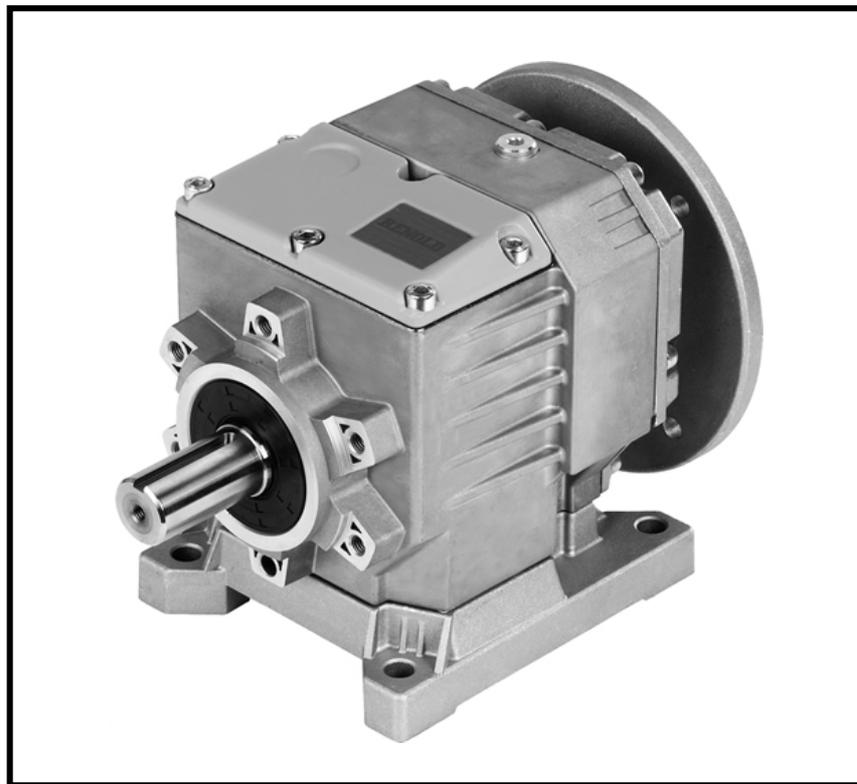


RENOLD

RP SERIES GEAR UNITS

INLINE HELICAL GEARED MOTOR UNIT



INSTALLATION & MAINTENANCE GUIDE



April 2006

INSTALLATION & MAINTENANCE GUIDE

IMPORTANT INFORMATION YOU MUST READ

Product Safety Information of *RENOLD* Gear Products

Important Notes

Always isolate the power source from the drive or the equipment.
Always wear protective clothing, safety glasses, hats, gloves, ear protectors and safety shoes as warranted by the circumstances.
Always ensure tools are in good working condition and use as directed by the manufacturer.
Loosen all tension devices.
Ensure that the correct lubrication is used prior to commissioning.

Customers are reminded that when purchasing any technical product for use at work (or otherwise), any additional or up-to-date information and guidance, which it has not been possible to include in the publication, should be obtained from your local sales office in relation to the suitability and the safety and proper use of the product.

All relevant information and guidance must be passed on by you to the person engaged in, or likely to be affected by or responsible for the use of the product.

Potential Hazards

There are a number of hazards that must be avoided when installing, maintaining and repairing Renold Gear units. The following are suggested safety guides when undertaking any of the above.

Hot surfaces and lubricants.

After prolonged running, a gear unit can generate high temperatures and can create surface temperatures that could burn the skin. Do not drain the oil from a gear unit that has been run for a prolonged period because the oil will be hot and could burn the skin. Allow the oil to cool, prior to draining.

Fire and Explosions.

A gear unit creates an oil mist or vapour internally after prolonged running and can be a fire and explosion risk if a naked flame is in close proximity. Allow the unit to cool prior to opening the unit. Flames or high running temperatures can burn or melt rubber compounds and melt plastic compounds and produce dangerous fumes. These compounds should be avoided until cool and then handled with protective gloves.

Guards

All rotating parts must be guarded with suitable guards, secured to the gear unit or machine frame.

Lifting

Lifting lugs or lifting points to suit eyebolts are provided on all Renold gear units. These must be used at all times.

Noise

Gear units run at high speed can create noise levels damaging to hearing. Ear protectors should be worn if there is a possibility of prolonged exposure to these conditions.

Lubrication.

The Installation & Maintenance Guide include the various types and quantities/ types of oils to be used in Renold gear units. These must be followed at all times.

Electrical Equipment

Follow all associated manufacturers instructions and always isolate all electrical equipment prior to carrying out any work.

Holdback/ Backstops

Failure of a backstop when fitted to the gear unit could result in personnel injury and machine damage. Secondary back-up systems must be provided.

Installation Maintenance and Storage.

Full Installation & Maintenance instructions are included in this document. Failure to follow the instructions could result in failure of the gear unit and / or damage to the equipment onto which it is being installed.

Short and long term storage instructions have been included in this Installation & Maintenance Guide.

General

All information contained in this document is subject to change without notice.

The right is reserved to make modifications to the product to meet manufacturing conditions and/or developments (for example in design or materials)
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1. UNIT DESIGNATION CODE

If further information or after sales service is required, please have the following information at hand.

- Order No.
- Unit Designation Code

Examples

| | |
|---------|-------------------|
| M | Fitted with motor |
| P | Motor ready |
| R | Reduction gear |
| 402 | Unit size |
| 9.426:1 | Ratio |
| B3 | Mounting position |

2. GENERAL INFORMATION

The instructions which follow are to help you achieve the recommended installation procedure, ensuring optimum performance, satisfaction and life from your Renold Gears RP Series gear unit.

Prior to despatch, all units are tested and checked to ensure that they comply with the highest standards required by our company. Also, a great deal of care is taken in the quality of packing and transport arrangements, ensuring that the unit reaches its final destination in its original condition.

Renold Gears hopes that the supplied unit will fully meet your expectations.

3. WEATHER PROTECTION

All RP gear units are protected to a standard capable of withstanding normal weather conditions.

Where it is probable that the unit will be subjected to adverse weather conditions, or where it is to be left inactive for a long period of time, our sales team should be notified when the order is placed so that the unit can be provided with the appropriate protection.

4. PRE-INSTALLATION

4.1 PLUG POSITIONS

RP Series gear units are fitted with solid plugs. If the unit is to be used with mineral oil, breather plugs can be ordered.

If required, a breather containing a filter can be ordered, for use where conditions could lead to dirt or water penetration of the breather.

4.2 FIXING SURFACES

Before starting to install the RP gear unit, any areas which are used to locate or have fittings attached to them, must be cleaned to remove any dirt, paint or grease which may be present. The same precautions must be taken with any other equipment being assembled. Cleansing the mating faces of the gear unit and its fitting area will ensure that the unit sits flat on the mounting area. This will in turn aid the necessary alignment of the gear unit.

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5. INSTALLATION

NOTE: *All units except sizes 025-273, unless otherwise indicated, are filled with lubricant to the correct oil level specified on the order*

5.1 MOTOR READY GEAR UNITS

Units which have been supplied “motor ready” require the fitting of the relevant motor by the customer. When fitting motors to the mounting face on a motor ready unit, use the following procedure:-

- I. Ensure that both mating faces are clean and free from dirt, grease and paint. The faces should also be checked for flatness and damage.
- II. Attach the motor to the sub-assembly using the relevant size of screws and tighten to the correct torque.

5.2 FITTING OF COMPONENTS ONTO INPUT/OUTPUT SHAFTS

Components which are to be fitted to either the input or output shaft of the gear unit (e.g. couplings, pulleys, sprockets, etc.) may be fitted using one of the following methods.

NOTE: *Do not strike the component onto the shaft with a mallet, as this could damage the support bearings.*

- The component can be heated using an appropriate method, expanding the bore. The part can then be dropped, lightly tapped, or jacked onto the shaft, depending on the fit of the item.
- The component may be applied to the shaft using a screw jack method which locates in the tapped hole situated in the end of the shaft. Please refer to Appendix B for the tapped hole dimensions relative to the size of shaft.

NOTE: *Gear units supplied for the American market will have shaft diameters to a nominal imperial size. A tapped hole will not be present in the end of the shaft.*

5.3 UNIT LOCATION REQUIREMENTS

Foot / Flange Mounted Gear Units

The gear unit and other drive components should be rigidly mounted onto firm and preferably flat foundations. This prevents any movement and vibration which may affect the alignment of the shafts, couplings, pulleys, etc.

If required, suitable baseplates to incorporate the unit can be supplied by Renold Gears.

5.4 FITTING GEAR UNIT TO CUSTOMER'S EQUIPMENT

When fitting an RP gear unit to its allocated position using a flange/skirt or the gear case feet, use hexagon head screws/bolts complying to ISO grade 8.8 as a minimum, and tighten to the relevant torque (shown below)

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| NOMINAL DIA | TIGHTENING TORQUE |
|--------------------|--------------------------|
| M6 | 11.7 Nm |
| M8 | 28 Nm |
| M10 | 56 Nm |
| M12 | 98 Nm |
| M16 | 244 Nm |
| M20 | 476 Nm |
| M24 | 822 Nm |

5.5 CONNECTING THE MOTOR SUPPLY**Mains Connection**

Motor connection to the mains supply should be carried out by a competent, fully qualified electrician. The current rating of the motor is located on the motor identification plate.

NOTE: *The correct sizing of cables to electrical regulations is essential.*

Motor

Where units are supplied with motors, connection to the motor terminal box should be carried out using the circuit diagrams contained in Appendix C.

Motors which are supplied or requested by the customer which are non-standard to the gear unit, should have the relevant circuit diagrams provided with them.

Motor With Brake

For brake motors, please refer to the circuit diagrams which will be supplied with the motorised gear unit.

5.6 INSTALLING FOOT MOUNTED GEAR UNITS

NOTE: *Before commencing installation, ensure that all pre-installation tasks in Section 4 have been executed.*

The following instructions are the recommended procedures for the fitting and location of foot mounted RP Series gear units. Standard RP units are free standing gearboxes. If required, they can be supplied with a suitable baseplate provided that its requirement is stipulated on the purchase order.

- I. Firstly, ensure that the foundation where the unit is to be positioned is suitable (as stated in Section 5.3) and is not distorted.
- II. Position the unit in its allocated position (preferably on the same foundation/baseplate as the driven unit). Secure unit to the foundation using the relevant size and grade of bolts. Tighten the bolts slightly.
- III. Align the unit using an appropriate technique. (Refer to Appendix D.) When alignment is complete, tighten feet bolts to the appropriate torque for that particular size of bolt (Section 5.4) and re-check unit alignment.

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IV. The unit should now be filled with a recommended lubricant to the correct level, as described in Section 6.4 – sizes **025 – 273 only**

V. Secure protective guarding around the equipment in accordance with the relevant standards.

WARNING: *All rotating equipment must be provided with suitable guarding before running, or injury may result.*

VI. Finally connect the motor to the power supply (Section 5.5) ensuring that the correct direction of rotation is achieved.

6. LUBRICATION

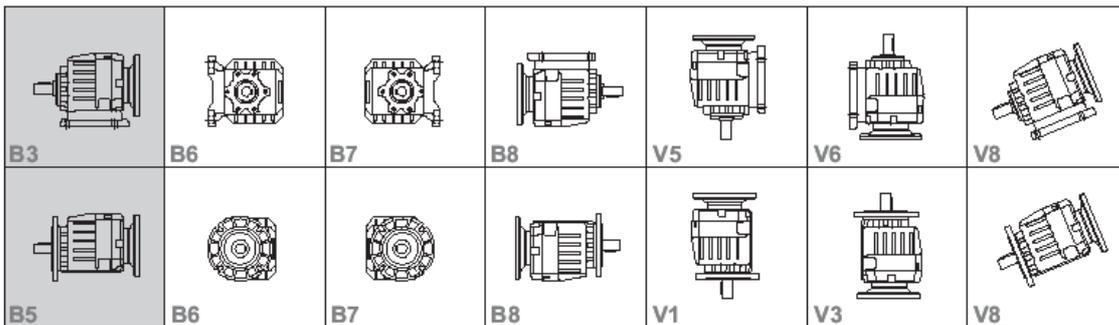
All units, (except sizes 025 – 273), are supplied with synthetic oil for lifetime lubrication. The oil quantity supplied is to suit mounting position B3/B5. If the unit is to be mounted in other positions, top the oil level up to the quantity indicated in section 6.2.

6.1 LUBRICATION REQUIREMENTS – SIZES 025 – 273

Dependant on the mounting position of the units, fill the unit with the correct lubrication to the position shown in section 6.2.

6.2 LUBRICATION QUANTITIES

Sizes 202-603

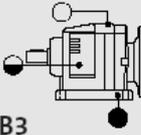
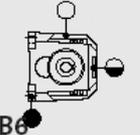
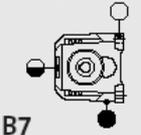
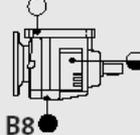
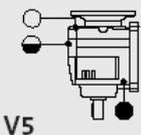
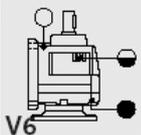
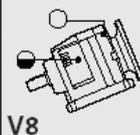
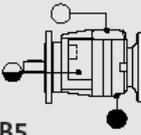
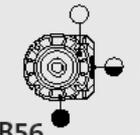
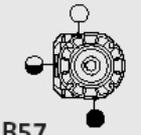
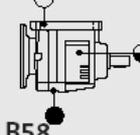
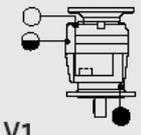
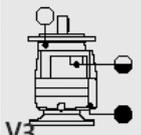


| | | | | | | | |
|-------------|------|------|------|------|------|------|------|
| 202A | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 302A | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 402A | 0.25 | 0.30 | 0.40 | 0.40 | 0.40 | 0.50 | 0.40 |
| 403A | 0.30 | 0.35 | 0.45 | 0.45 | 0.45 | 0.55 | 0.45 |
| 452A | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 | 0.31 |
| 502A | 0.45 | 0.55 | 1.00 | 1.10 | 1.10 | 1.15 | 1.10 |
| 503A | 0.75 | 0.75 | 1.05 | 1.15 | 1.20 | 1.20 | 1.20 |
| 602A | 0.55 | 0.85 | 1.10 | 1.20 | 1.20 | 1.25 | 1.20 |
| 603A | 0.75 | 0.90 | 1.15 | 1.25 | 1.30 | 1.35 | 1.30 |

| | | | | | | | |
|-------------|------|------|------|------|------|------|------|
| 402C | 0.50 | 0.50 | 0.50 | 0.50 | 0.65 | 0.85 | 0.65 |
| 403C | 0.55 | 0.55 | 0.55 | 0.55 | 0.70 | 0.90 | 0.70 |
| 602C | 1.00 | 1.50 | 1.50 | 1.50 | 2.00 | 2.00 | 2.00 |
| 603C | 1.30 | 1.50 | 1.50 | 1.50 | 2.10 | 2.00 | 2.10 |

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Sizes 025-273

| Standard | On Request | | | | | |
|---|--|--|--|--|---|--|
|  <p>B3</p> |  <p>B6</p> |  <p>B7</p> |  <p>B8</p> |  <p>V5</p> |  <p>V6</p> |  <p>V8</p> |
|  <p>B5</p> |  <p>B56</p> |  <p>B57</p> |  <p>B58</p> |  <p>V1</p> |  <p>V3</p> |  <p>V58</p> |

6.3 RECOMMENDED LUBRICANTS

A list of the approved lubricants is included in Appendix E of this manual.

6.4 APPLYING LUBRICATION TO THE GEAR UNIT (SIZES 025 – 273 ONLY)

NOTE: Care should be taken to avoid overfilling the gear unit.

When the gear unit has been installed, the unit must be filled with oil before running, using the following procedures:-

- I. Refer to the table in Appendix E to find a recommended lubricant type for the gear unit.
- II. Refer to the table in Section 6.2 for a guide to the position of lubricant which will be necessary for the assembly.
- III. Remove the filler/breather and oil level plugs from the gear unit. (See Appendix A for plug identification for the relevant mounting position.)
- IV. Fill the unit using the filler/breather plug opening until the lubricant is at the same height as the bottom of the threads or overflowing at the oil level aperture.
- V. Wait for a full minute to ensure that the lubricant level is static, and if necessary top up to the required level.
- VI. When the lubricant has settled at the correct level, replace and secure both the oil level and oil breather/filler plugs.

6.5 DRAINING LUBRICATION FROM THE GEAR UNIT

NOTE: Do not run the unit without lubrication.

WARNING: Do not drain lubrication out of the gear unit immediately after running. Oil temperatures can typically reach 90° C and higher. Allow the lubricant to cool to ambient temperature before draining, to minimise the risk of injury.

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- I. Ensure that the gearing is stationary.
- II. Place a suitable container underneath the drain plug of the unit.
- III. Remove the oil filler/breather plug from the gear unit.
- IV. Remove the oil drain plug from the gear unit.
- V. When the unit is fully drained of lubricant, replace and secure the oil drain plug.
- VI. Refill the gear unit using the technique described in Section 6.4

7. RUNNING-IN OF GEAR UNITS

Prior to despatch, all units are subjected to a short running-in period. However, many hours of running under full load are required for the unit to attain its maximum efficiency.

Where necessary, the gear unit may be put to work immediately; but where possible it is advantageous, with regards to the overall life of the gear unit, for the gearbox to be run in under gradually increasing loads, until full load is attained after a period between approximately 20 to 40 hours.

Reasonable precautions should be taken to assure that overloads do not occur during the early stages of running the gear unit.

8. GEAR UNIT ROUTINE MAINTENANCE

8.1 PERIODIC INSTRUCTIONS

The main inspections which are required for the gear unit are as follows:-

- I. The oil level in the unit should be checked weekly. To avoid false readings the level should be checked with the gears stationary. When necessary, top up to the required level, using the same lubricant that is already being used in the unit. Refer to Section 6.4 for the correct filling and topping up procedure.
- II. The filler/breather plug must be examined at least once a month to ensure that the breather hole is free from dirt or grease. Clean if required.
- III. Check for any lubricant leaking from the unit. Leakage from any of the plugs in the unit can be solved by removing the plug (drain the unit if necessary), add a suitable sealing medium to the threads of the plug, and re-fit the plug to the gear unit. If leaking is apparent from any other location, please note the position and contact your nearest outlet (Addresses are displayed on the back cover.)

8.2 RENEWING THE LUBRICANT

Note: *A gear units first filling of lubrication should be changed after 200 hours to remove any loose material produced during the bedding-in of the gears.*

Subsequent oil changes will depend upon the working conditions, giving consideration both to the loading of the gear unit and also to the environment where the unit is located. For example a dust laden atmosphere would require frequent monitoring and oil changes. As a guide, it is recommended to change the lubrication at 12 monthly intervals, under normal running conditions. Regular lubricant changes are essential to maintain the efficiency of the gear unit. If there is any doubt, then please contact your oil supplier. All major suppliers of lubricants offer a free advisory service.

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9. MOTOR ROUTINE MAINTENANCE

9.1 PERIODIC INSTRUCTIONS

Totally enclosed fan cooled three phase squirrel cage induction motors require very little maintenance. Nevertheless, it is recommended to check the motor regularly in order to prevent a breakdown caused by dust, moisture, vibration, too much or too little greasing. The following simple checks should help ensure the longevity of the motor:-

- I. The outer parts of the motor, especially the cooling ribs and cooling channels, have to be kept as clean as possible in order not to obstruct the passage of air generated by the fan to allow of heat exchange.
- II. Motors which are not often run, should be started periodically to prevent moisture affecting the windings in the long term.
- III. Due to vibration, the bolts fastening the motor to the gear unit should be examined to ensure that they have not worked loose.

9.2 MOTOR LUBRICATION

Motors which have been supplied by Renold Gears will have been pre-filled with a high quality Lithium-based grease. For re-greasing, it is recommended to use Shell Alvania R3 or an equivalent.

Motor sizes D80 to D132 are provided with shielded/sealed bearings, which have been pre-filled and greased-for-life by the bearing manufacturer. Motors with sealed bearings and no re-lubrication system require no maintenance apart from noise and temperature checks and the checks stated in Section 9.1.

Motors with frame sizes in the range of D160 up to D225 are provided with open bearings which have been filled up to $\frac{2}{3}$ with grease. The end shields are provided with bearing covers where the grease compartments are filled up to $\frac{1}{3}$ with grease.

9.3 GREASING INTERVAL

The term “greasing interval” means the number of working hours after which the bearing lubricant has to be replaced.

Electric motors have such a wide application range that they must have the ability to cope with many adverse conditions such as dust, moisture, vibration, temperature, chemicals, etc. The mounting position and loading of the gear unit/driven machine must also be taken into consideration. Generally, it can be stated that the lubrication life is a product of time, speed and bearing size. Due to the impact of all these factors, it is practically impossible to determine any exact values which are valid under all circumstances. Nevertheless, the following can be used as a rough guide.

Under normal circumstances, the grease needs to be renewed between 15,000 to 25,000 running hours or after every 5 years whichever is soonest. If the motor speed is above 1500 r.p.m., then it is recommended to halve these values.

A chemically aggressive environment, extreme moistness, strong vibrations, and high or low ambient temperatures are not considered as normal circumstances and such conditions must be taken into account.

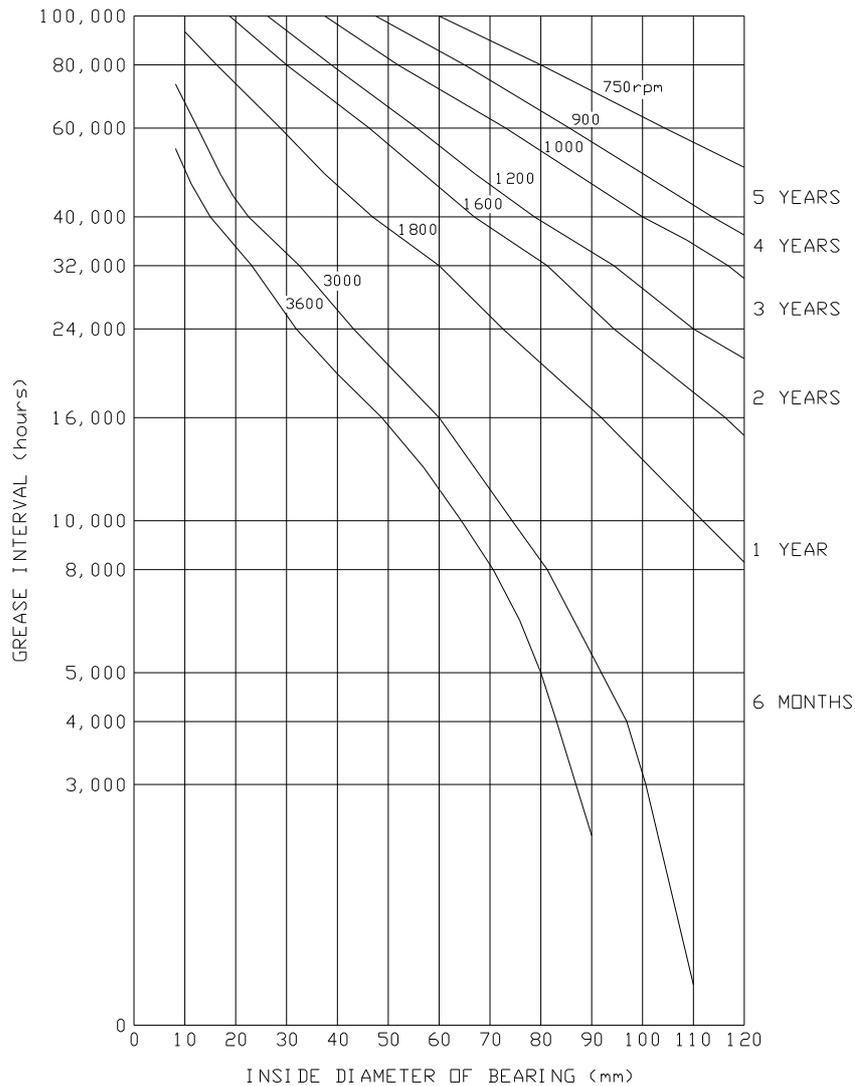
The following chart and graph shows the bearing type for each motor frame size and the greasing interval for bearings under normal circumstances. The indicated greasing interval values are valid for a bearing temperature of 70° C. At higher temperatures, the greasing interval will decrease.

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Bearing Type and Bearing Inside Diameter

| Frame Size | Type of Bearing | | Bearing Inside Diameter (mm) |
|------------|----------------------|----------------------|------------------------------|
| | Driven End | Non-Driven End | |
| D80 | 6204 ZZ / 6204 ZZ C3 | 6204 ZZ / 6203 ZZ C3 | 20/20/20/17 |
| D90 | 6205 ZZ / 6205 ZZ C3 | 6205 ZZ / 6204 ZZ C3 | 25/25/25/20 |
| D100 | 6206 ZZ / 6206 ZZ C3 | 6206 ZZ / 6206 ZZ C3 | 30/30/30/30 |
| D112 | 6306 ZZ / 6206 ZZ C3 | 6306 ZZ / 6206 ZZ C3 | 30/30/30/30 |
| D132 | 6308 ZZ / 6208 ZZ C3 | 6308 ZZ / 6208 ZZ C3 | 40/40/40/40 |
| D160 | 6309 | 6309 | 45/45 |
| D180 | 6311 | 6311 | 55/55 |
| D200 | 6312 | 6312 | 60/60 |
| D225 | 6313 | 6313 | 65/65 |

GREASE INTERVAL OF MOTOR BEARINGS



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10. STORING THE GEAR UNIT

Gear units which are to be stored or left inactive for long periods of time should be adequately protected, particularly those units situated on exposed sites and/or operating in corrosive or salty atmospheres.

The following precautions will generally be adequate for protecting the unit, but advice concerning the protection of particular units can be given if required.

10.1 SHORT TERM STORAGE (UP TO 12 MONTHS)

- I. The location should be free from vibration, otherwise brinelling could take place, particularly between bearing rolling elements and raceways, leading to noisy operation and early failure in service. Wherever possible, the shafts of the unit should be rotated at least once a week, by hand if necessary, to prevent brinelling.
- II. All external finish machined and unprotected surfaces should be spray coated with a anti-corrosion rust inhibitor.
- III. After spraying, all shafts should be wrapped in anti-corrosion rust inhibitor paper.
- IV. Where the unit is empty of oil, spray the gearcase interior with rust preventative oil, which is compatible with the recommended lubricant.
- V. Where the unit is filled with oil, operate at full speed once per month for not less than 10 minutes, to ensure that all of the internal components receive a liberal coating of oil.

10.2 LONG TERM STORAGE (FROM 12 MONTHS UP TO 2 YEARS)

- I. The location should be free from vibration, otherwise brinelling could take place, particularly between bearing rolling elements and raceways, leading to noisy operation and early failure in service. Wherever possible, the shafts of the unit should be rotated at least once a week, by hand if necessary, to prevent brinelling.
- II. Apply Denso paste and tape to all external finish machined and unprotected surfaces, including shaft extensions, ensuring full coverage to lip of oilseal.
- III. Completely fill the unit with oil, ensuring complete submersion of all internal components. When the unit is returned to service, drain and refill with new lubricant to the correct level (Sections 6.4 & 6.5).

Gear units can be prepared by Renold Gears for long term storage provided that this requirement is stipulated on the order before delivery. Gear units will not be filled with oil, therefore the interior of the unit would be sprayed with rust preventative oil.

11. SPARE PARTS

Information relating to spare parts can be obtained from the distributor of the unit.

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12. ATEX APPROVAL

Renold Gears products for operating in potentially Explosive Atmospheres.

12.1 GENERAL

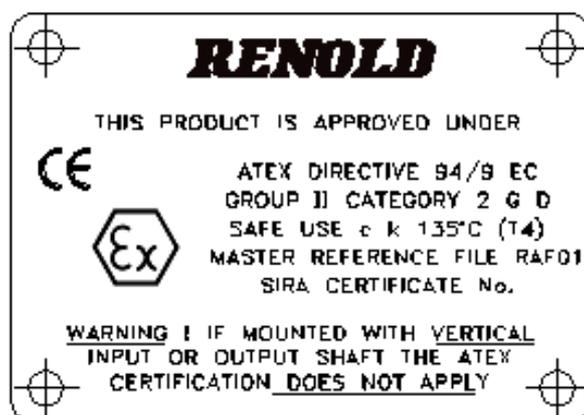
- Renold Gears units are classified as ATEX Group II Category 2 equipment, which embodies sufficient safeguards to be suitable for use in potentially explosive atmospheres for normal operation and for operation during an expected malfunction.
- It is essential that there is sufficient lubricant to prevent the gears and bearings running “ Dry “. Gear units should be inspected daily for signs of oil leakage, overheating or noisy operation.
- Gear units should be cleaned at regular intervals depending on the operating conditions, to ensure that dust coatings never exceed 5mm. Plastic parts should be wiped clean with a damp cloth.
- Oil leaks should be dealt with as quickly as practical. Compound joint faces and shims should be cleaned and thread-locking sealant should be applied to bolts and plugs prior to re assembly.
- The temperature of any external surfaces must not exceed the permitted maximum of 135°C (T4).
- Higher temperature class T5 is available dependant on unit mounting, ratio and gear type. For further details consult Renold.
- As a general rule, gear units should be mounted with their feet horizontal. For other mountings, particularly with shaft mounted units, consult Renold Gears.

WARNING: IF MOUNTING WITH VERTICAL INPUT OR OUTPUT SHAFTS, THE ATEX CERTIFICATION DOES NOT APPLY.

12.2 UNIT SELECTION.

- The gear unit selection procedures must include an additional reliability factor of 1.25 for mechanical ratings and 1.25 for thermal ratings.

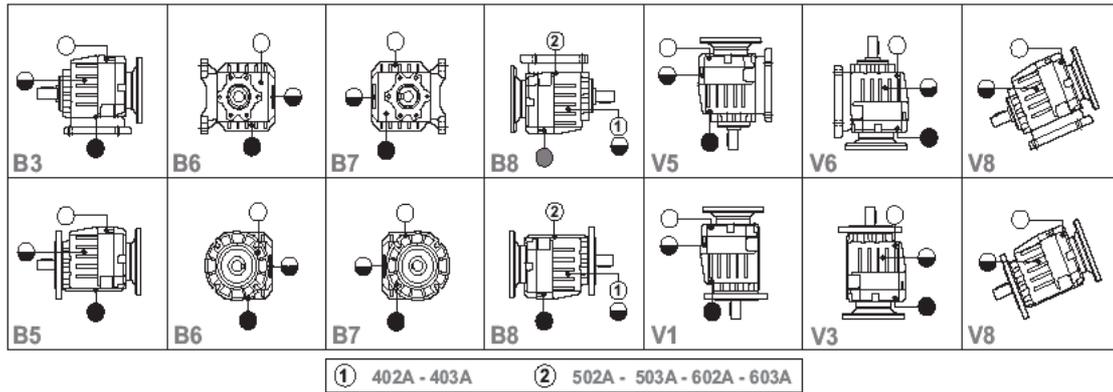
12.3 ATEX NAMEPLATE.



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Appendix A

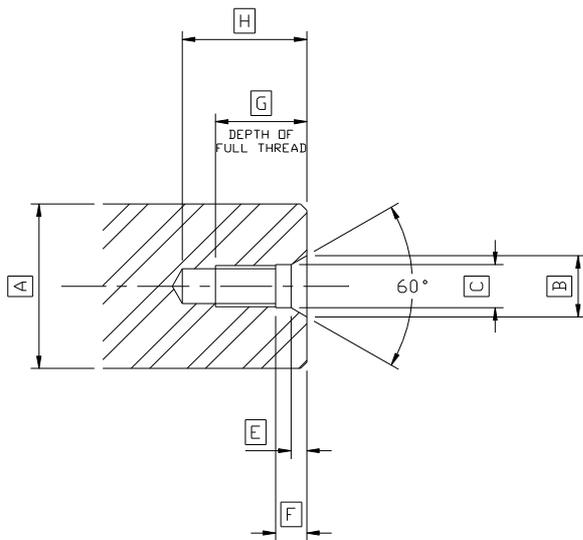
**RP SERIES INLINE HELICAL GEARED MOTOR & REDUCTION GEAR UNIT
MOUNTING CODES & PLUG POSITIONS**



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Appendix B

SHAFT END TAPPED HOLE DETAIL



| A' SHAFT DIA | | B | C | E | F | G | H | TAP |
|--------------|-------------------|------|------|-----|-----|----------|-------|-------------|
| ABOVE | UP TO & INCLUDING | | | | | +2 -0 | <MIN> | |
| 10 | 13 | 6.7 | 4.3 | 2.1 | 3.2 | 10 | 14 | M4x0.7-6H |
| 13 | 16 | 8.1 | 5.3 | 2.4 | 4 | 12.5 | 17 | M5x0.8-6H |
| 16 | 21 | 9.6 | 6.4 | 2.8 | 5 | 16 | 21 | M6x1.0-6H |
| 21 | 24 | 12.2 | 8.4 | 3.3 | 6 | 19 | 25 | M8x1.25-6H |
| 24 | 30 | 14.9 | 10.5 | 3.8 | 7.5 | 22 | 30 | M10x1.5-6H |
| 30 | 38 | 18.1 | 13 | 4.4 | 9.5 | 28 | 37.5 | M12x1.75-6H |
| 38 | 50 | 23 | 17 | 5.2 | 12 | 36 | 45 | M16x2.0-6H |
| 50 | 85 | 28.4 | 21 | 6.4 | 15 | 42 | 53 | M20x2.5-6H |
| 85 | 140 | 34.2 | 25 | 8 | 18 | 50 | 63 | M24x3.0-6H |
| 140 | 225 | 40.4 | 31 | 11 | 21 | 60 | 75 | M30x3.5-6H |

DIMENSIONS IN MILLIMETRES

* FOR SIZES 10-13 DIA. SHAFT
TO BE USED WITH FEATHER KEYWAY ONLY

SIZES UD TO 130 DIA. SHAFT
IN ACCORDANCE WITH DIN 322 SHEET 2 (OCTOBER 1970)

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Appendix C

MOTOR CIRCUIT DIAGRAMS

The following motor circuit diagrams are relevant for RP Series gear units supplied with our standard motors already fitted. For motor ready gear units, please refer to the motor supplier's installation and maintenance instructions for that particular motor.

Standard motors are provided with a terminal box, which contains six connections, to which six leads from the winding are connected either in a delta connection, or in a star connection by means of metallic connection links.

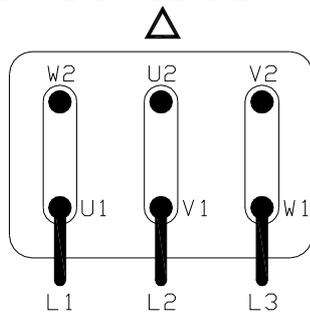
Usually, two voltages will be displayed on the rating plate of the motor. This means that the motor can be connected to a circuit which has one of these voltages. If the mains voltage corresponds to the lowest indicated voltage shown on the rating plate, then the motor winding has to be connected as a Delta connection (refer to C.1). However, if the mains supply has a voltage equalling the highest indicated voltage as shown on the rating plate, then the motor must be connected as a Star connection (refer to C.2). For example, a motor with 230/400V indicated on its rating plate, is suited either to a circuit with a voltage of 230V with the winding connected in a Delta connection; or on a circuit with a voltage of 400V with the winding connected in a Star connection.

For pole change motors (for two or more speeds) and brake motors, please refer to the wiring connection diagram which will be sent with the motorised gear unit.

WARNING: *Electrical connections should only be carried out by a fully qualified electrician.*

C.1 Delta Connection Procedure

To complete a Delta connection:



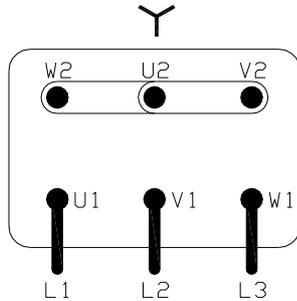
- I. Link W2-U1, U2-V1 and V2-W1 using the metallic strips provided.
- II. Connect Line 1 (L1) to U1, Line 2 (L2) to V1 and Line 3 (L3) to W1.
- III. Connect the Earth wire to the separate terminal supplied.
- IV. Turn on the power supply and check the direction of rotation.
- V. If the direction of rotation is incorrect, swap over any two of the "line - in" wires. For example, Line 1 (L1) to V1 and Line 2 (L2) to U1, etc.

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Appendix C

C.2 Star Connection Procedure

To complete a Star connection:



- I. Link W2, U2 and V2 together using the metallic strips provided.
- II. Connect Line 1 (L1) to U1, Line 2 (L2) to V1 and Line 3 (L3) to W1.
- III. Connect the Earth wire to the separate terminal supplied.
- IV. Turn on the power supply and check the direction of rotation.
- V. If the direction of rotation is incorrect, swap over any two of the “line - in” wires. For example, Line 1 (L1) to V1 and Line 2 (L2) to U1, etc.

C.3 Star-Delta Connection Procedure

If the motor is to be used with a Star-Delta starter, then the motor is only to be used with a mains supply which is equal to the Delta voltage as shown on the rating plate. In this case the metallic connection strips inside the terminal box have to be removed before the motor is connected; the Star and Delta connection will be made successively in the starter as the motor is started and approaches its operating speed/power output. Please refer to the wiring diagrams sent with the motor for wiring connections.

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Appendix D

UNIT ALIGNMENT

When coupling the gear unit to a mating shaft, the coupling halves should be correctly aligned to ensure optimum life and performance.

The irregularities which can occur in the coupling process fall into one of two categories:-

Angularity, i.e. the coupling faces do not run parallel to each other (Fig. 1)

Eccentricity, i.e. the coupling halves do not run concentric to each other (Fig. 2)

A combination of both defects is also possible.

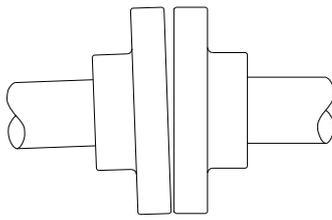


Fig.1

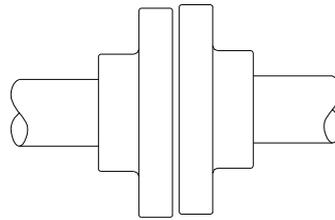


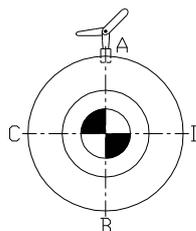
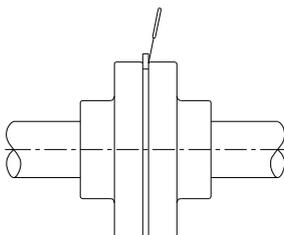
Fig.2

When correcting any defects in coupling alignment, the errors of angularity should be checked and rectified before correcting any errors of eccentricity.

D.1 Angularity Errors

Angularity errors should be checked for in the following manner.

- I. Obtain a slip block which is marginally smaller than the gap between the two coupling halves. Mark a datum point on both coupling halves.
- II. Position the datum mark in Position A as shown on the diagram below. By using feeler gauges and the slip block, measure and record the gap between the two coupling halves at Position A.
- III. Rotate the coupling until the datum mark is in Position B. Again, measure and record the gap, but this time at Position B.
- IV. The difference between the two values will give the error in alignment in the vertical plane measured over a length of shaft equal to the outside diameter of the coupling. This value can be used to calculate the correction in height that the connected motor or machine requires to eliminate the error.
- V. Repeat the process for each side of the coupling (Positions C & D). Similarly, the difference between the values will give an error in alignment in the horizontal plane, and can be corrected accordingly.



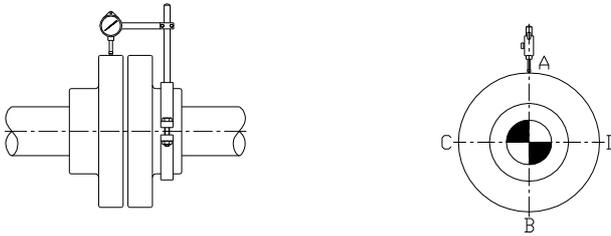
D.2 Eccentricity Errors

Eccentricity errors should be checked for in the following manner.

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Appendix D

- I. Obtain a Dial Test Indicator (D.T.I) and a rigid clamp. Attach this to one of the coupling halves.
- II. Place the D.T.I. in such a position that a sufficient 'touch' is achieved on the second coupling half.
- III. Move the plunger into Position A, and adjust the indicator to read zero.
- IV. Rotate the coupling half which is carrying the D.T.I. until Position B is reached. Observe and record the fluctuation in dial reading. The amount of vertical correction required is equal to the difference in readings.
- V. Repeat the process for Positions C & D. Similarly, this will give the horizontal alignment errors, and can be corrected accordingly.



Note: *After alignment is completed, the unit should be allowed to run until normal operating temperature has been reached. The unit should then be stopped and the alignment re-checked and corrected if necessary.*

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Appendix E

RECOMMENDED LUBRICANTS

NOTE: *The power ratings listed in the RP Series catalogue are those which the unit will produce only when the preferred Renold lubricant is used.*

There may be occasions where it is not practicable to obtain the preferred Renold lubricant. In these circumstances only good quality oils should be used, such as those listed in the following tables. The use of inferior or unsuitable products may cause rapid wear and possible damage to the gearbox.

Oils with three viscosity ranges (light, medium and heavy) are listed below, the correct choice depends on the application operating speed, load and temperature. Temperature and speed can often be the main factors as it affects the operating viscosity. If the unit runs below the catalogue rating and operates at a temperature below 60°C then a light grade oil should be used. Operating at catalogue rating with temperatures up to 100°C require medium grade, with higher temperatures and loading heavy grade oils should be used.

If the unit is operating with gear speeds below 2.5m/s (500ft/min) then the next higher grade should be used. Using too heavy a grade than required will result in reduced efficiency, too light a grade will result in premature wear, if in doubt ask Renold Gears Technical Department.

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*Appendix E***WHICH OIL TO SELECT**

There are three main oils Mineral, Synthetic (Polyalphaolefin) and Synthetic (Polyglycol). Mineral oils tend to be lower cost, have a shorter life and are less efficient. Synthetic (Polyalphaolefin) can operate over a higher temperature range, are more efficient, give higher ratings and have a longer life and as such are preferred.

The use of Synthetic (Polyglycol) are not recommended without prior discussion with Renold as special paints and seals are required. If necessary a list of recommended food grade oils is available on request.

MINERAL OILS

| LUBRICANT | LIGHT | | MEDIUM | | HEAVY | |
|------------------|-------|------------|--------|------------|-------|------------|
| | GRADE | TEMP °c | GRADE | TEMP °c | GRADE | TEMP °c |
| MOBIL GEAR | 630 | -13 to 90 | 632 | -13 to 90 | 634 | -1 to 90 |
| MOBIL GEAR XMP | 220 | -13 to 100 | 320 | -13 to 100 | 460 | -1 to 100 |
| CASTROL ALPHA SP | 220 | -21 to 120 | 320 | -21 to 120 | 460 | -6 to 120 |
| CASTROL APLHAMAX | 220 | -24 to 120 | 320 | -18 to 120 | 460 | -15 to 120 |
| SHELL OMALA F | 220 | -9 to 120 | 320 | -9 to 120 | 460 | -9 to 120 |
| SHELL OMALA | 220 | -9 to 120 | 320 | -9 to 120 | 460 | -9 to 120 |
| ESSO SPARTAN EP | 220 | -30 to 120 | 320 | -27 to 120 | 460 | -18 to 120 |
| KLUBER GEM | 220 | -18 to 100 | 320 | 0 to 100 | 460 | 0 to 100 |

POLYALPHAOLEFIN SYNTHETIC OILS

| LUBRICANT | LIGHT | | MEDIUM | | HEAVY | |
|------------------------------|-------|------------|--------|------------|-------|------------|
| | GRADE | TEMP °C | GRADE | TEMP °C | GRADE | TEMP °C |
| MOBIL GEAR SHC | 630 | -42 to 160 | 632 | -42 to 160 | 634 | -39 to 160 |
| MOBIL GEAR SHC XMP | 220 | -42 to 160 | 632 | -42 to 160 | 460 | -39 to 160 |
| CASTROL ALPHA EP | 220 | -42 to 150 | 320 | -36 to 150 | 460 | -20 to 150 |
| CASTROL ALPHA T | 220 | -36 to 150 | 320 | -33 to 150 | 460 | -33 to 150 |
| SHELL OMALA HD | 220 | -40 to 150 | 320 | -40 to 150 | 460 | -40 to 150 |
| ESSO SPARTAN SYNTHETIC EP | 220 | -27 to 120 | 320 | -27 to 120 | 460 | -18 to 120 |
| KLUBERSYNTH EG 4 | 220 | -30 to 160 | 320 | -30 to 160 | 460 | -25 to 160 |

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IMPORTANT INFORMATION YOU MUST READ

Product Safety Information of *RENOLD* Gear Products

Important Notes

Always isolate the power source from the drive or the equipment.
Always wear protective clothing, safety glasses, hats, gloves, ear protectors and safety shoes as warranted by the circumstances.
Always ensure tools are in good working condition and use as directed by the manufacturer.
Loosen all tension devices.
Ensure that the correct lubrication is used prior to commissioning.

Customers are reminded that when purchasing any technical product for use at work (or otherwise), any additional or up-to-date information and guidance, which it has not been possible to include in the publication, should be obtained from your local sales office in relation to the suitability and the safety and proper use of the product.

All relevant information and guidance must be passed on by you to the person engaged in, or likely to be affected by or responsible for the use of the product.

Potential Hazards

There are a number of hazards that must be avoided when installing, maintaining and repairing Renold Gear units. The following are suggested safety guides when undertaking any of the above.

Hot surfaces and lubricants.

After prolonged running, a gear unit can generate high temperatures and can create surface temperatures that could burn the skin. Do not drain the oil from a gear unit that has been run for a prolonged period because the oil will be hot and could burn the skin. Allow the oil to cool, prior to draining.

Fire and Explosions.

A gear unit creates an oil mist or vapour internally after prolonged running and can be a fire and explosion risk if a naked flame is in close proximity. Allow the unit to cool prior to opening the unit.

Flames or high running temperatures can burn or melt rubber compounds and melt plastic compounds and produce dangerous fumes. These compounds should be avoided until cool and then handled with protective gloves.

Guards

All rotating parts must be guarded with suitable guards, secured to the gear unit or machine frame.

Lifting

Lifting lugs or lifting points to suit eyebolts are provided on all Renold gear units. These must be used at all times.

Noise

Gear units run at high speed can create noise levels damaging to hearing. Ear protectors should be worn if there is a possibility of prolonged exposure to these conditions.

Lubrication.

The Installation & Maintenance Guide include the various types and quantities/ types of oils to be used in Renold gear units. These must be followed at all times.

Electrical Equipment

Follow all associated manufacturers instructions and always isolate all electrical equipment prior to carrying out any work.

Holdback/ Backstops

Failure of a backstop when fitted to the gear unit could result in personnel injury and machine damage. Secondary back-up systems must be provided.

Installation Maintenance and Storage.

Full Installation & Maintenance instructions are included in this document. Failure to follow the instructions could result in failure of the gear unit and / or damage to the equipment onto which it is being installed.

Short and long term storage instructions have been included in this Installation & Maintenance Guide.

General

All information contained in this document is subject to change without notice.

The right is reserved to make modifications to the product to meet manufacturing conditions and/or developments (for example in design or materials)
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INSTALLATION & MAINTENANCE GUIDE

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