RENOLD
TW Series

Heavy Duty Wormgear
**RENOLD**

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Products:
Worm, Helical and Bevel-Helical Speed Reducer Gear Units, Geared Motor Unit, Hydrostatic, Mechanical and Electronic Variable Speed Drives and Fully Engineered Package Drives.

**RENOLD**

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Products:
Resilient Shaft Couplings, Gear and Fluid Soft-Start Couplings, Clutches: Sprag, Slipping and Air Types.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renold Gears Company Profile</td>
<td>5</td>
</tr>
<tr>
<td>Renold Group Product Range</td>
<td>6 - 7</td>
</tr>
<tr>
<td>Typical Applications</td>
<td>8 - 9</td>
</tr>
<tr>
<td>Examples of Bespoke and Package Drives</td>
<td>10 - 11</td>
</tr>
<tr>
<td>'TW' Series Unit Features</td>
<td>12</td>
</tr>
<tr>
<td>General Specification</td>
<td>13</td>
</tr>
<tr>
<td>Selection of TW Series Units</td>
<td>14 - 15</td>
</tr>
<tr>
<td>Load Classification by Application</td>
<td>16</td>
</tr>
<tr>
<td>Overhung and Thrust Load Capacities</td>
<td>17 - 18</td>
</tr>
<tr>
<td>Exact Ratios</td>
<td>19</td>
</tr>
<tr>
<td>Selection Data - Single Reduction Units</td>
<td>20 - 33</td>
</tr>
<tr>
<td>Selection Data - Double Reduction Units</td>
<td>34 - 35</td>
</tr>
<tr>
<td>Dimensions - Single Reduction Units</td>
<td>36 - 40</td>
</tr>
<tr>
<td>Dimensions - Double Reduction Units</td>
<td>41 - 45</td>
</tr>
<tr>
<td>Dimensions - Motorised Units</td>
<td>46</td>
</tr>
<tr>
<td>Dimensions - Torque Arm</td>
<td>47</td>
</tr>
<tr>
<td>Installation, Maintenance and Storage</td>
<td>48</td>
</tr>
<tr>
<td>Lubrication</td>
<td>49</td>
</tr>
<tr>
<td>Oil Capacities</td>
<td>36 - 45</td>
</tr>
<tr>
<td>Weights</td>
<td>36 - 45</td>
</tr>
<tr>
<td>Renold Worldwide Sales and Service</td>
<td>50 - 51</td>
</tr>
</tbody>
</table>
Renold’s Quality is inherent across its range of power transmission products, allowing you to select for individual applications or combined engineered package solutions.

Select Renold to keep your plant running and design options open.

Renold is your one-stop solution for all your power transmission needs.

WITH HINDSIGHT YOU’D FIT RENOLD, WHY WAIT?

RENOlD
The Power Transmission Solution
Renold Gears was formed in 1964, a combination of John Holroyd & Co Ltd., of Milnrow and Croft Engineers Ltd of Bradford. Both companies had their origins in the 1880’s and had been manufacturing gears and gear units of all kinds since the early 1900’s.

The “Holroyd” wormgear tooth profile used exclusively in all Renold wormgears is based on BS.721 standard with special modifications to give a very high gear tooth efficiency and load carrying capacity.

Renold manufactures a comprehensive range of product comprising wormgear units, helical and bevel/helical gear units as speed reducer and motorised types.

All units have foot and shaft mounted options with modular build design to allow combination of many of the product types.

- **Service Excellence and Care**
  Renold offers a unique level of service excellence and customer care. Our experienced applications engineers will select the optimum solution, with the aid of the latest computer and design technology. Renold provides the service and care for peace of mind.

- **Special Solutions and Innovations**
  Renold Gears is recognised throughout the industry for its capability to create specific solutions to customer unique requirements, in a broad range of industries from food processing to escalators to textile machinery and general engineering.
  Creating complete solutions, providing total capability in all market sectors not just for gear units, but also for complete drive packages.

- **Leading Edge Technology**
  Value through quality with continuous investment in people, process technology, manufacturing and commitment to quality,
  enables Renold to provide the practical cost effective solutions to most power transmission problems.

- **Consistent Reliability**
  Renold has years of experience in the design and manufacture of its products to the highest specifications,
  used in a numerous variety of industries throughout the world, with proven performance, guaranteed quality and assurance of reliability.

- **Package Solutions**
  One stop for your drive systems including gears, motors, couplings, variators and fabricated bases.

- **Approval**
  Renold Gears is BS EN ISO 9001 Part 1 approved. All products are designed and manufactured to this Quality Assurance System.

- **Local and International**
  The Renold organisation stretches worldwide with 16 National Sales Companies and more than 70 accredited distributors offering the comprehensive Renold range of power transmission products and service.
RENOLD e.JM Series JW Type
- Wormgear unit in sizes 30 to 86mm centre distance, up to 4kW capacity.
- Motorised and speed reducer types available.
- Suitable for standard IEC, NEMA and high efficiency EFF motors.
- Wide ratio range up to 100:1 single reduction and 400:1 double reduction.
- Aluminium case up to size JW60 and fine grain cast iron to size 86.

RENOLD HC Series
- Helical and bevel/helical units available in 14 sizes up to 1000kW.
- Heavy duty design for high torque applications.
- Gear case hardened and ground for high efficiency and quiet running.
- Hollow and solid shaft variants allow design options.

RENOLD RP Series
- In-line helical speed reducers and geared motor units available in single, double and triple reduction types from 0.25kW to 45kW with ratios from 1:5:1 to 100:1.
- Designed to European standard therefore interchangeable without re-engineering.
- Foot and flange mounting for flexibility in applications.
- Standard heavy-duty version for higher load characteristics.

RENOLD e.JM Series PM Type
- Wormgear units with sizes from 1.125” to 3.0” centre distance, up to 4kW capacity.
- Available as worm or helical/worm options up to 300:1 ratio.
- Motorised and speed reducer types available.
- Variable mounting options allow design flexibility.
- Unique Holroyd tooth form profile for high efficiency and long life.
- Long life synthetic lubricant.

RENOLD e.PM Series PH Type
- Helical wormgear unit offering 6 sizes with ratios up to 300:1.
- Available as speed reducer or motorised versions.
- Heavy duty unit for demanding applications.
- Unique Holroyd tooth form profile for high efficiency and long life.
- Variable mounting allows total design flexibility.

RENOLD e.PM Series PW Type
- Wormgear unit in 6 sizes with powers up to 45kW capacity.
- Available as speed reducer or motorised versions.
- Ratios from 5:1 to 70:1
- Unique Holroyd tooth form profile for high efficiency and long life.

RENOLD e.PM Series PB Type
- Helical/bevel/helical unit with high gear ratio and large torque range up to 12000Nm.
- Available as speed reducer or motorised versions.
- Ratios from 16:1 to 160:1
- Robust case and gear construction allowing use in heavy duty applications.

RENOLD WM Series
- WM Series is available with 4" - 9" centres and ratios of 5:1 to 70:1 as a single reduction unit and 75:1 to 4900:1 as a double reduction. Foot, flange and shaft mounted types available.
- Heavy-duty version for demanding applications.
- Unique Holroyd tooth form profile for high efficiency and product life.
- Integral sprag clutch backstop for safe running.

RENOLD TW Series
- Heavy duty worm units with centres from 10” to 28” in single and reduction types. Ratios available from 5:1 to 4900:1 with input powers from 16 to 506kW.
- Heavy duty design for high torque applications.
- Unique Holroyd tooth form for high efficiency and product life.
- Optional protection for use in hostile and arduous environments.
**Renold Pinflex**
- A robust general purpose pin/buffer coupling providing reliable fail safe transmission of torque and mis-alignment capability.
- Steel half bodies, strong yet compact.
- Polyurethane buffers, reliable/flexible and temperature resistant.
- Torsionally flexible and shock absorbing, extending machine life.

**Renold Spiderflex**
- A medium power torsionally flexible coupling combining shock absorbing and mis-alignment capacity for use in the widest range of industries and applications.
- Mis-alignment capabilities allow flexibility in installation.
- Optional fire retardant anti static element for use in flameproof environment.
- High torque capacity, yet compact design.
- Taper bush and multiple bore options mean reduced stock.

**Renold Tyreflex**
- A range of highly flexible couplings offering excellent mis-alignment capacity and suitable to absorb both shock loads and vibrations.
- Standard fire retardant, anti static elements up to size TY100.
- Interchangeability means no re-engineering.
- Pump spacer option for easy pump maintenance.

**Renold Discflex**
- A general purpose fail safe, torsionally flexible coupling offering the option of either urethane or reinforced rubber disc, as the flexible element.
- Compact design, dimensionally small, yet high power capacity.
- Taper bush bores available for ease of maintenance.
- Optional fire retardant, anti static disc element for use in flameproof areas.

**Renold Spider**
- Compact coupling available with cast iron or bronze half bodies up to 107nm capacity.
- Torsionally flexible and shock absorbing for extended machine life.
- Bronze half bodies for use in corrosive atmospheres.

**Renold Chainflex**
- An all metal flexible coupling providing a high torque capacity with compact design.
- Torsionally stiff for use as a positive drive connection.
- Easy installation for ease of maintenance.
- Mis-alignment capacity up to 0.50mm offset and 4mm end float.

**Renold Crown Pin**
- An established pin/buffer coupling offering extended power capacity where the demand for long life and simplicity of construction make it suitable for working in arduous conditions.
- Heavy-duty pin and buffer coupling suitable for shock loads.
- Neoprene buffers for robust flexibility.
- Mis-alignment capabilities of up to 0.25° angular and 0.13-0.18mm parallel offset.

**Renold Rigid**
- An all steel, rigid, flanged coupling used where no shaft flexibility is required.
- Small compact design with high torque capacity.
- Taper bushed, multiple bore options mean reduced stock.

**Renold Gearflex**
- Heavy duty all metal couplings giving maximum power capacity within minimum space envelope and excellent mis-alignment capability.
- Single and double arrangement, standard and heavy-duty series types up to 60,000kW capacity.
- AGMA standard, therefore interchangeable and cost effective.
- Crowned and barreled teeth for optimum contact and long life.
- Mill motor, sheer pin and telescopic designs to give design suitability for demanding applications.

**Renold Hydrastart**
- A flex coupling suitable for soft starting high inertia machinery with reduced current demand, controlled acceleration, torque and motor overload protection.
- Fluid soft start available up to 700kW.
- Flexible couplings and vee pulley designs as standard for design flexibility.
- Soft start allows the motor to accelerate unloaded.
- Reduces motor size and drive package cost.
- Delay fill version extends acceleration time and reduces start up torque.

**Renold Sprag Clutch**
- Anti-runback clutch used on holdback, indexing and over running applications.
- No backlash, giving positive action.
- Long life means low maintenance costs.
- Enhanced performance from optimised sprag profile design.
- Compact design, yet high torque.
- Interchangeability means no re-engineering.

**Renold Air Clutches**
- Air operated, disconnecting clutches available as elements only or as a coupling drive package.
- Constricting and expanding types activated by standard factory air supply.
- Clutch or brake types available for flexible design choice.
- Air flow control allowing reaction time to be adjusted, therefore protecting all machinery types.
‘PM’ Series - Sizes 35 to 80
Helical/Worm geared motor and speed reducer unit rated up to 45kw, ratios available to 307:1.

- Conveyors
- Mixers
- Rotary Kilns
- Mining
- Steel Works
- Mechanical Handling

Ritepower
In line helical geared motor unit, single, double and triple reduction up to 100:1 ratio.

- Conveyors
- Mixers
- Pumps
- Mechanical handling
- Chemical
- Food process

TW Series
Heavy duty worm gear units from 10” to 28” centres, ratios up to 70:1 single reduction and 4900:1 double reduction.

- Ball Mills
- Conveyors
- Escalators
- Mining
- Rubber
- Timber

‘PM’ Series
Worm and Helical/Worm geared motor and speed reducer units.

- Conveyors
- Rotary screens
- Elevators
- Textiles
- Mechanical Handling
- Chemical
Worm, Helical and Bevel/Helical Gear Units Typical Applications

‘PM’ Series - Sizes 11 to 30
Worm and helical/wormgear unit available with ratios of up to 300:1 and capacity of 4kw.

- Rotary dryers
- Conveyors
- Filter presses
- Food & drink
- Hoists
- Printing

Hercules
Helical and bevel/helical heavy duty gear units available in 14 sizes up to 1000kw capacity.

- Crushers
- Conveyors
- Ball Mills
- Sewage Treatment
- Timber
- Steel Works

‘SM’ Series
Unit capacities up to 140kw with 4 unit ratios 5:1 13:1 20:1 and 25:1 with plain and taper bush bore options.

- Conveyors
- Elevators
- Mixers
- Mining
- Quarries
- Foundries

WM Series
Wormgear unit 4” to 9” centres with ratios of up to 70:1 single reduction and 4900:1 double reduction.

- Leisure Rides
- Conveyors
- Mixers
- Water Treatment
- Agitator
- Paper & Pulp

RENOLD GEARS. Tel: + 44 (0) 1706 751000 Fax: + 44 (0) 1706 751001 E-Mail: sales@gears.renold.com
Examples of Bespoke and Package Drive Units

Drive package used on overhead conveyor system in the automotive and food industry. Unit designed with built-in disengaging clutch for conveyor freewheeling.

Bespoke small wormgear unit designed for use as a double reduction drive in the textile industry.

Wormgear unit used on a roll drive with a splined input to allow the tandem units to have linear movement, allowing for roll adjustment.

Small/medium rise escalator drive with in-built caliper brake.

Multi spindle drive package using helical gear units and a belt variable speed drive. Used to drive forming rolls in the metals, plastics and glass industry.

Combined helical and wormgear package with speed reductions of up to 400,000:1 for use on a rotary air filter drive in a power station.

Elevator drive package including AC or DC motor, wormgear unit with disc brake, drive & guide sheaves and guard, all mounted on fabricated base plate.

Large rise escalator drive using AC motor, disc brake, wormgear and final chain drive. An auxiliary unit is also used as a slow speed maintenance drive.
Examples of Combination Units

Carter belt variable speed unit driving a 'PM' Series wormgear unit giving up to 8.75:1 variable speed range with a right angle drive.

Combined flange mounted RS Series and 'PM' Series helical/worm unit has a maximum ratio capability of up to 22,000:1.

To extend the catalogue ratio of TW Series wormgear unit or to allow output shaft back driving an 'RS' Series helical unit first stage reduction can be used.

Wormgear or helical gear unit can be supplied as a package often with motor, couplings on the input and output shafts or chain drive, all mounted on a base plate.

Motorised Carter hydrostatic variable speed unit with a 27:1 variable speed range combined with 'PM' Series helical worm unit.

Motorised 'GMF' flange mounted 'RS' Series unit combined with foot mounted 'RS' Series unit giving ratios up to 6500:1.
Unique Holroyd tooth form for maximum torque capacity and optimum efficiency.

Enhanced sealing available using a grease packed labyrinth system for use in hostile environments.

Phosphor bronze wormwheel rim electron beam welded onto cast iron centre on unit sizes up to 14 to ensure maximum strength under shock load conditions.

Sprag clutch backstop option to prevent drive reversals.

Two piece close grained cast iron gear case for strength and absorption of vibration for quiet running.

Applications
- Conveyors
- Mining
- Timber
- Materials Handling
- Packaging Machines
- Water Treatment
- Foundary Equipment
- General Industrial applications
The **RENOLD** range of TW Series heavy duty units is the result of continuing research and development, and enables significant increases in the power transmission and overhung load capabilities of each unit to be achieved.

Ten standard types of TW Series units are available with centre distances from 10” to 28” and with ratios ranging from 5:1 to 70:1 for single reduction units and from 75:1 to 4900:1 for double reduction units. All units incorporate metric taper roller bearings, and use the finest quality alloy steels for the wormshafts and centrifugally cast phosphor bronze rims for the wormwheels.

**Gear Case**

The gear cases are of close grained cast iron with all joints and bearing bores accurately machined to ensure oil tightness and precise gear location.

**Wormshaft and Wormwheel**

The worm is integral with its shaft and manufactured from alloy steel, casehardened on the threads, and ground and polished on the thread profiles.

The wormwheel rim is made from bronze complying with BS 1400 PB2-C (centrifugally cast) and secured to the cast iron centre by the electron beam welding process on the 10” - 14” sizes.

The Holroyd gear form used in the TW Series gear units corresponds to British Standard recommendations but, in addition has an exclusive feature which consists principally of an important modification to the worm threads and wheel teeth which confer additional valuable properties to gear performance. This ensures that our gears will run correctly and transmit true uniform angular velocity when running under all load conditions. The modification also gives a tapered oil entry gap between the teeth, which drags the lubricant between the surfaces and results in more efficient lubrication. Standard worm gears have right-hand threads but left-hand threads can be made to order.

**Shas**

Standard shaft extensions are to metric dimensions but imperial shaft extensions for units complying with BS5052: 1968 or to suit the requirements of the North American market are also available. The wheelshaft is produced in carbon steel but, if required by applicational conditions, can be made from high tensile steel. Double extension wormshafts or wheelshafts are also available on request, as well as special shaft extensions.

**Bearings**

Standard metric taper roller bearings are fitted throughout in the 10”, 12” and 14” units, with a face to face arrangement on both the worm and the wheeline to impart the maximum possible stiffness. A similar arrangement is used on the wheeline of the larger sized gear boxes, but on the wormline, a matched set of taper roller bearings is installed at one end to accommodate radial and thrust forces, with a deep groove ball bearing at the opposite end accommodating radial forces only. This bearing is free to move axially in the casing, to allow for expansion of the wormshaft. Where necessary an optional higher capacity bearing arrangement can be specified for the wheeline which considerably increases the overhung load or thrust capacity.

**Oil Seals**

Viton oil seals are fitted as standard on all TW Series gear units.

**Lubrication**

Gear and bearings are positively lubricated by oil from the sump in the underdriven and overdriven versions at normal motor speeds. With the vertical and agitator types, grease lubrication is necessary to the wheeline bearings.

For lower speeds it may be necessary to consider grease lubrication of certain bearings, and in this instance it is advisable to consult with Renold Engineers. Full lubrication details can be found under the “Installation & Maintenance” section.

**Cooling**

Maximum heat dissipation by air cooling is carried out by a radial fan directing air over the ribbed gear case. Where applicational circumstances permit, standard units can be supplied without a fan.

**Backstop**

A Sprag Clutch Backstop can be fitted internally to certain units when required, or alternatively an externally mounted backstop with manual tension release is available.
TW Series - Selection Information

To select a worm gear unit the following basic information must be known and, if we are to make the selection, should be submitted in full to our Technical Sales Department.

**Power**
a) Prime mover, type and output power (kW).
b) Gear unit input and output power required (kW).
c) For input speeds below 250 rev/min consult our Technical Sales Department giving details of required output torque (Nm) and diameter of driven shaft (mm).

**Speed**
Gear unit input and output rev/min.

**Duty**
a) The characteristics of the drive eg. degree of impulsiveness of the driven load.
b) Duration of service in hours/day.
c) Starting load (kW) and number of starts per day.
d) For intermittent duty, reversing or shock loading, state normal power (kW) and frequency.
e) Disposition and details of external loads imposed on input/output shafts.
f) Working conditions, i.e. clean, dusty, moist, abnormal temperatures etc.

If the operating conditions are in any way unusual it is advisable to consult our Technical Sales Department.

**Enquiry/Ordering Procedure**
At the order or enquiry stage, please quote the catalogue reference, shaft assembly number and nominal ratio or exact ratio if this important (see tables). Non standard mounting positions should be indicated with a sketch. Where a double extension wormwheel shaft is required, please state any special requirements regarding alignment of 3 keyways.

**Mechanical Rating**
The mechanical powers listed are those which the TW Series class units will transmit for 10 hours each day and correspond to a service factor of 1.0. Where non-uniform loading or a working day other than 10 hours is involved, a service factor fo should be applied to the selection power or torque which is taken from table 2. High numbers of starts per hour also influence the mechanical selection. Table 3 shows the start factor fs which should also be applied to the selection power or torque. For guidance a comprehensive list of the various load conditions for a number of applications is given in Table 1. When confirming the mechanical selection powers therefore, the rating must be equal to or greater than calculated power or torque demand x application service factor fo (table 1 and table 2) x starts factor fs (table 3)

**Efficiencies**
The efficiency figures are approximate only and are those that could be expected from a gearbox which is fully run-in and operating under full load with the lubricant at its full working temperature. For intermittent rating where the lubricant may remain comparatively cool, the efficiency may be somewhat lower due to the increased oil churning losses associated with the higher viscosity of the cool oil.
We shall be pleased to advise on any particular application.

**Thermal Rating**
The thermal ratings given are those which the gear units will transmit at an ambient temperature of 20°C, when the heat generated within the gearbox is being dissipated at the same rate. Whilst these ratings can be exceeded under start up conditions, this situation could lead to overheating and subsequent damage if continuously applied. Thermal torque ratings do not relate to mechanical gear life and are not affected by running time or momentary shock loads.
If the ambient temperature is likely to exceed 20°C, this situation will have to be taken into account in the selection procedure. This is done by applying the thermal service factor given in table 4 when calculating the selection output torque.
E.g. Thermal selection torque = continuous torque requirement x thermal service factor fr. Where intermittent running is involved it is probable the thermal limitation can be ignored, such as on a crane or which application, and when this type of operation is being considered full applicational details should be given to Renold for assessment.

**Selection Procedure**
The ratings tables for the single reduction wormgear units provide mechanical ratings in terms of input and output power in kW and mechanical and thermal output torque ratings in Newton Meters. Tables 1 and 2 list the service factors relative to the operational hours each working day and the load classification with regard to the nature of the service. When determining the selection power absorbed and not the rating of the prime mover should be used.
The procedure is as follows for single reduction units:
a) Establish the ratio required by dividing the input speed by the output, choosing the nearest nominal ratio available from tables 7 and 8.
Gear ratio = \( \frac{\text{input speed rev/min}}{\text{output speed rev/min}} \)
b) Determine the load classification from table 1 and the corresponding mechanical service factor fo. from table 2 and the starts factor fs from table 3.
c) Multiply the actual power absorbed by the mechanical service factor fo and tentatively select the size of unit by comparing this against the mechanical rating appropriate to the ratio and input speed.
Selection Output Torque = actual output torque x fo x fs
or
Selection Output Torque = \( \frac{\text{absorbed power x 9550 x fo x fs}}{\text{output speed (rev/min)}} \)
d) For continuous operation check that the thermal rating is at least equal to the thermal torque requirement.
External cooling can be offered to increase thermal rate.
Thermal torque requirement = continuous torque x thermal service factor fr from table 4.
e) Check the capability of the unit to withstand external loads applied to the output shaft, see tables 5 and 6.
For the selection of units from the double reduction range, the thermal rating is ignored since at the speeds involved only the mechanical rating needs to be considered.
It can be seen from the ratings tables on pages 20 - 35 that both mineral and synthetic oil ratings are included. Depending upon which type of oil is to be used inside the gear unit will determine which rating are used to make a selection.

Example 1

A right angled underdriven wormgear unit is required to drive a steady load conveyor operating for 24 hours per day under ambient temperature conditions of 20˚C. Stops/stops will not exceed 5 per hour. The electric motor speed is 1440 rpm and the conveyor headshaft torque is 13,800 Nm at 30 rpm.

1. Gear Ratio = \( \frac{1440}{30} = 48/1 \)
   The nearest standard ratio is 50/1.

2. Mechanical Service (f_D) = 1.25 Factor
3. Starts Factor (f_S) = 1.0
4. Thermal Service (f_T) = 1.0 Factor

5. Mechanical Selection (Nm) = Actual (Nm) x (f_D) x (f_S) x Torque requirement
   = 13,800 x 1.25 x 1.0
   = 17,250 Nm.

6. Thermal Selection (Nm) = Actual (Nm) x Torque requirement
   = 13,800 x 1
   = 13,800 Nm.

7. TWU17 unit is selected using 50/1 ratio. Using mineral oil.
   The mechanical torque rating is 23825 Nm and thermal rating is 16,176 Nm. However by using synthetic oil to lubricate the unit the selection would change to:
   TWU14 at 50/1 ratio. Using synthetic oil.

Example 2

A wormgear unit is required to drive an ore crusher in a mining complex. The duty is 16 hours per day continuous duty, maximum temperatures 30˚C. The limit ratio is 30/1 and the prime mover is an electric motor of 45kW at 1440 rpm (1500 rpm).

1. Mechanical Service (f_D) = 2.0 Factor
2. Starts Factor (f_S) = 1.0
3. Thermal Service (f_T) = 1.16 Factor

4. Mechanical Selection (kW) = Actual x (f_D) x (f_S) x Power requirement
   = 45 x 2.0 x 1.0
   = 90 kW.

5. A TWDU14 double reduction unit selection for this application having a mechanical rating of 34,000 Nm.

6. The efficiency of this this unit is listed at 63%, the input or motor power required to develope 30,000 Nm output:-
   = Actual torque x input RPM x 100
   = 9500 x efficiency x ratio
   = 9500 x 63 x 750
   = 30,000 x 960 x 100
   = 6.38 kW.

The normal power of the required motor will be 7.5kW.

Example 3

A gear unit is required to raise and lower sluice gate 4/5 times each day. The torque required is 30,000 nm at a speed of 1.5rpm. The electric motor speed is 906 rpm. A selection of both unit and motor power is required.

1. Gear ratio = 960 = 640/1
   The nearest standard ratio from table 8 is: 750/1.

2. As this unit is a double reduction type - The thermal ratings are ignored.
   Mechanical Service (fo) = 1.0 Factor

3. Starts Factor (fs) = 1.0

4. Mechanical Selection (Nm) = Actual x (fo) x (fs)
   Torque
   = 45 x 2.0 x 1
   = 90 kW.

5. Thermal Selection (Nm) = Actual x (fr)
   Torque
   = 45 x 1.16
   = 52.2 kW.
Table 1

<table>
<thead>
<tr>
<th>Prime mover (Drive input)</th>
<th>Duration</th>
<th>Steady load</th>
<th>Medium impulsive</th>
<th>Highly impulsive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric &amp; Air &amp; Hydraulic Motors or Steam Turbine (Steady input)</td>
<td>Intermittent - 3hrs/day max</td>
<td>0.90</td>
<td>1.00</td>
<td>1.50</td>
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<tr>
<td></td>
<td>3 - 10 over 10</td>
<td>1.00</td>
<td>1.25</td>
<td>1.75</td>
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<td></td>
<td>1.25</td>
<td>1.50</td>
<td>2.00</td>
<td></td>
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<tr>
<td>Multi-cylinder I.C. engine (Medium impulsive input)</td>
<td>Intermittent - 3hrs/day max</td>
<td>1.00</td>
<td>1.25</td>
<td>1.75</td>
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<td></td>
<td>1.50</td>
<td>1.75</td>
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<tr>
<td>Single-cylinder I.C. engine (Highly impulsive input)</td>
<td>Intermittent - 3hrs/day max</td>
<td>1.25</td>
<td>1.50</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>1.50</td>
<td>1.75</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.75</td>
<td>2.00</td>
<td>2.50</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 (Service factor f_M)

<table>
<thead>
<tr>
<th>Prime mover (Drive input)</th>
<th>Duration</th>
<th>Steady load</th>
<th>Medium impulsive</th>
<th>Highly impulsive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric &amp; Air &amp; Hydraulic Motors or Steam Turbine (Steady input)</td>
<td>Intermittent - 3hrs/day max</td>
<td>0.90</td>
<td>1.00</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>3 - 10 over 10</td>
<td>1.00</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>1.25</td>
<td>1.50</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td>Multi-cylinder I.C. engine (Medium impulsive input)</td>
<td>Intermittent - 3hrs/day max</td>
<td>1.00</td>
<td>1.25</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>1.25</td>
<td>1.50</td>
<td>2.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.50</td>
<td>1.75</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td>Single-cylinder I.C. engine (Highly impulsive input)</td>
<td>Intermittent - 3hrs/day max</td>
<td>1.25</td>
<td>1.50</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>1.50</td>
<td>1.75</td>
<td>2.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.75</td>
<td>2.00</td>
<td>2.50</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 (Factor for Starts/Hours (f_M))

<table>
<thead>
<tr>
<th>Maximum number of starts per hour</th>
<th>5</th>
<th>10</th>
<th>100</th>
<th>300</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starts factor f_M</td>
<td>1.0</td>
<td>1.1</td>
<td>1.15</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Table 4 (Thermal Service Factor f_T)

<table>
<thead>
<tr>
<th>Ambient °C</th>
<th>Temp °F</th>
<th>Factor f_T</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>50</td>
<td>0.87</td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>1.0</td>
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<tr>
<td>30</td>
<td>86</td>
<td>1.16</td>
</tr>
<tr>
<td>40</td>
<td>105</td>
<td>1.35</td>
</tr>
<tr>
<td>50</td>
<td>122</td>
<td>1.62</td>
</tr>
<tr>
<td>60</td>
<td>140</td>
<td>1.97</td>
</tr>
</tbody>
</table>

Note: Machinery characteristics and service factors listed in this catalogue are a guide only. Some applications (e.g. constant power) may require special considerations. Consult Renold Gears.
Output shafts of worm gear units are frequently fitted with a spur pinion, chain pinion or belt pulley causing an overhung load to be imposed on the output shaft and bearings. These loads can generally be sustained by the gear unit; however, if the load is greater than the maximum allowable load for the unit, it maybe necessary either to select a larger unit or to lessen the effect of the load on the shaft bearings. This can be done in two ways. The pinion can be mounted on a shaft in its own bearings and the shaft coupled to the gear unit; or the wheel shaft may be extended beyond the overhung load and fitted with a outboard bearing. In order to obtain the best possible arrangement for a particular application (where large over hung loads are anticipated) customers are advised to submit details of the load to our Sales Technical Staff for their consideration.

In the interests of good design, the overhung member should be fitted as close as possible to the gear case in order to minimise the stresses and reduce the deflecting moment on the unit.

The maximum imposed axial thrust and overhung loads to which the units can be subjected are given in tables 5 and 6.

Imposed axial thrust loads can also be minimised by the use of flexible couplings on the input and output shafts.

For drives where both imposed thrust and overhung loads are encountered, it is advisable to consult our Technical Sales Staff.

Where a double extension shaft is fitted ,the maximum overhung loads listed apply in full to each shaft extension.

\[
\frac{9.55P \times 10^6}{R \times S} \times F \text{ (Newtons)}
\]

Where

- \( P \) = Power absorbed at output shaft (kW)
- \( S \) = Speed of output shaft in rev/min
- \( R \) = Pitch circle radius of chain pinion, spur or helical gear, or belt pulley in mm.
- \( F \) = Overhung drive application factor as follows:
  - Chain pinion 1.00
  - Spur or helical gear 1.25
  - Vee pulley 1.50
  - Flat belt pulley 2.00

The overhung load capacities listed in table 5 assume the load is applied mid-way along the output shaft extension, the relevant dimension from the centre line of the unit being as given below.

<table>
<thead>
<tr>
<th>Unit Size</th>
<th>Dimension X</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>265</td>
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<tr>
<td>12</td>
<td>295</td>
</tr>
<tr>
<td>14</td>
<td>355</td>
</tr>
<tr>
<td>17</td>
<td>415</td>
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<tr>
<td>20</td>
<td>510</td>
</tr>
<tr>
<td>24</td>
<td>565</td>
</tr>
<tr>
<td>28</td>
<td>645</td>
</tr>
</tbody>
</table>
### TABLE 5: OUTPUT SHAFT OVERHUNG LOAD CAPACITIES FOR TWU, TWO AND TWV IN NEWTONS

#### At 1450 rev/min input speed
<table>
<thead>
<tr>
<th>Ratio</th>
<th>Output Speed</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>17</th>
<th>20</th>
<th>24</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>290</td>
<td>37300</td>
<td>40600</td>
<td>45200</td>
<td>59100</td>
<td>81700</td>
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<td>161800</td>
</tr>
<tr>
<td>10</td>
<td>145</td>
<td>44900</td>
<td>48600</td>
<td>53600</td>
<td>69000</td>
<td>93600</td>
<td>141400</td>
<td>187000</td>
</tr>
<tr>
<td>15</td>
<td>95</td>
<td>53300</td>
<td>57800</td>
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<td>82700</td>
<td>113100</td>
<td>164000</td>
<td>215100</td>
</tr>
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<td>73</td>
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<td>67200</td>
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<td>184900</td>
<td>240700</td>
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<td>66500</td>
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<td>203700</td>
<td>262100</td>
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<td>70900</td>
<td>77800</td>
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<td>220200</td>
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<td>99100</td>
<td>138000</td>
<td>184600</td>
<td>267600</td>
<td>315700</td>
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<tr>
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<td>24</td>
<td>79100</td>
<td>91700</td>
<td>99600</td>
<td>147100</td>
<td>197000</td>
<td>269100</td>
<td>316600</td>
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<td>70</td>
<td>21</td>
<td>79700</td>
<td>92800</td>
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<td>147900</td>
<td>198000</td>
<td>271700</td>
<td>371400</td>
</tr>
</tbody>
</table>

#### At 960 rev/min input speed
<table>
<thead>
<tr>
<th>Ratio</th>
<th>Output Speed</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>17</th>
<th>20</th>
<th>24</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
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<td>207700</td>
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</tr>
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<td>197800</td>
<td>270800</td>
<td>315700</td>
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</table>

### Table 6: OUTPUT SHAFT THRUST LOAD CAPACITIES FOR TWU, TWO AND TWV IN NEWTONS.

#### At 1450 and 960 rev/min input speed
<table>
<thead>
<tr>
<th>Ratio</th>
<th>Output Speed</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>17</th>
<th>20</th>
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<td>65280</td>
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<tr>
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<td>62020</td>
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<td>81650</td>
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<td>140000</td>
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</tr>
</tbody>
</table>

Allowable thrust loads for unit sizes 24 and 28 will be supplied upon receipt of information relative to a specific application.

---

For ratios not included above consult Renold.

The double reduction worm versions of the above will also accept overhung loads and when these are involved send applicational details to Renolds Engineers.

The loads listed apply to the standard bearing fitment higher loads are available which, when used in conjunction with a high tensile steel shaft, can allow an increase in the valves given. When a load has to be supported which is in excess of the value listed, send full applicational details to our technical department.

Table 6: OUTPUT SHAFT THRUST LOAD CAPACITIES FOR TWU, TWO AND TWV IN NEWTONS.
### TABLE 7: NOMINAL AND EXACT REDUCTION RATIOS: SINGLE REDUCTION.

<table>
<thead>
<tr>
<th>Ratio Nominal Ratio</th>
<th>10</th>
<th>12</th>
<th>14</th>
<th>17</th>
<th>20</th>
<th>24</th>
<th>28</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
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<td>46/8</td>
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<td>51/10</td>
<td>56/11</td>
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<td>52/7</td>
<td>52/7</td>
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<td>59/8</td>
<td>59/8</td>
</tr>
<tr>
<td>10</td>
<td>39/4</td>
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</tr>
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</table>

**TABLE 8: NOMINAL AND EXACT REDUCTION RATIOS: DOUBLE REDUCTION.**

<table>
<thead>
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<th>Ratio Nominal Ratio</th>
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<th>14</th>
<th>17</th>
<th>20</th>
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<td>50/1</td>
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</table>

It is possible to obtain ratios between those shown above - consult the technical sales department, at Renold Gears.
## TW Series - Single Reduction - Selection Data

**Nominal ratio: 5/1**  
**Preferred Ratio**  
**Unit Sizes 10”, 12”, 14”**

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>1800</td>
<td>1500</td>
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<td>1200</td>
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<td></td>
<td></td>
<td></td>
<td>Input kW, Thermal</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Output Torque Nm, Thermal</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Input kW, Mechanical</td>
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<tr>
<td></td>
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<td></td>
<td>Output Torque Nm, Mechanical</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>Efficiency %</td>
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### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
## TW Series - Single Reduction - Selection Data

### Nominal ratio: 7.5/1  Non Preferred Ratio.

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<th>Centre Distance</th>
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<td>Output Torque Nm, Mechanical</td>
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<td>200.0</td>
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<td>Input kW, Mechanical</td>
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<td>Efficiency %</td>
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<td>Efficiency %</td>
<td>95</td>
</tr>
<tr>
<td>1000</td>
<td>133.3</td>
<td>Input kW, Thermal</td>
<td>63</td>
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<tr>
<td></td>
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<td>Input kW, Mechanical</td>
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<td>Efficiency %</td>
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<td>66.7</td>
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<tr>
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<td>Efficiency %</td>
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### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.

Max Output  | Single Key  | Torque Nm  | Standard Shaft  |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11200</td>
<td>12000</td>
<td>17000</td>
<td>24000</td>
</tr>
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<td>13800</td>
<td>14100</td>
<td>26300</td>
<td>40100</td>
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<tr>
<td>15800</td>
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<td>43400</td>
</tr>
<tr>
<td>24000</td>
<td>41000</td>
<td>51000</td>
<td>72000</td>
</tr>
</tbody>
</table>

**RENOLD GEARS. Tel: +44 (0) 1706 751000 Fax: +44 (0) 1706 751001 E-Mail: sales@gears.renold.com**
### TW Series - Single Reduction - Selection Data

**Nominal ratio: 10/1**

<table>
<thead>
<tr>
<th>Gear Ratings</th>
<th>Centre Distance</th>
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<tbody>
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<td>3936</td>
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<tr>
<td>Input kW, Mechanical</td>
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</tr>
<tr>
<td>Output Torque Nm, Mechanical</td>
<td>3974</td>
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<tr>
<td>Efficiency %</td>
<td>95</td>
</tr>
</tbody>
</table>

**Min Output Torque Nm, Mechanical**

- 1800 rpm: 66 kW, 1200 rpm, 1200 Nm
- 1500 rpm: 66 kW, 1200 rpm, 1200 Nm
- 1200 rpm: 66 kW, 1200 rpm, 1200 Nm
- 1000 rpm: 66 kW, 1200 rpm, 1200 Nm
- 750 rpm: 66 kW, 1200 rpm, 1200 Nm
- 500 rpm: 66 kW, 1200 rpm, 1200 Nm
- 250 rpm: 66 kW, 1200 rpm, 1200 Nm

**Max Output Torque Nm, Mechanical**

- 11200 Nm at 12000 rpm
- 15800 Nm at 21000 rpm

**Notes:**

- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
### TW Series - Single Reduction - Selection Data

**Nominal ratio: 12.5/1 Non Preferred Ratio.**

**Mineral and Synthetic Oils**

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<th>Input rpm</th>
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<th>Gear Ratings</th>
<th>Centre Distance</th>
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<td></td>
<td>Efficiency %</td>
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</tr>
<tr>
<td>1500</td>
<td>120.0</td>
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</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td>Output Torque Nm, Thermal</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Input kW, Mechanical</td>
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<td>Efficiency %</td>
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</tr>
<tr>
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<td></td>
<td>Efficiency %</td>
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</tr>
<tr>
<td>1000</td>
<td>80.0</td>
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<tr>
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<td>Input kW, Thermal</td>
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<td>Input kW, Mechanical</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Output Torque Nm, Mechanical</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency %</td>
<td>93</td>
</tr>
<tr>
<td>750</td>
<td>60.0</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input kW, Thermal</td>
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<td>Output Torque Nm, Mechanical</td>
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<td>Input kW, Thermal</td>
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<td>Output Torque Nm, Mechanical</td>
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**Max Output**

<table>
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<tr>
<th>Single Key</th>
<th>Standard Shaft</th>
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<td>Torque Nm</td>
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<td>51000</td>
<td>108000</td>
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</table>

**Notes:**
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.

RENOld GEARS. Tel: + 44 (0) 1706 751000 Fax: + 44 (0) 1706 751001 E-Mail: sales@gears.renold.com
### TW Series - Single Reduction - Selection Data

**Nominal ratio: 15/1**  
**Preferred Ratio**  
**Unit Sizes 10”, 12”, 14”**.

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
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<tbody>
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<td>10”</td>
<td>12”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Syn</td>
</tr>
<tr>
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<td>1500</td>
<td>100.0</td>
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</tr>
<tr>
<td>1200</td>
<td>80.0</td>
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<tr>
<td>1000</td>
<td>66.7</td>
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<tr>
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**Notes:**  
Ratings in the grey shaded area require force feed lubrication.  
Higher thermal ratings may be obtained using oil coolers.  
Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.  
High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
## TW Series - Single Reduction - Selection Data

### Nominal ratio: 20/1 Preferred Ratio

#### Unit Sizes 10", 12", 14".

<table>
<thead>
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<th>Input rpm</th>
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<th>Gear Ratings</th>
<th>Centre Distance</th>
</tr>
</thead>
<tbody>
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<td>1200</td>
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<td>Min Syn</td>
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<td>Output Torque Nm, Thermal</td>
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<td></td>
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<td>Efficiency %</td>
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<tr>
<td>1200</td>
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</tr>
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<td>250</td>
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<tr>
<td></td>
<td></td>
<td>Efficiency %</td>
<td>83</td>
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</table>

### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.

---

#### Mineral and Synthetic Oils

- Higher output torque may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
### TW Series - Single Reduction - Selection Data

#### Nominal ratio: 25/1  Preferred Ratio  Unit Sizes 10”, 12”, 14”.

<table>
<thead>
<tr>
<th>Centre Distance</th>
<th>10”</th>
<th>12”</th>
<th>14”</th>
<th>17”</th>
<th>20”</th>
<th>24”</th>
<th>28”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input rpm</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Output rpm</strong></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Gear Ratings</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Input kW, Thermal</strong></td>
<td>42</td>
<td>50</td>
<td>63</td>
<td>74</td>
<td>88</td>
<td>105</td>
<td>121</td>
</tr>
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<td>Output Torque Nm, Thermal</td>
<td>4879</td>
<td>5883</td>
<td>7331</td>
<td>8840</td>
<td>10415</td>
<td>12558</td>
<td>14210</td>
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<tr>
<td><strong>Input kW, Mechanical</strong></td>
<td>47</td>
<td>52</td>
<td>73</td>
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<td>108</td>
<td>119</td>
<td>173</td>
</tr>
<tr>
<td>Output Torque Nm, Mechanical</td>
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<td>6188</td>
<td>8619</td>
<td>9653</td>
<td>12717</td>
<td>14243</td>
<td>20409</td>
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<td><strong>Efficiency %</strong></td>
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<td>91</td>
<td>92</td>
<td>91</td>
<td>92</td>
<td>92</td>
<td>92</td>
</tr>
</tbody>
</table>

#### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
## TW Series - Single Reduction - Selection Data

### Nominal ratio: 30/1 Preferred Ratio

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>10”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td><strong>Input kW, Thermal</strong></td>
<td><strong>Output Torque Nm, Thermal</strong></td>
<td><strong>Input kW, Mechanical</strong></td>
<td><strong>Output Torque Nm, Mechanical</strong></td>
</tr>
</tbody>
</table>

#### Higher thermal ratings may be obtained using oil coolers.

**RENOLD GEARS.** Tel: +44 (0) 1706 751000  Fax: +44 (0) 1706 751001  E-Mail: sales@gears.renold.com

### Mineral and Synthetic Oils

- **Mineral Oil:**
- **Synthetic Oil:**

### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.

**REVIEW**

**REVIEW**
<table>
<thead>
<tr>
<th>Gear Ratings</th>
<th>Centre Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input rpm</td>
<td>Output rpm</td>
</tr>
<tr>
<td>1800</td>
<td>51.4</td>
</tr>
<tr>
<td>Input kW, Thermal</td>
<td>30</td>
</tr>
<tr>
<td>Output Torque Nm, Thermal</td>
<td>4568</td>
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<tr>
<td>Input kW, Mechanical</td>
<td>32</td>
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<td>Output Torque Nm, Mechanical</td>
<td>4967</td>
</tr>
<tr>
<td>Efficiency %</td>
<td>86</td>
</tr>
<tr>
<td>1500</td>
<td>42.9</td>
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<td>Input kW, Thermal</td>
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</tr>
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<td>Output Torque Nm, Thermal</td>
<td>4980</td>
</tr>
<tr>
<td>Input kW, Mechanical</td>
<td>28</td>
</tr>
<tr>
<td>Output Torque Nm, Mechanical</td>
<td>5324</td>
</tr>
<tr>
<td>Efficiency %</td>
<td>86</td>
</tr>
<tr>
<td>1200</td>
<td>34.3</td>
</tr>
<tr>
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</tr>
<tr>
<td>Output Torque Nm, Thermal</td>
<td>5449</td>
</tr>
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<td>Input kW, Mechanical</td>
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</tr>
<tr>
<td>Output Torque Nm, Mechanical</td>
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<tr>
<td>Efficiency %</td>
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</tr>
<tr>
<td>1000</td>
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<tr>
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<td>Output Torque Nm, Thermal</td>
<td>5666</td>
</tr>
<tr>
<td>Input kW, Mechanical</td>
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</tr>
<tr>
<td>Output Torque Nm, Mechanical</td>
<td>6042</td>
</tr>
<tr>
<td>Efficiency %</td>
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</tr>
<tr>
<td>750</td>
<td>21.4</td>
</tr>
<tr>
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<tr>
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<td>5742</td>
</tr>
<tr>
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</tr>
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<td>Output Torque Nm, Mechanical</td>
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<tr>
<td>Efficiency %</td>
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</tr>
<tr>
<td>500</td>
<td>14.3</td>
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<tr>
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<td>250</td>
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<td>Efficiency %</td>
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**Notes:**
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
### TW Series - Single Reduction - Selection Data

#### Nominal ratio: 40/1 Preferred Ratio

**Unit Sizes 10”, 12”, 14”.**

<table>
<thead>
<tr>
<th>Input rpm</th>
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<th>Gear Ratings</th>
<th>Centre Distance</th>
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<tr>
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<td>Input kW, Thermal</td>
<td>Output Torque Nm, Thermal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28 33 42 50 64 75</td>
<td>14415 17376</td>
</tr>
<tr>
<td></td>
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<td>Output Torque Nm, Mechanical</td>
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<tr>
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<td></td>
<td>33 36 50 55 64 70</td>
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<td>Efficiency %</td>
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<td>86 87 86 88 88 89</td>
<td>87 88</td>
</tr>
<tr>
<td><strong>1500</strong></td>
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</tr>
<tr>
<td></td>
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<td>25 30 38 44 57 67</td>
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<td>Output Torque Nm, Mechanical</td>
</tr>
<tr>
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<td>Efficiency %</td>
<td>Efficiency %</td>
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<tr>
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<td>87 88</td>
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<td><strong>30.0</strong></td>
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<td>Input kW, Thermal</td>
<td>Output Torque Nm, Thermal</td>
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<td>25 28 30 43 50 55</td>
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<td>Efficiency %</td>
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<td>88 89</td>
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<td><strong>25.0</strong></td>
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<td>Output Torque Nm, Thermal</td>
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<td>57 67</td>
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<td></td>
<td>Input kW, Mechanical</td>
<td>Output Torque Nm, Mechanical</td>
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<td>Efficiency %</td>
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<td>86 87</td>
</tr>
<tr>
<td><strong>750</strong></td>
<td><strong>18.8</strong></td>
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<td>Output Torque Nm, Thermal</td>
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<td>45 52</td>
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<td>Output Torque Nm, Mechanical</td>
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<td>61 67</td>
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<td></td>
<td>Efficiency %</td>
<td>Efficiency %</td>
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<td></td>
<td></td>
<td>81 84 82 85 84 86</td>
<td>84 86</td>
</tr>
<tr>
<td><strong>500</strong></td>
<td><strong>12.5</strong></td>
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</tr>
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<td>10 12 15 17 23 27</td>
<td>31 36</td>
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<tr>
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<td></td>
<td>Input kW, Mechanical</td>
<td>Output Torque Nm, Mechanical</td>
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<tr>
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<td></td>
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<td>Efficiency %</td>
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<td>79 81 80 82 82 84</td>
<td>82 84</td>
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<td><strong>6.3</strong></td>
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<td>Input kW, Thermal</td>
<td>Output Torque Nm, Thermal</td>
</tr>
<tr>
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<td>6.4 7.3 8.7 10 14 17</td>
<td>19 22</td>
</tr>
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<td></td>
<td>Input kW, Mechanical</td>
<td>Output Torque Nm, Mechanical</td>
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<tr>
<td></td>
<td></td>
<td>9.4 10 15 16 18 20</td>
<td>30 33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Efficiency %</td>
<td>Efficiency %</td>
</tr>
<tr>
<td></td>
<td></td>
<td>74 77 75 78 78 81</td>
<td>78 80</td>
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</table>

**Min Output Torque Nm, Single Key**

<table>
<thead>
<tr>
<th>Torque Nm</th>
<th>11200</th>
<th>12000</th>
<th>17000</th>
<th>24000</th>
<th>41000</th>
<th>51000</th>
<th>72000</th>
</tr>
</thead>
</table>

**Max Output Torque Nm, Standard Shaft**

| Torque Nm | 15800 | 21000 | 27300 | 43400 | 77700 | 108000 | 146400 |

**Notes:**

- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
## TW Series - Single Reduction - Selection Data

### Nominal ratio: 45/1 Non Preferred Ratio

#### Gear Ratings

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td>10”</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
</tbody>
</table>

#### Output Torque Nm, Thermal

<table>
<thead>
<tr>
<th>Input kW, Thermal</th>
<th>Output Torque Nm, Thermal</th>
<th>Input kW, Mechanical</th>
<th>Output Torque Nm, Mechanical</th>
<th>Efficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.

---

**Mineral and Synthetic Oils**

- **Syn**
- **Min**

---

**Centre Distance**

<table>
<thead>
<tr>
<th>Gear</th>
<th>10”</th>
<th>12”</th>
<th>14”</th>
<th>17”</th>
<th>20”</th>
<th>24”</th>
<th>28”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Syn</td>
<td>Min</td>
<td>Syn</td>
<td>Min</td>
<td>Syn</td>
<td>Min</td>
</tr>
</tbody>
</table>

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**Max Output**

- **Single Key**
- **Torque Nm**

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<thead>
<tr>
<th>Torque Nm, Standard Shaft</th>
<th>11200</th>
<th>12000</th>
<th>17000</th>
<th>24000</th>
<th>41000</th>
<th>51000</th>
<th>72000</th>
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<tbody>
<tr>
<td></td>
<td>15800</td>
<td>21000</td>
<td>27300</td>
<td>43400</td>
<td>77700</td>
<td>108000</td>
<td>146400</td>
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</table>
### TW Series - Single Reduction - Selection Data

**Nominal ratio: 50/1 Preferred Ratio**

<table>
<thead>
<tr>
<th>Unit Sizes</th>
<th>10”</th>
<th>12”</th>
<th>14”</th>
<th>17”</th>
<th>20”</th>
<th>24”</th>
<th>28”</th>
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</thead>
<tbody>
<tr>
<td>Gear Ratings</td>
<td>Min</td>
<td>Syn</td>
<td>Min</td>
<td>Syn</td>
<td>Min</td>
<td>Syn</td>
<td>Min</td>
</tr>
<tr>
<td>Input kW, Thermal</td>
<td>24</td>
<td>28</td>
<td>35</td>
<td>41</td>
<td>50</td>
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<tr>
<td>Output Torque Nm, Thermal</td>
<td>5158</td>
<td>6217</td>
<td>7776</td>
<td>9372</td>
<td>11115</td>
<td>13397</td>
<td>15312</td>
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<tr>
<td>Input kW, Mechanical</td>
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<td>29</td>
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<td>69</td>
<td>101</td>
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<td>Output Torque Nm, Mechanical</td>
<td>5938</td>
<td>6492</td>
<td>9182</td>
<td>10080</td>
<td>14304</td>
<td>15750</td>
<td>22521</td>
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<tr>
<td>Efficiency %</td>
<td>83</td>
<td>85</td>
<td>84</td>
<td>85</td>
<td>85</td>
<td>86</td>
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</table>

### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
## TW Series - Single Reduction - Selection Data

### Nominal ratio: 60/1  Preferred Ratio  Unit Sizes 10", 12", 14".

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
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<tr>
<td></td>
<td>Output Torque Nm, Thermal</td>
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<tr>
<td>1500</td>
<td>Input kW, Mechanical</td>
<td>23</td>
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<td>Output Torque Nm, Mechanical</td>
<td>5890</td>
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<tr>
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<td>Efficiency %</td>
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<tr>
<td>1200</td>
<td>Input kW, Thermal</td>
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<td>Output Torque Nm, Thermal</td>
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<td>Input kW, Mechanical</td>
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<td>1000</td>
<td>Input kW, Thermal</td>
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<td>Input kW, Thermal</td>
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<td>Output Torque Nm, Thermal</td>
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<td>Input kW, Mechanical</td>
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<tr>
<td></td>
<td>Input kW, Mechanical</td>
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<td>Efficiency %</td>
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### Notes:
- Ratings in the grey shaded area require force feed lubrication.
- Higher thermal ratings may be obtained using oil coolers.
- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.
## TW Series - Single Reduction - Selection Data

### Nominal ratio: 70/1 Preferred Ratio

#### Unit Sizes 10", 12", 14"

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
<th>Min</th>
<th>Syn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
<td>25.7</td>
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<td></td>
<td></td>
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<td>5158</td>
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<td></td>
<td></td>
<td>Input kW, Mechanical</td>
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<td>17</td>
<td>18</td>
</tr>
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<td>5463</td>
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<td>76</td>
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#### Nominal ratio: 71/1 Preferred Ratio

<table>
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<th>Input rpm</th>
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<th>Gear Ratings</th>
<th>Centre Distance</th>
<th>Min</th>
<th>Syn</th>
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</thead>
<tbody>
<tr>
<td>1500</td>
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<td>5895</td>
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<td>Input kW, Mechanical</td>
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#### Nominal ratio: 72/1 Preferred Ratio

<table>
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<th>Centre Distance</th>
<th>Min</th>
<th>Syn</th>
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</thead>
<tbody>
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<td>Output Torque Nm, Thermal</td>
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<td>Input kW, Mechanical</td>
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#### Nominal ratio: 74/1 Preferred Ratio

<table>
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<th>Input rpm</th>
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<th>Gear Ratings</th>
<th>Centre Distance</th>
<th>Min</th>
<th>Syn</th>
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</thead>
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<tr>
<td>1000</td>
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<td>Output Torque Nm, Thermal</td>
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<td>6027</td>
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<td>Input kW, Mechanical</td>
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<td>Output Torque Nm, Mechanical</td>
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<td>7123</td>
<td>6944</td>
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<td>71</td>
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#### Nominal ratio: 76/1 Preferred Ratio

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>Centre Distance</th>
<th>Min</th>
<th>Syn</th>
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<tbody>
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<td>Output Torque Nm, Thermal</td>
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<td>6096</td>
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#### Nominal ratio: 79/1 Preferred Ratio

<table>
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<th>Input rpm</th>
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<th>Gear Ratings</th>
<th>Centre Distance</th>
<th>Min</th>
<th>Syn</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
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<td>Input kW, Thermal</td>
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<td>4.4</td>
<td>4.9</td>
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<td>Output Torque Nm, Thermal</td>
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<td>7062</td>
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<td>Input kW, Mechanical</td>
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<td>5.7</td>
<td>5.9</td>
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<td>Output Torque Nm, Mechanical</td>
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<td></td>
<td>Efficiency %</td>
<td></td>
<td>62</td>
<td>66</td>
</tr>
</tbody>
</table>

#### Notes:
- Ratings in the grey shaded area require force feed lubrication.
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- Two keys must be specified for the wheel and output shaft when maximum output torque for single key is exceeded.
- High tensile steel output shaft must be specified when maximum output torque for standard shaft is exceeded.

---

**RENOLD GEARS. Tel: + 44 (0) 1706 751000 Fax: + 44 (0) 1706 751001 E-Mail: sales@gears.renold.com**
### TW Series - Double Reduction - Selection Data

**Mineral or Synthetic Oil**

**Input Speed:** 1450 rev/min

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>Gear Ratings</th>
<th>TW Series Unit</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td>TWD 10</td>
</tr>
<tr>
<td>75</td>
<td>19.0</td>
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<tr>
<td>150</td>
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<td>13.3</td>
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<td>10.2</td>
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<tr>
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<td>5.0</td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>500</td>
<td>3.0</td>
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<td>6.2</td>
</tr>
<tr>
<td>750</td>
<td>2.0</td>
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<td>4.9</td>
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<td>1.5</td>
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<td>1.0</td>
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<td>2000</td>
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<tr>
<td>3000</td>
<td>0.48</td>
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<td>4000</td>
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<td>0.30</td>
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<td>1.2</td>
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</table>
## TW Series - Double Reduction - Selection Data

**Mineral or Synthetic Oil**

**Input Speed: 960 rev/min**

<table>
<thead>
<tr>
<th>Input rpm</th>
<th>Output rpm</th>
<th>TW Series Unit</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td>TWD 10</td>
</tr>
</tbody>
</table>

### 75 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 11.9
  - 9791
  - 16078
  - 22577
  - 32403
  - 50.5
  - 82
  - 77644

### 150 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 9.4
  - 18926
  - 27317
  - 37115
  - 66912
  - 54.6
  - 91
  - 138

### 250 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 7.7
  - 32453
  - 48800
  - 67800
  - 108500
  - 53.3
  - 83

### 300 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 6.6
  - 30000
  - 48800
  - 67800
  - 108500
  - 46.6

### 500 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 4.6
  - 21050
  - 34000
  - 37800
  - 108500
  - 29.5

### 750 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 3.6
  - 21050
  - 34000
  - 37800
  - 108500
  - 22.0

### 1000 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 2.8
  - 21050
  - 34000
  - 37800
  - 108500
  - 10.9

### 1500 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 2.2
  - 21050
  - 34000
  - 37800
  - 108500
  - 12.5

### 2000 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 1.8
  - 21050
  - 34000
  - 37800
  - 108500
  - 10.2

### 2500 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 1.5
  - 21050
  - 34000
  - 37800
  - 108500
  - 8.6

### 3000 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 1.3
  - 21050
  - 34000
  - 37800
  - 108500
  - 7.9

### 4000 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 0.9
  - 21050
  - 34000
  - 37800
  - 108500
  - 5.6

### 4900 rpm
- **Input kW, Mechanical**
- **Output Torque Nm, Mechanical**
- **Efficiency %**
  - 0.9
  - 21050
  - 34000
  - 37800
  - 108500
  - 5.6
**TW Series - Single Reduction - Dimensions (mm)**

**TYPE TWU UNDERDRIVEN**

<table>
<thead>
<tr>
<th>Catalogue Number</th>
<th>A (in.)</th>
<th>A (mm)</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
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<tbody>
<tr>
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<td>10.0</td>
<td>254.0</td>
<td>171.5</td>
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<td>349</td>
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<td>100.013/100.035</td>
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<td>165.1</td>
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<td>387</td>
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<td>110.013/110.035</td>
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<td>660</td>
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**Catalogue Number**

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**Output Shaft**

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‡ Units with central mounting pads. § Units with central mounting pad and bolt hole via K.
If non reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil.

FOR DETAILS OF UNITS WITH FLANGE MOUNTING MOTORS REFER TO PAGE 46.
TW Series - Single Reduction - Dimensions (mm)

### TYPE TWO OVERDRIVEN

**Input Shaft**

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<tr>
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<th>J</th>
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**Output Shaft**

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‡ Units with central mounting pads. § Units with central mounting pad and bolt hole via K.

If non reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil.

FOR DETAILS OF UNITS WITH FLANGE MOUNTING MOTORS REFER TO PAGE 46.
TW Series - Single Reduction - Dimensions (mm)

**TYPE TSMW SHAFT MOUNTED**

**TORQUE ARM AND FIXING DIMENSIONS SEE PAGE 45**

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<th>T</th>
<th>U</th>
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<th>Weight (approx) Kg</th>
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**Input Shaft**

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If non-reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil.

For details of units with flange mounting motors refer to page 46.

* Details on request.
If non-reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil.

FOR DETAILS OF UNITS WITH FLANGE MOUNTING MOTORS REFER TO PAGE 46.
# TW Series - Single Reduction - Dimensions (mm)

## Type TWA Agitator

### Input Shaft

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### Oil Capacity (approx) Litres

- TWA 10: 116
- TWA 12: 149
- TWA 14: 146
- TWA 17: 149
- TWA 20: 191
- TWA 24: 216
- TWA 28: 254

### Weight (approx) Kg

- TWA 10: 15.0
- TWA 12: 18.6
- TWA 14: 50.0
- TWA 17: 77.3
- TWA 20: 155
- TWA 24: 218
- TWA 28: 432

If non-reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil.

For details of units with flange mounting motors refer to page 46.
TW Series - Double Reduction - Dimensions (mm)

TYPE TWDU UNDERDRIVEN

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Wheelshafts have two output keys as a standard feature. ‡ 2nd reduction units with blank central mounting pads. § 2nd reduction unit with central mounting pad and bolt hole dia K. If a non reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil. * Figures on request. FOR DETAILS OF UNITS WITH FLANGE MOUNTING REFER TO PAGE 46.

RENOLD GEARS. Tel: + 44 (0) 1706 751000 Fax: + 44 (0) 1706 751001 E-Mail: sales@gears.renold.com
TW Series - Double Reduction - Dimensions (mm)

TYPE TWDO OVERDRIVEN

Wheelshafts have two output keys as a standard feature. 2nd reduction units with blank central mounting pads. 2nd reduction unit with central mounting pad and bolt hole dia K. If a non reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil. * Figures on request. FOR DETAILS OF UNITS WITH FLANGE MOUNTING REFER TO PAGE 46.
**TW Series - Double Reduction - Dimensions (mm)**

**TYPE TSMWD SHAFT MOUNTED**

![Diagram of TSMWD SHAFT MOUNTED]

**TORQUE ARM AND FIXING DIMENSIONS SEE PAGE 45**

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* Details on request

Flanged Torque Restraint available - details on request

If a non-reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil.

For details of units with flange mounting refer to page 46.

* Details on request
TYPE TWDV VERTICAL

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Wheelshafts have two output keys as a standard feature. 1st 2nd reduction units with blank central mounting pads. 2nd reduction unit with central mounting pad and bolt hole dia K. If a non reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil. * DETAILS ON REQUEST. FOR DETAILS OF UNITS WITH FLANGE MOUNTING REFER TO PAGE 46.
## TW Series - Double Reduction - Dimensions (mm)

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**Input Shaft**

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Wheelshafts have two output keys as a standard feature. ‡ 2nd reduction units with blank central mounting pads. § 2nd reduction unit with central mounting pad and bolt hole dia K. If a non reversible unit is essential, a sprag clutch backstop should be fitted. Weights quoted are without oil. * Details on request. FOR DETAILS OF UNITS WITH FLANGE MOUNTING REFER TO PAGE 46.
**TW Series - Motorised - Dimensions (mm)**

Unit types TW10, TW12, TW14, TW17.

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Unit types TWD10, TWD12, TWD14, TWD17, TWD20, TWD24, TWD28.

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TW Series - Torque Arm - Dimensions (mm)

Suitable for Unit Types TSMW and TSMWD

<table>
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<tr>
<th>Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<th>J</th>
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<td>127.0</td>
<td>88.9</td>
<td>76.2</td>
<td>26</td>
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<td>57.2</td>
<td>13.5</td>
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<td>76.2</td>
<td>26</td>
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<td>117.48</td>
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<td>133.35</td>
<td>42</td>
<td>120.7</td>
<td>95.25</td>
<td>26</td>
<td>44.4</td>
<td>1040/1180</td>
</tr>
</tbody>
</table>

RENOLD GEARS. Tel: + 44 (0) 1706 751000 Fax: + 44 (0) 1706 751001 E-Mail: sales@gears.renold.com
**Initial Running**

All worm gear units are supplied without oil and should be filled to the correct level with suitable lubricant before running.

**Changing Oil**

The oil should be changed completely at intervals depending upon the working conditions.

**First Filling**

**Single Reduction Units**

When installed and before running, the unit should be filled with new lubricant to the correct level as follows. With the gear stationary, remove the filler and breather plug and oil level plug. Fill until the lubricant level is visible at the indicator (if fitted) or until lubricant overflows from oil level aperture. Replace and secure both plugs. Care should be taken to avoid overfilling, as this may cause subsequent leakage.

**Double Reduction Units**

The 1st and 2nd stage reduction gears are positively and independently lubricated by oil from the sumps in the 1st and 2nd reduction gear cases. It is important, therefore, that both 1st and 2nd stage reduction gear cases are filled with oil following the procedure given above for single reduction units.

**Starting Up**

All units have been subjected to a short test before despatch to the customer but it takes many hours running under full load for the gear to attain its highest efficiency. The gear may if necessary be put to work immediately on full load, but if circumstances permit it is better for the ultimate life of the gear to run it in under gradually increasing load attaining the full load after about 20 to 40 hours. Reasonable precautions should however, be taken to avoid overloads in the early stage of running. Temperature rise on the initial run will be higher than that eventually attained after the gear is fully run in.

**Routine Maintenance**

The oil level in the unit should be regularly maintained, and should be checked at least once a month. To avoid false readings, examination of the oil level should be made with the gear stationary, and to maintain free ventilation of the unit under all conditions, the breather hole in the filler plug should be kept clear at all times. In the case of double reduction units, ensure that maintenance requirements given above are applied to both 1st and 2nd stage reduction gears.

**Storage**

All worm gear units stored or left inactive for long periods should be adequately protected, particularly those on exposed sites and those operating in corrosive atmospheres. The following precautions will generally be adequate, but advice on the protection of particular units will be given, if required. If empty of oil: spray the gear case interior with rust preventative oil; compatible with lubricant recommended for service conditions.

If filled with oil: operate at full speed once per month for not less than 10 minutes to ensure liberal coating of all internal parts with oil.

For indefinite storage: completely fill unit with oil ensuring complete submersion of all internal components and shafts should be occasionally turned by hand. When unit is returned to service, drain and refill with new oil to correct level.

External shaft extensions and oil seals can be protected by the use of grease impregnated tape.

Full long term storage specification details can be obtained from Renold on request.

**Spare Parts**

Information relating to spare parts is available on request.
Oil Lubrication Worm Helical Gears

The correct fill of oil for the unit size and mounting position can be found. Only good quality oils should be used, such as those listed below, as 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 therefore should be avoided.

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 factor 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 a medium grade, with higher temperatures and loading heavy grade oils should be used. If the unit is operating with gear speeds below 2.5 m/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.

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.

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<th>Mineral Oil</th>
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<th>Medium</th>
<th>Heavy</th>
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<tr>
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<td>Temp°C</td>
<td>Temp°C</td>
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<tr>
<td>Mobil Gear</td>
<td>630</td>
<td>-13 to 90</td>
<td>632</td>
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<tr>
<td>Mobil DTE</td>
<td>68</td>
<td>-7 to 90</td>
<td>AA</td>
</tr>
<tr>
<td>Castrol Alpha ZN</td>
<td>220</td>
<td>-9 to 120</td>
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<td>Castrol AlphaMax</td>
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<td>-24 to 80</td>
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<td>Shell Omala</td>
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<tr>
<td>Esso Teresso</td>
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<td>-18 to 120</td>
<td>320</td>
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<td>Esso Spartan EP</td>
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<td>320</td>
</tr>
<tr>
<td>Kluber Gem</td>
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<td>-18 to 100</td>
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<table>
<thead>
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<td>Temp°C</td>
<td>Temp°C</td>
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<tr>
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<td>Shell Omala RL</td>
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<tr>
<td>Esso Teresso SHP</td>
<td>220</td>
<td>-42 to 150</td>
<td>320</td>
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</tbody>
</table>
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