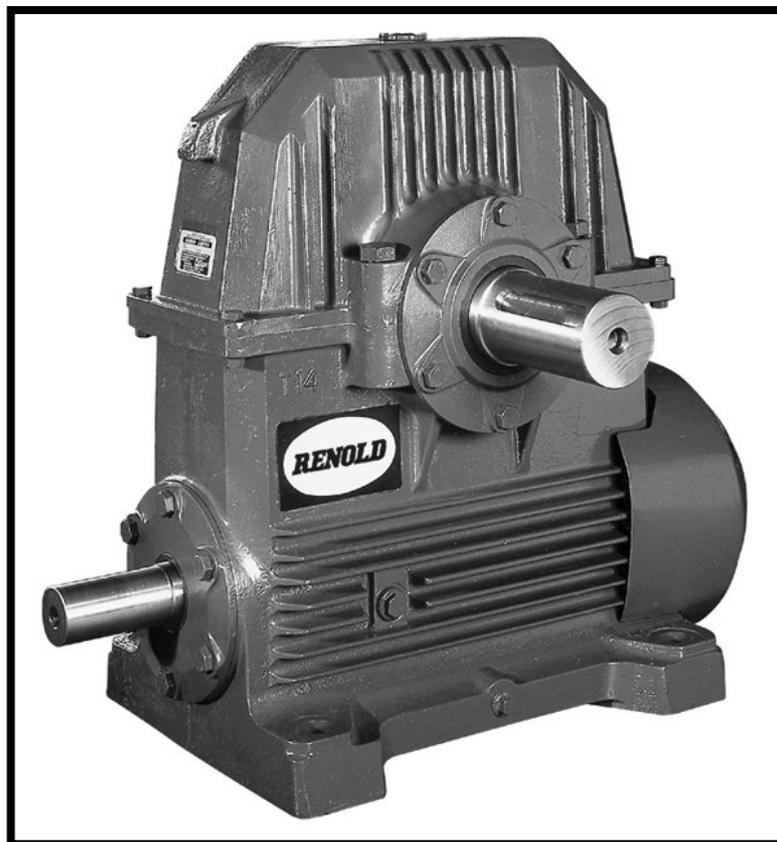


RENOLD

TW SERIES GEAR UNITS

SINGLE REDUCTION WORMGEAR UNITS AND DOUBLE REDUCTION WORMGEAR UNITS



INSTALLATION & MAINTENANCE GUIDE



July 2004

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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INSTALLATION & MAINTENANCE GUIDE

CONTENTS

Section	Description	Page No.
1.	Unit Designation Code.....	4
2.	General Information.....	4
3.	Weather Protection.....	5
4.	Pre-Installation.....	5
	4.1 Plug Positions	
	4.2 Fixing Surfaces	
5.	Installation.....	5
	5.1 Motor Ready Gear Units	
	5.2 Fitting Of Components Onto Input/Output Shafts	
	5.3 Unit Location Requirements	
	5.4 Fitting Gear Unit To Customer's Equipment	
	5.5 Connecting The Motor Supply	
	5.6 Installing Foot Mounted Gear Units	
	5.7 Installing Flange Mounted Gear Units	
	5.8 Installing Shaft Mounted Gear Units (Turnbuckle Restraint)	
	5.9 Shrink-disc Installation, Removal And Maintenance	
	5.10 Installing Gear Units Fitted With the Sprag Backstop Feature	
6.	Lubrication.....	11
	6.1 Gear Unit Lubrication Requirements	
	6.2 Lubrication Quantities	
	6.3 Recommended Lubricants	
	6.4 Applying Lubrication To The Gear Unit	
	6.5 Draining Lubrication From The Gear Unit	
7.	Running-in Of Gear Units.....	13
8.	Gear Unit Routine Maintenance.....	13
	8.1 Periodic Instructions	
	8.2 Renewing The Lubricant	
9.	Motor Routine Maintenance.....	13
	9.1 Periodic Instructions	
	9.2 Motor Lubrication	
	9.3 Greasing Interval	
10.	Storing The Gear Unit.....	16
11.	Spare Parts.....	16
12.	ATEX Approval.....	17

APPENDIX

Appendix A.....	18 - 19
Appendix B.....	20
Appendix C.....	21 - 22
Appendix D.....	23 - 24
Appendix E.....	25 - 26

INSTALLATION & MAINTENANCE GUIDE

1. UNIT DESIGNATION CODE

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

- Order No.
- Unit Designation Code

Examples**SINGLE REDUCTION SPEED REDUCER / REDUCTION GEAR UNIT****TWU14. 30. 12. M**

TW	Wormgear unit series - SINGLE REDUCTION	
U	Unit type	U - Underdriven O - Overdriven V - Vertical A - Agitator SM - Shaft mounted
14	Unit size (7 sizes 10, 12, 14, 17, 20, 24 and 28)	
30	Unit ratio	
12	Hand of assembly (See Appendix A)	
M	Shaft and bore type	M - Metric A - American (inch)

SINGLE REDUCTION MOTORISED UNIT**MTWU14. 30. 12. M**

MTW	Motorised wormgear unit series - SINGLE REDUCTION	
	All other details as above	

DOUBLE REDUCTION SPEED REDUCER / REDUCTION GEAR UNIT**TWDU10. 2000. 16. M**

TWD	Wormgear unit series - DOUBLE REDUCTION	
U	Unit type	U - Underdriven O - Overdriven V - Vertical A - Agitator SM - Shaft mounted
10	Unit size (7 sizes 10, 12, 14, 17, 20, 24 and 28)	
2000	Unit ratio	
16	Hand of assembly (see Appendix A)	
M	Shaft and bore type	M - Metric A - American (inch)

DOUBLE REDUCTION MOTORISED UNIT**MTWDU10. 2000. 16. M**

MTWD	Motorised wormgear unit series - DOUBLE REDUCTION	
	All other details as above	

2. GENERAL INFORMATION

The TW series of gear units comprises of seven unit sizes from 10" to 28" centres. The units can be supplied either as reduction gear, motorised units, or motor ready units for individual customers to fit their own motors. The unit range is available as single reduction units from 5:1 to 70:1 ratios and double reduction units from 75:1 to 4900:1 as standard. Wider ratios are available if required.

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

INSTALLATION & MAINTENANCE GUIDE

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 TW 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**

TW Series gear units are fitted with oil breather, oil level and drain plugs. The units are designed for mounting in any of the positions shown in Appendix A. Using the diagrams provided, ensure that the plugs are in the correct position for the intended mounting position.

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 TW 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.

5. INSTALLATION

NOTE: *Units are supplied without oil.*

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.*

INSTALLATION & MAINTENANCE GUIDE

- 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.

Shaft Mounted Gear Units

The shaft onto which the gear unit is to be fitted must be a close sliding fit into the sleeve of the gear unit. The key in the mating shaft must be a good side fit and of sufficient length to present a full face to the keyway in the sleeve over the length of the locating bore.

5.4 FITTING GEAR UNIT TO CUSTOMER'S EQUIPMENT

When fitting a TW 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)

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

INSTALLATION & MAINTENANCE GUIDE

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 TW Series gear units. Standard TW 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.
- IV. The unit should now be filled with a recommended lubricant to the correct level, as described in Section 6.4
- 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.

5.7 INSTALLING FLANGE 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 flange mounted TW Series gear units.

- 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. Locate the unit in the appropriate mounting position.

INSTALLATION & MAINTENANCE GUIDE

- III. Secure the unit to the mounting face using the appropriate size and grade of bolts and tighten to the correct torque (Section 5.4).
- IV. The unit should now be filled with a recommended lubricant to the correct level, as described in Section 6.4
- 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.

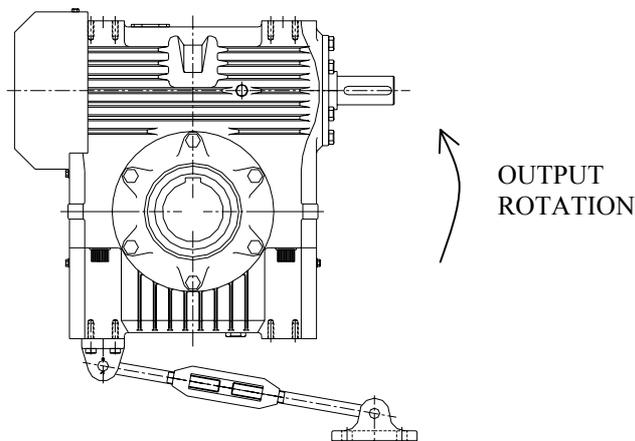
5.8 INSTALLING SHAFT MOUNTED GEAR UNITS (TURNBUCKLE RESTRAINT)

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

For instances where the customer is to supply the torque restraint, it must be ensured that a substantial clearance is provided for the fixing member, to allow for eccentricity of the drive shaft and bearings.

The following instructions are the recommended procedures for the fitting and location of shaft mounted TW Series gear units.

- I. Firstly, ensure that the shaft onto which the unit is to be mounted is suitable (as stated in Section 5.3) and is running true.
- II. Fit the required key into the shaft and coat both the shaft and key with anti-scuffing paste.
- III. Locate and secure the unit onto the mounting shaft using the most appropriate method available. Attempt to position the unit as close to the support bearing on the driven unit as possible.
- IV. Fit the torque arm to the unit using the most appropriate foot hole to achieve a position relative to the output shaft as shown in the example below.



- V. Attach the unit to a stable foundation using the foot bracket of the torque arm. Attempt to locate the foot bracket so that the torque arm will be at approximately right angles to the centre line created through the driven shaft and the torque arm pivot pin (as shown on the previous page). This angle may vary up to a maximum of 30° in either direction where necessary.

INSTALLATION & MAINTENANCE GUIDE

NOTE: *The torque arm should be in tension rather than in compression whilst the gear unit is running and should be fitted on the opposite side if the direction of rotation is opposite from that shown in the diagram. For reversible and/or heavy duty drives, it is recommended to use two torque arms in tension in the opposite direction.*

VI. The unit should now be filled with a recommended lubricant to the correct level, as described in Section 6.4

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

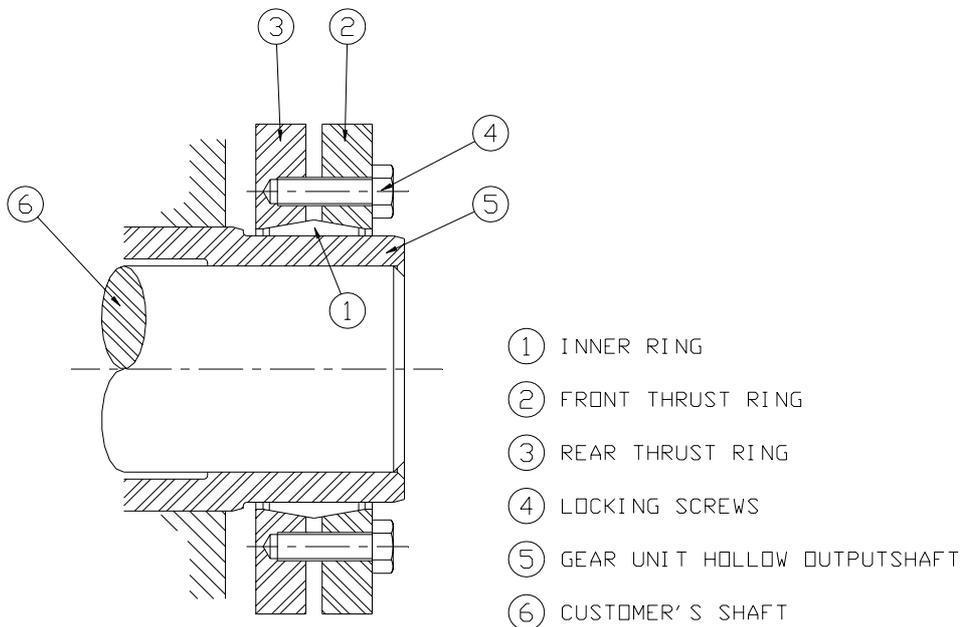
WARNING: *All rotating equipment must be provided with suitable guarding before running, or injury may result.*

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

5.9 SHRINK-DISC INSTALLATION, REMOVAL AND MAINTENANCE

Shrink-discs are delivered in a ready-to-install condition. Only the larger and heavier shrink-discs should be dismantled for easier installation.

NOTE: *Shrink-discs have stickers with different tightening torques. Those which are not valid in the specified case must be removed.*



Installation

- I. The contact area for the shrink-disc on the hub extension has to be cleaned.
- II. Remove transportation spacers (if provided) located between the front and rear thrust rings.

INSTALLATION & MAINTENANCE GUIDE

NOTE: *Do not tighten screws before the shrink-disc is positioned on the hollow wheelshaft of the gear unit. Also, once the shrink-disc has been positioned on the hollow wheelshaft, do not tighten the screws before the gear unit is fitted to the customer's shaft. Otherwise deformations may occur.*

- III. Fit shrink-disc onto hollow outputshaft of the gear unit.
- IV. Mount the gear unit onto customer's solid shaft. To facilitate easy mounting, the contact surfaces of the hollow outputshaft bore on the gear unit and the customer's solid shaft may be lightly oiled.

NOTE: *Do not use lubricants consisting of Molybdenum Disulphide (MoS₂)*

- V. Both thrust rings should be squarely positioned relative to the customer's shaft. This is done by lightly tightening the locking screws until the thrust rings move into position.
- VI. Using a torque wrench, equally tighten all of the locking screws one after another in a clockwise direction (not in a diametrically opposite sequence), by approximately ¼ to ½ a turn until the specified tightening torque is reached. (Refer to shrink-disc suppliers data sheets for torque values.)
- VII. Restrain the gear unit by one of the methods described in Sections 5.8 or 5.9.

Removal

- I. Loosen the locking screws in a clockwise direction in several stages using approximately ¼ turns to avoid tilting of the thrust rings.

WARNING: *Under no circumstances should the locking screws be taken out of the threads, as due to pre-tensioning the shrink disc could jump apart.*

- II. Remove the gear unit from the customer's solid shaft.
- III. The shrink-disc can now be removed from the gear unit hollow outputshaft.

Cleaning and Re-lubrication

An installed shrink-disc is maintenance free. Before reinstalling after prolonged use, the shrink-disc should be dismantled and thoroughly cleaned.

The cones have been lubricated with greases containing MoS₂ (e.g. Molykote G Rapid). If the tapered working surfaces are not damaged, they must be re-lubricated with Molykote BR 2. The locking screws (particularly the threads and contact areas for the heads) have to be lubricated with Molykote BR 2.

5.10 INSTALLING GEAR UNITS FITTED WITH THE SPRAG BACKSTOP FEATURE

The following procedures are recommended for the installation of units fitted with a sprag backstop assembly.

- I. Before installation has commenced the motor should be:-
 - a) Separated from the unit.
 - b) Connected to the power supply (Section 5.5)
 - c) Checked for correct direction of rotation.
- II. Ensure that the gear unit input shaft will rotate in the same direction as the motor.
- III. Re-connect the motor to the unit following the procedures described in Section 5.1.

INSTALLATION & MAINTENANCE GUIDE

IV. Follow the installation procedures for the relevant gear unit (Sections 5.6 - 5.9)

NOTE: *It is extremely important that motor shaft rotates in the same direction as the input shaft of the gear unit. The sprag backstop is designed to prevent the input shaft from rotating in the opposite direction. Therefore, if the motor was incorrectly wired, it could result in damage to the geared motor e.g. the motor could burn out.*

6. LUBRICATION

NOTE: *Units are supplied without oil unless requested when the order for the gear unit is placed.*

6.1 GEAR UNIT LUBRICATION REQUIREMENTS

If an initial first filling of oil is required to be supplied alongside the gear unit, Renold Gears will supply the recommended lubricant in the correct quantity for the mounting position. The lubricant will be supplied in oil containers separate to the gear unit.

Where the first filling of oil is to be carried out by the customer, a recommended grade of lubricant should be used. (Refer to Appendix E.) Use the tables on the next page as a guide to the quantity of lubricant required dependant upon the gear units mounting position and application.

6.2 LUBRICATION QUANTITIES

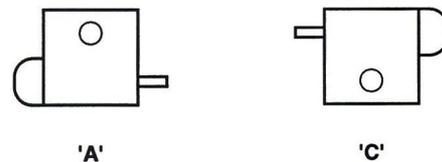
Use the tables below as a guide to the quantity of lubricant required dependant upon the gear units mounting position and application.

TW Series - Single Reduction Unit Oil Quantities (litres)

Gear Size	Underdriven TWU	Overdriven TWO	Vertical TWV	Agitator TWA	Shaft Mounted - TSMW	
					A	C
10	8.6	9.1	15.0	15.0	12.7	9.1
12	12.5	14.5	18.6	18.6	23	14.5
14	18.6	23.2	50	50	33	23.2
17	34.0	54.6	77	77	60	55
20	70.5	90	155	155	*	*
24	132	155	218	218	*	*
28	168	292	432	432	*	*

All oil quantities are approximate and are shown in litres.
Figures shown are nominal quantities only. May vary with ratio.

SHAFT MOUNTED UNIT TYPE - TSMW



TW Series - Double Reduction Unit Oil Quantities (litres)

Gear Size	Underdriven TWDU	Overdriven TWDO	Vertical TWDV	Agitator TWDA	Shaft Mounted TSMWD
10	3.8 / 8.6	2.1 / 9.1	3.8 / 15.0	3.8 / 15.0	3.8 / 9.1
12	4.9 / 12.5	2.5 / 14.5	4.9 / 18.6	4.9 / 18.6	4.9 / 14.6
14	7.7 / 18.6	3.6 / 23.2	7.7 / 50	7.7 / 50	7.7 / 23.2
17	10.4 / 34.0	4.4 / 54.6	10.4 / 77	10.4 / 77	10.4 / 55
20	14.4 / 70.5	6.9 / 90	14.4 / 155	14.4 / 155	* *
24	* *	* *	* *	* *	* *
28	* *	* *	* *	* *	* *

* Consult Renold Gears

INSTALLATION & MAINTENANCE GUIDE

NOTE: *The values given in the above tables are a rough guide to the lubricant quantities required for the relevant mounting position (Appendix A). These quantities vary between ratios, some requiring more or less than others.*

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

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 quantity of lubricant which will be necessary for the filling process.
- 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.*

- 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

INSTALLATION & MAINTENANCE GUIDE

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.

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.

INSTALLATION & MAINTENANCE GUIDE

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.

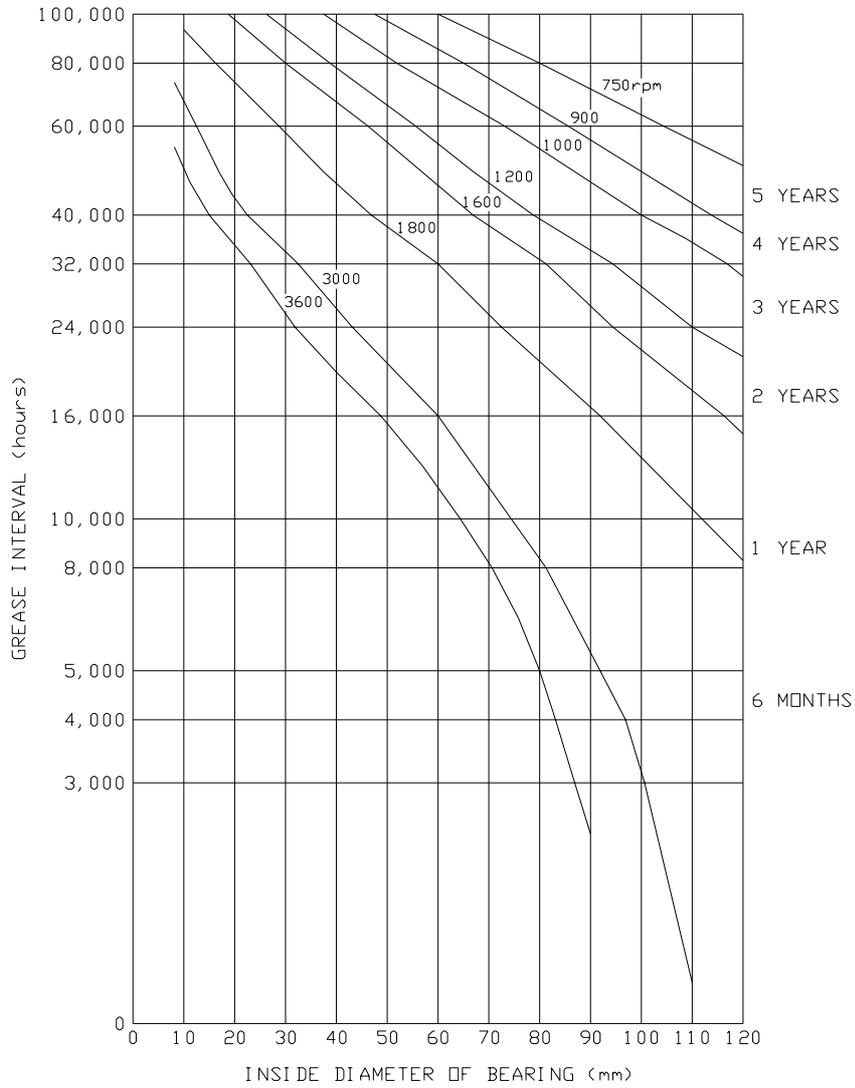
The following chart and graph shows the bearing type for each motor frame size and the greasing interval for bearings under normal circumstances. The indicated greasing interval values are valid for a bearing temperature of 70° C. At higher temperatures, the greasing interval will decrease.

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

INSTALLATION & MAINTENANCE GUIDE

GREASE INTERVAL OF MOTOR BEARINGS



INSTALLATION & MAINTENANCE GUIDE

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.

INSTALLATION & MAINTENANCE GUIDE

12. ATEX APPROVAL

Renold Gears products for operating in potentially Explosive Atmospheres.

12.1 GENERAL

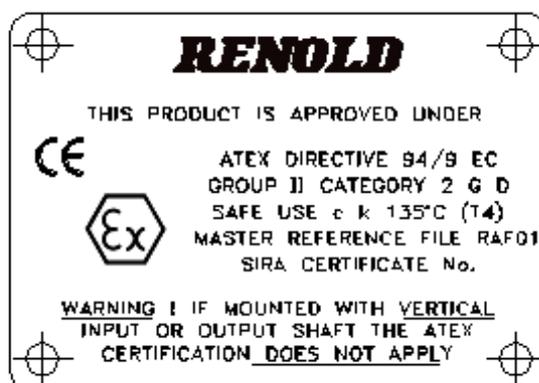
- Renold Gears units are classified as ATEX Group II Category 2 equipment, which embodies sufficient safeguards to be suitable for use in potentially explosive atmospheres for normal operation and for operation during an expected malfunction.
- It is essential that there is sufficient lubricant to prevent 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 T3 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.

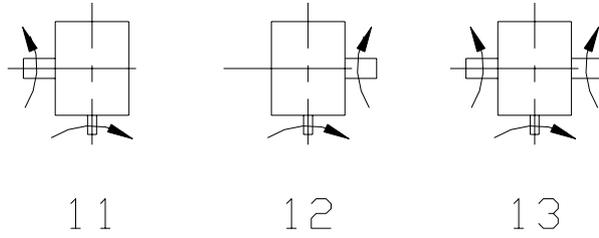


INSTALLATION & MAINTENANCE GUIDE

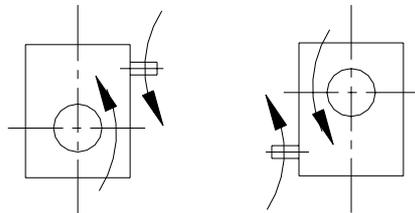
Appendix A

TW SERIES SINGLE REDUCTION WORM GEAR UNIT ASSEMBLY CODES

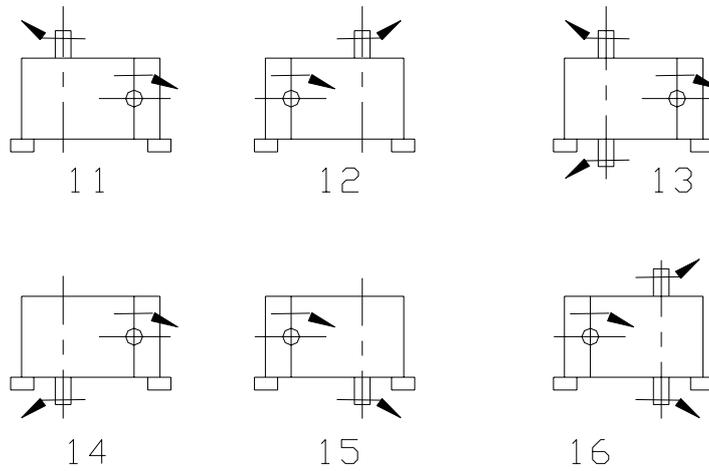
TWU & TWO



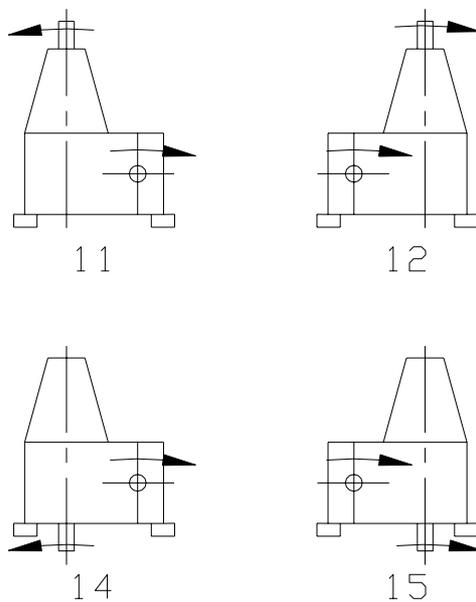
TWSM



TMV



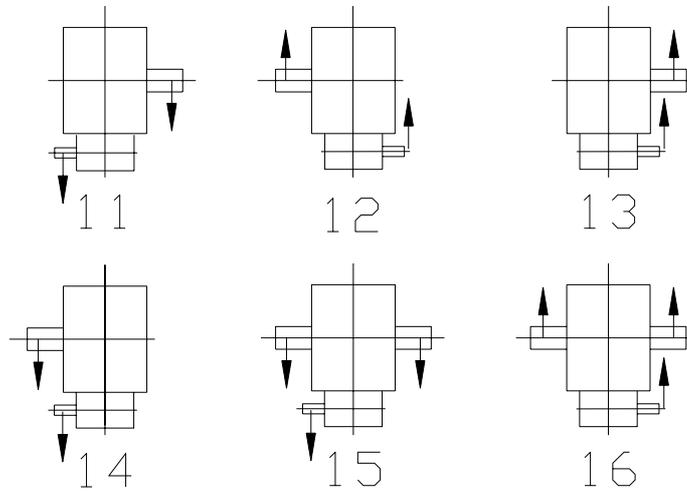
TWA



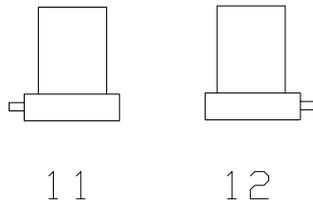
INSTALLATION & MAINTENANCE GUIDE

Appendix A

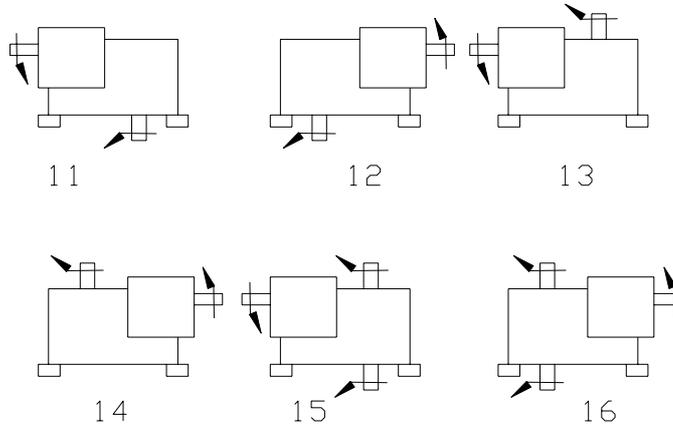
TWDU & TWDO



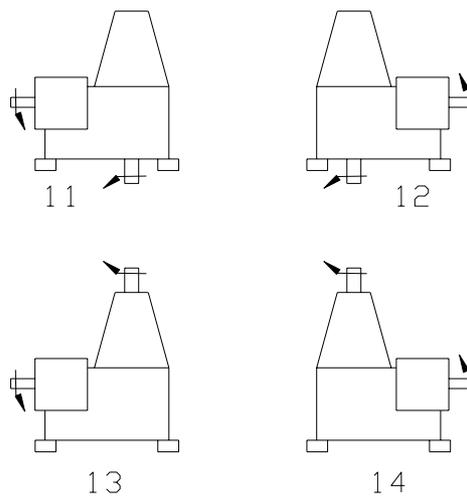
TWDSM



TWDV



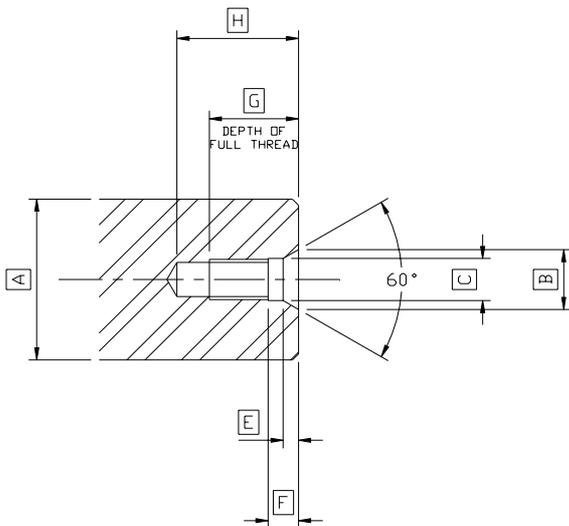
TWDA



INSTALLATION & MAINTENANCE GUIDE

Appendix B

SHAFT END TAPPED HOLE DETAIL



'A' SHAFT DIA ABOVE	UP TO & INCLUDING	B	C	E	F	G +2 -0	H (MIN)	TAP
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 UP TO 130 DIA. SHAFT
IN ACCORDANCE WITH DIN 322 SHEET 2 (OCTOBER 1970)

INSTALLATION & MAINTENANCE GUIDE*Appendix C***MOTOR CIRCUIT DIAGRAMS**

The following motor circuit diagrams are relevant for TW 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.

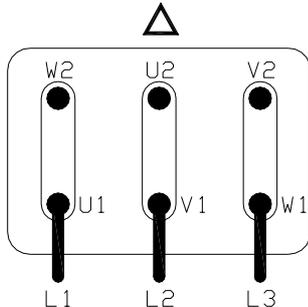
Usually, two voltages will be displayed on the rating plate of the motor. This means that the motor can be connected to a circuit which has one of these voltages. If the mains voltage corresponds to the lowest indicated voltage shown on the rating plate, then the motor winding has to be connected as 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:



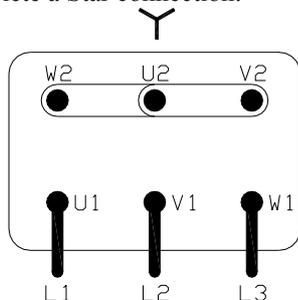
- I. Link W2-U1, U2-V1 and V2-W1 using the metallic strips provided.
- II. Connect Line 1 (L1) to U1, Line 2 (L2) to V1 and Line 3 (L3) to W1.
- III. Connect the Earth wire to the separate terminal supplied.
- IV. Turn on the power supply and check the direction of rotation.
- V. If the direction of 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.

INSTALLATION & MAINTENANCE GUIDE

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.

INSTALLATION & MAINTENANCE GUIDE*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.

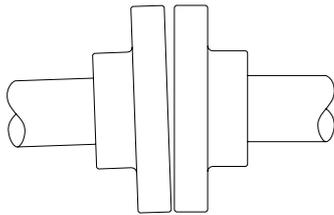


Fig.1

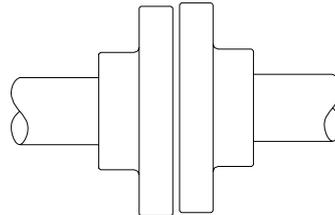


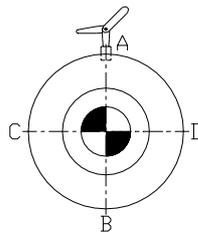
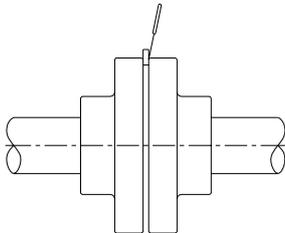
Fig.2

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.

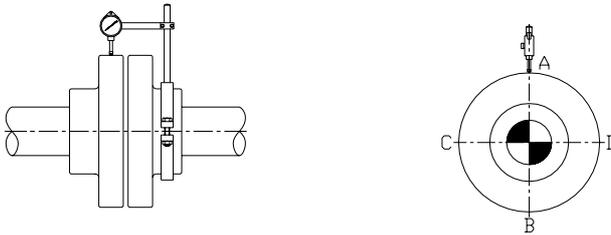
**D.2 Eccentricity Errors**

Eccentricity errors should be checked for in the following manner.

INSTALLATION & MAINTENANCE GUIDE

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.*

INSTALLATION & MAINTENANCE GUIDE

*Appendix E***RECOMMENDED LUBRICANTS**

When installed and before running, the unit should be filled with new lubricant to the correct level (see Section 6.4)

A first filling of oil is available from Renold Gears at the time of supplying the unit. To ensure that the correct grade and quantity of lubricant is obtained, we strongly recommend this service. This is a synthetic type lubricant and must be used to obtain the maximum performance from the gear unit.

NOTE: *The power ratings listed in the TW 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. Some EP additives such as Sulphur can attack Bronze, especially at operating temperatures above 80°C and should therefore be avoided.

Gear unit oils can be categorised into three distinct types; mineral, Polyalphaolefin synthetics and Polyglycol synthetics. Mineral oils tend to be cheaper, but have a lower life and reduce the efficiency of the gearing. Polyalphaolefin synthetic oils are able to operate over a higher temperature range, improve the efficiency of the gearing, produce higher gear ratings and have a longer life. The use of Polyglycol synthetic oils are not recommended without prior discussion with Renold, as special paints and seals are required.

Polyalphaolefin synthetic oils are the preferred choice in Renold Gears gear units. Where necessary, mineral oils can be used as the lubrication medium for the TW Series range; but the consequence will be a reduction in power capacity and efficiency, which will result in an increase in thermal output. If the intention is to use a mineral oil, please contact Renold Gears who will be pleased to advise.

The tables list oils with three viscosity ranges (light, medium and heavy). The correct choice depends upon the application, operating speed, load and temperature. Operating speed and temperature can often be the determining factors, as they have the greatest effect on the operating viscosity.

The correct choice of oil and grade is essential to obtain the best performance and life from the gear unit. Using too heavy a grade than required will result in reduced efficiency; whilst using too light a grade of oil will result in premature wear. If in doubt, ask Renold Gears Technical Department.

If the gear unit is operating below the catalogue rating at a temperature below 60°C, then a light grade oil should be used. Medium grade oils should be used when operating up to the catalogue rating with temperatures up to 100°C. Heavy grade oils should be used at temperatures in excess of 100°C under heavy loading. However, if the unit is operating at gear rubbing speeds below 2.5 metres/sec (500 ft/min), then the next higher grade should be used than that which would normally be selected.

If required, a list of recommended food grade oils is available on request.

INSTALLATION & MAINTENANCE GUIDE

E.1 SINGLE REDUCTION WORM GEARBOXES (TW TYPE)**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 DTE	BB	-7 to 90	AA	2 to 90	HH	2 to 90
CASTROL ALPHA ZN	220	-9 to 120	320	-9 to 120	460	-9 to 120
CASTROL APLHAMAX	220	-24 to 80	320	-18 to 80	460	-15 to 80
SHELL VITREA	220	-24 to 120	320	-18 to 120	460	-15 to 120
SHELL OMALA	220	-9 to 80	320	-9 to 80	460	-9 to 80
ESSO TERESSO	220	-18 to 120	320	-12 to 120	460	-9 to 120
ESSO SPARTAN EP	220	-30 to 80	320	-27 to 80	460	-18 to 80
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
CASTROL ALPHA T	220	-36 to 80	320	-33 to 80	460	-33 to 80
SHELL OMALA RL	220	-40 to 80	320	-40 to 80	460	-40 to 80
ESSO TERESSO SHP	220	-42 to 150	320	-36 to 150	460	-30 to 150

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

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INSTALLATION & MAINTENANCE GUIDE

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