct oil quantity.



### Warning.

Do not mix Synthetic and Mineral lubricants.  
Do not overfill the unit as this can cause leakage and overheating.



## Oil Change Period: F K & R Series

| UNIT OPERATING TEMPERATURE °C | RENEWAL PERIOD          |                           |
|-------------------------------|-------------------------|---------------------------|
|                               | MINERAL OIL             | SYNTHETIC OIL             |
| <75°C                         | 17000 HOURS OR 3 YEARS  | 26000 HOURS OR 3 YEARS    |
| 80°C                          | 12000 HOURS OR 3 YEARS  | 26000 HOURS OR 3 YEARS    |
| 85°C                          | 8500 HOURS OR 3 YEARS   | 21000 HOURS OR 3 YEARS    |
| 90°C                          | 6000 HOURS OR 2 YEARS   | 15000 HOURS OR 3 YEARS    |
| 95°C                          | 4200 HOURS OR 17 MONTHS | 10500 HOURS OR 3 YEARS    |
| 100°C                         | 3000 HOURS OR 12 MONTHS | 7500 HOURS OR 2 1/2 YEARS |
| 105°C                         | 2100 HOURS OR 8 MONTHS  | 6200 HOURS OR 2 YEARS     |
| 110°C                         | 1500 HOURS OR 6 MONTHS  | 2100 HOURS OR 18 MONTHS   |

## Oil Change Period: S Series

| UNIT OPERATING TEMPERATURE °C | RENEWAL PERIOD          |                           |
|-------------------------------|-------------------------|---------------------------|
|                               | MINERAL OIL             | SYNTHETIC OIL             |
| <65°C                         | 17000 HOURS OR 3 YEARS  | 26000 HOURS OR 3 YEARS    |
| 70°C                          | 12000 HOURS OR 3 YEARS  | 26000 HOURS OR 3 YEARS    |
| 75°C                          | 8500 HOURS OR 3 YEARS   | 22000 HOURS OR 3 YEARS    |
| 80°C                          | 6000 HOURS OR 2 YEARS   | 15000 HOURS OR 3 YEARS    |
| 85°C                          | 4200 HOURS OR 17 MONTHS | 10500 HOURS OR 3 YEARS    |
| 90°C                          | 3000 HOURS OR 12 MONTHS | 7500 HOURS OR 2 1/2 YEARS |
| 95°C                          | 2100 HOURS OR 8 MONTHS  | 6000 HOURS OR 2 YEARS     |
| 100°C                         | 1500 HOURS OR 6 MONTHS  | 4500 HOURS OR 18 MONTHS   |

*NB: INITIAL FILL OF OIL SHOULD BE CHANGED IN A NEW GEAR UNIT AFTER 1000 HOURS OPERATION OR ONE YEAR WHICHEVER IS THE SOONEST*



### 10.4. Bearings

- 10.4.1 For  marked units bearings should be checked after 5 years operation, and replaced (if necessary)

### 10.5. Grease Lubrication

- 10.5.1. Where re-greasing points are provided add 2 shots monthly of NLGI 2 grade grease. See appendix 4 for details of approved grease.



### 10.6. Cleaning

- 10.6.1. With the drive stationary, periodically clean any dirt or dust from the gear unit and the electric motor cooling fins and fan guard to aid cooling.



- 10.6.2. Ensure any dust build up does not exceed 5mm (maximum)

### 10.7. Motor Replacement



- 10.7.1. Isolate and secure the driven machine, and disconnect the motor power supply

- 10.7.2. Remove the motor flange fastenings

- 10.7.3. Carefully slide the motor away from the gear unit (do not hammer)

- 10.7.4. Clean the gear unit plug-in bore and the flange surface



- 10.7.5. Check the replacement motor is the of correct frame size and power rating for the gear unit, and re-fit the motor as described in Section 5.4

- 10.7.6. Re-connect motor power supply – See Section 7

*Connection of the electric motor to the mains supply should be made by a qualified person.*

## 11. Fault diagnosis

### 11.1. Gear unit problems:

| Symptom   | Possible Causes   | Remedy  |
|---|---|---|
| Output shaft does not rotate, even though the motor is running or the input shaft is rotating.  | Drive between shafts interrupted in the gear unit   | Return the gear unit / geared motor for repair  |
| Unusual, regular running noise  | a) A meshing or grinding sound : damage to bearings<br>b) A knocking sound : irregularity in the gearing  | a) Check oil (See Inspection and Maintenance)<br>b) Contact our Application Engineers   |
| Unusual, irregular running noise  | Foreign matter present in the oil   | a) Check oil (See Inspection and Maintenance)<br>b) Stop the unit, Contact our Application Engineers  |
| Oil leaking <sup>1</sup><br>• from the gear unit cover<br>• from the motor flange<br>• from the gear unit flange<br>• from the output end oilseal | a) Defective gasket on gear unit cover<br>b) Defective gasket<br>c) Gear unit not ventilated  | a) Retighten screws on gear unit cover and observe gear unit. If oil still leaks contact our Application Engineers<br>b) Contact our Application Engineers<br>c) Vent the gear unit (see Appendix 4 - Mounting positions)   |
| Oil leaking from the ventilator   | a) Gear unit over filled with oil<br>b) Gear unit installed in an incorrect mounting position<br>c) Frequent cold starts (oil foaming) and/or high oil level. | a) Correct the oil level (see lubrication section)<br>b) Fit the ventilator in the correct position (see Appendix 4 - Mounting positions) and check oil level (see lubrication)<br>c) Check the oil level (see lubrication) |

1) it is normal for small amounts of oil/grease to leak out of the oil seal during the running in period (24 hours running time)

### **When contacting our sales office**

Please have the following information available:

- Nameplate data (complete)
- Type and extent of the problem encountered
- The time and the circumstances the problem occurred
- A possible cause

Any further information or clarification required may be obtained by contacting our sales office, please see contact details at the back of this booklet.

## Shaft Alignment.

Errors of alignment fall into categories of angularity (see Figure 1) and eccentricity (see Figure 2), or a combination of both.

Errors of angularity should be checked for, and corrected, before errors of eccentricity.

Alignment in accordance with the following procedure will ensure vibration levels meeting those set out in ISO 10816 Part 1.

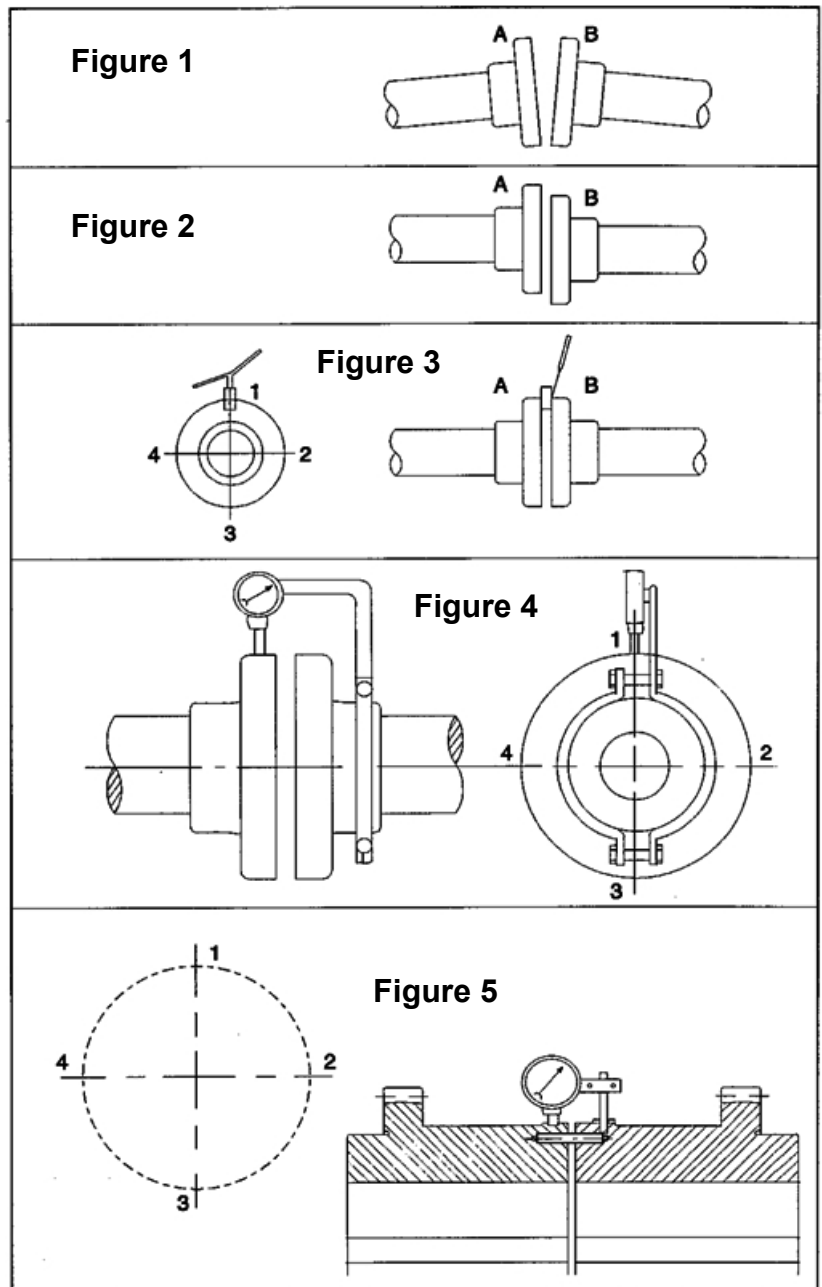
### Errors of Angularity.

If the faces are perfectly true, the angularity can be checked by keeping both shafts stationary and taking measurements with a block gauge and feelers at the four points 1, 2, 3 and 4 as shown in Figure 3. The difference between the readings 1 and 3 will give the error of alignment in the vertical plane, over the length of the shaft equal to the diameter of the coupling flanges, and from this the difference in the relative heights of the feet of the motor or other connected machine can be found by proportion. Similarly, the difference between the reading 2 and 4 gives the amount of sideways adjustment necessary to correct any errors of alignment in the horizontal plane.

Generally, however, the coupling faces will not be absolutely true and whilst any errors so found could be allowed for in checking angularity by the stationary method an easier method presents itself. This consists in marking the points 1 on both "A" and "B" and rotating both half couplings, keeping the marked points together. By taking measurements each quarter-revolution the errors in the vertical and horizontal planes are again found.

**NOTE:** Check the alignment after running the unit until it has attained its normal working temperature. Any discrepancies can then be rectified.

The permitted angularity error is as follows :



| Type of Coupling | Allowable Gap (G) (mm)  |
|------------------|---|
| Rigid Coupling   | $G = 0.0005 D$  |
| All other types  | Please see appropriate Installation and Maintenance Manual for coupling type fitted |

NOTE: D is the diameter (mm) at which the gap is measured.

**Errors of Eccentricity**

The procedure for measuring eccentricity is precisely analogous to that used for angularity. In this case, however, the measurements are taken in a radial direction and the most convenient and accurate means of doing this utilises a dial indicator suitably clamped to one half coupling, and bearing on the hub or flange of the other, as shown in figures 4 and 5 on page 11.

Care must, however, be taken to ensure the support for the dial indicator is sufficiently rigid to prevent the weight of the indicator from causing deflection and, in consequence inaccurate readings. Extra care should be taken where taper roller bearings are fitted to ensure that alignment is checked with shafts in mid-point position and a final check made with the unit at operating temperature.

| Type of Coupling | Unit Size   | Allowable Eccentricity (mm) |
|------------------|---|-----------------------------|
| Rigid            | SIZE 08 & UNDER   | 0.025                       |
|                  | SIZE 09 & OVER  | 0.035                       |
| All other types  | Please see appropriate installation and maintenance manual for coupling type fitted |                             |

**SPECIAL NOTE CONCERNING RIGID COUPLINGS**

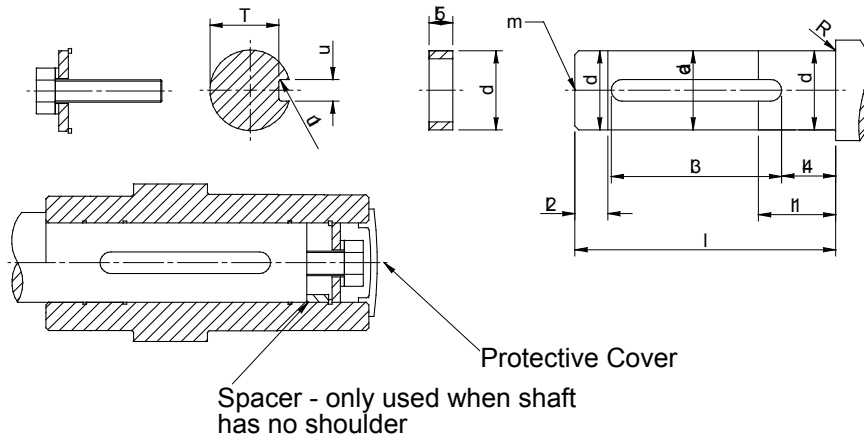
In lining up elements involving rigid couplings it is important that no attempt is made to correct errors of alignment or eccentricity greater than those above by tightening of the coupling bolts (This applies when the system is cold or at operating temperature). The result is miss-alignment and the setting up of undue stresses in the shaft, coupling and bearings. This will be revealed by the springing apart of the coupling faces if the bolts are slackened off. A check on the angularity of a pre-assembled job, after bolting down, can be obtained in the case of rigid couplings by slackening off the coupling bolts, when any mis-alignment will cause the coupling faces to spring apart. This check may not, however, reveal any strains due to eccentricity owing to the constant restraint imposed by the spigot.

**COUPLINGS**

We produce standard flexible couplings to cover the complete range of gear units, please contact Application Engineering for details.

## Shaft Mounted Units - Standard Bore/Shaft Assembly

### Customers Shaft Details



| UNIT      | Bore    | d                  | da   | I   | I1  | I2 | I3             | I4 | I5 | m                     | R    | T             | u                 | u1            |
|-----------|---------|--------------------|------|-----|-----|----|----------------|----|----|-----------------------|------|---------------|-------------------|---------------|
| S03       | Std     | 19.993/<br>19.980  | 19.6 | 82  | 30  | 10 | 613<br>61.0    | 3  | 22 | M6 x 1.0<br>16 deep   | 0.8R | 16.5<br>16.4  | 6.000/<br>5.970   | 0.16<br>0.25R |
| S04       | Reduced | 29.993/<br>29.980  | 24.6 | 99  | 38  | 13 | 79.3<br>79.0   | 3  | 23 | M10 x 1.5<br>22 deep  | 0.8R | 21.0<br>20.8  | 8.000/<br>7.964   | 0.16<br>0.25R |
|           | Std     | 29.993/<br>29.980  | 29.6 | 99  | 45  | 15 | 79.3<br>79.0   | 3  | 26 | M10 x 1.5<br>22 deep  | 0.8R | 26.0<br>25.8  | 8.000/<br>7.964   | 0.16<br>0.25R |
| S05       | Reduced | 29.993/<br>29.980  | 29.6 | 104 | 45  | 15 | 79.3<br>79.0   | 3  | 23 | M10 x 1.5<br>22 deep  | 0.8R | 26.0<br>25.8  | 8.000/<br>7.964   | 0.16<br>0.25R |
|           | Std     | 34.991/<br>34.975  | 34.6 | 104 | 53  | 18 | 77.3<br>77.0   | 3  | 23 | M12 x 1.75<br>22 deep | 0.8R | 30.0<br>29.8  | 10.000/<br>9.964  | 0.16<br>0.25R |
| S06       | Reduced | 39.991/<br>39.975  | 39.6 | 125 | 60  | 20 | 100.5<br>100.0 | 3  | 31 | M16 x 2<br>36 deep    | 0.8R | 35.0<br>34.8  | 12.000/<br>11.957 | 0.4<br>0.25R  |
|           | Std     | 44.991/<br>44.975  | 44.6 | 125 | 68  | 23 | 101.5<br>101.0 | 3  | 31 | M16 x 2<br>36 deep    | 0.8R | 39.5<br>39.3  | 14.000/<br>13.957 | 0.4<br>0.25R  |
| S07       | Reduced | 49.991/<br>49.975  | 49.6 | 153 | 75  | 25 | 130.5<br>130.0 | 3  | 35 | M16 x 2<br>38 deep    | 1.2R | 44.5<br>44.3  | 14.000/<br>13.957 | 0.4<br>0.25R  |
|           | Std     | 59.990/<br>59.971  | 59.6 | 153 | 90  | 30 | 148.5<br>148.0 | 3  | 38 | M20 x 2.5<br>42 deep  | 1.2R | 53.0<br>52.8  | 18.000/<br>17.957 | 0.4<br>0.25R  |
| S08       | Reduced | 59.990/<br>59.971  | 59.6 | 183 | 91  | 31 | 148.5<br>148.0 | 3  | 37 | M20 x 2.5<br>42 deep  | 1.2R | 53.0<br>52.8  | 18.000/<br>17.957 | 0.4<br>0.25R  |
|           | Std     | 69.990/<br>69.971  | 69.6 | 183 | 105 | 35 | 177.5<br>177.0 | 3  | 37 | M20 x 2.5<br>42 deep  | 1.2R | 62.5<br>62.3  | 20.000/<br>19.948 | 0.6<br>0.4R   |
| S09       | Reduced | 69.990/<br>69.971  | 69.6 | 227 | 105 | 35 | 177.5<br>177.0 | 3  | 58 | M20 x 2.5<br>42 deep  | 1.2R | 62.5<br>62.3  | 20.000/<br>19.948 | 0.6<br>0.4R   |
|           | Std     | 89.988/<br>89.966  | 76.6 | 227 | 135 | 45 | 221.5<br>221.0 | 3  | 58 | M24 x 3.0<br>50 deep  | 1.2R | 81.0<br>80.8  | 25.000/<br>24.948 | 0.6<br>0.4R   |
| S10       | Reduced | 79.990/<br>79.971  | 79.6 | 260 | 120 | 40 | 225.5<br>225.0 | 3  | 53 | M20 x 2.5<br>42 deep  | 1.2R | 71.0<br>70.8  | 22.000/<br>21.946 | 0.6<br>0.4R   |
|           | Std     | 99.988/<br>99.966  | 99.6 | 327 | 150 | 45 | 238.5<br>238.0 | 10 | 46 | M24 x 3.0<br>50 deep  | 0.8R | 90.0<br>89.8  | 28.000/<br>27.948 | 0.6<br>0.4R   |
| F02       | -       | 24.9931/<br>24.980 | 24.6 | 82  | 40  | 13 | 70.3<br>70.0   | 3  | 23 | M10 x 1.5<br>22 deep  | 0.8R | 21.0<br>20.8  | 8.000/<br>7.964   | 0.16<br>0.25R |
| F03 & K03 | -       | 29.993/<br>29.980  | 29.6 | 82  | 45  | 15 | 70.3<br>70.0   | 3  | 23 | M10 x 1.5<br>22 deep  | 0.8R | 26.0<br>25.8  | 8.000/<br>7.964   | 0.16<br>0.25R |
| F04 & K04 | -       | 34.991/<br>34.975  | 34.6 | 109 | 60  | 20 | 90.5<br>90.0   | 3  | 23 | M12 x 1.75<br>28 deep | 0.8R | 30.0<br>29.8  | 10.000/<br>9.964  | 0.16<br>0.25R |
| F05 & K05 | -       | 39.991/<br>39.975  | 39.6 | 112 | 60  | 20 | 92.5<br>92.0   | 3  | 30 | M16 x 2<br>36 deep    | 0.8R | 35.0<br>34.8  | 12.000/<br>11.957 | 0.4<br>0.25R  |
| F06 & K06 | -       | 39.991/<br>39.975  | 39.6 | 126 | 75  | 25 | 100.5<br>100.0 | 3  | 30 | M16 x 2<br>36 deep    | 0.8R | 35.0<br>34.8  | 12.000/<br>11.957 | 0.4<br>0.25R  |
| F07 & K07 | -       | 44.991/<br>44.975  | 49.6 | 153 | 75  | 25 | 101.5<br>101.0 | 3  | 30 | M16 x 2<br>36 deep    | 0.8R | 44.5<br>44.3  | 14.000/<br>13.957 | 0.4<br>0.25R  |
| F08 & K08 | -       | 59.990/<br>59.971  | 59.6 | 173 | 90  | 30 | 148.5<br>148.0 | 3  | 37 | M20 x 2.5<br>42 deep  | 0.8R | 53.0<br>52.8  | 18.000/<br>17.957 | 0.4<br>0.25R  |
| F09 & K09 | -       | 69.990/<br>69.971  | 69.6 | 232 | 105 | 35 | 161.5<br>161.0 | 3  | 38 | M20 x 2.5<br>42 deep  | 0.8R | 62.5<br>62.3  | 20.000/<br>19.948 | 0.6<br>0.4R   |
| F10 & K10 | -       | 79.990/<br>79.971  | 79.6 | 275 | 120 | 40 | 188.5<br>188.0 | 5  | 37 | M20 x 2.5<br>42 deep  | 0.8R | 71.0<br>70.8  | 22.000/<br>21.946 | 0.6<br>0.4R   |
| F11       | -       | 89.988/<br>89.996  | 89.9 | 265 | 60  | 55 | 206.5<br>206.0 | 42 | -  | M24 x 3.0<br>50 deep  | 0.8R | 81.0/<br>80.8 | 25.000/<br>24.948 | 0.6<br>0.4R   |
| F12       | -       | 99.988/<br>99.996  | 99.6 | 329 | 59  | 60 | 228.5<br>228.0 | 50 | -  | M24 x 3.0<br>50 deep  | 0.8R | 90.0<br>89.8  | 28.000/<br>27.948 | 0.6<br>4R     |
| K12       | -       | 99.988/<br>99.966  | 99.6 | 327 | 150 | 45 | 238.5<br>238.0 | 10 | 46 | M24 x 3.0<br>50 deep  | 0.8R | 90.0<br>89.8  | 28.000/<br>27.948 | 0.6<br>0.4R   |

See next page for shaft assembly instructions.

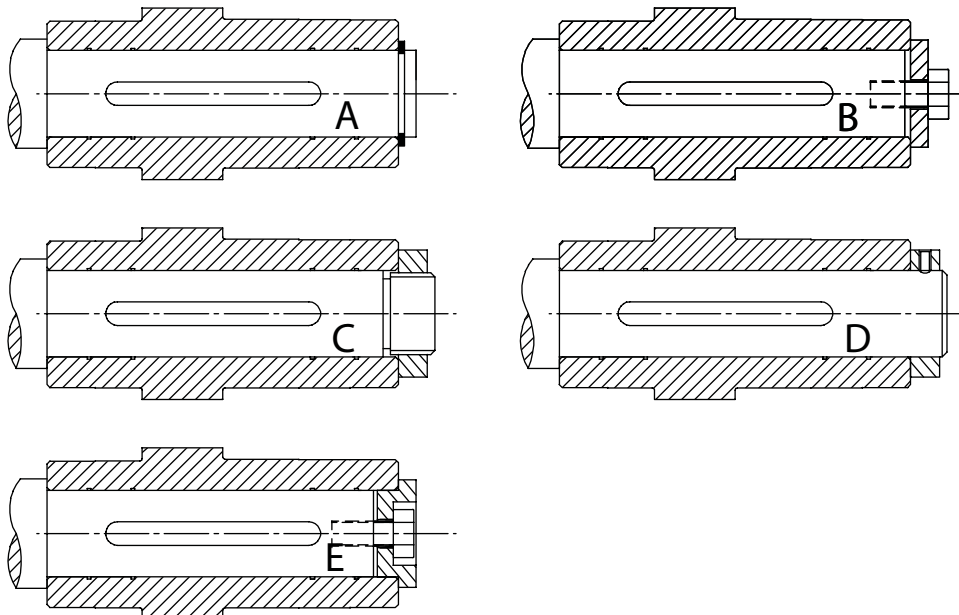
## Standard Bore/Shaft Assembly Instructions



1. Spray the hollow shaft bore and mating diameter of output shaft with an anti-fret compound.
2. Fit the shaft to hollow bore location key in position in the output shaft.
3. Fit the circlip into the output sleeve. (Units F11 and F12 can not be secured in this way, it is recommended to use the alternative fixing method type B as shown below)
4. Fit the output shaft into the output sleeve. Remember to fit a spacer tube (not supplied) if the output shaft has no shoulder. (see dimension table for details)
5. Secure in place with the washer and bolt, Torque tighten the bolt to the values stated in the table below.
6. Fit the protective cover over the open end of the output sleeve.

| Bolt | Torque |
|------|--------|
| M10  | 15     |
| M12  | 20     |
| M16  | 45     |
| M20  | 85     |
| M24  | 200    |

Alternative shaft fixing methods shown below may be considered



A - Retained with a Circlip

B – Retained with a Plate and Bolt

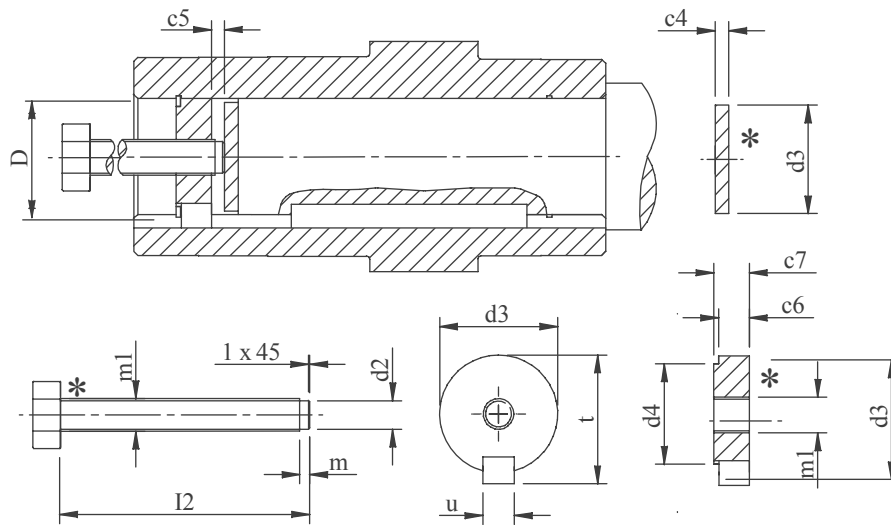
C – Retained with a Locknut

D – Retained with a Collar and Grub screw

E – Retained with a Plate and Bolt



## Standard Bore/Shaft Disassembly.



\*Parts supplied by customer

| UNIT      | Bore    | c4 | c6 | c7 | D (H7) | d2 | d3   | d4   | l2  | m | m1         | t    | u  |
|-----------|---------|----|----|----|--------|----|------|------|-----|---|------------|------|----|
| S03       | Std     | 5  | 10 | 12 | 20     | 7  | 19.9 | 11.2 | 120 | 3 | M10 x 1.5  | 22   | 6  |
| S04       | Reduced | 5  | 15 | 17 | 25     | 13 | 24.9 | 16.2 | 23  | 3 | M16 x 2    | 28   | 8  |
|           | Std     | 5  | 15 | 17 | 30     | 13 | 29.9 | 20.8 | 160 | 3 | M16 x 2    | 33   | 8  |
| S05       | Reduced | 5  | 15 | 17 | 30     | 13 | 29.9 | 20.8 | 260 | 3 | M16 x 2    | 33   | 8  |
|           | Std     | 5  | 15 | 17 | 35     | 13 | 34.9 | 25.2 | 160 | 3 | M16 x 2    | 38   | 10 |
| S06       | Reduced | 5  | 20 | 23 | 40     | 20 | 39.9 | 30.9 | 220 | 3 | M24 x 3    | 43   | 12 |
|           | Std     | 5  | 20 | 23 | 45     | 20 | 44.9 | 34.1 | 220 | 3 | M24 x 3    | 49   | 14 |
| S07       | Reduced | 5  | 20 | 23 | 50     | 20 | 49.9 | 39   | 220 | 3 | M24 x 3    | 54   | 14 |
|           | Std     | 8  | 24 | 27 | 60     | 26 | 59.9 | 47.4 | 250 | 5 | M30 x 3.5  | 64   | 18 |
| S08       | Reduced | 8  | 24 | 27 | 60     | 26 | 59.9 | 47.4 | 250 | 5 | M30 x 3.5  | 64   | 18 |
|           | Std     | 8  | 24 | 27 | 70     | 26 | 69.9 | 58.4 | 310 | 5 | M30 x 3.5  | 74.5 | 20 |
| S09       | Reduced | 8  | 24 | 27 | 70     | 26 | 69.9 | 58.4 | 310 | 5 | M30 x 3.5  | 74.5 | 20 |
|           | Std     | 8  | 24 | 27 | 90     | 26 | 89.9 | 75.3 | 360 | 5 | M30 x 3.5  | 95   | 25 |
| S10       | Reduced | 8  | 24 | 27 | 80     | 26 | 79.9 | 65.5 | 360 | 5 | M30 x 3.5  | 85   | 22 |
|           | Std     | 8  | 30 | 34 | 100    | 32 | 99.9 | 84.1 | 420 | 5 | M36 x 4    | 106  | 28 |
| F02       | -       | 5  | 15 | 17 | 25     | 10 | 24.9 | 16   | 120 | 3 | M12 x 17.5 | 28   | 8  |
| F03 & K03 | -       | 5  | 15 | 17 | 30     | 13 | 29.9 | 20.8 | 130 | 3 | M16 x 2    | 33   | 8  |
| F04 & K04 | -       | 5  | 15 | 17 | 35     | 13 | 34.9 | 25.2 | 160 | 3 | M16 x 2    | 38   | 10 |
| F05 & K05 | -       | 5  | 20 | 23 | 40     | 20 | 39.9 | 29.9 | 190 | 3 | M24 x 3    | 43   | 12 |
| F06 & K06 | -       | 5  | 20 | 23 | 40     | 20 | 39.9 | 29.9 | 190 | 3 | M24 x 3    | 43   | 12 |
| F07 & K07 | -       | 5  | 20 | 23 | 50     | 20 | 49.9 | 39   | 220 | 3 | M24 x 3    | 53.5 | 14 |
| F08 & K08 | -       | 8  | 24 | 27 | 60     | 26 | 59.9 | 47.4 | 250 | 5 | M30 x 3.5  | 64   | 18 |
| F09 & K09 | -       | 8  | 24 | 27 | 70     | 26 | 69.9 | 56.4 | 310 | 5 | M30 x 3.5  | 74.5 | 20 |
| F10 & K10 | -       | 8  | 24 | 27 | 80     | 26 | 79.9 | 65.5 | 360 | 5 | M30 x 3.5  | 95   | 25 |
| K12       | -       | 8  | 30 | 34 | 100    | 32 | 99.9 | 84.1 | 420 | 5 | M36 x 4    | 116  | 28 |

## Disassembly Procedure

1. Remove locating bolt, retaining plate and circlip
2. Place plate on shaft end to protect the shaft screw thread
3. Assemble disassembly tooling as shown in diagram above
4. Turn screw to apply pressure to shaft end.

## F Series - With Kibo Bushes.

The F Series Kibo Bush option requires a gear unit with a Kibo type tapered output bore, together with a Kibo bushing kit comprising of: bushes (2), locking nuts (2), end plate, fastening bolt, shaft key and protective cover.

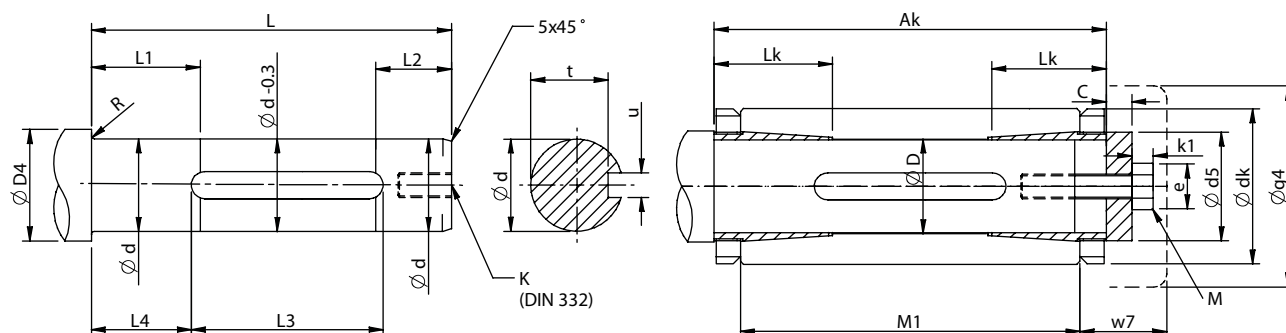
### Assembly



1. Assemble the inner bushing and locknut onto the machine shaft. The inner bushing must be mounted against a shoulder or retaining circlip, the shoulder diameter should not exceed inside diameter of nut.
2. Fully back off the inner locknut.
3. Fit the key into the shaft keyway.
3. Assemble the gear unit onto the inner bushing and shaft.
4. Assemble the outer bushing into the gear unit bore, fit locknut and finger tighten until it makes contact with the gear unit shaft
5. Mount the end plate and fixing bolt, tighten the bolt to the correct torque, the inner bushing is now locked
6. Loosen off the fixing bolt, so the outer bushing is loose, back off the outer locknut.
7. Re-tighten the fixing bolt to the correct torque, the outer bushing is now locked.
8. Finger tighten both the locknuts against the gear unit shaft, the mounting is now complete.
9. Fit the protective cover.

### Disassembly

- A. Remove the protective cover, fixing bolt and end plate
- B. Tighten the outer locknut with an adequate tool to withdraw the bushing from the gear unit shaft.
- C. Remove the gear unit from the shaft.



See table on next page for dimensions

NOTE: If reducer is to be used in a corrosive environment, machine shaft bushings and nuts should be oiled or greased. Do NOT use Molybdenum Disulfide based oil or grease.

**F Series - Kibo Bushes**

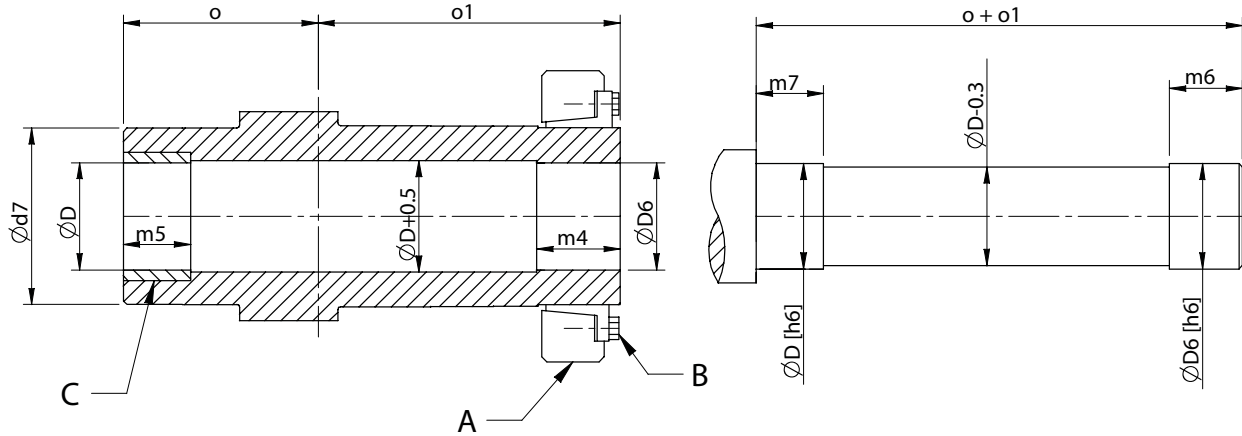
Dimensions (mm)

| Unit Size | Customers Shaft |     |     |               |     |    |    |     |      |            |      |           | End Plate |     |      |     |    |   | Cover |    |    |                         |     |    |
|-----------|-----------------|-----|-----|---------------|-----|----|----|-----|------|------------|------|-----------|-----------|-----|------|-----|----|---|-------|----|----|-------------------------|-----|----|
|           | d<br>(h8)       | d4  |     | K<br>Din(332) | L   | L1 | L2 | L3  | L4   | r<br>(max) | t    | u<br>(N9) | fk        | m1  | Ak   | Lk  | d5 | C | d4    |    |    | Tightening<br>Torque Nm | g4  | w7 |
|           |                 | min | max |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   | M     | e  | k1 |                         |     |    |
| F04       | 35              | 40  |     | M12x28        | 175 | 40 | 36 | 60  | 60   | 1.2        | 30   | 10        | 65        | 180 | 40   | 45  | 10 |   | M12   | 22 | 8  | 56                      | 81  | 34 |
|           | 30              | 35  | 42  | M10x22        |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 25              | 30  |     |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F05       | 40              | 45  |     | M16x36        | 198 | 50 | 42 | 77  | 65   | 1.2        | 35   | 12        | 75        | 207 | 50   | 55  | 12 |   | M16   | 28 | 10 | 124                     | 85  | 43 |
|           | 35              | 40  | 51  | M12x28        |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 30              | 35  |     | M10x22        |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F06       | 40              | 45  |     | M16x36        | 225 | 50 | 45 | 77  | 78   | 1.2        | 35   | 12        | 75        | 233 | 50   | 55  | 12 |   | M16   | 28 | 10 | 124                     | 85  | 43 |
|           | 35              | 40  | 51  | M12x28        |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 30              | 35  |     | M10x22        |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F07       | 50              | 55  |     | M16x36        | 258 | 58 | 52 | 79  | 93   | 1.2        | 44.5 | 14        | 80        | 265 | 58   | 65  | 14 |   | M16   | 28 | 10 | 154                     | 122 | 43 |
|           | 45              | 50  | 61  |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 40              | 45  |     |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F08       | 60              | 66  |     | M20x42        | 293 | 61 | 52 | 108 | 97.5 | 1.6        | 53   | 18        | 98        | 303 | 61   | 75  | 16 |   | M20   | 35 | 13 | 240                     | 147 | 47 |
|           | 55              | 61  | 71  |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 50              | 56  |     | M16x36        |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F09       | 70              | 76  |     | M20x42        | 340 | 70 | 50 | 131 | 75   | 1.6        | 62.5 | 20        | 110       | 369 | 67.5 | 85  | 20 |   | M20   | 35 | 13 | 290                     | 192 | 90 |
|           | 65              | 71  | 81  |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 60              | 66  |     |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F10       | 80              | 89  |     | M20x42        | 390 | 70 | 60 | 163 | 104  | 1.6        | 71   | 22        | 130       | 414 | 53   | 100 | 24 |   | M20   | 35 | 13 | 274                     | 242 | 90 |
|           | 75              | 84  | 96  |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 70              | 79  |     |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F11       | 90              | 99  |     | M24x50        | 368 | 70 | 73 | 181 | 110  | 2          | 81   | 25        | 140       | 390 | 57   | 105 | 26 |   | M24   | 42 | 15 | 308                     |     |    |
|           | 85              | 94  | 101 |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 80              | 89  |     |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
| F12       | 100             | 109 |     | M24x50        | 428 | 80 | 83 | 200 | 111  | 2.5        | 90   | 28        | 155       | 450 | 83   | 130 | 7  |   | M24   | 42 | 15 | 451                     |     |    |
|           | 95              | 104 | 116 |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |
|           | 90              | 99  |     |               |     |    |    |     |      |            |      |           |           |     |      |     |    |   |       |    |    |                         |     |    |

## K Series - With Shrink Disc

The Shrink Disc option requires a gear unit with a Shrink Disc type output bore, together with a Shrink Disc (A) locking device.

The Shrink Disc is a friction device (without keys) which exerts an external clamping force on the hollow gearbox shaft resulting in a mechanical shrink fit of the gear unit and driven shaft.



Dimensions (mm)

| SIZE | D   | D6  | d7  | m4 | m5 | m6 | m7 | o   | o1  | Torque Ta (Nm) |
|------|-----|-----|-----|----|----|----|----|-----|-----|----------------|
| K03  | 30  | 30  | 50  | 31 | 20 | 36 | 25 | 60  | 86  | 29             |
| K04  | 35  | 35  | 55  | 32 | 20 | 37 | 25 | 75  | 102 | 29             |
| K05  | 40  | 40  | 60  | 36 | 20 | 41 | 25 | 83  | 112 | 29             |
| K06  | 40  | 40  | 70  | 38 | 20 | 43 | 25 | 90  | 118 | 29             |
| K07  | 50  | 50  | 80  | 36 | 30 | 41 | 35 | 105 | 136 | 35             |
| K08  | 65  | 65  | 90  | 41 | 40 | 46 | 45 | 120 | 161 | 58             |
| K09  | 75  | 75  | 100 | 55 | 40 | 60 | 55 | 150 | 195 | 58             |
| K10  | 95  | 95  | 120 | 65 | 60 | 70 | 65 | 175 | 230 | 100            |
| K12  | 105 | 105 | 140 | 85 | 60 | 90 | 75 | 205 | 280 | 160            |

### Assembly



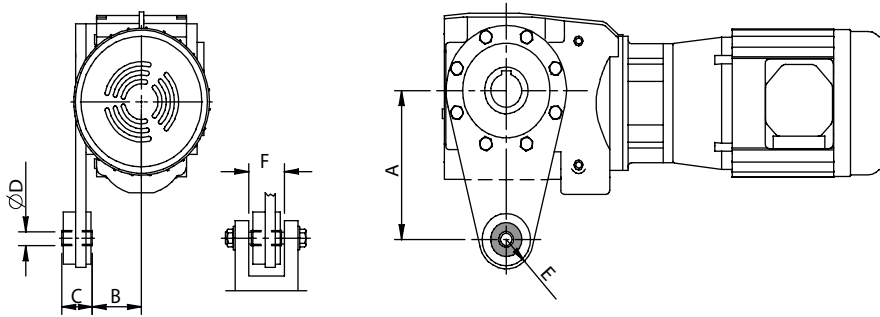
- Clean and degrease the locating diameters of the gear unit hollow shaft bore, the driven shaft and the shrink disc locating surfaces
- Ensure the Anti-fret yellow metal bush(C) is correctly inserted in the non driving end of the gear unit hollow shaft
- Draw the gear unit onto the driven shaft.
- Check and re-apply if necessary molykote 321R (or similar) to the tapered surfaces of the Shrink Disc inner ring and locking collar.
- Fit the Shrink Disc inner ring and collar into position on the shaft, fit and tighten all the locking screws gradually in succession, do **not** tighten in a diametrically opposite sequence. This tightening sequence will require several passes until all the screws are tightened to the torque specified in the table above.
- Fit the protective cover.

**Disassembly** similar to the reverse of the assembly procedure.

- Remove any rust and dirt from the assembly
- Loosen off the locking screws in succession but do not completely remove.
- Remove the shrink disc and withdraw the gear unit from the driven shaft.

NOTE: If the Shrink Disc is to be re-used it should be dismantled and cleaned thoroughly and Molykote 321R (or similar) applied to the tapered surfaces of the inner ring and collar

## S Series Torque Bracket

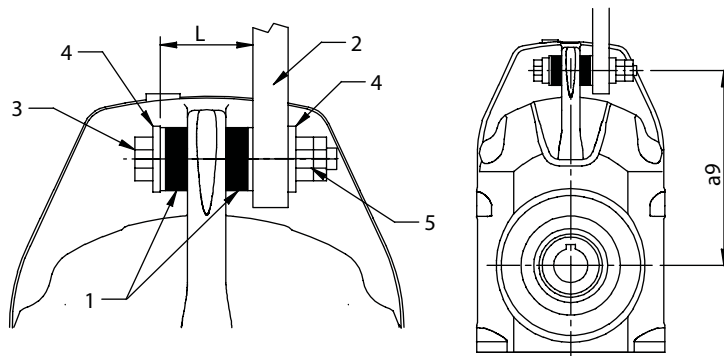


1. It is recommended that the torque bracket is positioned on the side of the gear unit adjacent to the driven machine.
2. The torque bracket requires a clevis type anchoring as shown above (not supplied)
3. The clevis position should be carefully adjusted at assembly so that it does not exert any external radial or axial pressure on the torque bracket

### Torque Bracket Dimensions mm

| Unit | A   | B   | C  | D    | E  | F (min) |
|------|-----|-----|----|------|----|---------|
| S03  | 110 | 47  | 36 | 10.4 | 23 | 41      |
| S04  | 130 | 52  | 36 | 10.4 | 23 | 41      |
| S05  | 160 | 52  | 36 | 10.4 | 23 | 41      |
| S06  | 200 | 72  | 44 | 16.4 | 43 | 49      |
| S07  | 250 | 78  | 60 | 16.4 | 43 | 65      |
| S08  | 310 | 86  | 60 | 16.4 | 45 | 65      |
| S09  | 380 | 98  | 80 | 25   | 50 | 85      |
| S10  | 430 | 137 | 80 | 25   | 50 | 85      |

## F Series Torque Buffers

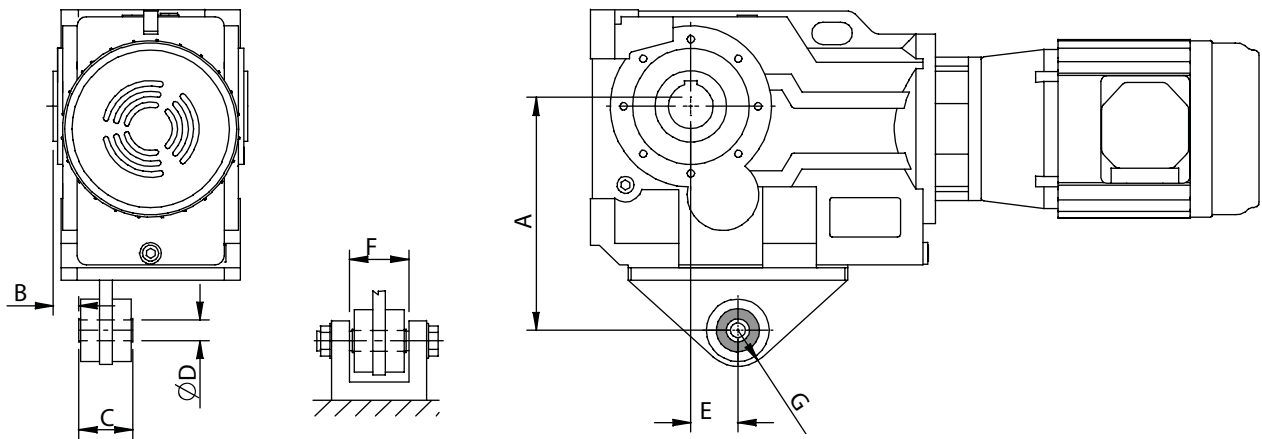


1. Torque arm components consist of a pair of rubber buffers (1) the customer must supply other components.
2. The gear unit should be anchored to a plate (2) using a bolt (3), washers (4), nut and locknut (5) as shown above.
3. Tighten bolt (3) to compress rubber bushes (1) to achieve dimension 'L' (listed in table below) secure with locknut.

| Unit | L  | Bolt (3) | a9  | Unit | L  | Bolt (3) | a9  | Unit | L   | Bolt (3) | a9  | Unit | L   | Bolt (3) | a9  |     |
|------|----|----------|-----|------|----|----------|-----|------|-----|----------|-----|------|-----|----------|-----|-----|
| F02  | 52 | M12      | 140 | F05  | 52 | M12      | 198 | F08  | 84  | M24      | 346 | F11  | 116 | M24      | 485 |     |
| F03  |    |          | 158 | F06  |    |          | 218 | F09  | 110 |          | 395 | F12  | 146 |          | M30 | 550 |
| F04  |    |          | 170 | F07  |    |          | 80  | M20  | 278 |          | F10 | 112  | M24 |          | 485 | -   |

Dimensions (mm)

### K Series Torque Bracket



1. It is recommended that the torque bracket is positioned on the side of the gear unit adjacent to the driven machine.
2. The torque bracket requires a clevis type anchoring as shown above (not supplied)
3. The clevis position should be carefully adjusted at assembly so that it does not exert any external radial or axial pressure on the torque bracket

#### Torque Bracket Dimensions mm

| Unit | A   | B  | C   | D    | E    | F (min) | G  |
|------|-----|----|-----|------|------|---------|----|
| K03  | 140 | 20 | 36  | 10.4 | 23.5 | 41      | 23 |
| K04  | 160 | 20 | 36  | 10.4 | 30   | 41      | 23 |
| K05  | 192 | 18 | 60  | 16.4 | 40   | 65      | 38 |
| K06  | 200 | 25 | 60  | 16.4 | 45   | 65      | 38 |
| K07  | 250 | 25 | 60  | 16.4 | 52.5 | 65      | 38 |
| K08  | 300 | 30 | 80  | 25   | 60   | 85      | 45 |
| K09  | 350 | 40 | 100 | 25   | 70   | 105     | 45 |
| K10  | 450 | 45 | 100 | 25   | 74   | 105     | 45 |
| K12  | 550 | 10 | 126 | 38   | 60   | 131     | 63 |

## Three Phase Induction Motor Installation.

### Connection to Mains Power Supply.



- Connection of the electric motor to the mains supply should be done by a qualified person.
- Connect motor terminals in accordance with the diagram inside the terminal box cover. (Also identified in the diagram below - this instruction only applies to our own brand plated motors)
- Motors fitted by the customer or requested by the customer from a different manufacturer will have separate documentation provided with it.

Note: It is important that the mains supply details are checked against the motor nameplate data and that they are connected as indicated on the nameplate. The correct sizing of the cables to electrical regulations is essential.

- To change the direction of rotation of the electric motor, one of the three main line terminals should be changed with the other.
- Connect the earth conductors to the marked earth terminals.

|                  |                    |
|------------------|--------------------|
| 0.12 Kw - 2.2 Kw | 220 / 240 v, 50Hz  |
|                  | 230 / 280 V, 60 Hz |
| ≥3 Kw            | 380 / 420 V, 50 Hz |
|                  | 440 / 480 V, 60 Hz |

|                  |                    |
|------------------|--------------------|
| 0.12 Kw - 2.2 Kw | 380 / 420 v, 50Hz  |
|                  | 440 / 480 V, 60 Hz |
| ≥3 Kw            | 380 / 420 V, 50 Hz |

**Approved Lubrication.**

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

| SUPPLIER                                  | LUBRICANT RANGE            | GRADE NUMBERS                |               |            |
|---|----------------------------|------------------------------|---------------|------------|
|   |                            | 5E                           | 6E            | 7E         |
|   |                            | AMBIENT TEMPERATURE RANGE °C |               |            |
|   |                            | -5 to 20                     | 0 to 35       | 20 to 50   |
| Batoyle Freedom                           | 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 (-21)                    | 320 (-15)     | 460 (-12)  |
|   | Carter XEP                 | 220 (-24)                    | 320 (-18)     | 460 (-13)  |
| 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 – S Series

Type G Polyglycol based synthetic lubricants with Anti-Wear or EP additives.

| SUPPLIER                              | LUBRICANT TYPE                      | 5G          | 6G          | 7G          | 8G        | 9G         |
|---------------------------------------|-------------------------------------|-------------|-------------|-------------|-----------|------------|
| Boxer Services / Millers Oils         | Boxergear W                         | 220 (-31)   | 320 (-31)   | 460 (-28)   |           |            |
| BP Oil International Limited          | Enersyn SG-XP                       | 220 (-31)   |             | 460 (-34)   | 680 (-28) |            |
| Caltex                                | Synlube CLP                         | 220 (-34)   | 320 (-31)   | 460 (-28)   | 680 (-31) |            |
| Carl Bechem GmbH                      | Berusrsynth 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 E, AND H

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 H Polyalphaolefin based synthetic lubricants with Anti-Wear or EP additives.

| 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   | Enersyn EPX            | -         | 320 (-28) |
| Caltex                         | Pinnacle EP            | 220 (-43) | 320 (-43) |
| Carl Bechem GmbH               | Berusrsynth 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 El 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 SH              | 220 (-48) | 320 (-42) |
| 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

## Approved Grease

NLGI grade 2 grease suitable for operation in ambient temperatures of -20°C to 50°C

- For use outside of this range contact our Application Engineers

| SUPPLIER                     | GREASE TYPE        |
|------------------------------|--------------------|
| BP Oil International Limited | Energ grease LS-EP |
| Caltex                       | Mulfak EP          |
| Castrol International        | LMX Grease         |
|                              | Spheerol AP        |
|                              | Spheerol EPL       |
| Fuchs Lubricants             | Renolit EP         |
| Klüber Lubrication           | Klüberlub BE41-542 |
| Mobil Oil Company Limited    | Mobilgrease XHP    |
|                              | Mobilith SHC       |
| Omega                        | Omega 85           |
| Optimol                      | Longtime PD        |
| Shell Oils                   | Albida RL          |
|                              | Alvania EP B       |
|                              | Nerita HV          |
| Texaco Limited               | Mulfak EP          |

## S Series Lubrication

1. S03 to S06 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. S07 to S10 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. S07 to S10 Oil levels for some units are dependent 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 S07 to S10 can be checked and maintained by filling via the ventilator position until oil escapes through the level plug hole,
  - S03 to S06 these units must be fully drained and re-filled with the correct quantity of lubricant

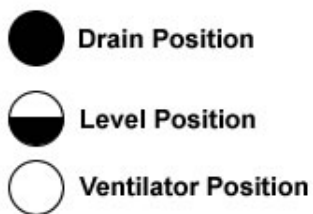
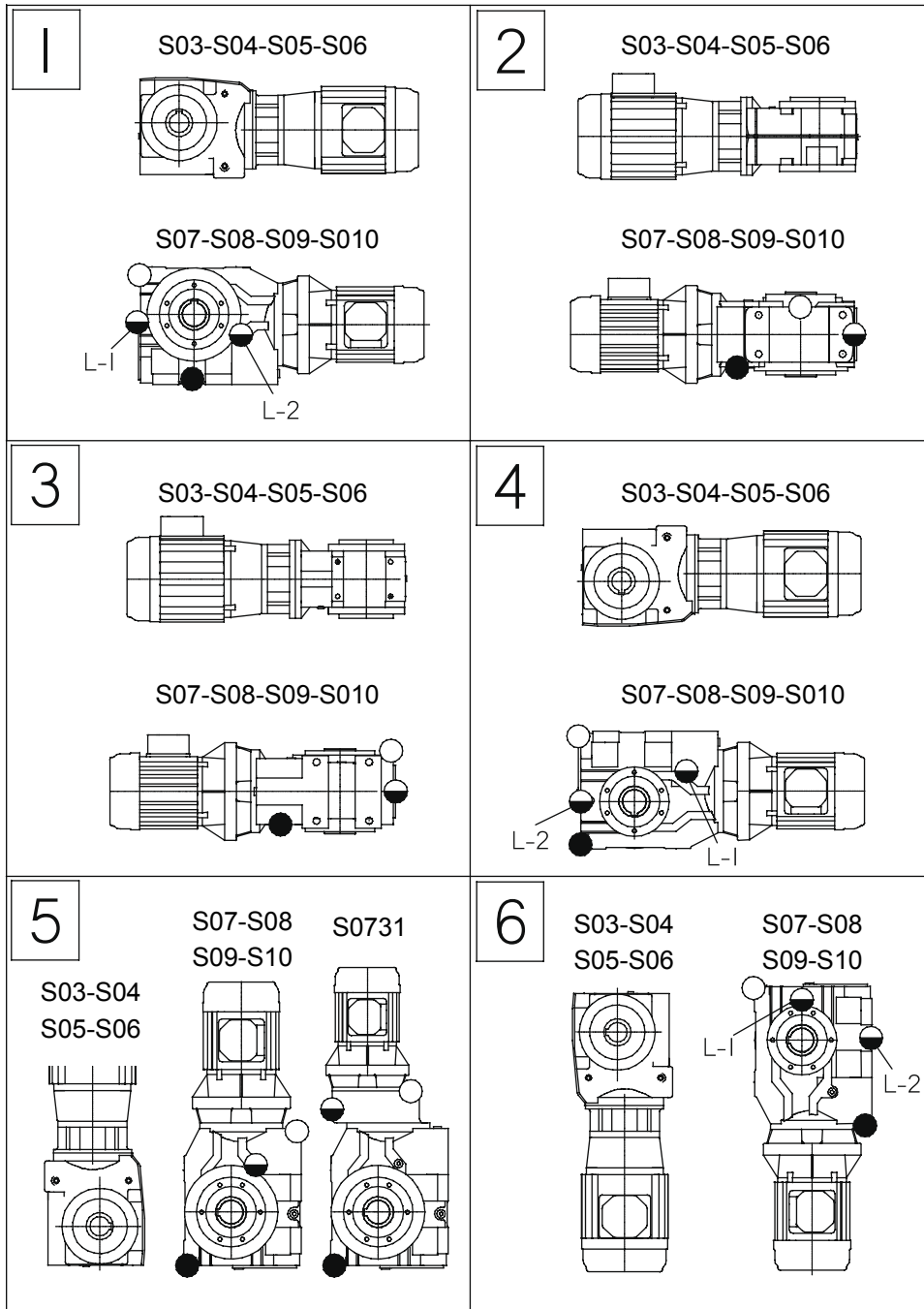
## Lubricant Quantities (Litres)

| Posn | Level | S0321 | S0421 | S0521 | S0621 | S0721 | S0821 | S0921 | S1021 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 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 | S0331 | S0431 | S0531 | S0631 | S0731 |
|------|-------|-------|-------|-------|-------|-------|
| 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. S07 to S10 Fit the ventilator plug in the position appropriate to the mounting position. S03 to S06 do **not** require a ventilator
6. Quadruple Reduction Units consist of a R Series primary unit flange mounted onto the S Series unit, see R Series lubrication data for details appropriate to the primary unit, both units should be checked for oil type and quantity.

## S Series Mounting Positions and Lubrication fill levels



## F Series 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 F10 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.

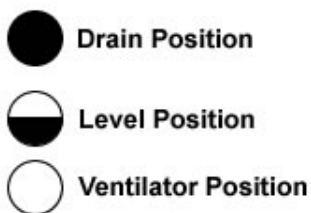
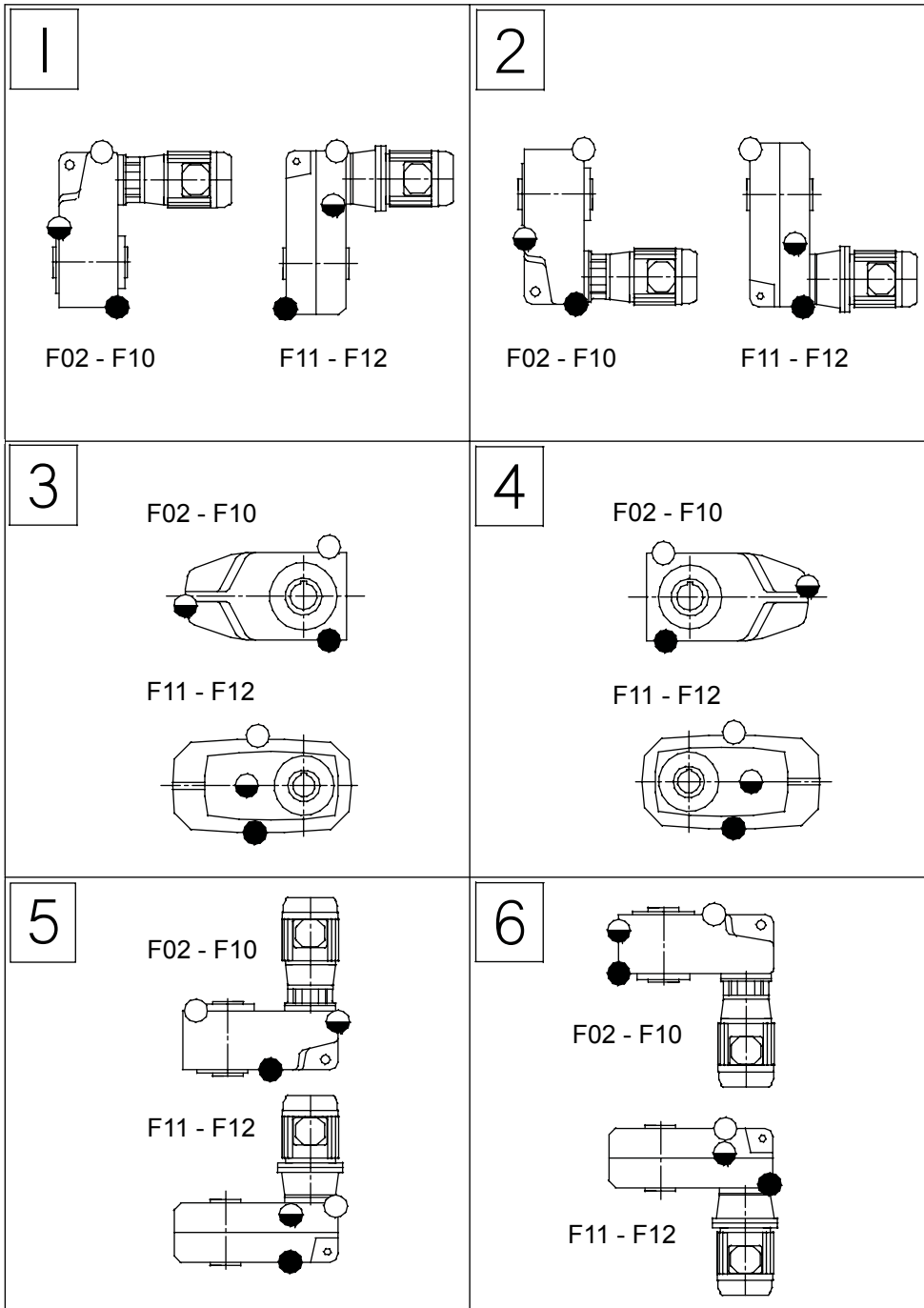
## Lubricant Quantities (Litres)

| 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    |

1. 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
2. Quadruple Reduction Units consist of a R Series primary unit flange mounted onto the F Series unit, see R Series lubrication data for details appropriate to the primary unit, both units should be checked for oil type and quantity.

**F Series - Mounting Positions and Lubrication Fill Levels**



**K Series Lubrication**

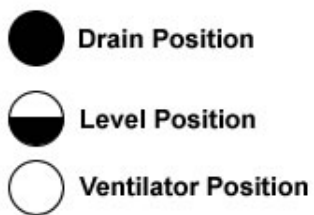
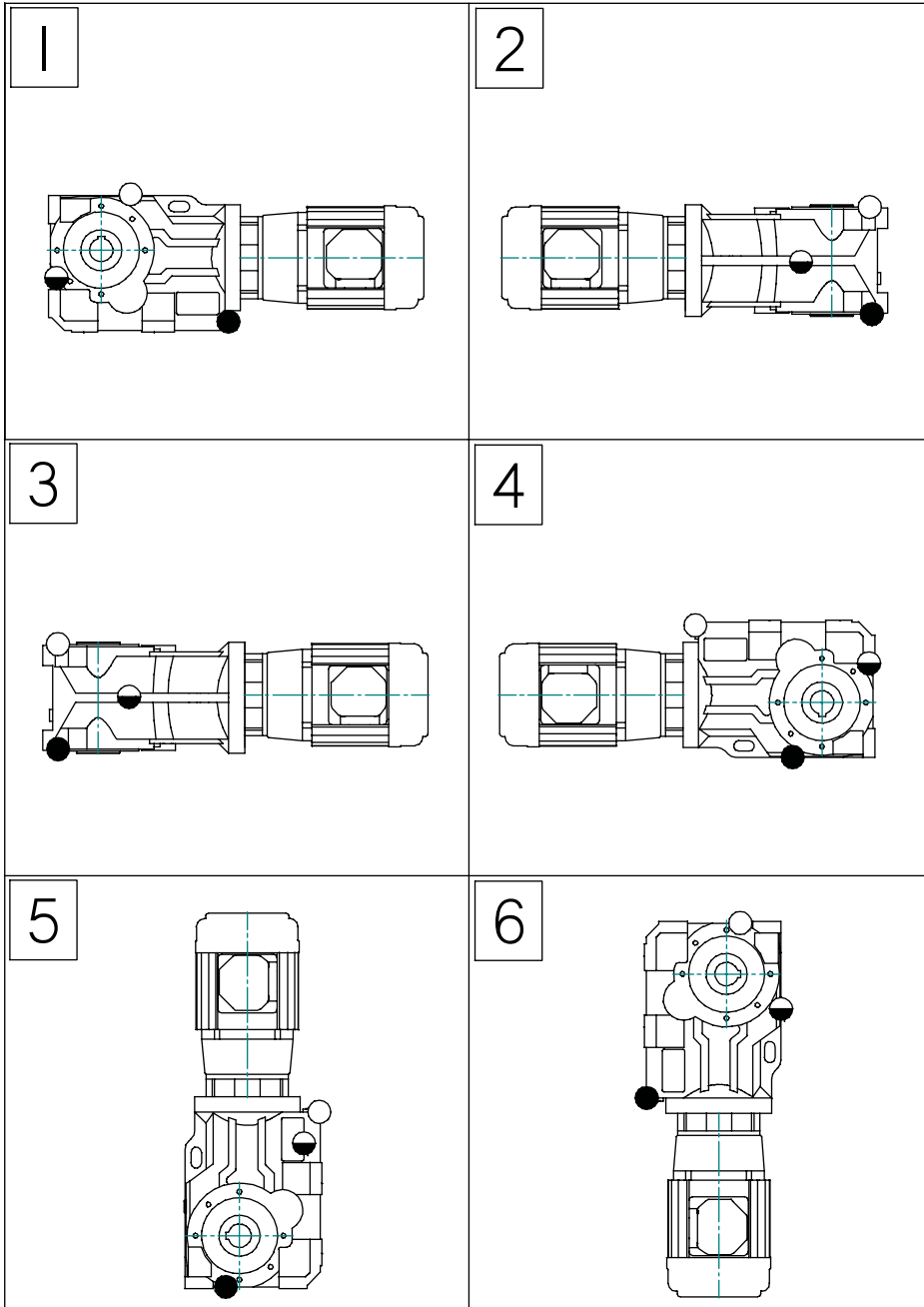
1. K03 to K07 are supplied factory filled with a quantity of EP mineral oil (Grade 6E) appropriate to the mounting position. If the gear unit is drained for any reason it must be re-filled with the correct grade and quantity of lubricant as shown in the table below.
2. K08 to K12 are supplied without 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 R Series primary unit flange mounted onto the K Series unit, see S Series lubrication data for details appropriate to the primary unit, both units should be checked for oil type and quantity.

**K Series - Mounting Positions and Lubrication Fill Levels**





## R Series Lubrication

1. R01 to R07 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. R08 to R14 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 R04 to R14 can be checked and maintained by filling via the ventilator position until oil escapes through the level plug hole,
  - b. These units R01, R02 and R03 must be fully drained and re-filled with the correct quantity of lubricant.

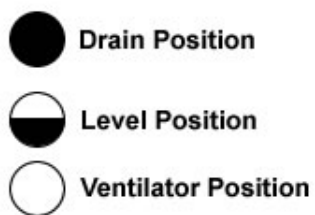
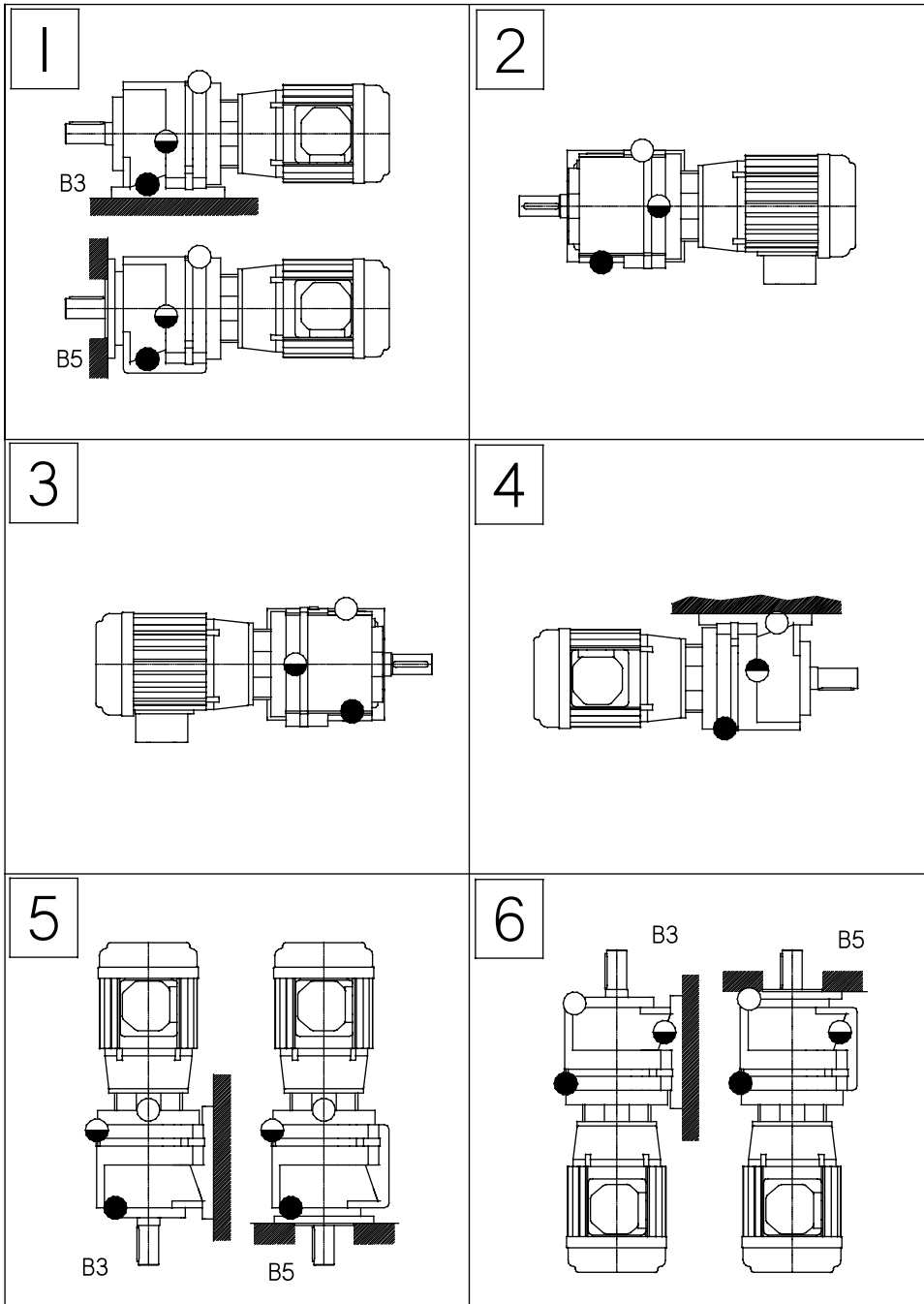
## Lubricant Quantities (Litres)

| Posn | R0122 | R0222 | R0322 | R0422 | R0522 | R0622 | R0722 | R0822 | R0921 | R1021 | R1321 | R1421 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 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 | R0132 | R0232 | R0332 | R0432 | R0532 | R0632 | R0732 | R0832 | R0931 | R1031 | R1331 | R1431 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 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. R04 to R14 units only, fit the ventilator plug in the position appropriate to the mounting position. R01 to R03 units do **not** require a ventilator.
7. Quintuple Reduction Units consist of a smaller R Series primary unit flange mounted onto the main R Series gear unit, both units should be checked for oil type and quantity.

**R Series - Mounting Positions and Lubrication Fill Levels**





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