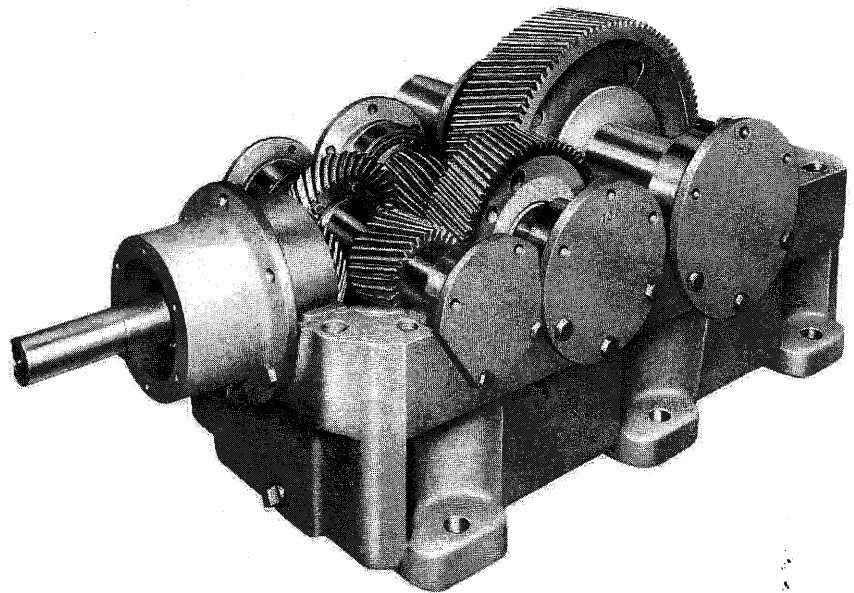
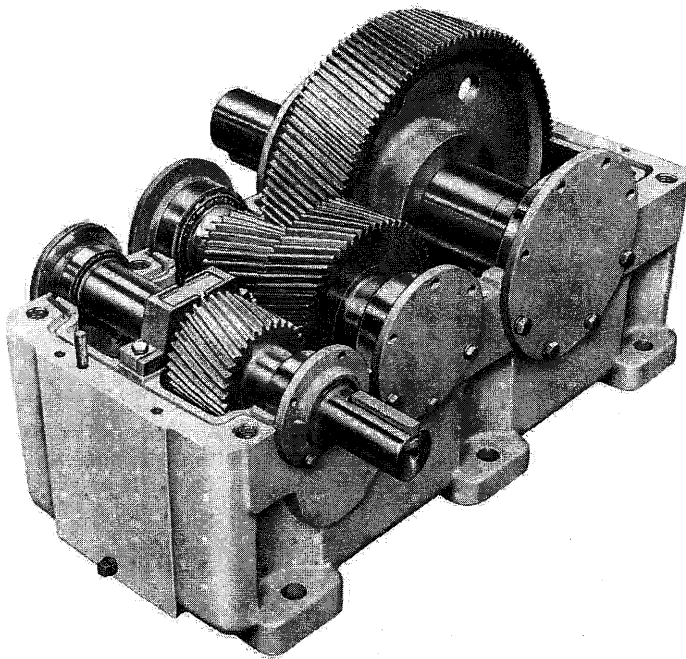


# **NUTTALL GEAR™**

A REGAL REXNORD BRAND

## *Type TDS Helical & Helical / Bevel Speed Reducers*

- Installation
- Lubrication
- Maintenance
- Operation
- Replacement Parts



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# WARRANTY

**CAUTION:** Service and repair under warranty must be performed only by a Nuttall authorized service shop, otherwise the warranty will become void.

Nuttall Gear warrants that the product furnished will be free of defects in material and workmanship for a period not to exceed one year from installation or eighteen months from shipment to the purchaser, whichever is soonest. Upon prompt notification and written substantiation that the equipment has been stored, installed, operated and maintained in accordance with Nuttall recommendations and standard industry practices, Nuttall will correct non-conformity by repair or replacement, at its option, F.O.B. factory.

The warranties set forth in this provision are exclusive and in lieu of all other warranties whether statutory, express or implied (including all warranties of merchantability and fitness for particular purpose and all warranties arising from course of dealing or usage of trade), except of title and against patent infringement. The remedies provided above shall constitute complete fulfillment of all the liabilities of Nuttall whether the claims of the purchaser are based in contract, in tort (including negligence), or otherwise with respect to, or arising out of, the product furnished hereunder.

The system of connected rotating parts—PRIME MOVER AND ACCESSORIES, GEAR UNIT, AND DRIVEN EQUIPMENT—must be compatible; free from critical speeds, torsional or other types of vibration, within the operating range, regardless of the source of such vibration, and/or its inducement. Nuttall Gear Corporation's responsibility is limited to providing a gear unit within normal commercial levels of vibration generation. Nuttall Gear Corporation is not responsible for the unsatisfactory operation or failure of the drive system, resulting from the incompatibility of rotating components, nor the analysis required. The system responsibility remains with the purchaser, system builder or designer, unless Nuttall Gear Corporation has agreed to perform such analysis, and the nature of such vibrations is fully defined.

Those units supplied with motor/gear couplings mounted must be final aligned by the installer, Nuttall Gear verifies that the motor and gear can be aligned; however, Nuttall Gear does not do final alignment, because of changes that occur during shipment handling as well as foundation variances.

The user is responsible for furnishing and installing any guards or other safety equipment needed to protect operating personnel, even though such safety equipment may not have been furnished by the seller with the equipment purchased.

Nuttall, its contractors and suppliers of any tier, shall not be liable in contract, in tort (including negligence), or otherwise for damage or loss of other property or equipment, loss of profits or revenue, loss of use of equipment or power system, cost of capital, cost of purchased or replacement power or temporary equipment (including additional expenses incurred in using existing facilities), claims of customers of the purchaser, or for any special; indirect, incidental, or consequential damages whatsoever.

The remedies of the purchaser set forth herein are exclusive and the liability of Nuttall with respect to any contract, or anything done in connection therewith, such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any equipment covered by or furnished under the contract, whether in contract, in tort (including negligence) or otherwise, shall not exceed the price of the equipment or part on which such liability is claimed.

In no event shall Nuttall be responsible for providing working access to the defect, including the removal, disassembly, replacement or reinstallation of any equipment, materials or structure to the extent necessary to permit Nuttall to perform its warranty obligations, or transportation costs to and from Nuttall factory or repair facility. The conditions of any tests shall be mutually agreed upon and Nuttall shall be notified of, and may be present at, all tests that may be made.

# INTRODUCTION

The following instructions apply to all Nuttall Gear Parallel Shaft and Right Angle Shaft reducers. If a unit is furnished with special features, refer to the supplemental instructions shipped with the unit or contact Nuttall Gear. This manual is meant to be used in conjunction with the outline and/or assembly drawing(s) for a particular gearbox. Where a conflict exists between this manual and supplied drawings, the drawings take precedence.

The gear drive is rated according to the latest standard of the American Gear Manufacturers Association, and was selected to suit the load conditions for the service ratings on the nameplate. Proper performance depends on adherence to these operational ratings. Operate this unit only at the ratings shown on the nameplate. Before changing any of these operational ratings, contact your Nuttall Gear representative for factory approval.

To protect warranty, installation and maintenance services must only be performed by trained personnel after reading the instructions. Particular attention must be paid to all nameplates and warning tags.

All warning labels and instructions for installing and operating electrical equipment must be carefully read and followed. All electrical connections must be installed only by qualified personnel in strict accordance with the national electric code and local requirements. Compliance with all codes, laws and safety ordinances is the sole responsibility of the user.

When communicating with your Nuttall Gear sales representative, make reference to the Nuttall nameplate shop order number, the type and rating of the gear drive, serial number, and any other information useful in identifying the gear drive.

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## RECEIVING & HANDLING

Immediately upon receipt examine the unit for damage. Notify the carrier and your Nuttall Gear sales representative immediately if there is any evidence of shipping damage. Responsibility for reimbursement for losses or damage in shipment remain solely with the transportation company.

Operating instructions for accessories mounted on the gear unit assembly are normally attached to the unit. Save all hardware, accessories, wiring diagrams, and instruction information included with the unit.

### CAUTION:

- Never use shaft extensions for pushing, pulling, or supporting the weight of the unit.
- Never drag the gear unit. Machined mounting surfaces will be marred and overstressing of the housing may occur.
- Never attempt to lift the entire unit by using the motor lifting lugs or eyebolt holes.
- When lifting, use slings to distribute the load evenly and to keep the unit from tilting. Spreader bars may be required to avoid stress on any piping and accessories mounted on the unit.
- Never use piping for lifting or climbing.
- If the unit is to be stored, refer to the storage instructions in this manual.

## STORAGE

### General

All internal and unpainted external surfaces of gear drives have been treated at the factory, prior to shipment, with a rust preventative. The protective life of this rust preventative will vary with temperature fluctuations, atmospheric moisture content, degree of exposure to the elements during storage, and degree of contact with other objects. Inspect all machined surfaces and spray or add rust inhibitor to exposed metal surfaces that may have had the protective coating removed in shipping and handling. To assure that the gear drive will operate satisfactorily at start-up, certain precautions must be taken by the customer upon receipt. The expected length of storage and the storage atmosphere dictated the maintenance schedule to be followed. Units must always be stored in their operating position and free of loads or weights on output and input shafts. These instructions apply to the reducer only. If a motor is included in our drive package, motor operating maintenance and storage instructions are included with drawing transmittals and are also attached to the unit. These instructions must be carefully read and followed.

### Short Term Storage (Indoor)

If the gear drives are to be stored for a period of 30 days or less, the following should be observed: Store in a clean, dry location with factory packaging intact, and with as nearly a constant temperature as possible. Elevate a minimum of six inches above the floor level. Avoid areas that are subject to extremes in temperature, vibrations, and humidity.

### Long Term Storage (Indoor)

If units are to be stored for a period longer than 30 days, the following should be observed: Store in a clean dry location with the unit elevated a minimum of six inches above the floor level. Avoid areas that are subject to extremes in temperature, vibrations, and humidity.

### Use one of the following recommendations:

#### 1. For all horizontal and vertically mounted units:

Remove breather and replace with pipe plug. Fill gear drive to the recommended oil level with Shell VSI grade 68 oil or equal, heated between 110-120°F. **Do Not Overfill.** Immediately close openings to maintain vapors in the housing. **(Special Note for units with labyrinth seals.** Prior to filling the unit with heated oil, pack entire seal area with grease to form a vapor barrier. Seal with tape.) Rotate the high speed shaft slowly by hand, a minimum of eighty revolutions, at least once every four weeks. Inspect unit periodically and spray or add rust inhibitor suitable for anticipated storage conditions, as required. Drain and replace with the recommended oil type prior to start-up.

#### 2. For all horizontal and vertically mounted units:

Remove breather and replace with pipe plug. A vapor-phase rust inhibitor such as Daubert Chemical, Nox-Rust Motorstor VCI-10, or equal, may be added to the recommended oil type in the amount of 2% of the total sump capacity. Fill the unit to the recommended oil level. **Do Not Overfill. (Special note for units with labyrinth seals:** Prior to filling the unit with oil, pack the entire seal area with grease to form a vapor barrier. Seal with tape.) Rotate the high speed shaft slowly by hand, a minimum of eighty revolutions, at least once every four weeks. Inspect unit periodically and spray or add rust inhibitor suitable for anticipated storage conditions, as required. The unit may run without changing this oil mixture.

#### 3. For horizontally mounted units only (Do not use when labyrinth seals are used):

Fill unit completely to the top of the housing with the recommended oil type for operation of the unit. Eliminate any air pockets. Rotate the high speed shaft slowly by hand a minimum of eighty revolutions, at least once every four weeks. Inspect unit periodically and spray or add rust inhibitor suitable for anticipated storage conditions, as required. Before start-up, lower the oil level to the correct operational level.

### Outdoor Storage

**Note: OUTDOOR STORAGE IS NOT RECOMMENDED.** When storage in a warehouse or enclosed building is not possible, however, the following should be observed:

1. Bring unit to an area in which the ambient temperature is greater than 50°F and allow to stand for a minimum of 24 hours.
2. Remove breather and replace with pipe plug. Seal the unit completely by sealing all air vents with pressure sensitive tape. Pack grease around the shafts near the contact seals and tape. Pack grease into the seal retainers and wrap tape against the seals.
3. Fill gear unit to half the recommended oil level with Shell VSI grade 68 oil or equal, heated between 110-120°F. Immediately close openings to maintain vapors in the housing.
4. Coat the entire exterior with a rust preventative.
5. Seal the unit in a moisture proof container with an adequate supply of desiccant inside to avoid moisture build-up. Unit must be elevated a minimum of six inches above the ground.
6. The high speed shaft should be rotated slowly by hand, eighty revolutions, at least once every four weeks.
7. Repeat operations 1,2,3, and 4 every six months. The Shell VSI Grade 68 Oil may be drained, reheated and reused.
8. Do not store the unit in direct sunlight.

# INSTALLATION

The continuous efficient operation of a gear unit depends chiefly on four factors:

1. Proper type of foundation and correct mounting.
2. Correct alignment with the driven equipment.
3. Correct lubrication.
4. Full consideration of both preventative and operating maintenance.

**CAUTION: Operate the gear unit only within the ratings shown on the nameplate.** Review the application to confirm the unit will not be operated in conditions exceeding the nameplate rating. Selection and installation of guard, warning signs, or any provisions required to meet national and local safety codes are the responsibility of the user.

## Environmental Considerations

Units should not be installed in locations of unusually high or low temperatures. Adequate air flow is required for proper heat dissipation from the unit. Ambient temperatures must not exceed 100°F, unless supplemental means of cooling are supplied. Environmental conditions, including exposure to direct sunlight, high humidity, dust or chemicals suspended in the air are worthy of special consideration. Gear drives exposed to the direct rays of the sun will run hotter than a gear drive in an identical application which is sheltered. Gear drives exposed to these and other adverse

conditions should be referred to Nuttall Gear for special evaluation and recommendation.

## Foundation

A foundation or mounting, which provides rigidity and prevents weaving or flexing with resultant misalignment of the shafts, is essential to the successful operation of a gear unit. A concrete foundation should be used whenever possible and should be carefully prepared to conform with data regarding bolt spacing and physical measurements contained in the Dimension Leaflet supplied prior to delivery of the equipment. Grout steel mounting pads into the concrete base. Mount the unit on these steel pads. Do not grout the unit directly into the concrete base. Mount the unit on these steel pads. Do not grout the unit directly into the concrete foundation. When the units are installed on structural foundation pads a supporting base plate of steel should be provided to obtain proper rigidity. These plates or pads should be of a thickness equal to or greater than the diameter of the hold down bolts.

## Foundation Bolt Torque Recommendations

Gear units must be securely bolted to their foundations with the specified bolt size. Bolts are to be SAE Grade 5 or equivalent fasteners. **Do not lubricate fasteners.** Tighten bolts per the torques listed below.

Bolt Size (UNC)	Torque (Ft. Lbs.)		Bolt Size (UNC)	Torque (Ft. Lbs.)	
	Metal To Metal	Metal To Concrete		Metal To Metal	Metal To Concrete
3/4	245	191	1-3/4	1,975	1,558
7/8	380	313	2	3,083	2,147
1	567	467	2-1/4	4,333	3,417
1-1/8	742	584	2-1/2	6,000	4,667
1-1/4	1,050	834	2-3/4	8,167	6,417
1-3/8	1,375	1,084	3	10,417	8,250
1-1/2	1,842	1,458			

## Bedplates

Bedplates are provided as common mounting surfaces which will support several components when mounted on a proper foundation. Bedplates are also designed to facilitate alignment of those components. Because of the disparity of component sizes, bedplates are not designed to be self-supporting structures under all conditions. They are not designed to provide a platform for lifting and transporting with all of the components mounted, unless the assemblies are properly supported and balanced with appropriate material handling fixtures. There will be occasions when it will be necessary to remove some components for transport, and subsequently, reassemble the drive train in its final location. Nuttall Gear supplies the components on the bedplate assemblies rough aligned to the coupling manufacturer's specifications. However, due to possible shifting in transit or handling and the possible variances in foundation surfaces, the final alignment is the responsibility of the installer. To align a bedplate supplied unit, the output shaft of the reducer should be aligned with the driven shaft by moving and shimming the bedplate assembly—not by moving the reducer on the bedplate. Insure that all bedplate mounting points are properly shimmed for proper support to provide a solid level surface. Failure to do so may create a twist in the bedplate and could make final alignment of the drive components difficult. After aligning the reducer output shaft and shimming between the bedplate and the foundation, the mounting bolts or lugs should be tightened and the bedplate firmly locked and grouted in place. Final alignment of the other bedplated components must now be completed.

## Alignment

Gear units are designed with a tolerance of +0 and -1/16 in. between the shaft center and the base, therefore, shimming may be required. Flat shims of various thicknesses, slotted to slide around the foundation bolts, should be used. All feet must be solidly supported before the mounting bolts are tightened. After alignment

has been secured through shimming, the equipment should be bolted down and alignment rechecked. Heat up couplings, sprockets or pinions and shrink them onto shaft extensions when required, avoiding contact with the shaft seal. Do not heat parts above manufacturers recommended limits, or 300°F, whichever is lower. **To avoid severe damage to bearing and gears the above must not be hammered on to shaft extensions.** When the prime-mover is connected to the gear unit or the gear unit is connected to the driven equipment by means of a coupling, correct alignment cannot be overemphasized. This becomes of greater importance as speeds are increased or the drive is subjected to variations in load conditions. Misalignment, either parallel or angular, is one of the most frequent causes of bearing or shaft failures, noisy operation, or excessive operating temperatures due to the extra load imposed. A straight edge laid across the coupling member at the machined diameter provided for alignment purposes shows correct parallel alignment when the straight edge rests on both coupling members for their full length. Check this at four positions-90 degrees apart. The use of feeler gauges between coupling member faces is a common method of checking for correct angular alignment. Check at four positions-90 degrees apart. A more accurate alignment check is obtained by the use of dial indicators. This is done by clamping the indicator on one coupling member with the indicator stem resting on the other coupling member, then rotating the member holding the clamped indicator. To minimize overhung loads, pulleys and sprockets should be mounted as close to the gear case as possible. Tighten hardware for pulleys and sprockets in accordance with the manufacturers recommendations. **Do not** over tighten belts or chains. Reducer bearing life may be significantly reduced if belts and chains are too tight. Install pulleys and sprockets on driver/driven equipment so that they run true. Guards should be mounted over couplings, pulleys, and sprockets after final alignment is completed.



# LUBRICATION

**Warning: Gear units are shipped from the factory without oil. Fill unit to the proper level before operating.**

Lubrication oil for use with gear units must be high quality, straight mineral petroleum oils. They must be non-corrosive to gears or bearings, neutral in reaction, free from grit or abrasives, and have good defoaming and oxidation resisting properties. Refer to AGMA 9005 for more detailed information on lubricant property requirements. Performance and life of the gear unit are dependent upon the use of the proper lubricants maintaining the correct oil level, and regular oil changes, including draining the unit at regular intervals, and flushing it, before refilling. For applications where

loads, speeds, or temperatures are abnormal, Nuttall should be contacted for specific recommendations.

## Oil Sump Temperature

Gear drives operating in the ambient temperature range described in the table below generally produce oil sump temperatures of not more than 180°F. This sump temperature is considered maximum because lubricants begin to lose their lubrication properties as temperatures exceed 180°F. These lubrication recommendations exclude applications such as those gear drives installed in the food and drug industry where a possibility exists for incidental contact between the lubricant and the product being processed.

## Lubricant Recommendations

Ambient Temperature Range*:			
-40°F to 0°F (-40°C to -20°C)	-20°F to +25°F (-30°C to -5°C)	15°F to 60°F (-10°C to +15°C)	50°F to 125°F (10°C to 50°C)
Contact factory	Use ISO VG 68 – 100 (AGMA 2 – 3)	Use ISO VG 100 – 150 (AGMA 3 – 4)	Use ISO VG 150 – 220 (AGMA 4 – 5)

\*The ambient temperature range is defined as the air temperature in the immediate vicinity of the gear drive.

## Lubricant Viscosity Ranges (for rust and oxidation inhibited gear oils)

ISO Viscosity Grade	AGMA Lubricant No.	CST Viscosity (mm <sup>2</sup> /s) at 40°C	SSU Viscosity at 100°F
VG 68	2	61.2 to 74.8	284 to 347
VG 100	3	90 to 110	417 to 510
VG 150	4	135 to 165	626 to 765
VG 220	5	198 to 242	918 to 1122

## Lubricant Brand Name Cross Reference

ISO Grade	VG 68 (AGMA 2)	VG 100 (AGMA 3)	VG 150 (AGMA 4)	VG 220 (AGMA 5)
Texaco Regal	68	100	150	220
Exxon Teresstic	68	100	150	220
Keystone KLC	20	30	40	--
Nevastone	--	--	--	90
Shell Turbo Oil	68	100	150	220
Gulf Harmony Oil	68	100	150	220
Sun Oil Sunvis	931	951	975	999
Mobil DTE	Heavy Medium	Heavy	Extra Heavy	BB

Note: All oils listed are non-EP. EP gear lubricants in the corresponding viscosity grade may be used where the user believes he has continuous sustained heavy duty loading on his gear units. Consult a lube oil specialist. EP lubricants must not be used in backstops.

## Oil Changes

Proper lubrication maintenance is vital to gear drive performance throughout its design life. After the first 500 hours or four weeks of operation, whichever occurs first, the gear drive should be thoroughly drained, flushed, and refilled with the proper lubricant. Under normal operating conditions, the lubricant should be changed every 2500 hours or six months, whichever occurs first. This change frequency can be extended if analysis of oil samples indicates very limited degradation or contamination.

## Cleaning and Flushing

Ideally, the lubricant should be drained while the gear drive is at operating temperature. The gear drive should be cleaned with a flushing oil. Used lubricant and flushing oil should be completely removed for the system to avoid contaminating the new oil. The use of a solvent should be avoided unless the gear drive contains deposits of oxidized or contaminated lubricant which cannot be removed with a flushing oil. When persistent deposits necessitate the use of a solvent, a flushing oil should then be used to remove all traces of solvent for the system. The interior surfaces should be inspected where possible, and all traces of foreign material removed. The new charge of lubricant should be added and circulated to coat all internal parts.

## Oil Filling Instructions

Drain all oil from the unit, pumps, external piping, and cooler, prior to adding new oil. Oil is added through the inspection cover on most units manufactured prior to 1995. The inspection cover must be removed to add oil. Care should be taken to seal the inspection cover when it is replaced. Most units manufactured after 1995, have

provisions on the inspection cover for filling the unit, without the need to remove the inspection cover, through a large removal pipe plug. Make sure all external piping, coolers, and pumps are fill prior to confirming the final oil level. Fill the unit to the proper oil level as follows.

- Units with dip sticks: fill to marks scribed on the dip stick
- Units with stand pipes: fill to the top edge of the standpipe.
- Units with vertical sight gauge: fill to the oil level indicated next to the glass sight gauge
- Units with round sight gauge: fill to the center of the round sight gauge

**CAUTION:** Never attempt to add or replace oil while the unit is running, unless a vertical sight glass is in use, and the running oil level has been established and marked on the sight glass. Do not fill beyond the indicated oil level. Excess lubrication increases the churning effect and may result in overheating and subsequent thinning of the oil and possible damage to the rotating components.

## Cold Temperature Conditions

Lubrication, either by splash or pump, shall be given special attention if the gear drive is to be started or operated at temperatures below which the oil can be effectively splashed or pumped. Preheating the oil may be necessary under these low ambient temperature conditions. Nuttall should be informed when gear drives are to operate outside the individual temperature ranges listed below. Gear drives operating in cold areas must be provided with oil that circulates freely and does not cause high starting torques. An acceptable low temperature gear oil in addition to meeting AGMA specifications, must have a pour point at least 5°C (10°F) below the minimum expected ambient temperature and a

viscosity which is low enough to allow the oil to flow freely at the start up temperature but high enough to carry the load at the operating temperature. When the lubricant selected does not provide proper lubrication for the expected ambient temperature range, the gear drive should be equipped with a sump heater to bring the oil up to a temperature at which it will circulate freely for starting. The heater watt-density should be selected to avoid excessive localized heating which could result in rapid degradation of the lubricant.

#### Abnormal Operating Conditions

A rise and fall in temperature may produce condensation. Dust, dirt, chemical particles, or chemical fumes may also react with the lubricant resulting in the formation of sludge. Sustained sump temperatures in excess of 180°F may result in accelerated degradation of the lubricant and excessive gear wear. When operating under these conditions the lubricant should be analyzed more frequently and changed when required.

#### Grease Lubrication of Seals and Bearings

On units supplied with special seals for hazardous dust conditions, fittings are provided for flushing away contaminated grease from

seals. Grease should be applied at regular lubrication change periods or more frequently depending upon severity of dust. On vertical units and units mounted on an incline, fittings are provided for grease lubrication of the input shaft outboard bearing. To lubricate, remove drain pipe plug on input bracket and add grease (with hand operated gun) to fitting on end cap until clean grease starts to flow from drain hole. Replace drain plug. A good grade of #2 bearing grease should be used for these applications and applied at regular lubrication change periods. On units supplied with internal backstops, fittings are provided for the input shaft outboard bearing and backstop. To lubricate, remove drain pipe plug on input bracket only and add grease (with hand operated gun) to fitting on end cap until clean grease starts to flow from drain hole on input bracket. Replace drain plug on input bracket. Remove drain pipe plug on end cap, and grease until grease starts to flow from drain hole on end cap. Replace drain plug. Socony Mobilux #2, Texaco Unitemp #2 or an equivalent grease should be used for these applications and applied at regular lubrication change periods. **WARNING: Do not use lubricants of the EP type or those containing slippery additive such as Molybdenum disulphide and graphite, in a backstop.**

## START-UP

#### Pre-start For Units in Storage

1. Replace breather if removed during storage period.
2. Remove all tape applied in storage preparation.
3. Drain all oils applied during storage; Shell VSI Grade 68 is soluble in recommended lubricating oils. Unit does not require flushing.
4. Thoroughly inspect unit, sump, and all accessories for damage.
5. Follow additional start-up steps as outlined in this manual.

#### Start-up

**Warning: Nuttall Gear units are shipped without oil. Prior to start-up, the unit must be filled with the proper amount of oil, selected in accordance with the operating conditions.**

1. Add the correct amount of oil to the gear unit. Fill to the indicated oil level (see oil filling instructions) when unit is at a standstill. Operate unit until oil fills all lines. Stop the unit and recheck oil level and add oil as required.
2. Check that all electrical connections are made and in working order; and that all accessories are properly mounted.
3. Check all external mounting bolts, screws, etc. to make sure they have not loosened in transit or handling.
4. Check that all couplings, sprockets, pulleys, etc. are properly aligned, lubricated, mounted and keyed on shaft extensions.

5. Check that inspection cover is securely tightened and install guards for rotating equipment.
6. For units equipped with oil heaters in cold ambient temperature operation, turn the heater on and allow oil temperature to rise at least to 40°F before start-up.
7. Turn the shafts by hand to confirm there are no obstructions to rotation.
8. To avoid damage to the motor used with reducer having a built in backstop, break the high speed coupling connection, turn input shaft by hand to check proper rotation. Operate motor to check shaft rotation reversing leads if necessary to secure proper rotation. Reconnect coupling. Reducers with piggyback motors should be started very carefully with the output shaft coupling disconnected. If output shaft does not rotate, reverse motor direction and test. Reconnect the coupling.
9. Start unit under as light a load as possible. If rotation of the unit is limited to one direction only, a tag on the housing indicates direction of rotation. Make certain that direction of shaft rotation is as shown on tag.
10. The machinery should be checked frequently for unusual sounds, oil leaks, excessive vibration and excessive heat. If an operating problem develops, shut down immediately and correct the problem before restarting. The operating temperature of the unit housing should normally not exceed 180°F.

## TROUBLE SHOOTING

#### Operating Temperature

These gear drives are designed for a 100°F rise in temperature over the ambient temperature, but not to exceed 180°F. If the unit is operated in the sun at ambient temperatures exceeding a "hot" running unit, takes periodic measurements over a twenty-four hour period.

#### Noisy Unit

By nature, all gear units produce some kind of noise in operation, either a low pitch rumble or a high whine from the high speed mesh. Learn to distinguish between normal gear noise and symptomatic noises that could mean lack of oil, bearing trouble, or misalignment. Remember that sound is often amplified by the type of mounting or can be induced by coupled apparatus. A new gear unit may be initially noisy and then quiet down after a reasonable period of service; normal wear has taken place, and teeth have established a well defined run-in-pattern. Other subtle changes can take place resulting in smoother, quieter operation. Always record changes in noise patterns of levels, as well as temperature changes.

Problem	Potential Causes
Excessive operating temperature	1, 2, 3, 4, 5, 6, 7, 9, 12, 18, 21, 22, 23
Oil leakage	1, 2, 3, 4, 5, 7, 9, 12, 13, 18, 19, 20, 22, 23
Gear wear	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 20, 22, 23
Bearing failure	1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20
Shaft failure	1, 6, 7, 8, 9, 10, 11, 12, 15, 16, 20, 21, 23
Excessive noise	1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 21, 22, 23

Potential Cause	Action
1. Unit overload	Reduce the loading.
2. Incorrect Oil Level	Verify that the oil level is correct. Too little or too much oil can cause high temperature.
3. Wrong Oil Grade	Use only the AGMA grade oil as specified for the unit size and ambient temperature.
4. Contaminated oil	If oil is oxidized, dirty, or has high sludge content, change the oil.
5. Clogged breather	Clean breather regularly.
6. Improper bearing Adjustment	Too few or too many shims cause incorrect bearing clearance. Contact the factory for correct end play, checking technique, and tolerance. Shafts should turn freely when disconnected from the load.
7. Improper coupling alignment	Disconnect couplings, check spacing between shafts, and check alignment. Realign as required.
8. Incorrect coupling	Rigid couplings can cause shaft failure. Replace with a coupling that provides flexibility and lateral play.
9. Excessive operating speed	Reduce the speed.
10. Torsional or lateral vibrations	Vibration can occur through a particular speed range known as the critical speed. Contact the factory for specific recommendations.
11. Extreme repetitive shocks	Apply couplings capable of absorbing shocks.
12. Improper lubrication of bearings	Verify that all bearings are receiving adequate amounts of lubricating oil, or grease.
13. Improper storage or prolonged shutdown	Destructive rusting of bearings and gears will be caused by storage or prolonged shutdown in moist ambient temperatures. If rust is found, unit must be disassembled, inspected and repaired.
14. Excessive backlash	Contact factory.
15. Misalignment of gears	Contact pattern to be a minimum of 75% of face.
16. Housing twisted or distorted	Verify proper shimming or stiffness of the foundation.
17. Gear tooth wear	Contact factory.
18. Open drains	Tighten drain plugs.
19. Worn oil seals	Check oil seals and replace if worn.
20. Loosely bolted covers	Check all bolted joints and tighten if necessary.
21. Motor related	Verify actual operating conditions are consistent with motor nameplate.
22. Excessive ambient temperature	Shield unit from direct sunlight, and maintain proper air flow around the gear unit.
23. Excessive overhung load	Move the pulley or sprocket closer to the housing. Check for excessive tension in belts or chains.

## RENEWAL PARTS

This parts list provides information organized by unit. A cut-a-way view of the gear unit is shown with the parts individually identified by item number and description. Refer to the assembly drawings provided with your gear unit for more detailed information, including part numbers.

### Instructions

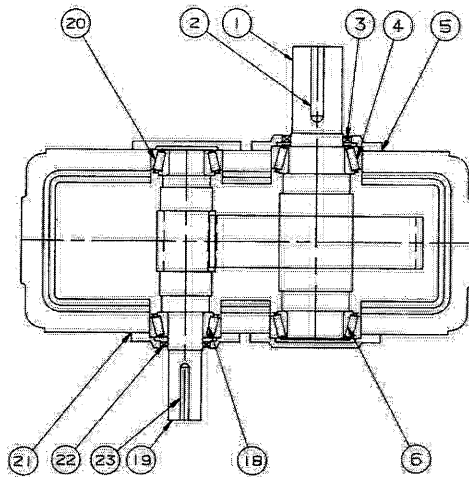
In order to obtain renewal parts for your gear unit:

1. Determine Type of Gear Unit (Parallel Shaft or Right Angle) and number of reductions (Single, Double, Triple, Quadruple).
2. Record all of the information off of the gear unit nameplate (refer to the illustration at the right).
3. Refer to the correct illustrations and/or assembly drawing for the description and part number of the required parts.
4. To order parts, contact your nearest Nuttall Gear Sales Office with the information you have assembled.

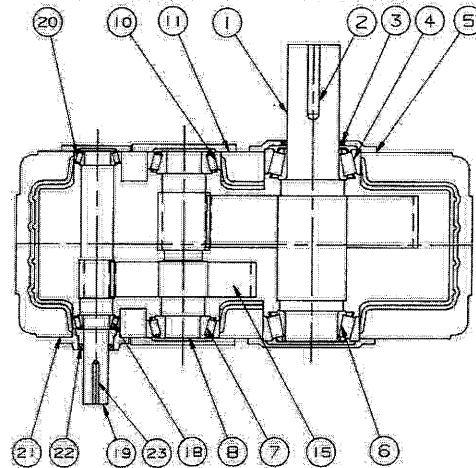
SHOP ORDER NUMBER	
CATALOG NO.	
SERVICE H.P.	RATIO
SERVICE FACTOR	OUTPUT RPM
FIGURE NO.	
Nuttall Gear LLC	
MADE IN U.S.A.	

# Parts Identification Parallel Shaft Reducers

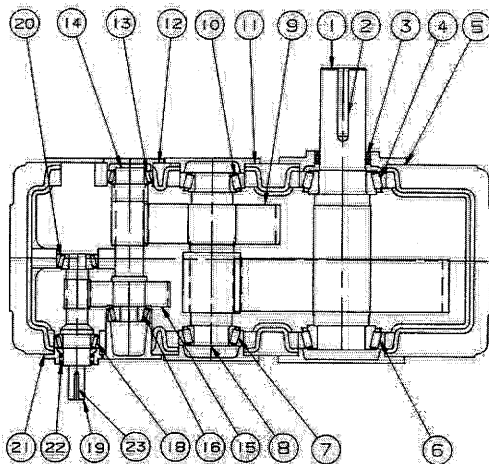
## SINGLE REDUCTION



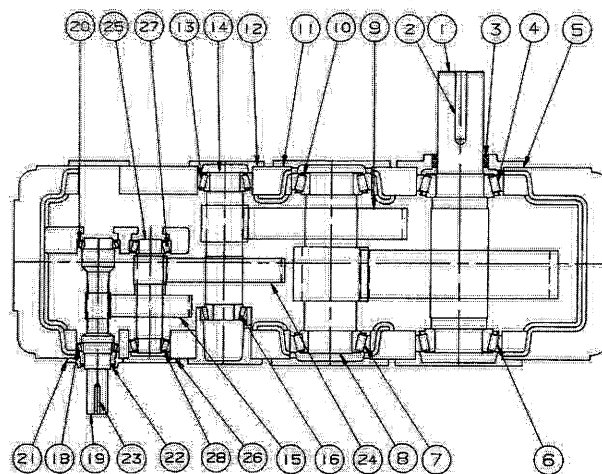
## DOUBLE REDUCTION



## TRIPLE REDUCTION



## QUADRUPLE REDUCTION



No. Description

### A. LOW SPEED COMPONENTS

Low Speed Gear Set Includes:

- 1 L.S. Gear and Shaft Assembly (Incl. No. 2)
- 2 L.S. Key
- 8 L.S. Pinion Shaft

Low Speed Bearing Set Includes:

- 4 L.S. Shaft Bearing (outer)
- 5 L.S. Shaft Bearing Shims
- 6 L.S. Shaft Bearing (inner)

Low Speed Pinion Shaft Bearing Set Includes:

- 7 L.S. Pinion Shaft Bearing
- 10 L.S. Pinion Shaft Bearing
- 11 L.S. Pinion Shaft Bearing Shims

### B. INTERMEDIATE SPEED COMPONENTS

#### B1. (TRIPLE AND QUADRUPLE)

Intermediate Gear Set Includes:

- 9 Intermediate Gear
- 14 Intermediate Pinion Shaft

Intermediate Bearing Set Includes:

- 12 Intermediate Pinion Shaft Bearing Shims
- 13 Intermediate Pinion Shaft Bearing
- 16 Intermediate Pinion Shaft Bearing

No. Description

### B2. (QUADRUPLE ONLY)

Intermediate Gear Set Includes:

- 24 Intermediate Gear
- 25 Intermediate Pinion Shaft

Intermediate Bearing Set Includes:

- 26 Intermediate Pinion Shaft Bearing Shims
- 27 Intermediate Pinion Shaft Bearing
- 28 Intermediate Pinion Shaft Bearing

### C. HIGH SPEED COMPONENTS

High Speed Gear Set Includes:

- 15 H.S. Gear
- 19 H.S. Pinion Shaft
- 23 H.S. Pinion Shaft Key

High Speed Pinion Shaft Bearing Set Includes:

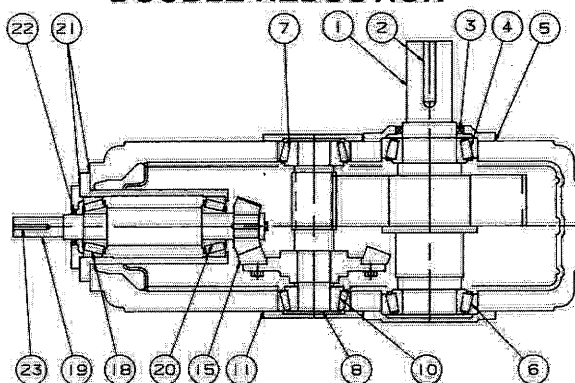
- 18 H.S. Pinion Shaft Bearing (outer)
- 20 H.S. Pinion Shaft Bearing (inner)
- 21 H.S. Pinion Shaft Bearing Shims

### D. OIL SEALS Include:

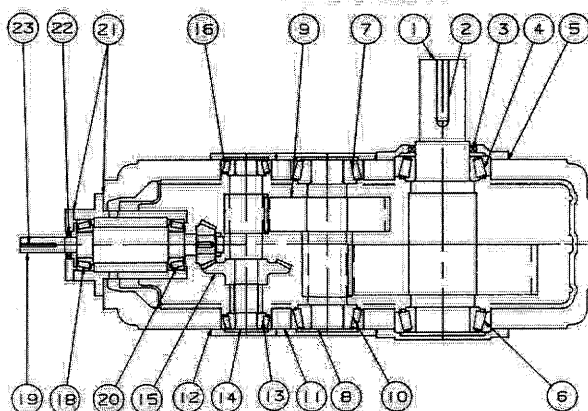
- 3 L.S. Shaft Oil Seal
- 22 H.S. Shaft Oil Seal

# Parts Identification For Right Angle Shaft Reducers

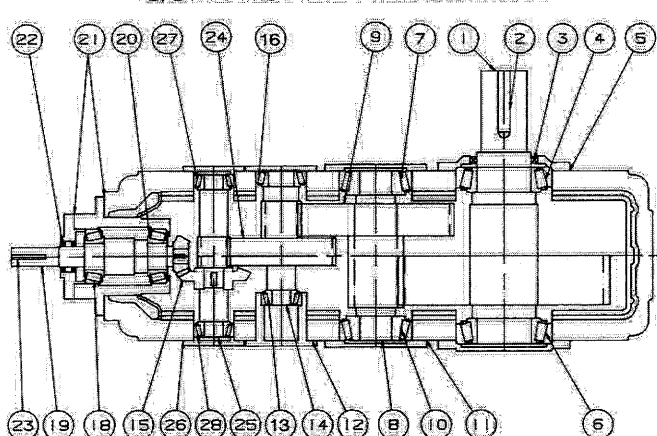
## DOUBLE REDUCTION



## TRIPLE REDUCTION



## QUADRUPLE REDUCTION



Item No.	Part Description
----------	------------------

### A. LOW SPEED COMPONENTS

#### Low Speed Gear Set Includes:

- |   |  |
|---|--|
| 1 | L.S. Gear and Shaft Assembly (Incl. No. 2) |
| 2 | L.S. Key                                   |
| 8 | L.S. Pinion Shaft                          |

#### Low Speed Bearing Set Includes:

- |   |                            |
|---|----------------------------|
| 4 | L.S. Shaft Bearing (outer) |
| 5 | L.S. Shaft Bearing Shims   |
| 6 | L.S. Shaft Bearing (inner) |

#### Low Speed Pinion Shaft Bearing Set Includes:

- |    |                                 |
|----|---------------------------------|
| 7  | L.S. Pinion Shaft Bearing       |
| 10 | L.S. Pinion Shaft Bearing       |
| 11 | L.S. Pinion Shaft Bearing Shims |

### B. INTERMEDIATE SPEED COMPONENTS

#### B1. (TRIPLE AND QUADRUPLE)

##### Intermediate Gear Set Includes:

- |    |                           |
|----|---------------------------|
| 9  | Intermediate Gear         |
| 14 | Intermediate Pinion Shaft |

##### Intermediate Bearing Set Includes:

- |    |   |
|----|---|
| 12 | Intermediate Pinion Shaft Bearing Shims |
| 13 | Intermediate Pinion Shaft Bearing       |
| 16 | Intermediate Pinion Shaft Bearing       |

#### B2. (QUADRUPLE ONLY)

##### Intermediate Gear Set Includes:

- |    |                           |
|----|---------------------------|
| 24 | Intermediate Gear         |
| 25 | Intermediate Pinion Shaft |

##### Intermediate Bearing Set Includes:

- |    |   |
|----|---|
| 26 | Intermediate Pinion Shaft Bearing Shims |
| 27 | Intermediate Pinion Shaft Bearing       |
| 28 | Intermediate Pinion Shaft Bearing       |

### C. HIGH SPEED COMPONENTS

#### High Speed Gear Set Includes:

- |    |                                 |
|----|---------------------------------|
| 15 | H.S. Gear Set (Spiral-Bevel)    |
| 19 | H.S. Shaft (Not Including Gear) |
| 23 | H.S. Shaft Key                  |

#### High Speed Pinion Shaft Bearing Set Includes:

- |    |                                   |
|----|-----------------------------------|
| 18 | H.S. Pinion Shaft Bearing (outer) |
| 20 | H.S. Pinion Shaft Bearing (inner) |
| 21 | H.S. Pinion Shaft Bearing Shims   |

### D. OIL SEALS Include:

- |    |                     |
|----|---------------------|
| 3  | L.S. Shaft Oil Seal |
| 22 | H.S. Shaft Oil Seal |

# ASSEMBLY & DISASSEMBLY

The following instructions apply to standard TDS parallel shaft units only. For right angle units see supplemental instructions on page 14.

## Speed Or Ratio Change

When either speed or ratio is required to be changed, Nuttall Gear should be consulted for rating data and/or design considerations, and a new nameplate.

## Required Equipment

In addition to standard mechanic's tools, the following equipment is required: hoist, sling, bearing/wheel puller, torque wrench, feeler gauges and dial indicator(s).

## General Instructions

Clean external surfaces of reducer before removing cover to prevent dirt and debris from falling into the unit. Record mounting dimensions and location of accessories for reference when reassembling. To remove reducer from its operating area, disconnect all connected equipment and lift reducer from its foundation by means of the lifting lugs. Before removing oil seals from end caps, record location of seal lips for use as a reference when replacing seals.

## Cover Removal

1. Drain oil and remove the dipstick.
2. Remove housing cover fasteners and all fasteners **ABOVE** housing split that hold end covers to housing cover. Loosen fasteners below housing split three or four turns. **DO NOT** remove these for they hold outer bearing races in position.
3. Tighten nuts on dowel pins and lift out all dowels. Dowel pins are located at each end of gear unit above the split line.
4. Attach hoist to cover and lift **STRAIGHT UP. TAKE CARE NOT BUMP OR DAMAGE GEAR TEETH.**

## Removal Of Gear And Shaft Assemblies

1. Complete the following procedure for each shaft assembly. Start with the high speed shaft and work through to the low speed shaft.
  - a. Place sling around shaft assembly and take up the slack just enough to take the weight off the bearings.
  - b. Remove balance of fasteners, end covers, and outer bearing races.
  - c. Lift shaft assembly straight up out of base. **DO NOT DAMAGE GEAR TEETH.**
2. **EXCEPTIONS TO STEP 1 ABOVE**
  - a. The intermediate pinion shaft/gear assembly, item 14, is the last to be removed from a triple or quadruple reduction unit.
  - b. After attaching sling, remove fasteners, end cover, bearing cartridge and one outer bearing race. The other outer bearing race will come out with the cartridge. Carefully move assembly into pinion side of bearing bore, then lift out at an angle.
  - c. When disassembling a quadruple reduction parallel shaft gear unit, the high speed pinion shaft must be removed before removing the top half of the housing. Remove oil dam from upper pedestal bearing bore. Remove high speed end cap from housing and slide high speed pinion shaft out through bearing bore.

## Preparation

1. Housing cover and base: Remove sealing compound from housing split line. Clean oil troughs, oil passages and oil sump with a suitable solvent.
2. Endcaps and bearing cartridges: Remove sealing compound from all end caps and bearing cartridges. Remove oil seals from end caps. Clean parts with a suitable solvent.
3. Oil seals: Refer to general instructions above before removing and installing oil seals.

**CAUTION: New seals will leak if seal lips are cut or if a seal's rubbing surface on the shaft has been altered. Protect seal lips at all times. Clean the shaft, but do not use any abrasive material on rubbing surface polished by the seal.**

4. Bearings: Bearing re-use is not recommended, however, if bearings are to be reused, wash in clean kerosene or suitable solvent and then dry. Do not spin bearings for they may score due to lack of lubricant. Inspect bearings carefully and replace those that are worn or questionable. Use a bearing puller or press to remove bearings. Apply force to the inner race only, not the bearing cage.
5. Gears, pinions and shafts: Whenever possible, it is recommended that gears and pinions always be replaced as a set. It is also recommended that gear and shaft or gear and pinion assemblies be replaced as factory supplied assemblies.
6. Check to insure that all parts are cleaned and all preservatives have been removed from gears and bearings.

## Reducer Assembly

1. Bearings: To install bearings, heat in an oil bath or oven to a maximum of 300°F and slide or press on to shaft tight against shaft shoulder. When heating bearings, do not apply flame directly to bearings or rest bearings on bottom of heated container. Check bearing inner race for position against shaft shoulders with feeler gauge after bearings have cooled. When installing outer bearing race into a bearing cartridge, check with feeler gauge for position of race against cartridge shoulder.
2. Coat bearings with a light coating of grease and install gears, pinions, and shafts into lower housing in reverse order of removal, along with their respective end caps or cartridges and a new shim pack for each shaft. Do not tighten fasteners at this time unless a cartridge is used. If a bearing cartridge is used, seal with RTV sealer when installing. **NOTE: Whenever possible, place all shim packs on the same side of the gear unit. However, do not place shims under a bearing cartridge.**
3. Use a thin wire to hold upper portion of shims to their respective end covers to avoid damage to them when installing cover.
4. Place a 3/32"—1/8" bead of RTV sealer on split of lower housing. Do not deposit excessive quantities near bearings.
5. Carefully lower cover on to the base using caution not to bump gear teeth.
6. Position cover properly and drive in dowel pins.
7. Remove wire from shims, install remaining split line fasteners and tighten to torques specified on page 22.

## Bearing End Play

Nuttall gear must be contacted for bearing end play tolerances for units manufactured prior to 1997. Units manufactured after 1997 normally have a nameplate mounted on the unit listing all end play tolerances. If operation conditions vary from the unit nameplate, for instance, speed, horsepower, etc., contact Nuttall Gear for revised end play tolerances.

**CAUTION: Extreme accuracy must be maintained when setting end play. If end play is set too tight, premature bearing failure can result. If end play is set too loose, end loading of the gear teeth will result and cause premature gear failure. Bearing outer races must be kept tight up against their respective end caps when adjusting end play.**

## Bearing End Play Adjustment

1. Tip gear unit on its side keeping the machined surface level to the floor, with shim side up. Loosen fasteners on upper end cap approximately 1/8" and loosen lower end cap until it drops approximately 1/8". **DO NOT REMOVE OR LOWER A BEARING CARTRIDGE.** Tap on shaft so the lower outer bearing race will drop against the lower end cap. **THIS STEP IS NOT NECESSARY WHEN LOWER CAP IS A BEARING CARTRIDGE.** If shaft will not drop, cover fasteners must be

loosened on either side of bearing which will then allow the shaft to drop against the end cap. With the weight of the shaft resting on the end cap, draw the end cap up evenly per the bolt-tightening sketch on page 12. This will ensure that the outer bearing race is in contact with the lower end cap. If cover fasteners were loosened, retighten lower fasteners at this time.

2. Using the threaded hole in the lower end cap and a hydraulic jack, raise shafts until upper end cap moves up approximately 1/8". Tighten upper end cap fasteners evenly per the bolt-tightening sketch on page 12 with jack pressure still applied. This will ensure that the upper bearing race is in contact with the upper end cap. If cover fasteners were loosened, retighten upper fasteners at this time. Release jack pressure after fasteners are tightened.
3. Rotate shaft back and forth and tap down to properly position bearing rollers. Place dial indicator on top of shaft or through the threaded hole in upper end cap and raise shaft with a hydraulic jack until housing just begins to lift.
4. Record end play and release jack pressure. Rotate shaft back and forth until indicator returns to zero at the SAME POINT the reading was taken. Repeat step 3 until readings repeat at least three times.
5. Adjust shim pack to obtain required end play (remove shims to decrease end play and add shims to increase end play) and repeat steps 3 and 4 for verification.
6. Repeat steps 1 thru 5 for remaining shafts that extend the full width of the gear box.
7. On short shafts such as high speed shafts which extend only to the center pedestal, tip gear unit on its side with short shaft up.

Tap shaft down to seat lower outer bearing race against the shoulder. Loosen end cap fasteners and place a clam onto the shaft. Use a crane or hoist and lift shaft upward to raise upper outer bearing race. If shaft will not raise, cover fasteners must be loosened. Follow steps 3 thru 5 to adjust end play except use a hoist or crane when lifting shaft.

8. Remove all end caps and shims (do not remove bearing cartridges). Use caution not to alter shim pack at this time. Apply 3/32" to 1/8" bead of RTV to all end caps and reinstall with appropriate shim pack.

**IMPORTANT: During assembly, position all end caps with the end cap oil slots in line and below the oil troughs in the lower housing to permit proper circulation of lubricant.**

#### Oil Seal Installation

1. Coat outer diameter of seal with Permatex and seal lips with grease prior to assembly into unit.

**CAUTION: Protect seal lips from sharp edges of keyway by wrapping a thin, strong paper around the shaft and coating it with grease before sliding seal into position. Do not expand the diameter of the seal lips more than 1/32".**

2. When double seals are used, they must be installed into the end cap prior to installing the end cap onto the gear unit. Pack the area between the two seals with grease.

#### Reducer Installation

1. Reinstall all exterior accessories.
2. Reinstall reducer.
3. Fill reducer with oil to the indicated oil level.

## SUPPLEMENTAL INSTRUCTIONS FOR RIGHT ANGLE DRIVES

#### Disassembly Of Right Angle Gear Units

1. Remove the cartridge mounting bolts from the cartridge flange above split line.
2. Loosen, but do not remove, the cartridge mounting bolts from the cartridge flange below the split line. Back these bolts out 1/8 to 1/4 inch.
3. Using the two threaded holes in the cartridge flange, jack the cartridge away from the gear housing to permit removal of the upper housing.
4. To remove the upper housing, follow the disassembly instructions for standard TDS units.
5. After the upper housing has been removed, the remaining cartridge mounting bolts may be removed and the cartridge removed from the gear unit.
6. To remove the remaining shafts follow the disassembly instructions for standard TDS gear units.

NOTE: The right angle cartridge must be assembled, bearing end play set, and the correct positioning of the high speed pinion must be completed before the reducer can be assembled.

#### Cartridge Assembly

1. Install inner bearing races as described under "Reducer Assembly".
2. Place right angle cartridge on a suitable bench in a vertical position.
3. Press lower outer bearing race into the right angle cartridge. Check with feeler gauge for position of race against cartridge shoulder.
4. Lightly coat bearings with grease and install high speed shaft into cartridge.
5. Press upper outer bearing race into the cartridge. Do not bottom the race against bearing rollers.
6. Install the high speed end cap and a full shim pack and tighten bolts evenly to draw the bearing race into the cartridge and still remain in full contact with the end cap.
7. When a third bearing is required, turn the cartridge over and mount this bearing before adjusting the end play.
8. To adjust end play, use a dial indicator as described in 3, 4 and 5 under "Bearing End Play Adjustment" except a hydraulic jack is not needed to lift the shaft.

#### Bevel Pinion Assembly

1. Record the mounting dimension (M.D.) and backlash which is stamped on the bevel pinion.
2. Refer to figure 1 and measure the "A" dimension of the gear case (+/- .002"). This is the dimension from the machined end of the gear case to the centerline of the bearing bore.
3. If it is a small pinion as shown in figure 2, measure the "B" dimension between the right angle flange and the high speed shaft shoulder. If it is a larger bevel pinions as shown in figure 3, measure the "B" dimension between the right angle cartridge and the bevel pinion hub shoulder.
4. Subtract the "B" dimension from the "A" dimension to obtain the "T" dimension. The "T" dimension is the distance from the bearing centerline to the high speed shaft shoulder or the pinion hub shoulder, whichever applies.
5. Using the formula  $S=MD-T$ , determine the required value of shims to be placed between the right angle cartridge and the gear case as shown in figure 4. "S" equals the correct amount of shims required. When installing the right angle cartridge into the gear case using the previously determined shims, the bevel pinion will be in the correct mounting position.
6. The bevel pinion may now be shrunk onto the high speed shaft, using caution not to heat the pinion above 275 degrees F.

#### Bevel Gear Assembly And Backlash Adjustment

Proper end play setting of the bevel gear shaft bearings must be completed before the right angle cartridge is installed and the backlash set.

1. The end play on this shaft can be set with the upper housing removed. Install the bevel gear shaft into the lower housing placing a full shim-pack on the side of the gear unit that the bevel gear is mounted on. To adjust end play, mount a dial indicator and record axial movement of the shaft. Care should be exercised to be exercised that the outer bearing races are tightly seated against the bearing caps. To reduce end play, remove shims, and to increase end play, add shims.
2. After the bevel gear shaft end play has been set, install the assembled right angle cartridge and the correct shims into the lower housing. When installing the right angle cartridge into the lower housing, match marks on the bevel gear and bevel



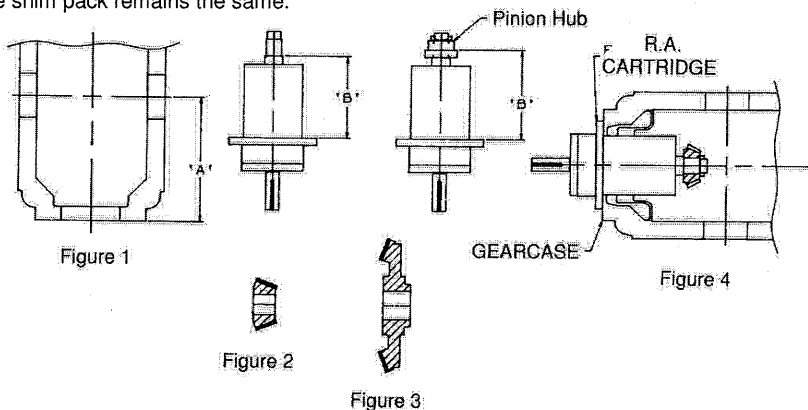
pinion must be lined up. Backlash must now be adjusted as follows:

- To adjust backlash, shim (on the bevel gear shaft) must be moved from one side of the gear case to the other until proper backlash is achieved.
- When shims are added to one side, the shaft must be tapped in that direction to move the bearing race up against the end cap.

NOTE: Once end play has been established, moving shims from one side to another will not alter the end play as long as the combined size of the shim pack remains the same.

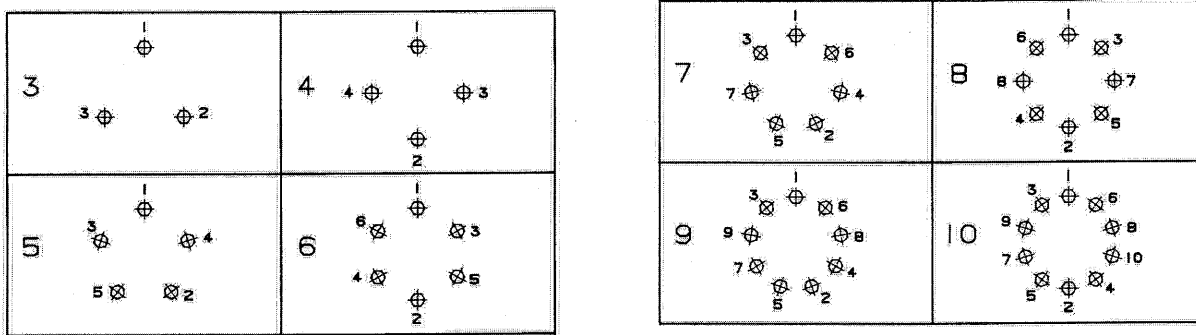
- After backlash has been set, install the remaining parallel shafts, and upper housing (right angle cartridge must be backed out far enough to permit installation of the upper housing). Seal the housing split and the right angle cartridge flange with RTV sealer. When drawing the cartridge into final position after the upper housing has been installed, check that the match marks on the bevel gear set are still aligned.

Follow the assembly instructions for standard TDS gear units to assemble and adjust the remaining shafts.



## FASTENERS

### Fastener Tightening Sequence



### Grade 5 Fastener Tightening Torques

The following torque values are to be used for end covers, seal cages, shaft guards, inspection covers, and housing split line bolts, unless otherwise specified on the drawing or assembly instructions. Torque values for lubricated fasteners are to be used when fasteners are coated with thread locking compounds.

Diameter UNC	Dry Fastener (foot-lbs)		Lubricated Fastener (foot-lbs)	
	Min.	Max.	Min.	Max.
1/4	7	8	4	5
5/16	14	17	8	10
3/8	25	31	15	19
7/16	40	49	24	30
1/2	60	75	36	45
9/16	87	109	52	65
5/8	120	150	72	90
3/4	213	266	128	160
7/8	344	430	206	258
1	515	644	309	386
1-1/8	635	794	381	476
1-1/4	896	1,120	538	672
1-3/8	1,175	1,469	705	881
1-1/2	1,560	1,949	936	1,170
1-3/4	1,829	2,286	1,097	1,372
2	2,750	3,438	1,650	2,063
2-1/4	4,022	5,027	2,413	3,016
2-1/2	5,500	6,875	3,300	4,125
2-3/4	7,457	9,321	4,474	5,592

# OIL CAPACITY

**Approximate Oil Capacity in U.S. Gallons for Standard Floor Mounted Horizontal Units.**

Unit Size	Single Reduction All Ratios	Double Reduction 21:1 Ratio	Double Reduction 6:1 Ratio	Triple Reduction All Ratios	Quad Reduction All Ratios
7	1.9	5.3	3.9	4.1	5.3
8	4.0	9.5	7.1	7.3	9.5
9	2.9	8.7	5.8	6.1	8.7
11	3.3	20	14	14	20
12	3.7	24	16	17	24
13	6.4	29	19	20	29
15	5.6	38	27	28	38
16	11	52	36	38	52
18	8	64	46	48	64
20	10	87	63	66	87
22	15	107	82	84	107
25	19	144	105	109	144
28	25	201	141	146	201
30	33	251	184	189	251
32	-	212	157	164	212
34	-	223	165	172	223
36	-	260	180	191	260
38	-	317	228	240	317
40	-	410	310	324	410

NOTE: For single and double reduction units the approximate oil capacity is normally inversely proportional to the gear ratio, but may vary in individual situations. All values are approximate. Refer to the drawings supplied with the gear unit for a more precise estimate. Always fill the unit to the level marked on the gear unit itself. Do not overfill.

# WEIGHT

**Approximate Unit Weight in Pounds**

Unit Size	Parallel Shaft				Right Angle		
	Single	Double	Triple	Quad	Double	Triple	Quad
7	500	550	600	650	600	650	700
8	750	900	950	1,000	950	1,000	1,050
9	850	1,000	1,100	1,200	1,100	1,200	1,300
11	1,400	1,750	1,850	1,950	1,850	1,950	2,050
12	1,900	2,450	2,550	2,650	2,550	2,650	2,750
13	2,750	2,900	3,050	3,200	3,050	3,200	3,350
15	2,750	3,450	3,550	3,700	3,550	3,700	3,850
16	4,850	4,850	5,000	5,150	5,000	5,150	5,300
18	4,650	5,650	5,850	5,050	5,850	6,050	6,250
20	4,900	5,900	6,100	6,300	6,100	6,300	6,500
22	5,500	7,000	7,250	7,500	7,250	7,500	7,750
25	5,950	8,450	8,750	9,050	8,750	9,050	9,350
28	9,400	9,900	10,250	10,600	10,250	10,600	10,950
30	11,300	12,800	13,150	13,500	13,150	13,500	13,850
32	-	18,400	18,850	19,200	18,850	19,200	19,600
34	-	21,650	22,050	22,450	22,050	22,450	22,850
36	-	25,600	26,050	26,500	26,050	26,500	26,950
38	-	30,000	30,450	30,900	30,450	30,900	31,350
40	-	35,600	36,100	36,600	36,100	36,600	37,100

## NOTES

# SERVICE DIVISION

## YOUR TOTAL DRIVE SOURCE

Your business depends upon the continued operation of your rotating machinery. The quality of service you receive in maintaining your gear drives combined with a quality product, will determine the degree of success you achieve. Nuttall Gear specializes in providing you with both. The Service Division of Nuttall Gear has comprehensive services designed to keep your rotating machinery in operation. Whether you need a unit repaired or rebuilt, ratio changed or unit upgraded, training, preventive maintenance, or drive train analyzed, Nuttall Gear can offer you the solution for any manufacturer's gear drive. Our extensive experience in gear drive applications, combined with the total manufacturing and design capabilities of Nuttall Gear enable us to provide you with a single, comprehensive source for improving your productivity.

Nuttall Gear is your TOTAL DRIVE SOURCE for equipment and services. TDS is more than a catchy phrase. It means a commitment to quality and excellence in everything we do. In addition to our extensive service capabilities, we specialize in providing complete mechanical and electrical packaged component assemblies. We can also custom design and manufacture units to your unique requirements, utilizing our extensive expertise in designing gear drives for a wide variety of applications.

## OUR SERVICE DIVISION CAPABILITIES INCLUDE...

★ **Repair and Rebuild (of almost any manufacturer's unit)**

- Gear Refinishing
- Shaft Repair
- Rebabbiting Sleeve Bearings
- Cast Iron and Welded Housing Repair
- Complete Nondestructive Testing
- Complete Unit Assembly and Testing

★ **Redesign and Rerate**

- Ratio Change
- Increased Mechanical and Thermal Ratings
- Complete Redesign

★ **Field Service**

- Installation
- On-Site Rebuild
- Trouble Shooting
- Mechanical Alignment

★ **System Analysis**

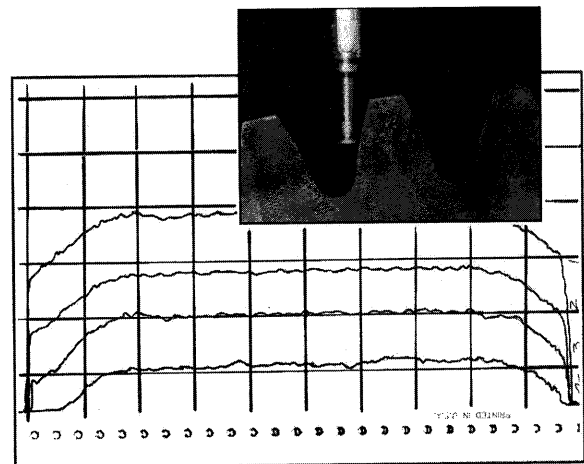
- Vibration and Sound
- Torsional System Study
- Lubrication
- Metallurgical

★ **On-Site Seminars**

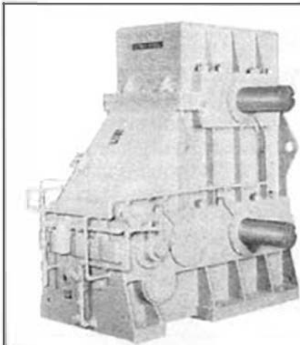
- Preventive Maintenance
- Assembly and Rebuild

## QUALITY ASSURANCE

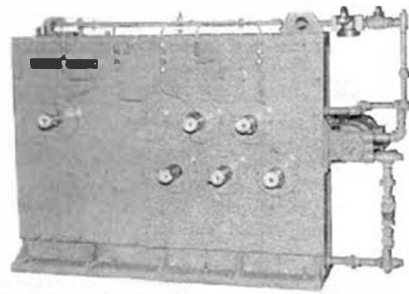
From inspection and teardown to reassembly and complete unit testing, each step is planned and executed within the requirements of our Quality Assurance Program. Our program was designed to meet the strict requirements of the Nuclear Industry, as well as the world recognized standards established by ISO 9001-2000. Documented traceability for materials, processes, and testing is part of the Quality Assurance Program that applies to all service work.



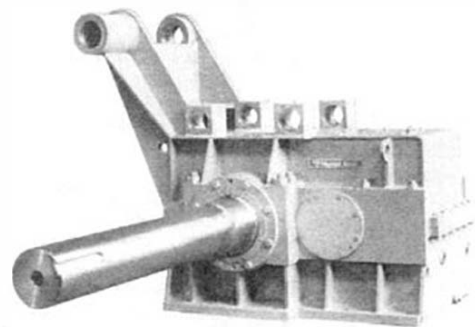
Total Commitment To Your Needs Drives Us....  
Our Commitment Keeps You Driving.



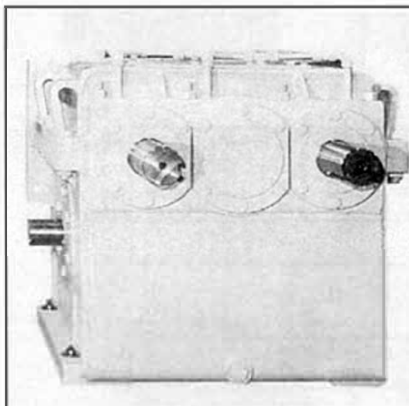
**Combination Reducer/ Pinion Stands** are available in ratings up to 14000 HP and output speeds down to 1.7 RPM and in ratios up to 357:1.



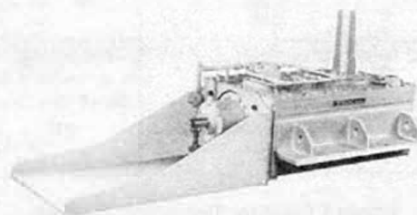
**Combination Reducer Levelers & Flatteners** are available in ratings up to 300 HP and output speeds down to 2.4 RPM and in ratios up to 357:1.



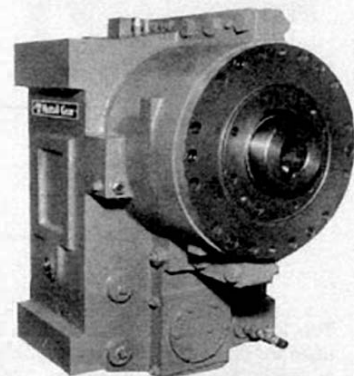
**Reel Units** are available in single and multiple speed designs, in ratings up to 14000 HP and output speeds down to 2.4 RPM and in ratios up to 357:1.



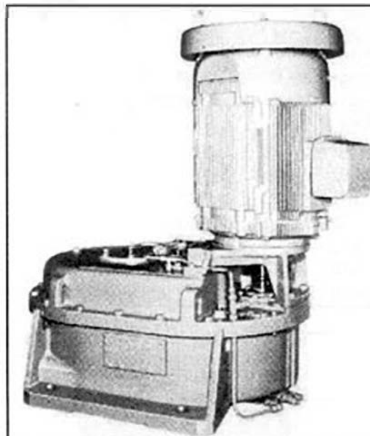
**Custom Engineered Drives** are available in ratings up to 6,000,000 inch pounds of torque, designed for specific customer and/or application requirements.



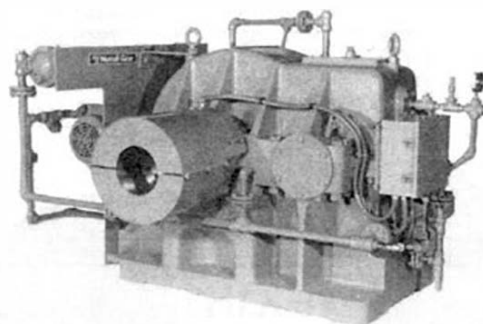
**Type DRV, TRV, QRV Right Angle Vertical Reducers** are available in ratings up to 9000 HP and output speeds down to 2.4 RPM and in ratios up to 238:1.



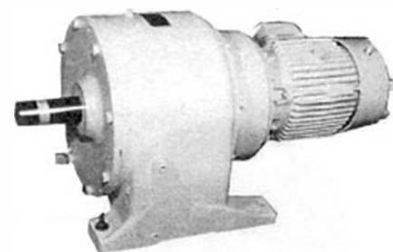
**DHE, DVE Extruder Drives** are available in horizontal and vertical mountings, in ratings up to 3000 HP and output speeds down to 55 RPM and in ratios up to 21:1.



**Veri-Dri, Vertical Reducers** are available in ratings up to 14000 HP and output speeds down to 1.7 RPM and in ratios up to 357:1.



**Type SU Speed Increasers and SD Speed Reducers** are available in ratings up to 15000 HP and output speeds up to 15000 RPM and in ratios up to 9:1.



**Type R, G, & U Concentric Shaft Reducers and Integral and Scoop Mount Gearmotors** are available in ratings up to 200 HP and output speeds down to 1.5 RPM and in ratios up to 985:1.

**NUTTALL GEAR™**  
A REGAL REXNORD BRAND

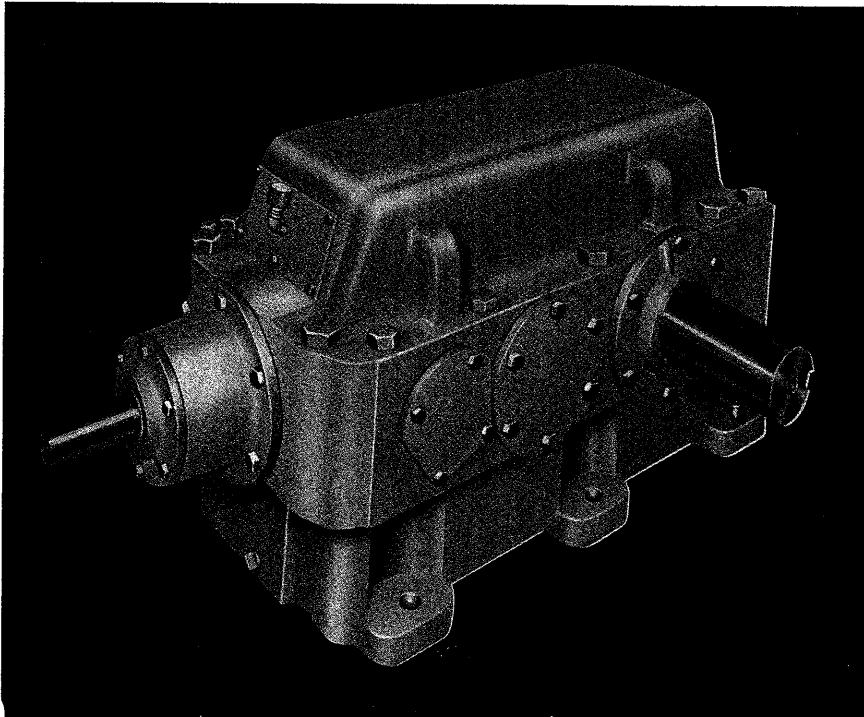


# Type TDS

Section 330

Page 1

## Right Angle Shaft Speed Reducers



Type TDS Right Angle Shaft Speed Reducers are available with torque ratings up to 6,200,000 inch-pounds and standard gear ratios up to 238:1. TDS units enclose precision spiral bevel and helical gearing in heavy duty cast iron or steel fabricated housings. Standard features include tapered roller bearings, large inspection plates, a positive splash lubrication system, extra wide bearing spans and center bearing supports; all to provide a rugged reliable unit with proven dependability in virtually every industrial application. **Nuttall Gear Corporation** can supply TDS units separately or in completely engineered packages including motors, reducers, couplings, clutches and other accessories mounted on bedplates, ready to install and operate.

For over 100 years **Nuttall Gear** has provided cost effective solutions to application problems in the broad spectrum of industrial machinery.

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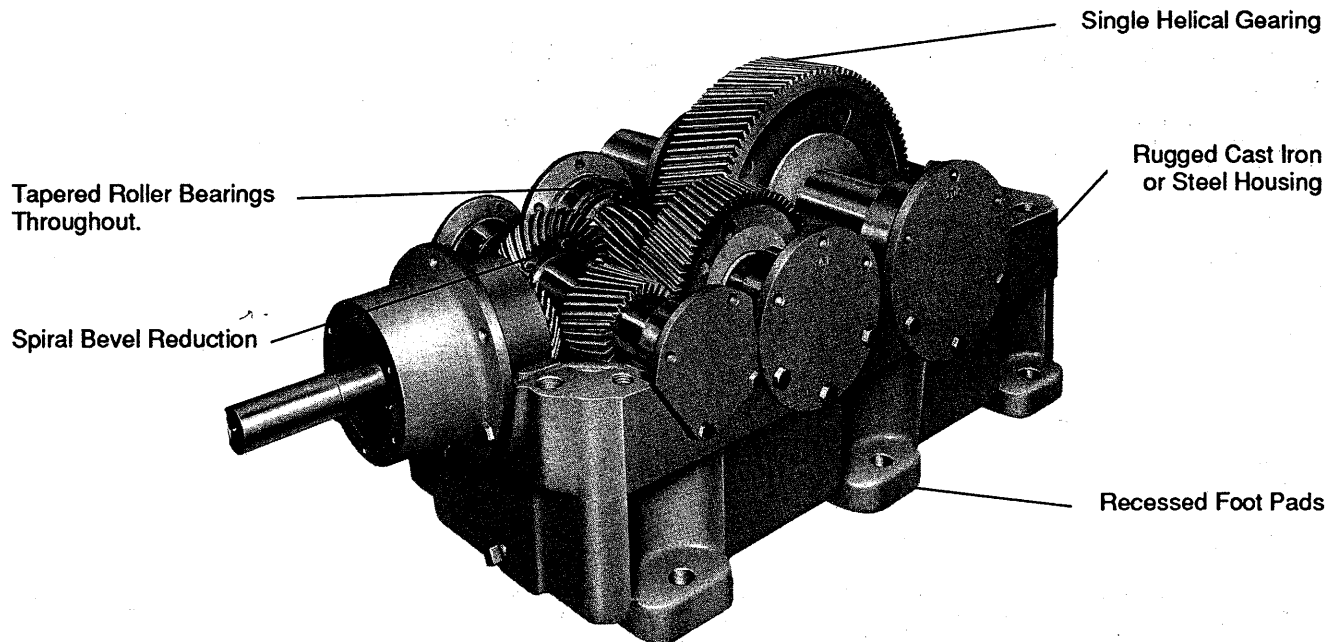
As a charter member of the American Gear Manufacturers Association (AGMA), **Nuttall Gear** research and field experience have added many advanced concepts to increase efficiency and operational reliability, and to simplify adaptation to the many special application requirements of specific industries in today's industrial environment.



# Type TDS

## Right Angle Shaft Speed Reducers

### Construction Features



**Spiral Bevel and Helical Gears** made from high alloy steel for strength and shock resistance, to provide a long trouble free operating life.

**Inspection Plate** with attached breather permits easy inspection for preventative maintenance check-ups.

**Oil Dip Stick** provides a foolproof and time-saving method of accurately checking and maintaining the proper oil level.

**Recessed Foot Pads** reduce floor space requirements. Adequate clearance is provided in the housing recess for standard tools.

**Splash Lubricated** with oil troughs. Wipers and oil dams are also included when required.

**Lifting Lugs** can be used to lift the entire reducer safely and easily.

**Cast-Iron Housings**, corrosion resistant, provide rigid alignment of internal components. The flat top allows for mounting of motors and auxiliary equipment. **TDS Reducers** are also available in fabricated steel housings in standard and special configurations.

**Shafts** are made of high alloy 4150 ANSI steel. Input and output shafts are fitted with **double lip seals** to keep oil in, and contaminants out.



# Type TDS

## Right Angle Shaft Speed Reducers

### Reducer Selection

Section 330

Page 3

Selection

#### REQUIRED APPLICATION DATA

- A. Application Type
- B. Hours of operation per day
- C. Application Horsepower (or torque) required
- D. Determine AGMA minimum application factor from tables on Section 330, pages 5 - 7
- E. Prime mover, type and speed
- F. Gear ratio or desired output speed
- G. Overhung load requirements, if any
- H. Modifications or accessories
- I. Mounting position

#### SELECTION PROCEDURE

##### Procedure:

**A.** Using the proper AGMA application factor, determine the minimum equivalent horsepower or torque capacity required. (Equivalent power = application power x application factor)

**B.** The rating tables are grouped by reduction, and sub-divided by input speeds of 1750, 1170, 870, 720, and 580 RPM. Locate the appropriate pages and find the desired gear ratio or output speed. Read across the page until you have found the horsepower or torque rating that equals or exceeds the equivalent power required. The column heading will indicate the selected unit. The column headings define the units selected. the first letter, **D, T, or Q** indicates the number of reductions, **Double, Triple or Quadruple**. The second letter, **R**, shows it is a right-angle unit. the number, from **7 to 40**, is the approximate center distance of the low speed gear set. A "W" prefix indicates steel construction.

**C.** Compare the thermal horsepower rating with the actual prime mover horsepower rating (not the equivalent horsepower rating - see Section 330, page 4 "Thermal Ratings"). If the rating equals or exceeds the prime mover rating then the selection is complete. If the prime mover rating is larger than the thermal capacity, consider the fan cooled unit, an oil-to-water, or oil-to-air heat exchanger, or, in some cases where auxiliary cooling cannot be used, select a larger unit that will meet the requirements.

##### Example:

A **heavy duty overland conveyor, not uniformly loaded**, operates **24 hours per day**. The prime mover is a **75 HP, 1750 RPM** electric motor. The desired output speed is **100 RPM**.

##### Solution:

- 1. **Application factor** is 1.5 (Section 330, page 5)
- 2. **Equivalent horsepower** is 112.5 (75 x 1.5)
- 3. **Required ratio** is 1750/100 or 17.5:1 (The closest nominal ratio is 17.09:1).
- 4. Look in the triple reduction section for an input speed of 1750 (Section 330, page 18).
- 5. Read across the **17.09/100 RPM** line until you reach the bold figure **147** which is greater than the equivalent HP required..
- 6. Reading the top of the column the type designation is found to be a **TR9**. Reading down the column, we find the basic unit has a **thermal capacity of 68 horsepower**, which is less than the rating of the prime mover; however, the **fan-cooled unit has thermal capacity of 136 horsepower**, which is more than adequate.
- 7. If auxiliary cooling is not acceptable and the unit must be self cooling, moving to the next larger unit, **TR11**, will provide the thermal capacity needed.
- 8. If the exact output speed is critical, look at the table at the bottom of the page to determine the **exact gear ratio** for the unit selected. That ratio for the TR9 would be **17.471:1**. If the TR11 were to be used, the ratio would be **17.212:1**. When required, Nuttall Gear can produce special gear ratios to meet your specifications.

#### MODIFICATION AND ACCESSORIES

Among the many options available are:

- A.** Complete packaged drive systems with motors, couplings, reducers and accessories mounted and "ready to run" without further assembly of components.
- B.** Motor mounting with bedplates, scoops, or piggy-back provisions.
- C.** Special enclosures, steel fabricated housings, sound dampening shrouds, protection from corrosive or abrasive ambient conditions as well as appropriate seals for

applications requiring special attention, such as taconite or paper mill duty.

- D.** Backstops, brakes, clutches, and special couplings can all be supplied and mounted by Nuttall Gear.
- E.** Temperature detectors to monitor bearing and/or oil sump temperatures, as well as heaters to be used in low temperature locations.
- F.** Special exact gear ratios.
- G.** Special shafts.

# Type TDS Right Angle Shaft Speed Reducers Application

## APPLICATION FACTORS

To provide long life and reliability for any given application, a suitable application factor must be applied to the load requirements.

The required equivalent horsepower or equivalent torque necessary to select a reducer from the rating tables is found by multiplying the load horsepower or torque by an application factor.

The gear drive selected will require a rating equal to, or in excess of, the equivalent horsepower or equivalent torque.

Pages 5 through 7, following, list the **minimum recommended** application factors for a broad spectrum of applications. These factors were developed by The American Gear Manufacturers Association, and were derived from data collected from countless installations over many years.

It is not possible to list all possible applications requiring gear drives, but a sufficient variety of types is covered to serve as a guide for other applications.

It should be noted that the values given in the tables are based on field experience of **average** operating conditions for each class of equipment and may not be correct in all cases, due to unique operating conditions or design of the driving or driven equipment.

Proper application factors can be determined if full operational conditions are known. It is necessary to have this data before a final gear drive selection is made. Any drive for use under abnormal conditions must be referred to Nuttall Gear.

The table also indicates the application factors for duration of service. If a single or multi-cylinder engine is used as the prime mover, the factors must be adjusted further. For a single cylinder engine, add .50 to the appropriate factor, if a multi-cylinder engine is used, then only a .25 addition is made.

## THERMAL CAPACITY

The thermal horsepower rating represents the **actual** horsepower that a gear drive will transmit continually for more than three (3) hours without overheating. Maximum sump temperature is not to exceed 200°F.

It is not necessary to check thermal horsepower ratings when the continuous operating period is three (3) hours or less, and the shutdown time equals or exceeds the running time. If, however, the running time exceeds the shutdown time, selection must be made on the basis of an adequate thermal rating. It is important that the thermal horsepower be checked prior to application, for if the unit develops heat at a faster rate than can be dissipated, premature failure may occur. **Note: application factors do not apply to thermal ratings.** Only the **actual** transmitted horsepower is subject to thermal horsepower consideration.

In cases where transmitted horsepower exceeds the thermal rating horsepower, additional cooling by means of shaft mounted fans or an oil to water heat exchanger will be necessary at added cost. It should be noted that fan cooling may not be effective in high ambient conditions **or in high altitudes**, and all such applications must be referred to the factory.

The area in which the reducer is located should allow adequate air circulation. Also, the housing should be free from dust or other material which can become an insulator. Gear drives operating outdoors should be provided with a sun shield roof structure to eliminate the effects of solar heating. If these precautions are not taken, over-heating with premature failure may occur.

## LOAD CONDITIONS

Basic conditions to be observed before applying application factors are as follows:

### 1. Excessive Overloads

The maximum momentary or starting load must not exceed 200 percent of rated load (100% overload). Rated load is defined as the unit rating with a service factor of 1.0. Driven equipment with high inertia loading may require higher application factors than indicated because of the high momentary torque required for breakaway. Expected breakaway and shock load torques must not exceed 200% of rated reducer torque.

### 2. Oversize Prime Mover

The practice of using oversize motors for motor standardization or starting conditions must be given attention due to the potential high starting torque available.

### 3. Braking Conditions

When the rating of a shaft mounted or motor mounted brake exceeds the motor rating, the rating of the brake must be used in selection of the reducer.

### 4. Drive-Train Vibrations

Gear reducers are sold with the understanding that the rotating parts are free from serious critical speeds or torsional vibrations. Calculation required to check the entire system is the responsibility of the systems builder. Details of reducer rotating parts for such calculations are available on request at time of order.

### 5. Pulsating Loads

The responsibility for satisfactory operation of reducers driving or driven by pulsating or reciprocating apparatus such as compressors, pumps, and internal combustion engines is assumed by Nuttall Gear provided that:

- The gears are not operated with torque reversals at the gear mesh, except when starting and stopping.
- When loaded, the torque variation at the gear mesh does not exceed  $\pm 25\%$  of average transmitted torque.
- When unloaded, the torque variation at the gear mesh does not exceed  $\pm 15\%$  of rated torque with no negative torque.

## AMBIENT CONDITIONS

Standard speed reducers are basically designed for horizontal floor mounted operation in a heated building where reasonably clean and dry

conditions exist. For conditions other than this, special features may be required. Full data should be provided to insure proper selection.

### Low Temperature Operation

Starting and operating gear drives at temperatures below 40°F could result in damage to the gears and bearings if the pour point of the lubricant is higher than the ambient temperature. This is of particular concern when controlled splash lubrication or circulation lube oil systems with pump and piping are employed. In such cases, it may be necessary to provide immersion heaters in the oil sump and provide a method of heating the external oil pump and piping at start-up.

### High Temperature Operation

Operation at sustained ambient temperatures in excess of 100°F will greatly affect thermal modifications required to provide a reasonable operating temperature. High oil sump temperatures will drastically reduce the life of most lubricants and require frequent oil changes. Contact Nuttall Gear for lubrication recommendations if this condition is expected.

# Type TDS

## Right Angle Shaft Speed Reducers

### AGMA Application Factors

Section 330

Page 5

APPLICATION	LOAD DURATION HOURS PER DAY			APPLICATION	LOAD DURATION HOURS PER DAY		
	0-3	3-10	10+		0-3	3-10	10+
<b>AGITATORS (Mixers)</b>				<b>CRANES (cont.)</b>			
Pure Liquids	1.00	1.00	1.25	Trolley Travel	2.50	3.00	3.00
Liquids and Solids	1.00	1.25	1.50	Industrial Duty			
Liquids - Variable Density	1.00	1.25	1.50	Main	2.50	2.50	3.00
<b>BLOWERS</b>				Auxiliary	2.50	2.50	3.00
Centrifugal	1.00	1.00	1.25	Bridge and	2.50	3.00	3.00
Lobe	1.00	1.25	1.50	Trolley Travel	2.50	3.00	3.00
Vane	1.00	1.25	1.50	<b>CRUSHER</b>			
<b>BREWING AND DISTILLING</b>				Stone or Ore	1.75	1.75	2.00
Bottling Machinery	1.00	1.00	1.25	<b>DREDGES</b>			
Brew Kettles - Continuous Duty	1.25	1.25	1.25	Cable Reels	1.25	1.25	1.50
Cookers - Continuous Duty	1.25	1.25	1.25	Conveyors	1.25	1.25	1.50
Mash Tubs - Continuous Duty	1.25	1.25	1.25	Cutter Head Drives	2.00	2.00	2.00
Scale Hopper - Frequent Starts	1.25	1.25	1.50	Pumps	2.00	2.00	2.00
<b>CAN FILLING MACHINES</b>	1.00	1.00	1.25	Screen Drives	1.75	1.75	2.00
<b>CAR DUMPERS</b>	1.50	1.75	2.00	Stackers	1.25	1.25	1.50
<b>CAR PULLERS</b>	1.00	1.25	1.50	Winches	1.25	1.25	1.50
<b>CLARIFIERS</b>	1.00	1.00	1.25	<b>ELEVATORS</b>			
<b>CLASSIFIERS</b>	1.00	1.25	1.50	Bucket	1.00	1.25	1.50
<b>CLAY WORKING MACHINERY</b>				Centrifugal Discharge	1.00	1.00	1.25
Brick Press	1.50	1.75	2.00	Escalators	1.00	1.00	1.25
Briquette Machine	1.50	1.75	2.00	Freight	1.00	1.25	1.50
Pug Mill	1.00	1.25	1.50	Gravity Discharge	1.00	1.00	1.25
<b>COMPACTORS</b>	2.00	2.00	2.00	<b>EXTRUDERS</b>			
<b>COMPRESSORS</b>				General	1.50	1.50	1.50
Centrifugal	1.00	1.00	1.25	Plastics			
Lobe	1.00	1.25	1.50	Variable Speed Drive	1.50	1.50	1.50
Reciprocating, Multi-Cylinder	1.50	1.50	1.75	Fixed Speed Drive	1.75	1.75	1.75
Reciprocating, Single-Cylinder	1.75	1.75	2.00	Rubber			
<b>CONVEYORS - GENERAL PURPOSE</b>				Continuous Screw Operation	1.75	1.75	1.75
Uniformly loaded or fed	1.00	1.00	1.25	Intermittent Screw Operation	1.75	1.75	1.75
Heavy Duty, not uniformly fed	1.00	1.25	1.50	<b>FANS</b>			
Reciprocating of Shaker	1.50	1.75	2.00	Centrifugal	1.00	1.00	1.25
<b>CRANES ①</b>				Cooling Towers	2.00	2.00	2.00
Dry Dock				Forced Draft	1.25	1.25	1.25
Main Hoist	2.50	2.50	2.50	Induced Draft	1.50	1.50	1.50
Auxiliary Hoist	2.50	2.50	3.00	Industrial and Mine	1.50	1.50	1.50
Boom Hoist	2.50	2.50	3.00	<b>FEEDERS</b>			
Slewing Drive	2.50	2.50	3.00	Apron	1.00	1.25	1.50
Traction Drive	3.00	3.00	3.00	Belt	1.00	1.15	1.50
Container				Disc	1.00	1.00	1.25
Main Hoist	3.00	3.00	3.00	Reciprocating	1.50	1.75	2.00
Boom Hoist	2.00	2.00	2.00	Screw	1.00	1.25	1.50
Trolley Drive				<b>FOOD INDUSTRY</b>			
Gantry Drive	3.00	3.00	3.00	Cereal Cooker	1.00	1.00	1.25
Traction Drive	2.00	2.00	2.00	Dough Mixer	1.25	1.25	1.50
<b>Mill Duty</b>				Meat Grinders	1.25	1.25	1.50
Main Hoist	3.50	3.50	3.50	Slicers	1.25	1.25	1.50
Auxiliary	3.50	3.50	3.50	<b>GENERATORS AND EXCITERS</b>	1.00	1.00	1.25
Bridge and	2.50	3.00	3.00	<b>HAMMER MILLS</b>	1.75	1.75	2.00
				<b>HOISTS</b>			
				Heavy Duty	1.75	1.75	2.00

# Type TDS

## Right Angle Shaft Speed Reducers

### AGMA Application Factors

APPLICATION	LOAD DURATION HOURS PER DAY			APPLICATION	LOAD DURATION HOURS PER DAY		
	0-3	3-10	10+		0-3	3-10	10+
HOISTS (cont.)				METAL STRIP PROCESSING MACHINERY (cont.)			
Medium Duty	1.25	1.25	1.50	Shears	2.00	2.00	2.00
Skip Hoist	1.25	1.25	1.50	Slitters	1.00	1.25	1.50
LAUNDRY				MILLS, ROTARY TYPE			
Tumblers	1.25	1.25	1.50	Ball and Rod			
Washers	1.50	1.50	2.00	Spur Ring Gear	2.00	2.00	2.00
LUMBER INDUSTRY				Helical Ring Gear	1.50	1.50	1.50
Barkers - Spindle Feed	1.25	1.25	1.50	Direct Connected	2.00	2.00	2.00
Main Drive	1.75	1.75	1.75	Cement Kilns	1.50	1.50	1.50
Conveyors - Burner	1.25	1.25	1.50	Dryers and Coolers	1.50	1.50	1.50
Main Drive or Heavy Duty	1.50	1.50	1.50	MIXERS			
Main Log	1.75	1.75	2.00	Concrete	1.25	1.25	1.50
Re-saw, Merry-Go-Round	1.25	1.25	1.50	PAPER MILLS ②			
Slab	1.75	1.75	2.00	Agitator (Mixer)	1.50	1.50	1.50
Transfer	1.25	1.25	1.50	Agitator for Pure Liquors	1.25	1.25	1.25
Chains				Barking Drums	2.00	2.00	2.00
Floor	1.50	1.50	1.50	Barkers - Mechanical	2.00	2.00	2.00
Green	1.50	1.50	1.75	Beater	1.50	1.50	1.50
Cut-Off Saws				Breaker Stack	1.25	1.25	1.25
Chain	1.50	1.50	1.75	Calender ③	1.25	1.25	1.25
Drag	1.50	1.50	1.75	Chipper	2.00	2.00	2.00
Debarking Drums	1.75	1.75	2.00	Chip Feeder	1.50	1.50	1.50
Feeds				Coating Rolls	1.25	1.25	1.25
Edger	1.25	1.25	1.50	Conveyors			
Gang	1.75	1.75	1.75	Chip, Bark, Chemical	1.25	1.25	1.25
Trimmer	1.25	1.25	1.50	Log (including Slab)	2.00	2.00	2.00
Log Deck	1.75	1.75	1.75	Couch Rolls	1.25	1.25	1.25
Log Hauls - Incline - Well Type	1.75	1.75	1.75	Cutter	2.00	2.00	2.00
Log Turning Devices	1.75	1.75	1.75	Cylinder Molds	1.25	1.25	1.25
Planer Feed	1.25	1.25	1.50	Dryers ③			
Planer Tilting Hoists	1.50	1.50	1.50	Paper Machine	1.25	1.25	1.25
Rolls - Live-of brg - Roll Cases	1.75	1.75	1.75	Conveyor Type	1.25	1.25	1.25
Sorting Table	1.25	1.25	1.50	Embosser	1.25	1.25	1.25
Tipple Hoist	1.25	1.25	1.50	Extruder	1.50	1.50	1.50
Transfers				Fourdriner Rolls (Includes Lump breaker, dandy roll, wire turning, and return rolls)	1.25	1.25	1.25
Chain	1.50	1.50	1.75	Jordan	1.50	1.50	1.50
Craneway	1.50	1.50	1.75	Kiln Drive	1.50	1.50	1.50
Tray Drives	1.25	1.25	1.50	Mt. Hope Roll	1.25	1.25	1.25
Veneer Lathe Drives	1.25	1.25	1.50	Paper Rolls	1.25	1.25	1.25
METAL MILLS				Platter	1.50	1.50	1.50
Draw Bench Carriage and Main Drive	1.25	1.25	1.50	Presses, Felt and Suction	1.25	1.25	1.25
Runout Table				Pulper	2.00	2.00	2.00
Non-Reversing				Pumps - Vacuum	1.50	1.50	1.50
Group Drives	1.50	1.50	1.50	Reel (Surface Type)	1.25	1.25	1.25
Individual Drives	2.00	2.00	2.00	Screens			
Reversing	2.00	2.00	2.00	Chip	1.50	1.50	1.50
Slab Pushers	1.50	1.50	1.50	Rotary	1.50	1.50	1.50
Shears	2.00	2.00	2.00	Vibrating	2.00	2.00	2.00
Wire Drawing	1.25	1.25	1.50	Size Press	1.25	1.25	1.25
Wire Winding Machine	1.25	1.50	1.50	Super Calender ④	1.25	1.25	1.25
METAL STRIP PROCESSING MACHINERY				Thickener (AC Motor)	1.50	1.50	1.50
Bridles	1.25	1.25	1.50	Thickener (DC Motor)	1.25	1.25	1.25
Coilers and Uncoilers	1.00	1.00	1.25	Washer (AC Motor)	1.50	1.50	1.50
Edge Trimmers	1.00	1.25	1.50	Washer (DC Motor)	1.25	1.25	1.25
Flatteners	1.25	1.25	1.50	Wind and Unwind Stand	1.00	1.00	1.25
Loopers (Accumulators)	1.00	1.00	1.25	Winders (Surface Type)	1.25	1.25	1.25
Pinch Rolls	1.25	1.25	1.50				
Scrap Choppers	1.25	1.25	1.50				

# Type TDS

## Right Angle Shaft Speed Reducers

### AGMA Application Factors

Section 330

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APPLICATION	LOAD DURATION HOURS PER DAY		
	0-3	3-10	10+
PAPER MILLS (cont.)			
Yankee Dryers ③	1.25	1.25	1.25
PLASTICS INDUSTRY			
Primary Processing			
Intensive Internal Mixers			
Batch Mixers	1.75	1.75	1.75
Continuous Mixers	1.50	1.50	1.50
Batch Drop Mill - 2 smooth rolls	1.25	1.25	1.25
Continuous Feed, Holding & Blend Mill	1.25	1.25	1.25
Compounding Mill	1.25	1.25	1.25
Calenders	1.50	1.50	1.50
Secondary Processing			
Blow Molders	1.50	1.50	1.50
Coating	1.25	1.25	1.25
Film	1.25	1.25	1.25
Pipe	1.25	1.25	1.25
Pre-Plasticizers	1.50	1.50	1.50
Rods	1.25	1.25	1.25
Sheet	1.25	1.25	1.25
Tubing	1.25	1.25	1.50
PULLERS - BARGE HAUL	1.25	1.25	1.50
PUMPS			
Centrifugal	1.00	1.00	1.25
Proportioning	1.25	1.25	1.50
Reciprocating			
Single Acting, 3 or more cylinders	1.25	1.25	1.50
Double Acting, 2 or more cylinders	1.25	1.25	1.50
Rotary			
Gear Type	1.00	1.00	1.25
Lobe	1.00	1.00	1.25
Vane	1.00	1.00	1.25
RUBBER INDUSTRY			
Intensive Internal Mixers			
Batch Mixers	1.75	1.75	1.75
Continuous Mixers	1.50	1.50	1.50
Mixing Mill - 2 smooth rolls - (if corrugated rolls are used, then use the same service factors that are used for a Cracker-Warmer)	1.50	1.50	1.50
Batch Drop Mill - 2 smooth rolls	1.50	1.50	1.50
Cracker-Warmer - 2 rolls; 1 corrugated roll	1.75	1.75	1.75
Cracker - 2 corrugated rolls	2.00	2.00	2.00
RUBBER INDUSTRY (cont.)			
Holding, Feed & blend Mill - 2 rolls	1.25	1.25	1.25
Refiner - 2 rolls	1.50	1.50	1.50
Calenders	1.50	1.50	1.50
SAND MULLER	1.25	1.25	1.50
SEWAGE DISPOSAL EQUIPMENT			
Bar Screens	1.25	1.25	1.25
Chemical Feeders	1.25	1.25	1.25
Dewatering Screens	1.50	1.50	1.50
Scum Breakers	1.50	1.50	1.50
Slow or Rapid Mixers	1.50	1.50	1.50
Sludge Collectors	1.25	1.25	1.25
Thickeners	1.50	1.50	1.50
Vacuum Filters	1.50	1.50	1.50
SCREENS			
Air Washing	1.00	1.00	1.25
Rotary - Stone or Gravel	1.25	1.25	1.50
Traveling Water Intake	1.00	1.00	1.25
SUGAR INDUSTRY			
Beet Slicer	2.00	2.00	2.00
Cane Knives	1.50	1.50	1.50
Crushers	1.50	1.50	1.50
Mills (low speed end)	1.75	1.75	1.75
TEXTILE INDUSTRY			
Batchers	1.25	1.25	1.50
Calenders	1.25	1.25	1.50
Cards	1.25	1.25	1.50
Dry Cans	1.25	1.25	1.50
Dryers	1.25	1.25	1.50
Dyeing Machinery	1.25	1.25	1.50
Looms	1.25	1.25	1.50
Mangles	1.25	1.25	1.50
Nappers	1.25	1.25	1.50
Pads	1.25	1.25	1.50
Slashers	1.25	1.25	1.50
Soapers	1.25	1.25	1.50
Spinners	1.25	1.25	1.50
Tenter Frames	1.25	1.25	1.50
Washers	1.25	1.25	1.50
Winders	1.25	1.25	1.50

#### NOTES:

① Crane drives are to be selected based on gear tooth bending strength. Contact **Nuttall Gear** for strength ratings. Application factor in durability should be a minimum of 1.0.

NOTE: Application factors shown for cranes are based on tooth bending strength and their use must be coordinated with **Nuttall Gear**. The values shown are consistent with those recommended by C.M.A.A. (Crane Manufacturers Association of America).

② Application factors for paper mill applications are applied to the nameplate rating of the electric drive motor at the motor rated based speed.

③ Anti-Friction Bearings only. Use 1.5 for sleeve bearings.

④ An application Factor of 1.00 may be applied at base speed of a super calender operating over a speed range of part constant horsepower, part constant torque where the constant horsepower speed range is greater than 1.5 to 1. An application factor of 1.25 is applicable to super calenders operating over the entire speed range at constant torque or where the constant horsepower speed range is less than 1.5 to 1.

# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	520	MECH HP 218 TORQUE (X1000 IN. LBS.) 26	337 41	367 43	508 59	711 91	920 115	1397 162	1891 224	2526 308	3050 358	
4.134	420	MECH HP 218 TORQUE (X1000 IN. LBS.) 32	337 50	367 54	508 75	711 105	920 141	1391 207	1891 282	2526 376	3050 446	
5.060	350	MECH HP 206 TORQUE (X1000 IN. LBS.) 38	285 51	367 66	508 89	711 128	920 170	1391 256	1891 341	2526 441	3050 538	
6.200	280	MECH HP 177 TORQUE (X1000 IN. LBS.) 39	237 52	367 83	508 111	711 158	920 207	1370 298	1600 354	2006 463	2437 556	
7.590	230	MECH HP 150 TORQUE (X1000 IN. LBS.) 40	193 53	322 86	506 135	622 176	867 243	1132 306	1306 363	1701 475	2103 570	
9.300	190	MECH HP 121 TORQUE (X1000 IN. LBS.) 40	162 54	266 87	414 137	520 180	737 248	932 312	1141 372	1406 486	1695 585	
11.39	155	MECH HP 103 TORQUE (X1000 IN. LBS.) 41	133 55	222 89	330 139	432 183	602 253	787 319	941 379	1229 497	1463 595	
13.95	125	MECH HP 85 TORQUE (X1000 IN. LBS.) 42	112 56	183 90	294 143	361 187	512 258	649 326	792 387	1012 507	1217 609	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	520	THERMAL HP WITH FANS	35 71	49 97	55 111	91 183	115 231	133 266	152 304	184 368	206 412	241 482
4.134	420	THERMAL HP WITH FANS	36 72	49 99	57 113	93 187	118 235	135 271	155 310	188 375	210 420	246 492
5.060	350	THERMAL HP WITH FANS	37 74	50 101	58 115	95 190	120 240	138 276	158 316	191 383	214 428	251 502
6.200	280	THERMAL HP WITH FANS	38 75	52 103	59 118	97 195	123 246	141 283	162 323	196 392	219 438	257 513
7.590	230	THERMAL HP WITH FANS	38 76	53 106	60 120	99 198	125 250	144 288	165 330	200 400	224 448	262 524
9.300	190	THERMAL HP WITH FANS	39 78	54 108	61 122	101 202	128 256	147 294	168 336	204 408	228 456	267 534
11.39	155	THERMAL HP WITH FANS	40 80	55 110	63 126	104 208	132 264	151 302	173 346	210 420	235 470	275 550
13.95	125	THERMAL HP WITH FANS	42 84	57 114	66 132	1008 216	137 274	157 314	180 360	218 436	244 488	285 570

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	3.394	3.459	3.287	3.235	3.564	3.471	3.235	3.297	3.394	3.263
4.134	4.138	4.121	4.146	4.150	4.138	4.267	4.137	4.143	4.138	4.061
5.060	5.120	4.966	5.062	4.865	5.027	5.160	5.097	5.005	4.846	4.897
6.200	6.091	6.080	6.297	6.120	6.205	6.268	6.036	6.142	6.406	6.333
7.590	7.368	7.619	7.400	7.408	7.854	7.778	7.505	7.713	7.750	7.524
9.300	9.125	9.222	9.059	9.180	9.600	9.341	9.294	9.053	9.597	9.582
11.39	11.053	11.429	11.100	11.667	11.743	11.655	11.247	11.175	11.228	11.286
13.95	13.688	13.833	13.588	13.500	14.353	13.978	13.928	13.567	13.905	13.884



# Type TDS Right Angle Shaft Speed Reducers Double Reduction

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Ratio 3.375 thru 13.95

1750 Input

## MECHANICAL CAPACITY

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
3451 416	5085 613	6624 802	8785 1078						MECH HP TORQUE (X1000 IN. LBS.)	520	3.375
3451 511	5085 760	6624 980	8785 1298						MECH HP TORQUE (X1000 IN. LBS.)	420	4.134
3451 638	5085 921	6624 1216	8785 1582						MECH HP TORQUE (X1000 IN. LBS.)	350	5.060
2972 667	4335 968	5677 1257	7349 1643	7690 1710	9601 2219	11047 2479	12031 2728	14001 3095	MECH HP TORQUE (X1000 IN. LBS.)	280	6.200
2461 685	3698 994	4760 1297	6251 1693	6214 1767	8349 2291	9747 2564	10689 2823	11957 3204	MECH HP TORQUE (X1000 IN. LBS.)	230	7.590
2107 703	3078 1018	3852 1329	5164 1736	5609 1830	7081 2352	7910 2639	8773 2907	9915 3299	MECH HP TORQUE (X1000 IN. LBS.)	190	9.300
1712 715	2572 1037	3315 1355	4354 1769	4410 1881	5911 2433	6887 2718	7557 2994	8456 3399	MECH HP TORQUE (X1000 IN. LBS.)	155	11.39
1462 732	2147 1065	2688 1391	3605 1818	3933 1925	5026 2504	5601 2803	6215 3089	7029 3508	MECH HP TORQUE (X1000 IN. LBS.)	125	13.95

## THERMAL CAPACITY

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
273 547	310 619	356 713	374 747						THERMAL HP WITH FANS	520	3.375
279 558	316 631	364 727	381 762						THERMAL HP WITH FANS	420	4.134
284 569	322 644	371 742	389 778						THERMAL HP WITH FANS	350	5.060
291 582	329 659	379 759	398 795	412 825	423 846	430 860	426 853	407 814	THERMAL HP WITH FANS	280	6.200
297 595	336 673	387 775	406 812	421 842	432 864	439 878	435 871	416 831	THERMAL HP WITH FANS	230	7.590
303 606	343 686	395 790	414 828	429 858	440 880	448 896	444 888	424 848	THERMAL HP WITH FANS	190	9.300
312 624	353 706	406 812	426 852	442 884	453 906	461 922	457 914	436 872	THERMAL HP WITH FANS	155	11.39
324 648	366 732	422 824	442 884	459 918	470 940	478 956	474 948	453 906	THERMAL HP WITH FANS	125	13.95

## EXACT GEAR RATIO

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	NOMINAL GEAR RATIO
3.350	3.348	3.366	3.409						3.375
4.114	4.150	4.111	4.103						4.134
5.133	5.029	5.097	5.000						5.060
6.231	6.200	6.148	6.207	6.174	6.417	6.231	6.296	6.138	6.200
7.727	7.462	7.565	7.520	7.895	7.619	7.304	7.333	7.440	7.590
9.263	9.182	9.579	9.333	9.059	9.222	9.263	9.200	9.238	9.300
11.591	11.192	11.348	11.280	11.842	11.429	10.957	11.000	11.160	11.39
13.895	13.773	14.369	14.000	13.588	13.833	13.895	13.800	13.857	13.95



# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	350	MECH HP 151 TORQUE (X1000 IN. LBS.) 27	234 43	254 44	353 61	495 95	641 119	973 169	1346 239	1819 332	2160 379	
4.134	280	MECH HP 151 TORQUE (X1000 IN. LBS.) 33	234 52	254 56	353 78	495 110	641 147	973 216	1346 300	1819 405	2160 472	
5.060	230	MECH HP 145 TORQUE (X1000 IN. LBS.) 40	198 53	254 69	353 92	495 134	641 178	973 267	1346 362	1819 475	2160 570	
6.200	190	MECH HP 121 TORQUE (X1000 IN. LBS.) 40	164 54	254 86	353 116	495 165	641 216	959 312	1121 371	1408 486	1706 582	
7.590	155	MECH HP 103 TORQUE (X1000 IN. LBS.) 41	134 55	223 89	350 140	432 183	606 254	786 318	909 378	1188 496	1470 596	
9.300	125	MECH HP 85 TORQUE (X1000 IN. LBS.) 42	112 56	184 90	287 142	361 187	512 258	649 325	793 387	980 507	1183 611	
11.39	100	MECH HP 70 TORQUE (X1000 IN. LBS.) 42	92 57	153 92	229 144	300 190	420 264	546 331	654 394	856 518	1019 620	
13.95	84	MECH HP 58 TORQUE (X1000 IN. LBS.) 43	77 58	128 94	202 147	249 193	355 268	450 338	548 401	702 526	846 633	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	350	THERMAL HP WITH FANS	70 117	96 160	110 183	181 302	228 381	263 438	300 501	364 607	407 679	477 795
4.134	280	THERMAL HP WITH FANS	71 118	97 161	111 185	182 304	230 384	265 442	303 506	367 612	410 685	481 802
5.060	230	THERMAL HP WITH FANS	72 119	98 163	112 187	185 308	233 389	268 447	307 512	372 620	416 694	487 812
6.200	190	THERMAL HP WITH FANS	73 121	99 166	114 190	187 313	237 395	272 454	311 520	377 629	422 704	494 824
7.590	155	THERMAL HP WITH FANS	74 124	101 169	115 192	190 317	240 401	276 461	316 528	383 640	428 715	501 837
9.300	125	THERMAL HP WITH FANS	75 125	103 172	117 195	194 324	244 407	281 469	322 538	390 651	436 728	510 850
11.39	100	THERMAL HP WITH FANS	76 127	105 175	119 199	197 329	249 416	286 478	327 546	396 661	443 740	519 865
13.95	84	THERMAL HP WITH FANS	78 174	106 177	122 204	200 334	253 423	291 486	333 556	404 675	451 753	529 883

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	3.394	3.459	3.287	3.235	3.564	3.471	3.235	3.297	3.394	3.263
4.134	4.138	4.121	4.146	4.150	4.138	4.267	4.137	4.143	4.138	4.061
5.060	5.120	4.966	5.062	4.865	5.027	5.160	5.097	5.005	4.846	4.897
6.200	6.091	6.080	6.297	6.120	6.205	6.268	6.036	6.142	6.406	6.333
7.590	7.368	7.619	7.400	7.408	7.854	7.778	7.505	7.713	7.750	7.524
9.300	9.125	9.222	9.059	9.180	9.600	9.341	9.294	9.053	9.597	9.582
11.39	11.053	11.429	11.100	11.667	11.743	11.655	11.247	11.175	11.228	11.286
13.95	13.688	13.833	13.588	13.500	14.353	13.978	13.928	13.567	13.905	13.884



# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

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Ratio 3.375 thru 13.95

1170 Input

#### MECHANICAL CAPACITY

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
2477 446	3669 661	4723 856	6285 1154						MECH HP TORQUE (X1000 IN. LBS.)	350	3.375
2477 548	3669 820	4723 1045	6285 1389						MECH HP TORQUE (X1000 IN. LBS.)	280	4.134
2477 685	3669 994	4723 1297	6285 1693						MECH HP TORQUE (X1000 IN. LBS.)	230	5.060
2082 699	3039 1015	3985 1320	5168 1728	5472 1820	6836 2363	7871 2642	8580 2910	9989 3303	MECH HP TORQUE (X1000 IN. LBS.)	190	6.200
1720 716	2594 1043	3332 1358	4384 1776	4408 1875	5930 2434	6925 2725	7599 3002	8506 3409	MECH HP TORQUE (X1000 IN. LBS.)	155	7.590
1471 734	2155 1066	2689 1388	3612 1816	3969 1937	5020 2494	5613 2801	6229 3087	7045 3506	MECH HP TORQUE (X1000 IN. LBS.)	125	9.300
1194 746	1801 1086	2311 1413	3044 1850	3119 1990	4179 2573	4867 2873	5356 3174	5985 3598	MECH HP TORQUE (X1000 IN. LBS.)	100	11.39
1018 762	1498 1112	1870 1448	2515 1897	2773 2030	3545 2642	3950 2957	4386 3261	4962 3704	MECH HP TORQUE (X1000 IN. LBS.)	84	13.95

#### THERMAL CAPACITY

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
541 902	612 1021	705 1176	739 1233						THERMAL HP WITH FANS	350	3.375
545 910	617 1030	711 1186	745 1244						THERMAL HP WITH FANS	280	4.134
552 922	625 1043	720 1201	755 1259						THERMAL HP WITH FANS	230	5.060
560 935	634 1059	731 1219	766 1278	794 1325	814 1359	828 1382	821 1370	784 1307	THERMAL HP WITH FANS	190	6.200
569 949	644 1074	741 1237	777 1297	806 1345	826 1379	841 1402	833 1390	795 1327	THERMAL HP WITH FANS	155	7.590
579 966	655 1092	755 1259	791 1319	820 1368	841 1403	856 1428	848 1414	809 1350	THERMAL HP WITH FANS	125	9.300
589 982	667 1112	768 1281	805 1343	835 1393	856 1428	870 1451	863 1440	823 1373	THERMAL HP WITH FANS	100	11.39
600 1001	679 1132	782 1304	819 1366	850 1418	871 1453	886 1478	878 1465	838 1398	THERMAL HP WITH FANS	84	13.95

#### EXACT GEAR RATIO

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	NOMINAL GEAR RATIO
3.350	3.348	3.366	3.409						3.375
4.114	4.150	4.111	4.103						4.134
5.133	5.029	5.097	5.000						5.060
6.231	6.200	6.148	6.207	6.174	6.417	6.231	6.296	6.138	6.200
7.727	7.462	7.565	7.520	7.895	7.619	7.304	7.333	7.440	7.590
9.263	9.182	9.579	9.333	9.059	9.222	9.263	9.200	9.238	9.300
11.591	11.192	11.348	11.280	11.842	11.429	10.957	11.000	11.160	11.39
13.895	13.773	14.369	14.000	13.588	13.833	13.895	13.800	13.857	13.95

# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	258	MECH HP 115 TORQUE (X1000 IN. LBS.) 28	178	194	269	378	490	746	1020	1367	1649	
4.134	210	MECH HP 115 TORQUE (X1000 IN. LBS.) 34	178	194	269	378	490	746	1020	1367	1649	
5.060	172	MECH HP 107 TORQUE (X1000 IN. LBS.) 40	150	194	269	378	490	746	1020	1367	1649	
6.200	140	MECH HP 95 TORQUE (X1000 IN. LBS.) 42	124	194	269	378	490	734	860	1081	1310	
7.590	115	MECH HP 78 TORQUE (X1000 IN. LBS.) 42	103	171	268	332	461	603	698	910	1126	
9.300	94	MECH HP 65 TORQUE (X1000 IN. LBS.) 43	85	141	219	276	390	496	606	749	906	
11.39	76	MECH HP 53 TORQUE (X1000 IN. LBS.) 43	70	118	175	229	318	417	500	652	780	
13.95	62	MECH HP 45 TORQUE (X1000 IN. LBS.) 45	58	97	154	190	270	343	420	536	646	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	258	THERMAL HP WITH FANS	107 160	146 219	167 250	275 412	347 520	400 599	457 685	554 830	620 928	726 1087
4.134	210	THERMAL HP WITH FANS	109 163	149 223	170 255	281 420	354 530	408 611	467 699	565 846	632 946	740 1108
5.060	172	THERMAL HP WITH FANS	111 166	152 227	174 260	286 429	361 541	416 623	476 712	576 863	645 965	755 1130
6.200	140	THERMAL HP WITH FANS	113 170	155 233	178 266	293 438	370 553	425 637	486 728	589 882	659 987	772 1156
7.590	115	THERMAL HP WITH FANS	116 174	158 237	181 272	298 447	377 564	433 650	496 742	601 900	672 1006	787 1178
9.300	94	THERMAL HP WITH FANS	118 177	162 243	185 278	305 458	385 578	443 665	507 761	614 921	687 1031	805 1205
11.39	76	THERMAL HP WITH FANS	121 182	166 249	189 284	312 468	394 591	453 680	518 777	628 942	702 1053	822 1230
13.95	62	THERMAL HP WITH FANS	124 186	169 254	193 290	319 479	402 603	463 695	530 795	642 963	718 1077	841 1262

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	3.394	3.459	3.287	3.235	3.564	3.471	3.235	3.297	3.394	3.263
4.134	4.138	4.121	4.146	4.150	4.138	4.267	4.137	4.143	4.138	4.061
5.060	5.120	4.966	5.062	4.865	5.027	5.160	5.097	5.005	4.846	4.897
6.200	6.091	6.080	6.297	6.120	6.205	6.268	6.036	6.142	6.406	6.333
7.590	7.368	7.619	7.400	7.408	7.854	7.778	7.505	7.713	7.750	7.524
9.300	9.125	9.222	9.059	9.180	9.600	9.341	9.294	9.053	9.597	9.582
11.39	11.053	11.429	11.100	11.667	11.743	11.655	11.247	11.175	11.228	11.286
13.95	13.688	13.833	13.588	13.500	14.353	13.978	13.928	13.567	13.905	13.884

# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

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MECHANICAL CAPACITY											NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	REDUCER SIZE			
1861 451	2753 667	3623 883	4781 1180						MECH HP TORQUE (X1000 IN. LBS.)		258	3.375
1861 554	2753 827	3623 1078	4781 1421						MECH HP TORQUE (X1000 IN. LBS.)		210	4.134
1861 692	2753 1003	3623 1338	4781 1732						MECH HP TORQUE (X1000 IN. LBS.)		172	5.060
1599 722	2333 1048	3073 1369	3989 1794	4248 1900	5309 2468	6121 2763	6674 3044	7774 3457	MECH HP TORQUE (X1000 IN. LBS.)		140	6.200
1320 739	1988 1075	2563 1405	3379 1841	3418 1955	4598 2538	5371 2842	5897 3133	6601 3558	MECH HP TORQUE (X1000 IN. LBS.)		115	7.590
1126 756	1650 1098	2067 1435	2783 1882	3065 2012	3885 2596	4336 2910	4814 3209	5448 3646	MECH HP TORQUE (X1000 IN. LBS.)		94	9.300
913 767	1324 1114	1773 1458	2339 1912	2403 2062	3228 2673	3759 2984	4141 3300	4626 3740	MECH HP TORQUE (X1000 IN. LBS.)		76	11.39
777 783	1142 1140	1432 1491	1930 1958	2134 2101	2734 2740	3049 3070	3388 3387	3835 3850	MECH HP TORQUE (X1000 IN. LBS.)		62	13.95
THERMAL CAPACITY												
DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40			NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
823 1233	932 1395	1073 1607	1125 1685						THERMAL HP WITH FANS		258	3.375
840 1257	951 1423	1095 1639	1148 1718						THERMAL HP WITH FANS		210	4.134
856 1282	969 1451	1116 1672	1170 1752						THERMAL HP WITH FANS		172	5.060
876 1311	991 1484	1142 1709	1197 1792	1241 1858	1272 1905	1294 1937	1283 1920	1224 1833	THERMAL HP WITH FANS		140	6.200
892 1336	1010 1512	1163 1742	1220 1826	1264 1893	1297 1941	1319 1974	1307 1957	1247 1868	THERMAL HP WITH FANS		115	7.590
913 1368	1033 1546	1190 1781	1247 1866	1293 1935	1326 1985	1349 2019	1337 2001	1276 1910	THERMAL HP WITH FANS		94	9.300
933 1396	1056 1580	1216 1820	1275 1908	1322 1979	1356 2030	1379 2064	1366 2045	1304 1952	THERMAL HP WITH FANS		76	11.39
954 1428	1080 1616	1243 1860	1304 1952	1352 2024	1386 2075	1410 2110	1397 2091	1333 1995	THERMAL HP WITH FANS		62	13.95
EXACT GEAR RATIO												
DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40				NOMINAL GEAR RATIO
3.350	3.348	3.366	3.409									3.375
4.114	4.150	4.111	4.103									4.134
5.133	5.029	5.097	5.000									5.060
6.231	6.200	6.148	6.207	6.174	6.417	6.231	6.296	6.138				6.200
7.727	7.462	7.565	7.520	7.895	7.619	7.304	7.333	7.440				7.590
9.263	9.182	9.579	9.333	9.059	9.222	9.263	9.200	9.238				9.300
11.591	11.192	11.348	11.280	11.842	11.429	10.957	11.000	11.160				11.39
13.895	13.773	14.369	14.000	13.588	13.833	13.895	13.800	13.857				13.95

# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	213	MECH HP 96	126	162	226	318	412	629	860	1155	1392	
		TORQUE (X1000 IN. LBS.) 28	38	46	63	99	125	178	248	343	397	
4.134	174	MECH HP 96	126	162	226	318	412	629	860	1153	1392	
		TORQUE (X1000 IN. LBS.) 34	45	58	82	115	153	227	311	418	494	
5.060	142	MECH HP 91	126	162	226	318	412	629	860	1155	1392	
		TORQUE (X1000 IN. LBS.) 41	55	71	96	139	186	280	377	490	597	
6.200	116	MECH HP 78	105	162	226	318	412	618	723	909	1105	
		TORQUE (X1000 IN. LBS.) 42	56	89	121	172	226	327	389	510	613	
7.590	95	MECH HP 66	85	143	225	279	389	508	588	768	950	
		TORQUE (X1000 IN. LBS.) 43	57	93	146	192	265	334	397	521	626	
9.300	77	MECH HP 55	71	118	182	230	329	416	511	630	763	
		TORQUE (X1000 IN. LBS.) 44	58	94	147	194	269	339	405	530	640	
11.39	63	MECH HP 45	60	97	146	192	269	351	420	556	654	
		TORQUE (X1000 IN. LBS.) 44	60	95	150	198	275	346	411	541	641	
13.95	52	MECH HP 37	49	81	130	160	278	288	352	451	543	
		TORQUE (X1000 IN. LBS.) 45	60	97	154	201	280	352	418	550	660	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
<b>3.375</b>	<b>213</b>	THERMAL HP WITH FANS	151 213	207 292	236 333	389 550	491 694	566 798	647 913	784 1106	877 1237	1027 1449
<b>4.134</b>	<b>174</b>	THERMAL HP WITH FANS	154 217	211 297	241 340	397 560	501 707	576 814	660 931	799 1128	894 1261	1046 1477
<b>5.060</b>	<b>142</b>	THERMAL HP WITH FANS	156 221	214 302	245 345	403 569	509 718	586 827	670 946	812 1146	908 1282	1064 1501
<b>6.200</b>	<b>116</b>	THERMAL HP WITH FANS	159 225	218 308	249 352	411 580	519 732	597 842	683 964	827 1168	925 1306	1084 1529
<b>7.590</b>	<b>95</b>	THERMAL HP WITH FANS	162 229	222 313	254 358	418 589	527 743	607 856	694 978	841 1186	941 1327	1102 1555
<b>9.300</b>	<b>77</b>	THERMAL HP WITH FANS	165 233	226 319	258 364	426 601	537 757	618 871	707 997	857 1208	959 1352	1123 1585
<b>11.39</b>	<b>63</b>	THERMAL HP WITH FANS	168 237	230 324	263 371	434 612	547 771	630 888	720 1015	873 1231	976 1376	1143 1613
<b>13.95</b>	<b>52</b>	THERMAL HP WITH FANS	171 241	234 330	268 378	442 623	557 785	641 904	733 1034	889 1253	994 1402	1164 1642

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	3.394	3.459	3.287	3.235	3.564	3.471	3.235	3.297	3.394	3.263
4.134	4.138	4.121	4.146	4.150	4.138	4.267	4.137	4.143	4.138	4.061
5.060	5.120	4.966	5.062	4.865	5.027	5.160	5.097	5.005	4.846	4.897
6.200	6.091	6.080	6.297	6.120	6.205	6.268	6.036	6.142	6.406	6.333
7.590	7.368	7.619	7.400	7.408	7.854	7.778	7.505	7.713	7.750	7.524
9.300	9.125	9.222	9.059	9.180	9.600	9.341	9.294	9.053	9.597	9.582
11.39	11.053	11.429	11.100	11.667	11.743	11.655	11.247	11.175	11.228	11.286
13.95	13.688	13.833	13.588	13.500	14.353	13.978	13.928	13.567	13.905	13.884



# Type TDS Right Angle Shaft Speed Reducers Double Reduction

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MECHANICAL CAPACITY										NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	REDUCER SIZE		
1573 461	2328 682	3066 903	4057 1210						MECH HP TORQUE (X1000 IN. LBS.)	213	3.375
1573 566	2328 845	3066 1103	4057 1457						MECH HP TORQUE (X1000 IN. LBS.)	174	4.134
1573 707	2328 1025	3066 1368	4057 1776						MECH HP TORQUE (X1000 IN. LBS.)	142	5.060
1349 736	1975 1072	2592 1395	3360 1826	3608 1950	4511 2534	5195 2834	5668 3124	6603 3548	MECH HP TORQUE (X1000 IN. LBS.)	116	6.200
1113 753	1677 1096	2161 1431	2845 1873	2898 2003	3901 2602	4554 2912	5002 3211	5601 3648	MECH HP TORQUE (X1000 IN. LBS.)	95	7.590
949 770	1391 1118	1743 1462	2342 1914	2597 2060	3293 2659	3677 2982	4084 3289	4621 3737	MECH HP TORQUE (X1000 IN. LBS.)	77	9.300
769 781	1157 1134	1493 1484	1967 1943	2038 2113	2733 2735	3183 3053	3509 3379	3918 3828	MECH HP TORQUE (X1000 IN. LBS.)	63	11.39
654 796	966 1165	1206 1518	1623 1990	1808 2151	2313 2801	2581 3140	2869 3466	3248 3940	MECH HP TORQUE (X1000 IN. LBS.)	52	13.95
THERMAL CAPACITY											
DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1165 1644	1318 1861	1518 2143	1592 2247						THERMAL HP WITH FANS	213	3.375
1187 1676	1344 1897	1548 2184	1622 2290						THERMAL HP WITH FANS	174	4.134
1207 1703	1366 1928	1573 2220	1649 2327						THERMAL HP WITH FANS	142	5.060
1229 1735	1391 1964	1602 2262	1680 2371	1742 2458	1786 2521	1816 2564	1801 2541	1718 2425	THERMAL HP WITH FANS	116	6.200
1250 1764	1415 1997	1630 2300	1708 2411	1771 2500	1816 2564	1847 2607	1831 2584	1747 2466	THERMAL HP WITH FANS	95	7.590
1274 1798	1442 2035	1660 2342	1741 2457	1805 2547	1851 2612	1882 2656	1866 2633	1780 2512	THERMAL HP WITH FANS	77	9.300
1296 1829	1467 2070	1690 2385	1772 2501	1837 2592	1884 2659	1916 2704	1899 2680	1812 2557	THERMAL HP WITH FANS	63	11.39
1320 1863	1495 2110	1721 2429	1805 2547	1871 2640	1919 2708	1951 2753	1934 2729	1846 2605	THERMAL HP WITH FANS	52	13.95
EXACT GEAR RATIO											
DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40		NOMINAL GEAR RATIO	
3.350	3.348	3.366	3.409								3.375
4.114	4.150	4.111	4.103								4.134
5.133	5.029	5.097	5.000								5.060
6.231	6.200	6.148	6.207	6.174	6.417	6.231	6.296	6.138			6.200
7.727	7.462	7.565	7.520	7.895	7.619	7.304	7.333	7.440			7.590
9.263	9.182	9.579	9.333	9.059	9.222	9.263	9.200	9.238			9.300
11.591	11.192	11.348	11.280	11.842	11.429	10.957	11.000	11.160			11.39
13.895	13.773	14.369	14.000	13.588	13.833	13.895	13.800	13.857			13.95

## Nuttall Gear Corporation

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Effective: 15 SEPT 1993  
Supersedes: NEW

# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	172	MECH HP 79 TORQUE (X1000 IN. LBS.) 29	122 45	133 47	185 65	260 100	338 127	516 181	717 256	970 357	1153 408	
4.134	140	MECH HP 79 TORQUE (X1000 IN. LBS.) 35	122 54	133 59	185 83	260 116	338 156	516 231	717 322	970 436	1153 508	
5.060	115	MECH HP 75 TORQUE (X1000 IN. LBS.) 42	105 57	133 73	185 97	260 142	338 189	516 285	717 390	970 511	1153 614	
6.200	94	MECH HP 63 TORQUE (X1000 IN. LBS.) 42	86 57	133 91	185 123	260 175	338 230	507 333	596 398	748 521	906 624	
7.590	76	MECH HP 53 TORQUE (X1000 IN. LBS.) 43	70 58	118 95	185 149	229 196	318 269	415 339	482 404	629 530	781 639	
9.300	62	MECH HP 44 TORQUE (X1000 IN. LBS.) 44	58 59	96 95	151 151	189 198	269 274	342 346	418 412	518 541	626 652	
11.39	51	MECH HP 37 TORQUE (X1000 IN. LBS.) 45	48 60	80 97	121 154	157 201	219 278	288 352	345 420	450 550	537 659	
13.95	42	MECH HP 30 TORQUE (X1000 IN. LBS.) 46	40 61	66 98	107 157	130 204	186 283	236 358	288 425	370 560	446 673	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	172	THERMAL HP WITH FANS	211 281	289 385	330 440	545 725	687 915	791 1053	905 1205	1096 1460	1226 1633	1436 1912
4.134	140	THERMAL HP WITH FANS	220 293	302 401	345 459	569 757	717 955	826 1099	945 1258	1144 1523	1280 1704	1499 1995
5.060	115	THERMAL HP WITH FANS	230 306	314 418	359 479	593 789	748 996	861 1146	985 1311	1193 1588	1334 1776	1562 2080
6.200	94	THERMAL HP WITH FANS	240 320	329 438	376 500	620 825	782 1041	900 1198	1029 1371	1247 1660	1395 1857	1633 2175
7.590	76	THERMAL HP WITH FANS	247 329	338 450	387 515	638 849	805 1071	926 1232	1059 1411	1284 1708	1435 1911	1681 2238
9.300	62	THERMAL HP WITH FANS	253 336	347 462	397 528	654 870	825 1097	950 1264	1086 1448	1317 1752	1472 1958	1724 2295
11.39	51	THERMAL HP WITH FANS	258 343	353 469	404 537	666 886	841 1119	967 1286	1107 1472	1341 1784	1499 1994	1756 2337
13.95	42	THERMAL HP WITH FANS	262 348	359 477	411 547	677 900	855 1138	983 1307	1125 1496	1363 1813	1524 2027	1786 2377

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	DR7	DR8	DR9	DR11	DR12	DR13	DR15	DR16	DR18	DR20
3.375	3.394	3.459	3.287	3.235	3.564	3.471	3.235	3.297	3.394	3.263
4.134	4.138	4.121	4.146	4.150	4.138	4.267	4.137	4.143	4.138	4.061
5.060	5.120	4.966	5.062	4.865	5.027	5.160	5.097	5.005	4.846	4.897
6.200	6.091	6.080	6.297	6.120	6.205	6.268	6.036	6.142	6.406	6.333
7.590	7.368	7.619	7.400	7.408	7.854	7.778	7.505	7.713	7.750	7.524
9.300	9.125	9.222	9.059	9.180	9.600	9.341	9.294	9.053	9.597	9.582
11.39	11.053	11.429	11.100	11.667	11.743	11.655	11.247	11.175	11.228	11.286
13.95	13.688	13.833	13.588	13.500	14.353	13.978	13.928	13.567	13.905	13.884





# Type TDS Right Angle Shaft Speed Reducers Double Reduction

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## MECHANICAL CAPACITY

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1324 481	1967 715	2536 927	3380 1252						MECH HP TORQUE (X1000 IN. LBS.)	172	3.375
1324 591	1967 887	2536 1132	3380 1506						MECH HP TORQUE (X1000 IN. LBS.)	140	4.134
1324 739	1967 1075	2536 1405	3388 1841						MECH HP TORQUE (X1000 IN. LBS.)	115	5.060
1112 753	1622 1093	2137 1428	2778 1874	2985 2003	3738 2607	4315 2922	4708 3221	5485 3659	MECH HP TORQUE (X1000 IN. LBS.)	94	6.200
915 769	1380 1119	1779 1463	2348 1919	2400 2059	3231 2675	3773 2995	4145 3303	4643 3754	MECH HP TORQUE (X1000 IN. LBS.)	76	7.590
779 785	1140 1138	1430 1489	1927 1955	2146 2113	2725 2731	3053 3073	3385 3384	3830 3845	MECH HP TORQUE (X1000 IN. LBS.)	62	9.300
632 796	951 1157	1227 1514	1621 1987	1673 2154	2258 2805	2632 3134	2893 3459	3242 3932	MECH HP TORQUE (X1000 IN. LBS.)	51	11.39
537 811	789 1181	990 1547	1335 2031	1481 2187	1908 2869	2122 3205	2359 3538	2671 4023	MECH HP TORQUE (X1000 IN. LBS.)	42	13.95

## THERMAL CAPACITY

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1629 2169	1844 2455	2124 2827	2226 2964						THERMAL HP WITH FANS	172	3.375
1700 2264	1925 2562	2216 2951	2324 3094						THERMAL HP WITH FANS	140	4.134
1772 2360	2006 2671	2310 3076	2422 3225						THERMAL HP WITH FANS	115	5.060
1853 2467	2098 2793	2416 3216	2533 3372	2626 3496	2693 3585	2738 3646	2714 3614	2590 3449	THERMAL HP WITH FANS	94	6.200
1907 2539	2159 2874	2486 3310	2606 3470	2702 3598	2771 3690	2818 3752	2794 3719	2666 3550	THERMAL HP WITH FANS	76	7.590
1956 2604	2214 2947	2550 3395	2673 3558	2772 3690	2842 3783	2891 3849	2865 3814	2735 3641	THERMAL HP WITH FANS	62	9.300
1992 2652	2255 3002	2597 3457	2723 3625	2823 3758	2895 3854	2944 3919	2918 3885	2785 3708	THERMAL HP WITH FANS	51	11.39
2025 2696	2292 3051	2640 3514	2768 3685	2870 3821	2943 3918	2993 3985	2967 3950	2831 3769	THERMAL HP WITH FANS	42	13.95

## EXACT GEAR RATIO

DR22	WDR25	WDR28	WDR30	WDR32	WDR34	WDR36	WDR38	WDR40	NOMINAL GEAR RATIO
3.350	3.348	3.366	3.409						3.375
4.114	4.150	4.111	4.103						4.134
5.133	5.029	5.097	5.000						5.060
6.231	6.200	6.148	6.207	6.174	6.417	6.231	6.296	6.138	6.200
7.727	7.462	7.565	7.520	7.895	7.619	7.304	7.333	7.440	7.590
9.263	9.182	9.579	9.333	9.059	9.222	9.263	9.200	9.238	9.300
11.591	11.192	11.348	11.280	11.842	11.429	10.957	11.000	11.160	11.39
13.895	13.773	14.369	14.000	13.588	13.833	13.895	13.800	13.857	13.95

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	100	MECH HP 66 TORQUE (X1000 IN. LBS.) 42	94	147	233	314	434	525	636	844	1008	
			57	93	145	189	263	332	395	517	620	
20.93	84	MECH HP 56 TORQUE (X1000 IN. LBS.) 43	78	127	196	263	375	436	534	696	834	
			58	94	147	193	266	335	402	525	633	
25.63	68	MECH HP 46 TORQUE (X1000 IN. LBS.) 44	64	103	165	215	293	370	440	598	718	
			59	96	151	197	273	344	409	534	646	
31.39	56	MECH HP 39 TORQUE (X1000 IN. LBS.) 45	54	86	133	182	246	298	362	476	570	
			60	97	153	200	279	351	418	546	658	
38.44	45	MECH HP 32 TORQUE (X1000 IN. LBS.) 46	45	71	111	151	199	248	300	389	467	
			61	99	155	203	283	356	423	553	668	
47.08	37	MECH HP 26 TORQUE (X1000 IN. LBS.) 46	37	59	91	125	168	205	248	333	400	
			62	100	158	206	287	362	430	562	679	
57.66	30	MECH HP 22 TORQUE (X1000 IN. LBS.) 47	31	49	77	104	137	171	209	277	331	
			63	103	162	210	292	370	443	579	696	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	100	THERMAL HP WITH FANS	43	59	68	112	141	163	186	226	252	296
			86	118	136	224	282	326	372	452	504	592
20.93	84	THERMAL HP WITH FANS	45	61	70	116	146	168	193	233	261	306
			90	122	140	232	292	336	386	466	522	612
25.63	68	THERMAL HP WITH FANS	47	64	73	120	152	175	200	242	271	317
			94	128	146	240	304	350	400	484	542	634
31.39	56	THERMAL HP WITH FANS	48	65	75	123	155	178	204	247	276	324
			96	130	150	246	310	356	408	494	552	648
38.44	45	THERMAL HP WITH FANS	49	67	77	127	160	185	211	256	286	335
			98	134	154	254	320	370	422	512	572	670
47.08	37	THERMAL HP WITH FANS	50	68	78	129	163	187	214	260	291	340
			100	136	156	258	326	374	428	520	582	680
57.66	30	THERMAL HP WITH FANS	51	69	79	131	165	190	217	263	294	344
			102	138	158	262	330	380	434	526	588	688

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	17.488	16.723	17.471	17.212	16.686	16.799	17.550	17.230	16.992	17.079
20.93	21.333	20.400	20.462	20.738	20.374	19.690	21.292	20.902	20.936	21.073
25.63	26.517	25.357	25.717	25.393	25.346	25.828	25.765	25.800	24.793	24.956
31.39	31.765	30.375	31.111	31.821	30.379	31.481	32.612	32.016	31.831	32.041
38.44	38.865	37.165	38.528	38.516	37.189	39.397	39.862	39.133	39.420	39.679
47.08	47.647	45.563	46.667	47.731	45.568	47.222	48.918	48.024	46.811	47.119
57.66	58.298	55.747	57.792	57.775	55.783	59.095	59.792	58.700	57.971	58.352



# Type TDS Right Angle Shaft Speed Reducers Triple Reduction

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## MECHANICAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1162 746	1679 1086	2279 1413	3030 1850	3324 1990	4250 2573	4694 2873	5191 3174	5828 3598	MECH HP TORQUE (X1000 IN. LBS.)	100	17.09
1046 762	1468 1112	1842 1448	2577 1897	2717 2030	3602 2642	3987 2957	4401 3261	4951 3704	MECH HP TORQUE (X1000 IN. LBS.)	84	20.93
848 777	1190 1133	1619 1480	2153 1938	2311 2095	2990 2704	3311 3028	3677 3359	4136 3815	MECH HP TORQUE (X1000 IN. LBS.)	68	25.63
714 792	1037 1157	1323 1507	1816 1975	1817 2149	2545 2770	2831 3116	3145 3458	3539 3929	MECH HP TORQUE (X1000 IN. LBS.)	56	31.39
585 804	850 1176	1083 1535	1440 2012	1546 2192	2108 2824	2355 3190	2618 3542	2946 4025	MECH HP TORQUE (X1000 IN. LBS.)	45	38.44
492 817	715 1195	948 1565	1283 2052	1294 2218	1774 2896	1968 3249	2187 3607	2462 4100	MECH HP TORQUE (X1000 IN. LBS.)	37	47.08
407 836	584 1210	756 1605	989 2103	1115 2255	1480 2974	1652 3356	1836 3727	2069 4239	MECH HP TORQUE (X1000 IN. LBS.)	30	57.66

## THERMAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
335 670	380 760	437 874	458 916	475 950	487 974	495 990	491 982	469 938	THERMAL HP WITH FANS	100	17.09
347 694	392 784	452 904	474 948	491 982	504 1008	512 1024	508 1016	485 970	THERMAL HP WITH FANS	84	20.93
360 720	407 814	469 938	491 982	510 1020	523 1046	531 1062	527 1054	503 1006	THERMAL HP WITH FANS	68	25.63
367 734	416 832	479 958	502 1004	521 1042	534 1068	543 1086	538 1076	514 1028	THERMAL HP WITH FANS	56	31.39
380 760	430 860	495 990	519 1038	538 1076	552 1104	561 1122	557 1114	531 1062	THERMAL HP WITH FANS	45	38.44
386 772	437 874	503 1006	528 1056	547 1094	561 1122	570 1140	565 1130	540 1080	THERMAL HP WITH FANS	37	47.08
391 782	442 884	509 1018	534 1068	554 1108	568 1136	577 1154	572 1144	546 1092	THERMAL HP WITH FANS	30	57.66

## EXACT GEAR RATIO

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	NOMINAL GEAR RATIO
17.823	17.952	17.209	16.949	16.621	16.808	16.995	16.977	17.141	17.09
20.214	21.025	21.826	20.438	20.739	20.366	20.593	20.572	20.770	20.93
25.443	26.425	25.373	24.988	25.172	25.110	25.390	25.364	25.608	25.63
30.779	30.958	31.607	30.189	32.833	30.219	30.557	30.525	30.819	31.39
38.116	38.393	39.329	38.790	39.359	37.186	37.601	37.561	37.925	38.44
46.057	46.392	45.794	44.396	47.570	45.329	45.835	45.787	46.229	47.08
56.988	57.451	58.937	59.045	56.135	55.779	56.402	56.343	56.887	57.66

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	68	MECH HP 46 TORQUE (X1000 IN. LBS.) 44	65	59	100	161	218	300	363	440	585	700
20.93	56	MECH HP 38 TORQUE (X1000 IN. LBS.) 44	53	59	87	136	181	260	302	369	481	577
25.63	45	MECH HP 32 TORQUE (X1000 IN. LBS.) 46	44	61	71	113	148	202	256	304	414	496
31.39	37	MECH HP 26 TORQUE (X1000 IN. LBS.) 46	37	62	59	92	125	169	206	249	328	394
38.44	30	MECH HP 22 TORQUE (X1000 IN. LBS.) 47	31	63	49	77	104	138	172	208	270	375
47.08	25	MECH HP 19 TORQUE (X1000 IN. LBS.) 49	26	65	41	64	88	118	145	175	234	281
57.66	20	MECH HP 15 TORQUE (X1000 IN. LBS.) 50	22	67	34	54	73	96	121	148	196	234

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	68	THERMAL HP WITH FANS	79	109	124	205	259	298	340	413	461	540
20.93	56	THERMAL HP WITH FANS	81	111	127	210	265	305	348	422	472	553
25.63	45	THERMAL HP WITH FANS	83	113	130	214	270	310	355	430	481	563
31.39	37	THERMAL HP WITH FANS	85	116	133	219	276	318	364	441	493	577
38.44	30	THERMAL HP WITH FANS	86	118	135	223	281	324	370	449	502	588
47.08	25	THERMAL HP WITH FANS	88	120	137	227	286	329	376	456	510	597
57.66	20	THERMAL HP WITH FANS	89	122	140	230	290	334	382	463	518	607

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	17.488	16.723	17.471	17.212	16.686	16.799	17.550	17.230	16.992	17.079
20.93	21.333	20.400	20.462	20.738	20.374	19.690	21.292	20.902	20.936	21.073
25.63	26.517	25.357	25.717	25.393	25.346	25.828	25.765	25.800	24.793	24.956
31.39	31.765	30.375	31.111	31.821	30.379	31.481	32.612	32.016	31.831	32.041
38.44	38.865	37.165	38.528	38.516	37.189	39.397	39.862	39.133	39.420	39.679
47.08	47.647	45.563	46.667	47.731	45.568	47.222	48.918	48.024	46.811	47.119
57.66	58.298	55.747	57.792	57.775	55.783	59.095	59.792	58.700	57.971	58.352



# Type TDS Right Angle Shaft Speed Reducers Triple Reduction

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## MECHANICAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
809 777	1171 1133	1596 1480	2122 1938	2339 2095	2986 2704	3307 3028	3673 3359	4131 3815	MECH HP TORQUE (X1000 IN. LBS.)	68	17.09
727 792	1021 1157	1281 1507	1793 1975	1923 2149	2524 2770	2809 3116	3120 3458	3511 3929	MECH HP TORQUE (X1000 IN. LBS.)	56	20.93
587 805	825 1175	1123 1535	1494 2012	1609 2183	2095 2834	2321 3175	2580 3525	2903 4005	MECH HP TORQUE (X1000 IN. LBS.)	45	25.63
494 819	716 1195	916 1561	1258 2047	1255 2221	1779 2897	1980 3260	2201 3620	2478 4115	MECH HP TORQUE (X1000 IN. LBS.)	37	31.39
406 835	583 1207	756 1603	1005 2101	1066 2260	1476 2957	1655 3353	1840 3724	2073 4236	MECH HP TORQUE (X1000 IN. LBS.)	30	38.44
346 859	488 1220	671 1657	897 2147	891 2284	1258 3073	1396 3447	1552 3829	1749 4356	MECH HP TORQUE (X1000 IN. LBS.)	25	47.08
288 885	398 1234	535 1701	681 2167	766 2317	1057 3176	1180 3585	1312 3983	1479 4533	MECH HP TORQUE (X1000 IN. LBS.)	20	57.66

## THERMAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
613 1024	694 1159	799 1334	838 1399	868 1450	891 1488	906 1513	898 1500	857 1431	THERMAL HP WITH FANS	68	17.09
627 1047	710 1186	818 1366	857 1431	889 1485	911 1521	927 1548	919 1535	877 1465	THERMAL HP WITH FANS	56	20.93
639 1067	723 1207	833 1391	873 1458	905 1511	928 1550	944 1576	936 1563	893 1491	THERMAL HP WITH FANS	45	25.63
655 1094	741 1237	853 1425	895 1495	927 1548	951 1588	967 1615	959 1602	915 1528	THERMAL HP WITH FANS	37	31.39
667 1114	755 1261	870 1453	912 1523	945 1578	969 1618	986 1647	977 1632	933 1558	THERMAL HP WITH FANS	30	38.44
677 1131	767 1281	883 1475	926 1546	960 1603	984 1643	1001 1672	992 1657	947 1581	THERMAL HP WITH FANS	25	47.08
688 1149	779 1301	897 1498	941 1571	975 1628	1000 1670	1017 1698	1008 1683	962 1607	THERMAL HP WITH FANS	20	57.66

## EXACT GEAR RATIO

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	NOMINAL GEAR RATIO
17.823	17.952	17.209	16.949	16.621	16.808	16.995	16.977	17.141	17.09
20.214	21.025	21.826	20.438	20.739	20.366	20.593	20.572	20.770	20.93
25.443	26.425	25.373	24.988	25.172	25.110	25.390	25.364	25.608	25.63
30.779	30.958	31.607	30.189	32.833	30.219	30.557	30.525	30.819	31.39
38.116	38.393	39.329	38.790	39.359	37.186	37.601	37.561	37.925	38.44
46.057	46.392	45.794	44.396	47.570	45.329	45.835	45.787	46.229	47.08
56.988	57.451	58.937	59.045	56.135	55.779	56.402	56.343	56.887	57.66

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	51	MECH HP 35 TORQUE (X1000 IN. LBS.) 45	49	76	123	166	229	276	337	445	534	661
20.93	42	MECH HP 29 TORQUE (X1000 IN. LBS.) 46	41	66	103	138	197	230	282	367	438	669
25.63	34	MECH HP 24 TORQUE (X1000 IN. LBS.) 47	34	54	86	113	154	195	231	315	379	686
31.39	27.5	MECH HP 20 TORQUE (X1000 IN. LBS.) 48	29	46	71	96	130	159	193	254	304	707
38.44	22.5	MECH HP 17 TORQUE (X1000 IN. LBS.) 49	24	38	60	81	107	133	161	209	252	725
47.08	18.5	MECH HP 14 TORQUE (X1000 IN. LBS.) 50	20	32	49	68	91	112	135	181	218	745
57.66	15.0	MECH HP 12 TORQUE (X1000 IN. LBS.) 52	17	27	42	56	75	93	114	151	181	767

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	51	THERMAL HP WITH FANS	127 191	173 260	198 297	327 491	412 618	474 711	543 815	657 986	735 1103	861 1292
20.93	42	THERMAL HP WITH FANS	129 194	177 266	203 305	334 501	422 633	485 728	555 833	673 1010	752 1128	881 1322
25.63	34	THERMAL HP WITH FANS	132 198	181 272	207 311	341 512	430 645	494 741	566 849	685 1028	766 1149	898 1347
31.39	27.5	THERMAL HP WITH FANS	134 201	183 275	209 314	345 518	435 653	501 752	573 860	694 1041	776 1164	909 1364
38.44	22.5	THERMAL HP WITH FANS	135 203	185 278	211 317	348 522	439 659	506 759	578 867	701 1052	784 1176	918 1377
47.08	18.5	THERMAL HP WITH FANS	136 204	186 279	212 318	350 525	442 663	508 762	581 872	705 1058	788 1182	923 1385
57.66	15.0	THERMAL HP WITH FANS	136 204	187 281	213 320	352 528	444 666	511 767	584 876	708 1062	791 1187	927 1391

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	17.488	16.723	17.471	17.212	16.686	16.799	17.550	17.230	16.992	17.079
20.93	21.333	20.400	20.462	20.738	20.374	19.690	21.292	20.902	20.936	21.073
25.63	26.517	25.357	25.717	25.393	25.346	25.828	25.765	25.800	24.793	24.956
31.39	31.765	30.375	31.111	31.821	30.379	31.481	32.612	32.016	31.831	32.041
38.44	38.865	37.165	38.528	38.516	37.189	39.397	39.862	39.133	39.420	39.679
47.08	47.647	45.563	46.667	47.731	45.568	47.222	48.918	48.024	46.811	47.119
57.66	58.298	55.747	57.792	57.775	55.783	59.095	59.792	58.700	57.971	58.352



# Type TDS Right Angle Shaft Speed Reducers Triple Reduction

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## MECHANICAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
616 796	889 1157	1214 1514	1618 1987	1788 2154	2303 2805	2545 3134	2812 3459	3166 3932	MECH HP TORQUE (X1000 IN. LBS.)	51	17.09
553 811	775 1181	978 1547	1371 2031	1455 2187	1944 2869	2148 3205	2374 3538	2673 4023	MECH HP TORQUE (X1000 IN. LBS.)	42	20.93
447 825	626 1199	859 1579	1142 2068	1225 2234	1608 2926	1783 3280	1982 3642	2231 4140	MECH HP TORQUE (X1000 IN. LBS.)	34	25.63
380 849	541 1214	709 1625	973 2129	954 2269	1379 3020	1538 3405	1710 3782	1926 4300	MECH HP TORQUE (X1000 IN. LBS.)	27.5	31.39
315 871	440 1225	587 1674	766 2155	808 2306	1153 3106	1293 3522	1437 3912	1620 4452	MECH HP TORQUE (X1000 IN. LBS.)	22.5	38.44
268 895	368 1238	520 1728	677 2179	675 2328	981 3223	1089 3617	1211 4018	1359 4554	MECH HP TORQUE (X1000 IN. LBS.)	18.5	47.08
223 922	300 1250	415 1774	513 2198	580 2359	823 3327	919 3757	1022 4174	1122 4625	MECH HP TORQUE (X1000 IN. LBS.)	15.0	57.66

## THERMAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
977 1466	1106 1659	1273 1910	1335 2003	1384 2076	1419 2129	1444 2166	1431 2147	1366 2049	THERMAL HP WITH FANS	51	17.09
1000 1500	1132 1698	1303 1955	1366 2049	1417 2126	1453 2180	1477 2216	1464 2196	1398 2097	THERMAL HP WITH FANS	42	20.93
1018 1527	1153 1730	1328 1992	1392 2088	1443 2165	1480 2220	1505 2258	1492 2238	1424 2136	THERMAL HP WITH FANS	34	25.63
1031 1547	1167 1751	1344 2016	1409 2114	1461 2192	1498 2247	1523 2285	1510 2265	1441 2162	THERMAL HP WITH FANS	27.5	31.39
1041 1562	1179 1769	1358 2037	1423 2135	1476 2214	1513 2270	1539 2309	1525 2288	1456 2184	THERMAL HP WITH FANS	22.5	38.44
1047 1571	1185 1778	1365 2048	1431 2147	1484 2226	1521 2282	1547 2321	1534 2301	1464 2196	THERMAL HP WITH FANS	18.5	47.08
1052 1578	1191 1787	1371 2057	1437 2156	1490 2235	1528 2292	1554 2331	1540 2310	1470 2205	THERMAL HP WITH FANS	15.0	57.66

## EXACT GEAR RATIO

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL GEAR RATIO
17.823	17.952	17.209	16.949	16.621	16.808	16.995	16.977	17.141		17.09
20.214	21.025	21.826	20.438	20.739	20.366	20.593	20.572	20.770		20.93
25.443	26.425	25.373	24.988	25.172	25.110	25.390	25.364	25.608		25.63
30.779	30.958	31.607	30.189	32.833	30.219	30.557	30.525	30.819		31.39
38.116	38.393	39.329	38.790	39.359	37.186	37.601	37.561	37.925		38.44
46.057	46.392	45.794	44.396	47.570	45.329	45.835	45.787	46.229		47.08
56.988	57.451	58.937	59.045	56.135	55.779	56.402	56.343	56.887		57.66

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	42	MECH HP 29 TORQUE (X1000 IN. LBS.) 45	41 61	64 99	102 155	139 204	193 284	233 358	281 425	374 557	447 669	
20.93	34	MECH HP 24 TORQUE (X1000 IN. LBS.) 46	34 61	55 100	86 157	115 206	166 287	193 360	235 431	308 565	369 682	
25.63	28	MECH HP 20 TORQUE (X1000 IN. LBS.) 48	28 64	46 104	73 163	95 212	130 296	165 374	197 445	268 582	322 705	
31.39	23	MECH HP 17 TORQUE (X1000 IN. LBS.) 49	24 66	39 107	60 168	82 219	110 305	135 386	164 460	215 601	258 726	
38.44	19	MECH HP 14 TORQUE (X1000 IN. LBS.) 50	20 67	32 109	51 172	69 225	90 313	113 396	136 469	177 614	214 744	
47.08	15	MECH HP 12 TORQUE (X1000 IN. LBS.) 52	17 69	27 112	42 177	57 231	77 322	95 408	114 483	154 633	185 764	
57.66	12.5	MECH HP 10 TORQUE (X1000 IN. LBS.) 53	14 71	22 115	36 182	48 236	63 329	79 417	97 499	128 653	154 787	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	42	THERMAL HP WITH FANS	174 245	239 337	273 385	451 636	568 801	654 922	748 1055	907 1279	1014 1430	1188 1675
20.93	34	THERMAL HP WITH FANS	178 251	244 344	279 393	460 649	580 818	667 940	763 1076	925 1304	1034 1458	1212 1709
25.63	28	THERMAL HP WITH FANS	181 255	248 350	283 399	467 658	589 830	678 956	775 1093	939 1324	1050 1481	1230 1734
31.39	23	THERMAL HP WITH FANS	183 258	250 353	286 403	472 666	595 839	685 966	784 1105	950 1340	1062 1497	1244 1754
38.44	19	THERMAL HP WITH FANS	184 259	253 357	289 407	476 671	601 847	691 974	791 1115	958 1351	1072 1512	1255 1770
47.08	15	THERMAL HP WITH FANS	185 261	254 358	290 409	478 674	604 852	695 980	795 1121	963 1358	1077 1519	1262 1779
57.66	12.5	THERMAL HP WITH FANS	186 262	255 360	291 410	481 678	606 854	698 984	798 1125	967 1363	1082 1526	1267 1786

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	17.488	16.723	17.471	17.212	16.686	16.799	17.550	17.230	16.992	17.079
20.93	21.333	20.400	20.462	20.738	20.374	19.690	21.292	20.902	20.936	21.073
25.63	26.517	25.357	25.717	25.393	25.346	25.828	25.765	25.800	24.793	24.956
31.39	31.765	30.375	31.111	31.821	30.379	31.481	32.612	32.016	31.831	32.041
38.44	38.865	37.165	38.528	38.516	37.189	39.397	39.862	39.133	39.420	39.679
47.08	47.647	45.563	46.667	47.731	45.568	47.222	48.918	48.024	46.811	47.119
57.66	58.298	55.747	57.792	57.775	55.783	59.095	59.792	58.700	57.971	58.352



# Type TDS Right Angle Shaft Speed Reducers Triple Reduction

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## MECHANICAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
519 811	751 1181	1027 1547	1368 2031	1503 2187	1950 2869	2154 3205	2380 3538	2681 4023	MECH HP TORQUE (X1000 IN. LBS.)	42	17.09
466 825	651 1199	826 1579	1155 2068	1230 2234	1641 2926	1819 3286	2022 3642	2277 4140	MECH HP TORQUE (X1000 IN. LBS.)	34	20.93
380 847	523 1211	731 1624	972 2128	1027 2264	1371 3014	1519 3376	1689 3750	1900 4260	MECH HP TORQUE (X1000 IN. LBS.)	28	25.63
324 873	452 1225	603 1670	814 2153	799 2299	1177 3115	1313 3513	1460 3902	1645 4440	MECH HP TORQUE (X1000 IN. LBS.)	23	31.39
268 895	367 1236	499 1720	640 2176	677 2333	983 3202	1102 3630	1226 4034	1373 4561	MECH HP TORQUE (X1000 IN. LBS.)	19	38.44
227 919	307 1248	442 1775	565 2198	565 2355	836 3319	928 3726	1032 4140	1139 4610	MECH HP TORQUE (X1000 IN. LBS.)	15	47.08
189 946	250 1260	352 1818	428 2217	485 2385	701 3424	783 3867	866 4271	939 4679	MECH HP TORQUE (X1000 IN. LBS.)	12.5	57.66

## THERMAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1347 1899	1525 2150	1756 2476	1841 2596	1909 2692	1958 2761	1991 2807	1973 2782	1883 2655	THERMAL HP WITH FANS	42	17.09
1374 1937	1556 2194	1791 2525	1878 2648	1947 2745	1997 2816	2031 2864	2013 2838	1921 2709	THERMAL HP WITH FANS	34	20.93
1396 1968	1580 2228	1819 2565	1907 2689	1977 2788	2028 2859	2062 2907	2044 2882	1951 2751	THERMAL HP WITH FANS	28	25.63
1411 1990	1598 2253	1840 2594	1929 2720	2000 2820	2051 2892	2085 2940	2067 2914	1973 2782	THERMAL HP WITH FANS	23	31.39
1424 2008	1612 2273	1856 2617	1946 2744	2017 2844	2069 2917	2104 2967	2085 2940	1990 2806	THERMAL HP WITH FANS	19	38.44
1431 2018	1620 2284	1865 2630	1956 2758	2027 2858	2079 2931	2114 2981	2096 2955	2000 2820	THERMAL HP WITH FANS	15	47.08
1437 2026	1627 2294	1874 2642	1964 2769	2036 2871	2088 2944	2124 2995	2105 2968	2009 2833	THERMAL HP WITH FANS	12.5	57.66

## EXACT GEAR RATIO

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL GEAR RATIO
17.823	17.952	17.209	16.949	16.621	16.808	16.995	16.977	17.141		17.09
20.214	21.025	21.826	20.438	20.739	20.366	20.593	20.572	20.770		20.93
25.443	26.425	25.373	24.988	25.172	25.110	25.390	25.364	25.608		25.63
30.779	30.958	31.607	30.189	32.833	30.219	30.557	30.525	30.819		31.39
38.116	38.393	39.329	38.790	39.359	37.186	37.601	37.561	37.925		38.44
46.057	46.392	45.794	44.396	47.570	45.329	45.835	45.787	46.229		47.08
56.988	57.451	58.937	59.045	56.135	55.779	56.402	56.343	56.887		57.66

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	34	MECH HP 24 TORQUE (X1000 IN. LBS.) 46	34 62	52 99	85 160	114 208	156 286	190 363	231 434	306 565	368 683	
20.93	28	MECH HP 20 TORQUE (X1000 IN. LBS.) 47	28 63	46 103	71 161	95 212	136 292	160 372	196 447	254 580	306 701	
25.63	22.6	MECH HP 17 TORQUE (X1000 IN. LBS.) 49	24 66	38 107	60 168	79 219	108 305	137 386	163 458	222 600	267 726	
31.39	18.5	MECH HP 14 TORQUE (X1000 IN. LBS.) 50	20 68	32 110	50 173	68 225	91 314	112 398	136 474	179 620	214 748	
38.44	15.1	MECH HP 12 TORQUE (X1000 IN. LBS.) 52	17 69	26 112	42 177	57 231	75 323	94 408	113 483	147 633	177 767	
47.08	12.3	MECH HP 10 TORQUE (X1000 IN. LBS.) 53	14 71	22 115	35 182	48 238	64 331	78 418	95 498	128 651	153 787	
57.66	10.1	MECH HP 8.5 TORQUE (X1000 IN. LBS.) 54	11 72	18 117	29 184	39 241	52 336	65 423	79 506	105 662	125 798	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	34	THERMAL HP WITH FANS	266 354	364 484	417 555	687 914	867 1153	997 1326	1141 1518	1382 1838	1545 2055	1811 2409
20.93	28	THERMAL HP WITH FANS	569 358	368 478	421 560	694 923	876 1165	1008 1341	1153 1533	1397 1858	1562 2077	1830 2434
25.63	22.6	THERMAL HP WITH FANS	271 360	371 493	424 564	699 930	882 1173	1015 1350	1161 1544	1407 1871	1574 2093	1844 2453
31.39	18.5	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
38.44	15.1	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
47.08	12.3	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
57.66	10.1	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	TR7	TR8	TR9	TR11	TR12	TR13	TR15	TR16	TR18	TR20
17.09	17.488	16.723	17.471	17.212	16.686	16.799	17.550	17.230	16.992	17.079
20.93	21.333	20.400	20.462	20.738	20.374	19.690	21.292	20.902	20.936	21.073
25.63	26.517	25.357	25.717	25.393	25.346	25.828	25.765	25.800	24.793	24.956
31.39	31.765	30.375	31.111	31.821	30.379	31.481	32.612	32.016	31.831	32.041
38.44	38.865	37.165	38.528	38.516	37.189	39.397	39.862	39.133	39.420	39.679
47.08	47.647	45.563	46.667	47.731	45.568	47.222	48.918	48.024	46.811	47.119
57.66	58.298	55.747	57.792	57.775	55.783	59.095	59.792	58.700	57.971	58.352

# Type TDS Right Angle Shaft Speed Reducers Triple Reduction

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## MECHANICAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
426 825	614 1199	844 1579	1122 2068	1236 2234	1602 2926	1776 3280	1974 3642	2222 4140	MECH HP TORQUE (X1000 IN. LBS.)	34	17.09
385 847	530 1211	684 1624	958 2128	1004 2264	1361 3014	1508 3376	1677 3750	1887 4760	MECH HP TORQUE (X1000 IN. LBS.)	28	20.93
315 873	426 1225	607 1676	792 2153	840 2298	1144 3123	1268 3499	1410 3887	1589 4423	MECH HP TORQUE (X1000 IN. LBS.)	22.6	25.63
268 899	368 1238	501 1723	663 2177	653 2330	982 3225	1095 3637	1218 4041	1362 4564	MECH HP TORQUE (X1000 IN. LBS.)	18.5	31.39
222 922	299 1248	414 1773	521 2198	552 2364	819 3312	919 3756	1022 4173	1122 4625	MECH HP TORQUE (X1000 IN. LBS.)	15.1	38.44
189 946	249 1260	366 1822	460 2221	461 2384	696 3431	773 3852	857 4265	929 4671	MECH HP TORQUE (X1000 IN. LBS.)	12.3	47.08
155 965	203 1271	288 1846	348 2237	395 2412	578 3507	644 3951	706 4323	766 4737	MECH HP TORQUE (X1000 IN. LBS.)	10.1	57.66

## THERMAL CAPACITY

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
2054 2732	2325 3092	2677 3560	2807 3733	2910 3870	2984 3969	3035 4037	3008 4001	2871 3818	THERMAL HP WITH FANS	34	17.09
2076 2761	2350 3126	2706 3599	2837 3773	2941 3912	3016 4011	3068 4080	3041 4110	2902 3860	THERMAL HP WITH FANS	28	20.93
2091 2781	2367 3148	2726 3626	2858 3801	2963 3941	3038 4041	3090 4074	3063 4074	2923 3888	THERMAL HP WITH FANS	22.6	25.63
2094 2785	2370 3152	2729 3629	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3888	THERMAL HP WITH FANS	18.5	31.39
2094 2785	2370 3152	2729 3629	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3888	THERMAL HPS WITH FAN	15.1	38.44
2094 2785	2370 3152	2729 3629	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3888	THERMAL HP WITH FANS	12.3	47.08
2094 2785	2370 3152	2729 3629	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3888	THERMAL HP WITH FANS	10.1	57.66

## EXACT GEAR RATIO

TR22	WTR25	WTR28	WTR30	WTR32	WTR34	WTR36	WTR38	WTR40	NOMINAL GEAR RATIO
17.823	17.952	17.209	16.949	16.621	16.808	16.995	16.977	17.141	17.09
20.214	21.025	21.826	20.438	20.739	20.366	20.593	20.572	20.770	20.93
25.443	26.425	25.373	24.988	25.172	25.110	25.390	25.364	25.608	25.63
30.779	30.958	31.607	30.189	32.833	30.219	30.557	30.525	30.819	31.39
38.116	38.393	39.329	38.790	39.359	37.186	37.601	37.561	37.925	38.44
46.057	46.392	45.794	44.396	47.570	45.329	45.835	45.787	46.229	47.08
56.988	57.451	58.937	59.045	56.135	55.779	56.402	56.343	56.887	57.66

# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	25	MECH HP 18 TORQUE (X1000 IN. LBS.) 48	25 65	41 105	66 166	87 217	121 303	148 383	172 455	234 596	278 714	
86.50	20	MECH HP 16 TORQUE (X1000 IN. LBS.) 50	21 67	35 108	56 171	73 221	97 309	122 390	142 465	195 608	234 734	
105.9	16.5	MECH HP 13 TORQUE (X1000 IN. LBS.) 51	17 69	29 112	47 175	61 230	86 320	106 405	124 482	163 630	194 755	
129.7	13.5	MECH HP 11 TORQUE (X1000 IN. LBS.) 52	14 70	24 114	38 180	49 235	70 328	90 416	105 496	140 649	166 778	
158.9	11.0	MECH HP 9.4 TORQUE (X1000 IN. LBS.) 53	12 72	20 116	32 183	40 240	59 335	73 422	86 503	116 658	138 793	
194.6	9.0	MECH HP 8.0 TORQUE (X1000 IN. LBS.) 54	10 72	16 117	26 185	34 244	48 340	61 427	72 510	96 667	114 804	
238.4	7.5	MECH HP 6.5 TORQUE (X1000 IN. LBS.) 55	8.4 74	13 119	22 189	28 248	40 343	50 436	60 523	80 686	95 815	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	25	THERMAL HP WITH FANS	51 102	70 140	80 160	131 262	166 332	191 382	218 436	264 528	295 590	346 692
86.50	20	THERMAL HP WITH FANS	51 102	70 140	80 160	132 264	166 332	191 382	219 438	265 530	296 592	347 694
105.9	16.5	THERMAL HP WITH FANS	51 102	70 140	80 160	132 264	167 334	192 384	220 440	266 532	297 594	348 696
129.7	13.5	THERMAL HP WITH FANS	51 102	70 140	81 162	133 266	168 336	193 386	221 442	267 534	299 598	350 700
158.9	11.0	THERMAL HP WITH FANS	52 104	71 142	81 162	133 266	168 336	194 388	222 444	269 538	300 600	352 704
194.6	9.0	THERMAL HP WITH FANS	52 104	71 142	82 164	134 268	170 340	195 390	223 446	270 540	302 604	354 708
238.4	7.5	THERMAL HP WITH FANS	52 104	72 144	82 164	135 270	171 342	197 394	225 450	273 546	305 610	357 714

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	71.744	70.455	70.909	69.682	68.651	69.396	71.529	73.122	70.670	71.135
86.50	85.115	86.625	85.655	84.173	83.747	87.891	88.696	90.476	86.291	86.859
105.9	109.181	108.675	105.120	103.301	104.095	102.540	105.668	107.633	107.346	108.052
129.7	125.226	131.305	132.000	129.716	133.011	128.582	128.000	130.208	128.664	129.510
158.9	157.315	162.422	160.000	157.232	164.185	155.708	158.706	161.248	157.506	158.542
194.6	187.839	196.958	198.000	194.574	199.516	192.872	192.000	195.312	192.996	194.265
238.4	235.973	243.633	240.000	235.848	246.277	233.563	238.059	241.873	236.259	237.813



# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

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#### MECHANICAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
328 857	477 1222	618 1654	834 2146	917 2284	1205 3058	1311 3472	1458 3857	1728 4388	MECH HP TORQUE (X1000 IN. LBS.)	25	70.62
282 882	396 1230	506 1691	682 2163	755 2316	1071 3188	1185 3560	1276 3954	1438 4500	MECH HP TORQUE (X1000 IN. LBS.)	20	86.50
239 908	331 1245	430 1748	583 2187	646 2347	875 3272	984 3715	1090 4113	1206 4594	MECH HP TORQUE (X1000 IN. LBS.)	16.5	105.9
198 936	264 1257	366 1807	459 2211	509 2375	747 3381	839 3838	931 4253	1011 4659	MECH HP TORQUE (X1000 IN. LBS.)	13.5	129.7
169 958	217 1267	309 1830	373 2226	415 2399	620 3472	692 3923	760 4301	825 4712	MECH HP TORQUE (X1000 IN. LBS.)	11.0	158.9
137 971	179 1277	265 1855	317 2246	353 2423	521 3527	582 3985	636 4350	690 4766	MECH HP TORQUE (X1000 IN. LBS.)	9.0	194.6
115 982	147 1285	210 1872	258 2267	288 2449	437 3603	482 4086	520 4402	576 4923	MECH HP TORQUE (X1000 IN. LBS.)	7.5	238.4

#### THERMAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
393 786	444 888	512 1024	537 1074	556 1112	570 1140	580 1160	576 1152	549 1098	THERMAL HP WITH FANS	25	70.62
394 788	446 892	513 1026	538 1076	558 1116	522 1144	582 1164	578 1156	550 1100	THERMAL HP WITH FANS	20	86.50
395 790	447 894	515 1030	540 1080	560 1170	574 1148	584 1168	580 1160	553 1106	THERMAL HP WITH FANS	16.5	105.9
397 794	449 898	518 1036	543 1086	563 1126	577 1154	587 1174	583 1166	555 1110	THERMAL HP WITH FANS	13.5	129.7
399 798	452 904	520 1040	546 1092	566 1132	580 1160	590 1180	586 1172	558 1116	THERMAL HP WITH FANS	11.0	158.9
402 804	455 910	524 1048	549 1098	569 1138	584 1168	594 1188	590 1180	562 1124	THERMAL HP WITH FANS	9.0	194.6
405 810	459 918	528 1056	554 1108	574 1148	589 1178	599 1198	595 1190	566 1132	THERMAL HP WITH FANS	7.5	238.4

#### EXACT GEAR RATIO

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL GEAR RATIO
72.437	71.073	74.282	71.390	69.100	70.411	73.518	73.440	70.482		70.62
86.723	86.222	92.762	87.959	85.137	82.581	83.381	86.009	86.840		86.50
105.401	104.337	112.668	104.167	100.825	103.793	104.799	104.689	105.700		105.9
130.872	132.065	137.071	133.737	129.447	125.560	126.962	126.828	127.867		129.7
157.014	161.424	164.380	165.619	160.306	155.493	157.229	157.064	158.580		158.9
196.309	198.098	194.324	196.672	190.363	187.725	189.984	189.784	191.617		194.6
235.521	242.136	246.571	243.556	235.744	228.667	235.072	234.826	237.298		238.4

# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	16	MECH HP 13 TORQUE (X1000 IN. LBS.) 51	17 68	29 111	46 175	61 229	85 320	104 404	122 481	165 629	197 755	
86.50	13.5	MECH HP 11 TORQUE (X1000 IN. LBS.) 52	15 70	24 114	39 180	51 233	68 326	86 412	100 491	138 642	165 775	
105.9	11.0	MECH HP 9.0 TORQUE (X1000 IN. LBS.) 53	12 72	20 116	32 183	43 241	60 335	74 422	86 503	113 658	136 792	
129.7	9.0	MECH HP 8.0 TORQUE (X1000 IN. LBS.) 54	10 73	16 117	26 185	33 243	48 339	61 427	72 510	96 668	115 804	
158.9	7.5	MECH HP 6.5 TORQUE (X1000 IN. LBS.) 55	8.5 74	13 120	22 189	28 248	40 343	51 437	60 521	80 681	95 818	
194.6	6.0	MECH HP 5.5 TORQUE (X1000 IN. LBS.) 56	7.2 76	11 123	18 194	23 255	33 346	43 449	50 535	67 699	80 840	
238.4	5.0	MECH HP 4.6 TORQUE (X1000 IN. LBS.) 58	5.9 77	9.7 125	15 198	19 261	27 347	35 458	42 550	56 719	67 858	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	16	THERMAL HP WITH FANS	90 150	123 205	140 234	232 387	292 488	336 561	385 643	466 778	521 870	611 1020
86.50	13.5	THERMAL HP WITH FANS	90 150	123 205	141 235	232 387	293 489	337 563	386 645	468 782	523 873	613 1024
105.9	11.0	THERMAL HP WITH FANS	90 150	124 207	142 237	233 389	294 491	339 566	388 648	470 785	525 877	615 1027
129.7	9.0	THERMAL HP WITH FANS	91 152	124 207	142 237	235 392	296 494	341 569	390 651	472 788	528 882	618 1032
158.9	7.5	THERMAL HP WITH FANS	91 152	125 209	143 239	236 394	298 498	343 573	392 655	475 793	531 887	622 1039
194.6	6.0	THERMAL HP WITH FANS	92 154	126 210	144 240	238 397	300 501	345 576	395 660	479 800	535 893	627 1047
238.4	5.0	THERMAL HP WITH FANS	93 155	127 212	146 244	240 401	303 506	348 581	398 665	483 807	540 902	633 1057

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	71.744	70.455	70.909	69.682	68.651	69.396	71.529	73.122	70.670	71.135
86.50	85.115	86.625	85.655	84.173	83.747	87.891	88.696	90.476	86.291	86.859
105.9	109.181	108.675	105.120	103.301	104.095	102.540	105.668	107.633	107.346	108.052
129.7	125.226	131.305	132.000	129.716	133.011	128.582	128.000	130.208	128.664	129.510
158.9	157.315	162.422	160.000	157.232	164.185	155.708	158.706	161.248	157.506	158.542
194.6	187.839	196.958	198.000	194.574	199.516	192.872	192.000	195.312	192.996	194.265
238.4	235.973	243.633	240.000	235.848	246.277	233.563	238.059	241.873	236.259	237.813

# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

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#### MECHANICAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
232 907	325 1245	437 1752	569 2189	629 2344	860 3262	935 3704	1040 4115	1211 4599	MECH HP TORQUE (X1000 IN. LBS.)	16	70.62
199 932	269 1253	358 1789	465 2204	517 2373	763 3394	844 3792	909 4214	992 4643	MECH HP TORQUE (X1000 IN. LBS.)	13.5	86.50
168 957	225 1266	301 1832	396 2227	442 2401	621 3475	693 3916	762 4297	826 4708	MECH HP TORQUE (X1000 IN. LBS.)	11.0	105.9
137 971	179 1277	251 1857	312 2249	348 2427	522 3536	584 3994	636 4351	692 4767	MECH HP TORQUE (X1000 IN. LBS.)	9.0	129.7
116 983	147 1286	211 1868	253 2261	283 2448	429 3601	482 4083	519 4394	563 4815	MECH HP TORQUE (X1000 IN. LBS.)	7.5	158.9
93 990	120 1290	179 1883	215 2280	240 2470	366 3701	402 4122	434 4438	471 4864	MECH HP TORQUE (X1000 IN. LBS.)	6.0	194.6
78 996	99 1303	143 1899	175 2300	196 2494	309 3813	328 4163	354 4485	384 4916	MECH HP TORQUE (X1000 IN. LBS.)	5.0	238.4

#### THERMAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
693 1157	784 1309	903 1508	946 1580	981 1638	1006 1680	1023 1708	1017 1696	968 1617	THERMAL HP WITH FANS	16	70.62
695 1161	787 1314	906 1513	950 1587	985 1645	1010 1687	1027 1715	1020 1701	971 1622	THERMAL HP WITH FANS	13.5	86.50
698 1166	790 1319	910 1520	953 1592	989 1652	1014 1693	1031 1722	1025 1712	975 1628	THERMAL HP WITH FANS	11.0	105.9
701 1171	794 1326	914 1526	959 1602	994 1660	1019 1702	1037 1732	1030 1720	980 1637	THERMAL HP WITH FANS	9.0	129.7
706 1179	799 1334	920 1536	964 1610	1000 1670	1025 1712	1043 1742	1036 1730	986 1647	THERMAL HP WITH FANS	7.5	158.9
711 1187	805 1344	927 1548	972 1623	1008 1683	1033 1725	1051 1755	1044 1743	994 1660	THERMAL HP WITH FANS	6.0	194.6
718 1199	812 1356	935 1561	981 1638	1017 1698	1043 1742	1061 1772	1054 1760	1003 1675	THERMAL HP WITH FANS	5.0	238.4

#### EXACT GEAR RATIO

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	NOMINAL GEAR RATIO
72.437	71.073	74.282	71.390	69.100	70.411	73.518	73.440	70.482	70.62
86.723	86.222	92.762	87.959	85.137	82.581	83.381	86.009	86.840	86.50
105.401	104.337	112.668	104.167	100.825	103.793	104.799	104.689	105.700	105.9
130.872	132.065	137.071	133.737	129.447	125.560	126.962	126.828	127.867	129.7
157.014	161.424	164.380	165.619	160.306	155.493	157.229	157.064	158.580	158.9
196.309	198.098	194.324	196.672	190.363	187.725	189.984	189.784	191.617	194.6
235.521	242.136	246.571	243.556	235.744	228.667	235.072	234.826	237.298	238.4

# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	12.5	MECH HP 10 TORQUE (X1000 IN. LBS.) 53	13	13	22	36	47	66	80	94	127	152
			71	71	115	182	238	332	419	500	653	785
86.50	10.0	MECH HP 8.8 TORQUE (X1000 IN. LBS.) 54	11	11	18	30	39	52	65	77	105	126
			72	72	117	184	241	336	423	505	660	797
105.9	8.2	MECH HP 6.8 TORQUE (X1000 IN. LBS.) 54	9.3	9.3	15	25	32	46	56	65	86	103
			73	73	119	187	245	342	432	514	672	808
129.7	6.7	MECH HP 6.1 TORQUE (X1000 IN. LBS.) 55	7.9	7.9	12	20	26	36	48	56	74	88
			75	75	121	191	251	344	446	529	691	829
158.9	5.5	MECH HP 5.0 TORQUE (X1000 IN. LBS.) 57	6.5	6.5	10	17	21	30	39	46	62	73
			77	77	124	196	257	347	453	541	707	849
194.6	4.5	MECH HP 4.3 TORQUE (X1000 IN. LBS.) 58	5.4	5.4	8.9	14	18	25	33	39	51	62
			77	77	127	201	264	349	465	555	725	872
238.4	3.6	MECH HP 3.5 TORQUE (X1000 IN. LBS.) 60	4.4	4.4	7.5	12	15	20	27	32	43	51
			78	78	130	206	270	350	476	563	746	887

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	12.5	THERMAL HP WITH FANS	137	187	214	353	445	512	586	710	794	930
			206	281	321	530	668	768	879	1065	1191	1395
86.50	10.0	THERMAL HP WITH FANS	137	188	215	354	447	514	588	713	797	933
			206	282	323	531	671	771	882	1070	1196	1400
105.9	8.2	THERMAL HP WITH FANS	138	189	216	355	449	516	590	716	800	937
			207	284	324	533	674	774	885	1074	1200	1406
129.7	6.7	THERMAL HP WITH FANS	138	190	217	357	451	519	593	719	804	942
			207	285	326	536	677	779	890	1079	1206	1413
158.9	5.5	THERMAL HP WITH FANS	139	191	218	359	454	522	597	724	809	948
			209	287	327	539	681	783	896	1086	1214	1422
194.6	4.5	THERMAL HP WITH FANS	140	192	220	362	457	526	602	729	815	955
			210	288	330	543	686	789	903	1094	1223	1433
238.4	3.6	THERMAL HP WITH FANS	142	194	222	365	461	531	607	735	822	963
			213	291	333	548	692	797	911	1103	1233	1445

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	71.744	70.455	70.909	69.682	68.651	69.396	71.529	73.122	70.670	71.135
86.50	85.115	86.625	85.655	84.173	83.747	87.891	88.696	90.476	86.291	86.859
105.9	109.181	108.675	105.120	103.301	104.095	102.540	105.668	107.633	107.346	108.052
129.7	125.226	131.305	132.000	129.716	133.011	128.582	128.000	130.208	128.664	129.510
158.9	157.315	162.422	160.000	157.232	164.185	155.708	158.706	161.248	157.506	158.542
194.6	187.839	196.958	198.000	194.574	199.516	192.872	192.000	195.312	192.996	194.265
238.4	235.973	243.633	240.000	235.848	246.277	233.563	238.059	241.873	236.259	237.813



# Type TDS Right Angle Shaft Speed Reducers Quadruple Reduction

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## MECHANICAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
180 945	244 1261	338 1820	428 2218	476 2384	669 3414	727 3876	803 4275	917 4683	MECH HP TORQUE (X1000 IN. LBS.)	12.5	70.62
153 963	203 1268	273 1840	350 2232	390 2411	587 3513	651 3935	692 4312	750 4724	MECH HP TORQUE (X1000 IN. LBS.)	10.0	86.50
127 976	169 1281	228 1861	298 2254	333 2437	473 3559	530 4027	575 4367	624 4784	MECH HP TORQUE (X1000 IN. LBS.)	8.2	105.9
104 987	134 1291	189 1878	234 2274	262 2461	402 3661	446 4107	480 4416	522 4841	MECH HP TORQUE (X1000 IN. LBS.)	6.7	129.7
87 993	111 1300	158 1888	190 2287	213 2482	333 3755	363 4142	391 4457	425 4884	MECH HP TORQUE (X1000 IN. LBS.)	5.5	158.9
70 1000	91 1309	135 1902	161 2304	181 2502	282 3840	303 4177	327 4498	355 4930	MECH HP TORQUE (X1000 IN. LBS.)	4.5	194.6
58 1005	75 1316	107 1917	131 2323	147 2524	233 3874	247 4215	267 4542	289 4979	MECH HP TORQUE (X1000 IN. LBS.)	3.6	238.4

## THERMAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1055 1583	1194 1791	1376 2064	1442 2138	1495 2243	1533 2300	1560 2340	1546 2319	1475 2213	THERMAL HP WITH FANS	12.5	70.62
1059 1589	1198 1797	1380 2070	1447 2171	1500 2250	1538 2307	1565 2348	1551 2327	1480 2220	THERMAL HP WITH FANS	10.0	86.50
1063 1595	1203 1805	1386 2079	1453 2180	1506 2259	1545 2318	1571 2357	1557 2336	1486 2229	THERMAL HP WITH FANS	8.2	105.9
1069 1604	1210 1815	1393 2090	1460 2190	1514 2271	1553 2330	1579 2369	1565 2348	1494 2241	THERMAL HP WITH FANS	6.7	129.7
1075 1613	1217 1826	1401 2102	1469 2204	1523 2285	1562 2343	1589 2384	1575 2363	1503 2255	THERMAL HP WITH FANS	5.5	158.9
1083 1625	1226 1839	1412 2118	1480 2220	1535 2303	1574 2361	1601 2402	1586 2379	1514 2271	THERMAL HP WITH FANS	4.5	194.6
1093 1640	1237 1856	1425 2138	1493 2240	1548 2322	1588 2382	1615 2423	1601 2402	1527 2291	THERMAL HP WITH FANS	3.6	238.4

## EXACT GEAR RATIO

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	NOMINAL GEAR RATIO
72.437	71.073	74.282	71.390	69.100	70.411	73.518	73.440	70.482	70.62
86.723	86.222	92.762	87.959	85.137	82.581	83.381	86.009	86.840	86.50
105.401	104.337	112.668	104.167	100.825	103.793	104.799	104.689	105.700	105.9
130.872	132.065	137.071	133.737	129.447	125.560	126.962	126.828	127.867	129.7
157.014	161.424	164.380	165.619	160.306	155.493	157.229	157.064	158.580	158.9
196.309	198.098	194.324	196.672	190.363	187.725	189.984	189.784	191.617	194.6
235.521	242.136	246.571	243.556	235.744	228.667	235.072	234.826	237.298	238.4

# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	10	MECH HP TORQUE (X1000 IN. LBS.)	8.6 54	11 72	18 116	30 184	40 242	55 337	67 424	79 506	106 661	127 796
86.50	8.3	MECH HP TORQUE (X1000 IN. LBS.)	7.2 54	9.6 73	15 118	25 186	33 244	44 340	55 428	64 511	88 668	106 807
105.9	6.8	MECH HP TORQUE (X1000 IN. LBS.)	5.9 56	7.9 75	13 121	21 191	27 251	38 344	47 442	55 527	73 688	87 825
129.7	5.6	MECH HP TORQUE (X1000 IN. LBS.)	5.2 57	6.7 77	10 124	17 196	22 257	30 346	40 453	47 541	62 708	74 849
158.9	4.5	MECH HP TORQUE (X1000 IN. LBS.)	4.2 58	5.4 77	9.1 127	14 201	18 263	25 348	33 464	39 554	52 724	62 870
194.6	3.7	MECH HP TORQUE (X1000 IN. LBS.)	3.6 60	4.9 77	7.5 130	12 206	15 270	20 351	28 476	32 562	44 743	52 887
238.4	3.0	MECH HP TORQUE (X1000 IN. LBS.)	3.0 61	3.7 78	6.3 133	10 210	12 271	17 352	23 487	26 566	36 763	42 892

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	10	THERMAL HP WITH FANS	186 262	255 360	292 412	481 678	607 856	699 986	799 1127	969 1366	1083 1527	1269 1789
86.50	8.3	THERMAL HP WITH FANS	187 264	256 361	292 412	482 680	608 857	700 987	800 1128	970 1368	1084 1528	1270 1791
105.9	6.8	THERMAL HP WITH FANS	187 264	256 361	292 412	482 680	608 857	700 987	801 1129	971 1369	1085 1530	1271 1792
129.7	5.6	THERMAL HP WITH FANS	187 264	256 361	293 413	483 681	609 859	701 988	802 1131	972 1370	1087 1533	1273 1795
158.9	4.5	THERMAL HP WITH FANS	187 264	257 362	293 413	484 682	610 860	702 990	803 1132	973 1372	1088 1534	1275 1798
194.6	3.7	THERMAL HP WITH FANS	188 265	257 362	294 415	484 682	611 862	703 991	805 1135	975 1375	1090 1537	1277 1801
238.4	3.0	THERMAL HP WITH FANS	188 265	258 364	294 415	486 685	613 864	705 994	806 1136	977 1378	1093 1541	1280 1805

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	71.744	70.455	70.909	69.682	68.651	69.396	71.529	73.122	70.670	71.135
86.50	85.115	86.625	85.655	84.173	83.747	87.891	88.696	90.476	86.291	86.859
105.9	109.181	108.675	105.120	103.301	104.095	102.540	105.668	107.633	107.346	108.052
129.7	125.226	131.305	132.000	129.716	133.011	128.582	128.000	130.208	128.664	129.510
158.9	157.315	162.422	160.000	157.232	164.185	155.708	158.706	161.248	157.506	158.542
194.6	187.839	196.958	198.000	194.574	199.516	192.872	192.000	195.312	192.996	194.265
238.4	235.973	243.633	240.000	235.848	246.277	233.563	238.059	241.873	236.259	237.813



# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

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#### MECHANICAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
151 962	204 1270	283 1844	357 2236	398 2409	566 3493	613 3947	672 4321	767 4734	MECH HP TORQUE (X1000 IN. LBS.)	10	70.62
128 975	169 1277	228 1858	292 2250	326 2434	493 3566	547 3996	578 4356	627 4773	MECH HP TORQUE (X1000 IN. LBS.)	8.3	86.50
106 986	141 1290	190 1875	249 2270	278 2459	401 3649	447 4103	481 4408	522 4831	MECH HP TORQUE (X1000 IN. LBS.)	6.8	105.9
86 993	112 1300	157 1891	195 2290	219 2482	342 3760	372 4143	401 4456	436 4883	MECH HP TORQUE (X1000 IN. LBS.)	5.6	129.7
72 999	92 1308	132 1901	158 2302	178 2502	282 3839	303 4177	326 4494	354 4926	MECH HP TORQUE (X1000 IN. LBS.)	4.5	158.9
58 1006	75 1317	112 1914	134 2319	151 2522	235 3870	253 4210	272 4534	296 4971	MECH HP TORQUE (X1000 IN. LBS.)	3.7	194.6
49 1011	62 1323	89 1929	109 2337	123 2543	195 3903	206 4247	222 4577	241 5017	MECH HP TORQUE (X1000 IN. LBS.)	3.0	238.4

#### THERMAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
1439 2029	1629 2297	1877 2646	1967 2773	2040 2876	2091 2948	2127 2999	2108 2972	2012 2837	THERMAL HP WITH FANS	10	70.62
1441 2032	1631 2300	1878 2648	1969 2776	2041 2878	2093 2951	2129 3002	2110 2975	2014 2840	THERMAL HP WITH FANS	8.3	86.50
1442 2033	1632 2301	1880 2651	1971 2779	2043 2881	2095 2954	2131 3005	2112 2978	2016 2843	THERMAL HP WITH FANS	6.8	105.9
1444 2036	1634 2304	1882 2654	1973 2782	2046 2885	2098 2958	2134 3009	2115 2982	2018 2845	THERMAL HP WITH FANS	5.6	129.7
1446 2039	1637 2308	1885 2658	1976 2786	2049 2889	2101 2962	2137 3013	2118 2986	2021 2850	THERMAL HP WITH FANS	4.5	158.9
1449 2043	1640 2312	1889 2663	1980 2792	2053 2895	2105 2968	2141 3019	2122 2992	2025 2855	THERMAL HP WITH FANS	3.7	194.6
1452 2047	1644 2318	1893 2669	1984 2797	2057 2900	2110 2975	2146 3026	2127 2999	2030 2862	THERMAL HP WITH FANS	3.0	238.4

#### EXACT GEAR RATIO

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL GEAR RATIO
72.437	71.073	74.282	71.390	69.100	70.411	73.518	73.440	70.482		70.62
86.723	86.222	92.762	87.959	85.137	82.581	83.381	86.009	86.840		86.50
105.401	104.337	112.668	104.167	100.825	103.793	104.799	104.689	105.700		105.9
130.872	132.065	137.071	133.737	129.447	125.560	126.962	126.828	127.867		129.7
157.014	161.424	164.380	165.619	160.306	155.493	157.229	157.064	158.580		158.9
196.309	198.098	194.324	196.672	190.363	187.725	189.984	189.784	191.617		194.6
235.521	242.136	246.571	243.556	235.744	228.667	235.072	234.826	237.298		238.4

# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction

#### MECHANICAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED	REDUCER SIZE	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	8.2	MECH HP 6.9 TORQUE (X1000 IN. LBS.) 54	9.5 73	15 118	24 186	32 245	45 342	55 431	64 514	87 671	104 807	
86.50	6.7	MECH HP 6.1 TORQUE (X1000 IN. LBS.) 56	8.0 75	13 121	20 191	27 249	36 344	45 438	53 524	72 684	87 826	
105.9	5.5	MECH HP 4.8 TORQUE (X1000 IN. LBS.) 57	6.5 77	10 125	17 196	22 258	31 347	39 454	46 541	60 708	72 848	
129.7	4.5	MECH HP 4.3 TORQUE (X1000 IN. LBS.) 58	5.4 77	8.9 127	14 201	18 264	25 349	33 465	39 556	52 727	62 873	
158.9	3.7	MECH HP 3.5 TORQUE (X1000 IN. LBS.) 60	4.4 78	7.5 131	12 206	15 270	20 351	27 476	32 563	43 744	51 888	
194.6	3.0	MECH HP 3.0 TORQUE (X1000 IN. LBS.) 61	3.6 78	6.2 133	10 211	12 271	16 353	23 489	26 566	36 763	47 893	
238.4	2.4	MECH HP 2.5 TORQUE (X1000 IN. LBS.) 63	7.9 78	5.2 135	8.4 216	10 273	14 356	19 500	21 574	30 783	34 898	

#### THERMAL CAPACITY

NOMINAL GEAR RATIO	NOMINAL OUTPUT SPEED		QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	8.2	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
86.50	6.7	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
105.9	5.5	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
129.7	4.5	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
158.9	3.7	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
194.6	3.0	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455
238.4	2.4	THERMAL HP WITH FANS	271 360	371 493	425 565	700 931	883 1174	1017 1353	1163 1547	1409 1874	1576 2096	1846 2455

#### EXACT GEAR RATIO

NOMINAL GEAR RATIO	QR7	QR8	QR9	QR11	QR12	QR13	QR15	QR16	QR18	QR20
70.62	71.744	70.455	70.909	69.682	68.651	69.396	71.529	73.122	70.670	71.135
86.50	85.115	86.625	85.655	84.173	83.747	87.891	88.696	90.476	86.291	86.859
105.9	109.181	108.675	105.120	103.301	104.095	102.540	105.668	107.633	107.346	108.052
129.7	125.226	131.305	132.000	129.716	133.011	128.582	128.000	130.208	128.664	129.510
158.9	157.315	162.422	160.000	157.232	164.185	155.708	158.706	161.248	157.506	158.542
194.6	187.839	196.958	198.000	194.574	199.516	192.872	192.000	195.312	192.996	194.265
238.4	235.973	243.633	240.000	235.848	246.277	233.563	238.059	241.873	236.259	237.813



# Type TDS Right Angle Shaft Speed Reducers Quadruple Reduction

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Ratio 70.62 thru 238.4  
580 Input

## MECHANICAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	REDUCER SIZE	NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
124 976	165 1281	230 1863	290 2254	324 2435	464 3555	502 4017	547 4370	625 4789	MECH HP TORQUE (X1000 IN. LBS.)	8.2	70.62
104 986	137 1287	185 1873	237 2268	265 2460	409 3676	451 4093	471 4404	511 4826	MECH HP TORQUE (X1000 IN. LBS.)	6.7	86.50
86 993	114 1299	154 1889	202 2288	226 2483	333 3762	363 4144	391 4454	425 4881	MECH HP TORQUE (X1000 IN. LBS.)	5.5	105.9
70 1000	91 1309	127 1905	158 2307	178 2505	281 3845	303 4183	326 4499	354 4931	MECH HP TORQUE (X1000 IN. LBS.)	4.5	129.7
59 1006	75 1317	107 1914	128 2319	144 2524	229 3874	246 4215	265 4536	288 4972	MECH HP TORQUE (X1000 IN. LBS.)	3.7	158.9
47 1013	61 1326	91 1927	109 2335	122 2543	191 3904	205 4247	221 4574	240 5014	MECH HP TORQUE (X1000 IN. LBS.)	3.0	194.6
39 1018	50 1336	72 1954	89 2368	100 2571	158 3935	168 4293	181 4642	197 5089	MECH HP TORQUE (X1000 IN. LBS.)	2.4	238.4

## THERMAL CAPACITY

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40		NOMINAL OUTPUT SPEED	NOMINAL GEAR RATIO
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	8.2	70.62
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	6.7	86.50
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	5.5	105.9
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	4.5	129.7
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	3.7	158.9
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	3.0	194.6
2094 2785	2370 3152	2729 3630	2861 3805	2966 3945	3042 4046	3094 4115	3067 4079	2927 3893	THERMAL HP WITH FANS	2.4	238.4

## EXACT GEAR RATIO

QR22	WQR25	WQR28	WQR30	WQR32	WQR34	WQR36	WQR38	WQR40	NOMINAL GEAR RATIO
72.437	71.073	74.282	71.390	69.100	70.411	73.518	73.440	70.482	70.62
86.723	86.222	92.762	87.959	85.137	82.581	83.381	86.009	86.840	86.50
105.401	104.337	112.668	104.167	100.825	103.793	104.799	104.689	105.700	105.9
130.872	132.065	137.071	133.737	129.447	125.560	126.962	126.828	127.867	129.7
157.014	161.424	164.380	165.619	160.306	155.493	157.229	157.064	158.580	158.9
196.309	198.098	194.324	196.672	190.363	187.725	189.984	189.784	191.617	194.6
235.521	242.136	246.571	243.556	235.744	228.667	235.072	234.826	237.298	238.4

**Type TDS**  
**Right Angle Shaft Speed Reducers**

**NOTES**

# Type TDS

## Right Angle Shaft Speed Reducers

### Additional Thermal Capacity

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Engineering Data

#### A. Increased Thermal Rating Capacity by fan Cooling

Cooling fans mounted externally on the extensions of a double extended high speed shaft provide a method of increasing the heat dissipation of the gear housing thereby permitting increased thermal ratings.

Thermal Ratings with Fans are shown in the Selection Tables (Section 330).

#### B. Increased Thermal Rating Capacity by Water Cooling

If the required thermal rating is beyond the range of cooling fans, a circulating lube oil system will be required. This method requires the user to supply cooling water for removal of excess heat.

The circulating lube oil system includes — shaft driven lube oil pump, oil to water heat exchanger (for 85°F max. water temp. fouling factor .001) cleanable oil strainer, flow switch, necessary pipe and pipe fittings to provide a complete assembly.

For thermal increase greater than shown, refer to Nuttall Gear. If cooling water is not available, oil-to-air heat exchangers can be furnished. Refer to Nuttall Gear.

#### SELECTION OF PUMP AND COOLER UNITS

1. Determine the thermal horsepower capacity that is required. This is usually the horsepower rating of the prime mover.
2. Use the rating tables (Section 330) to determine the thermal capacity of the selected unit (the rating without fans).
3. Subtracting the unit's thermal rating from the thermal requirement results in the additional cooling that is needed.
4. In the Cooling Capacity Table, locate the input speed in the far left column, and within that speed group, select the number of reductions — double, triple, or quadruple. Reading to the right on the appropriate line, select the first size that **exceeds** the additional cooling needed.
5. Determine the water flow required for the unit selected, using the adjacent table, and insure that there is an adequate supply available. Please refer to Nuttall Gear for application assistance.

ADDITIONAL THERMAL HORSEPOWER CAPACITY ①							
INPUT SPEED	REDUC.	COOLING UNIT SIZES					
		1	2	3	4	5	6
1750	Double Triple Quadruple	245 163 122		489 326 245		1101 734 551	
1170	Double Triple		184 122		306 204		734 489
870	Double Triple				245 163		551 367
720	Double				184		428
580	Double				184		367
WATER FLOW REQUIRED ②							
1750	All Reductions	4	8	18			
1170		3	5	12			
870		—	4	9			
720		—	4	7			
580		—	4	6			

① Ratios 11.39, 13.95, 47.08, 57.66, 194.6, and 238.4 contain 3:1 bevel sets. Units with these ratios may reduce the rating of the cooling capacity of the packages listed. Please contact Nuttall Gear for application assistance.

② In GPM with a maximum temperature of 85°F.

# Type TDS

## Right Angle Shaft Speed Reducers

### Backstop Ratings

Backstops are required for applications in which rotation in one direction must be prevented — for example, on conveyor drives.

The instant the shaft attempts to change direction, the backstop sprags grip, thereby preventing reverse rotation. This action is fully automatic.

A backstop is generally located on one end of an intermediate speed shaft.

#### SELECTION

1. Calculate the required torque. Use the formula below. Since the backstop cannot be mounted on the input shaft, the formula must be modified to reflect the spiral bevel set ratio.

$$T = \frac{63,000 \times \text{Motor HP}}{\text{Input Speed}} \times \text{Spiral Bevel Ratio} \text{ ①}$$

2. Refer to the backstop selection table and read down the column until the listed torque rating is equal to or greater than the required torque calculated in step 1. Read to the left to determine the model number of the required backstop.
3. The maximum allowable backstop speed must be equal to or greater than the speed of the shaft upon which the backstop is mounted. If this is not the case, refer to Nuttall Gear.
4. Specify the direction of rotation of the reducer output shaft when ordering a backstop (clockwise or counter-clockwise when facing the end of the low speed shaft).

① Ratios 11.39, 13.95, 47.08, 57.66, 194.6, and 238.4 use a spiral bevel ratio of 3:1, all other ratios use a 2:1 spiral bevel set.

BACKSTOP SELECTION TABLE		
MODEL No.	MAX. RPM	TORQUE RATING
B20	2,900	3,600
B50	2,650	12,000
B80	2,300	26,400
B110	2,000	48,000
B120	1,800	81,600
B130	1,400	138,000
B150	1,300	216,000



# Type TDS Right Angle Shaft Speed Reducers WK<sup>2</sup>

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Page 3  
Engineering Data  
Inertia Values

NOM. GEAR RATIO	UNIT SIZE													
	7	8	9	11	12	13	15	16	18	20	22	25	28	30
DOUBLE REDUCTION														
3.38	1.71	3.85	5.12	9.86	19.30	29.31	80.36							
4.13	1.61	3.64	4.81	9.15	17.88	27.33	75.97							
5.06	1.50	3.42	4.38	8.55	16.52	25.74	72.91							
6.20	1.40	3.23	4.14	8.02	15.56	24.38	70.47	76.59						
7.59	1.31	1.58	3.43	7.55	14.80	23.12	67.94	72.29	78.84					
9.30	.59	1.47	3.27	7.27	14.11	22.23	24.27	70.44	74.88					
11.39	.47	1.03	2.20	5.01	8.72	15.66	23.24	31.19	34.15					
13.95	.45	.98	2.13	2.99	5.52	8.98	16.37	24.45	32.40	33.24				

TRIPLE REDUCTION														
17.09	.36	.66	1.74	3.94	5.13	10.16	13.45	20.51	35.18	36.50	73.00	106.10		
20.93	.32	.59	.92	2.16	4.59	9.24	11.95	18.66	25.55	32.82	65.64	96.17		
25.63	.19	.31	.78	1.87	2.60	5.50	7.79	11.19	22.13	22.64	44.30	87.78	108.16	
31.39	.16	.27	.69	1.66	2.25	4.79	6.71	7.15	13.91	20.31	38.44	80.90	95.41	98.05
38.44	.14	.16	.39	.85	1.96	2.80	5.76	6.03	12.21	12.65	27.43	33.06	87.67	89.68
47.08	.10	.11	.35	.63	1.33	1.80	2.66	3.89	8.40	8.73	17.50	23.08	36.10	43.03
57.66	.05	.10	.21	.42	.77	1.58	2.24	3.38	5.54	7.64	12.15	14.43	32.60	39.28

QUADRUPLE REDUCTION														
70.62	.06	.08	.18	.31	.74	.86	1.93	2.07	4.87	5.53	8.06	14.48	25.57	39.98
86.50	.04	.07	.15	.27	.43	.75	1.06	1.86	2.90	4.88	6.96	12.53	22.61	29.03
105.9	.03	.06	.10	.15	.37	.67	.93	1.00	2.50	2.85	5.92	8.47	14.34	24.96
129.7	.03	.04	.08	.13	.32	.37	.82	.87	2.18	2.45	3.66	7.12	9.69	16.17
158.9	.02	.03	.07	.12	.20	.33	.50	.78	1.27	2.16	3.14	4.66	8.61	14.13
194.6	.02	.02	.05	.09	.14	.21	.32	.46	.90	1.05	2.07	2.99	5.54	8.18
238.4	.02	.02	.05	.05	.13	.19	.28	.43	.65	.92	1.84	2.56	4.87	6.52

NOM. GEAR RATIO	UNIT SIZE				
	32	34	36	38	40

QUADRUPLE REDUCTION					
70.62	40.96	109.66	136.39	153.15	
86.50	35.75	53.19	120.73	132.96	185.54
105.9	25.11	38.95	107.80	118.22	159.16
129.7	16.57	32.75	51.68	58.92	136.61
158.9	14.37	22.40	37.19	49.40	71.50
194.6	10.18	15.73	24.35	34.66	50.02
238.4	7.17	13.12	20.88	23.33	34.89

The WK<sup>2</sup> values listed are in pound-feet<sup>2</sup> at the high speed shaft. These values include rotating parts of the standard reducer but do not include values for couplings, clutches, fans, brake wheels or other external devices. Special ratios, extended shafts and shaft driven pumps will also affect actual values, and can be calculated at time of order engineering, if required.

# Type TDS

## Right Angle Shaft Speed Reducers

### Overhung Load Ratings

**Overhung Load Capacities**

When a pulley, sprocket or pinion is to be mounted on the input or output shaft of a reducer, the overhung load capacity of the reducer must be checked. The magnitude of the overhung load varies with the type of connection and its location from the shaft bearing. Use the following overhung load formula after selecting appropriate Lc and Lf factors from the tables.

**Overhung Load Formula**

$$\text{OHL (lbs)} = \frac{\text{Motor Hp} \times 126,000 \times \text{Lc}}{\text{Shaft RPM} \times \text{Pitch Diameter (Inches)} \times \text{Lf}}$$

Compare the calculated overhung load with the overhung load table applicable to the reducer type, size and shaft. If the calculated overhung load is greater than that listed, contact Nuttall Gear.

**Load Connection Factor • Lc**

Type of Load Connection	Factor, Lc
Sprocket	1.00
Pinion	1.25
V-Belt	1.50
Flat Belt	2.50

**Load Location Factor • Lf**

See table below for low speed shafts.

**EXAMPLE**

Calculate the overhung load.

Lc = 1.00 from table

Lf = .99 from table

$$100 \times 126,000 \times 1.00$$

$$68 \times 12 \times .99$$

$$= 15,597 \text{ lbs.}$$

Refer to the "low speed shaft overhung rating" table. The TR11 reducer at 68 RPM has a rating of 22,500 pounds and is suitable for the application.

**Lf - LOAD LOCATION FACTORS - LOW SPEED SHAFT**  
**UNIT SIZE**

IN. ①	7	8	9	11	12	13	15	16	18	20	22	25	28	30	32	34	36	38	40
1	1.13	1.13	1.18	1.16	1.16	1.22	1.17	1.16	1.18	1.17	1.17	1.19	1.20	1.20	1.21	1.19	1.20	1.19	1.18
2	1.04	1.06	1.10	1.10	1.11	1.16	1.12	1.11	1.13	1.13	1.13	1.15	1.16	1.17	1.17	1.17	1.17	1.16	1.15
3	0.96	0.99	1.03	1.05	1.06	1.11	1.07	1.07	1.09	1.09	1.10	1.12	1.13	1.13	1.15	1.14	1.14	1.13	1.13
4	0.89	0.93	0.96	0.99	1.01	1.06	1.02	1.02	1.05	1.06	1.06	1.08	1.10	1.10	1.12	1.12	1.11	1.11	1.10
5	0.84	0.88	0.91	0.95	0.97	1.02	0.99	0.99	1.01	1.02	1.03	1.05	1.07	1.07	1.09	1.09	1.09	1.09	1.08
6			0.86	0.91	0.93	0.99	0.95	0.95	0.98	0.99	1.00	1.02	1.04	1.05	1.06	1.06	1.07	1.07	1.06
7				0.87	0.89	0.94	0.92	0.92	0.95	0.96	0.97	0.99	1.01	1.02	1.03	1.04	1.04	1.04	1.04
8					0.86	0.91	0.88	0.90	0.92	0.93	0.94	0.97	0.99	1.00	1.01	1.01	1.02	1.02	1.02
9						0.88	0.86	0.87	0.89	0.91	0.92	0.94	0.96	0.97	0.99	1.00	1.00	1.00	1.00
10									0.86	0.88	0.90	0.92	0.94	0.95	0.97	0.97	0.98	0.98	0.98
11										0.85	0.87	0.89	0.92	0.93	0.95	0.95	0.96	0.96	0.96
12											0.85	0.87	0.90	0.91	0.93	0.94	0.94	0.95	0.95
13												0.85	0.88	0.89	0.91	0.92	0.92	0.93	0.93
14													0.86	0.87	0.90	0.90	0.90	0.91	0.91
15														0.84	0.85	0.87	0.88	0.89	0.90
16															0.83	0.86	0.87	0.88	0.88

① Center of applied load in inches from the end cap.

**LOW SPEED SHAFT OVERHUNG LOAD RATINGS ②**  
**UNIT SIZE**

OUTPUT SPEED	7	8	9	11	12	13	15	16	18	20	22	25	28	30	32	34	36	38	40
640	3.6	6.7	5.3	8.8	9.0	8.6	7.7	10.9	9.3	15.0	13.8	16.8	28.1	26.2					
520	4.3	7.4	6.3	9.8	10.7	10.5	9.6	13.7	11.8	17.0	16.8	19.5	32.5	31.1					
420	4.8	8.3	7.0	10.8	11.9	12.0	11.0	15.6	13.6	20.1	19.0	22.6	37.8	36.0					
350	5.1	9.1	7.6	11.7	13.4	14.2	11.9	18.1	14.6	22.6	21.5	26.6	42.1	40.4					
280	4.8	8.3	6.9	12.6	13.6	10.5	6.3	10.8	14.3	13.4	21.2	16.7	34.2	30.6	43.3	67.5	57.0	63.0	81.0
230	5.2	9.1	7.7	13.9	13.6	11.8	7.5	12.0	15.7	15.2	23.0	19.7	38.4	35.1	47.6	72.8	63.0	70.0	89.0
190	5.6	9.8	8.0	14.9	16.0	14.1	8.4	12.9	17.1	17.2	25.1	21.7	41.9	38.4	52.8	72.5	69.0	76.0	96.0
155	6.1	10.6	8.9	16.2	17.3	15.0	9.4	14.5	19.1	18.1	27.5	23.1	44.5	40.8	57.3	79.6	75.0	83.0	104.0
125	6.7	11.5	9.6	17.8	18.8	16.8	10.8	15.5	20.6	20.2	29.8	26.1	49.4	47.2	60.6	86.1	84.0	92.0	115.0
100	7.2	12.6	10.5	19.3	20.0	18.3	11.7	17.3	22.5	21.7	31.1	28.7	53.6	52.5	67.2	91.6	91.0	100.0	124.0
84	8.0	13.3	11.4	20.4	21.7	19.4	12.8	19.0	24.7	24.2	36.3	30.7	56.9	55.9	73.5	95.0	103.0	113.0	139.0
68	8.6	14.5	12.4	22.5	23.5	21.6	14.1	20.6	27.1	26.4	38.2	35.2	60.7	60.7	75.0	95.0	109.0	119.0	147.0
56	9.3	15.5	13.6	24.3	25.6	23.5	15.8	23.2	30.0	29.1	41.4	38.0	68.6	65.6	75.0	95.0	120.0	135.0	160.0
45	10.1	16.7	14.6	26.1	27.6	25.4	17.4	24.6	31.8	31.4	45.0	41.2	74.4	71.0	75.0	95.0	120.0	140.0	160.0
③ 37	10.8	18.0	15.8	28.0	29.8	27.4	19.1	27.1	34.9	33.8	48.8	45.1	81.3	77.8	75.0	89.5	120.0	140.0	160.0

② X 1000 Pounds

③ And all lower speeds



# Type TDS Right Angle Shaft Speed Reducers Dimensions

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TR7 - TR9	3	<b>TRIPLE REDUCTION</b>	WTR7 - WTR9	10
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## ACCESSORIES AND AUXILIARY EQUIPMENT

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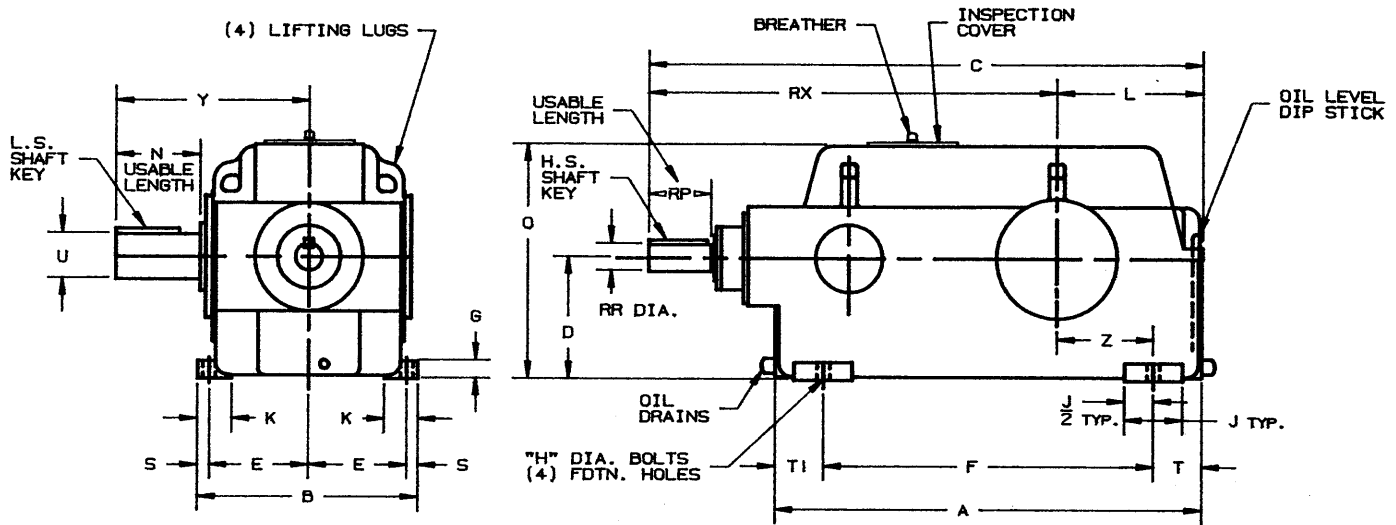
# Type TDS Right Angle Shaft Speed Reducers Double Reduction

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Dimensions

DR7 to DR9



ALL UNITS FURNISHED WITH SINGLE END SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

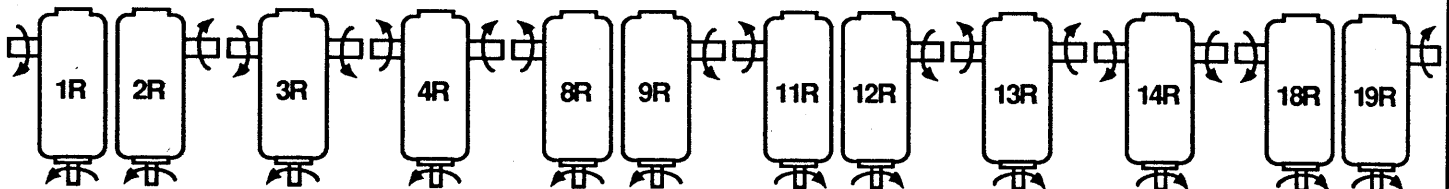
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	J	K	L	O	S	T	T1	Z	APPROX WT. LBS.
DR7	27.0	12.8	33.7	8.25	5.50	20.00	1.1	0.75	3.5	2.4	9.1	15.8	0.9	3.0	4.0	6.00	600
DR8	35.4	15.0	41.9	10.25	6.50	25.50	1.5	1.00	4.0	2.8	11.1	20.0	1.0	3.8	6.1	7.25	950
DR9	35.4	15.0	43.4	10.25	6.50	25.50	1.5	1.00	4.0	2.8	11.1	20.0	1.0	3.8	6.1	7.25	1,100

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
DR7	2.875	.750 x .750 x 4.0	5.0	11.3		1.375	.312 x .312 x 2.5	3.5	24.6
DR8	3.375	.875 x .875 x 4.5	6.0	13.6		1.500	.375 x .375 x 2.5	3.7	30.8
DR9	3.875	1.000 x 1.000 x 5.3	6.6	14.3		1.875	.500 x .500 x 3.0	4.0	32.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

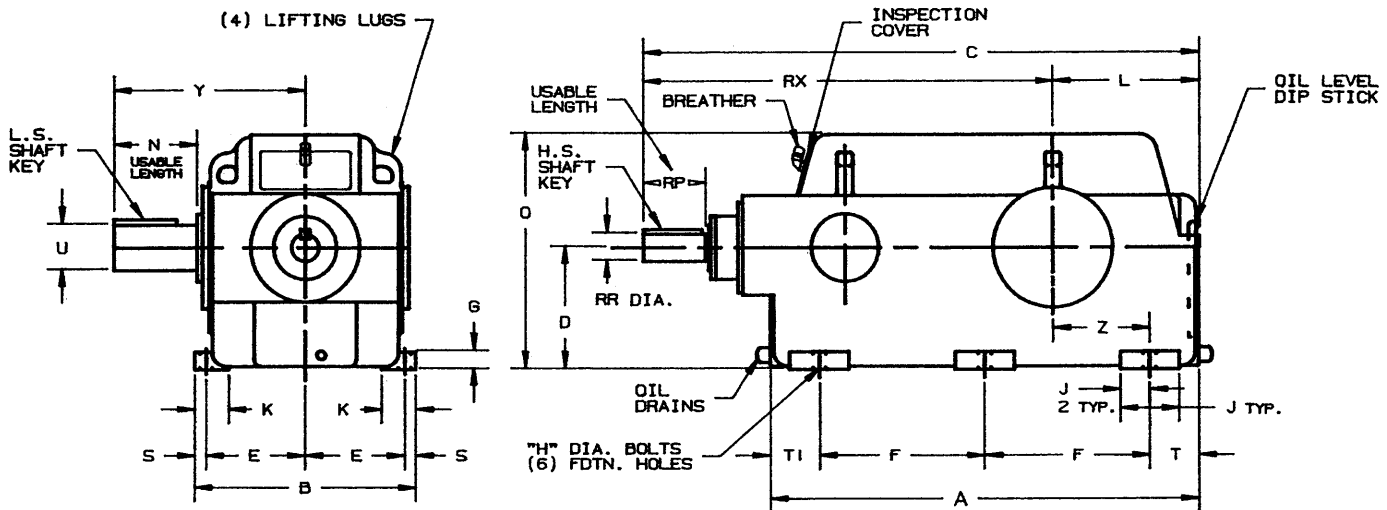
## STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:		ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:		

# Type TDS Right Angle Shaft Speed Reducers Double Reduction



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

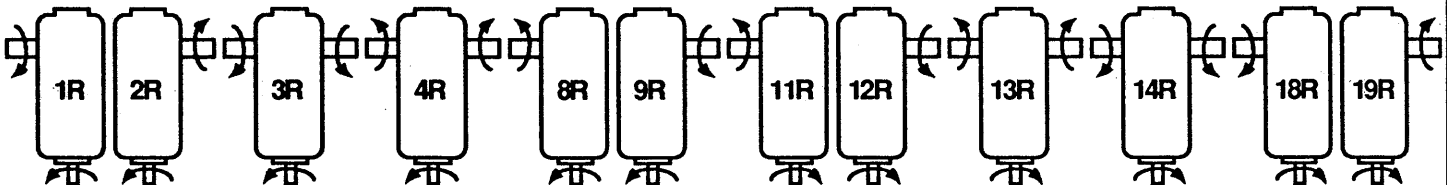
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	J	K	L	O	S	T	T1	Z	APPROX WT. LBS.
DR11	42.3	21.0	51.2	11.50	9.25	14.75	1.8	1.00	5.8	3.8	14.0	23.0	1.3	5.0	7.8	8.88	1850
DR12	44.5	23.0	54.9	12.50	10.25	16.25	2.0	1.25	6.5	3.8	15.3	25.0	1.3	5.3	6.8	9.88	2550
DR13	49.5	23.8	60.1	13.50	10.63	18.25	2.0	1.25	6.5	3.8	16.2	27.0	1.3	5.4	7.6	10.70	3050
DR15	54.6	25.0	66.8	15.00	11.00	19.25	2.3	1.50	7.3	4.3	17.4	30.0	1.5	5.5	10.6	11.75	3550
DR16	58.8	28.5	71.1	16.50	12.50	21.88	2.5	1.50	7.5	5.0	19.6	33.0	1.8	5.9	9.1	13.62	5000
DR18	66.0	29.0	78.3	18.00	12.75	23.00	2.8	1.75	8.5	5.0	20.8	35.5	1.8	6.4	13.6	14.25	5850
DR20	70.5	31.0	83.3	20.00	13.75	25.50	3.0	1.75	9.3	5.8	23.1	39.5	1.8	7.1	12.4	15.88	6100
DR22	78.8	33.0	92.8	22.00	14.50	26.50	3.3	2.00	9.8	6.3	24.6	43.5	2.0	7.6	17.7	16.88	7250

UNIT SIZE	LOW SPEED SHAFT				HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y	RR <sup>①</sup>	KEY	RP	RX
DR11	4.500	1.000 x 1.000 x 6.0	7.8	18.5	2.125	.500 x .500 x 3.5	4.5	37.2
DR12	4.750	1.250 x 1.250 x 6.8	8.5	20.3	2.625	.625 x .625 x 4.0	5.3	39.6
DR13	5.000	1.250 x 1.250 x 7.0	9.1	21.3	2.875	.750 x .750 x 4.3	5.6	43.9
DR15	5.250	1.250 x 1.250 x 7.8	9.5	22.0	3.125	.750 x .750 x 4.8	6.0	49.4
DR16	5.500	1.250 x 1.250 x 8.3	9.5	23.5	3.375	.875 x .875 x 4.8	6.0	51.5
DR18	6.000	1.500 x 1.500 x 8.8	10.5	25.0	3.375	.875 x .875 x 5.0	6.5	57.5
DR20	6.500	1.500 x 1.500 x 9.3	11.3	26.5	3.375	.875 x .875 x 5.0	6.5	60.2
DR22	7.000	1.750 x 1.750 x 9.8	12.0	28.8	3.625	.875 x .875 x 5.0	7.0	68.2

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

## STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

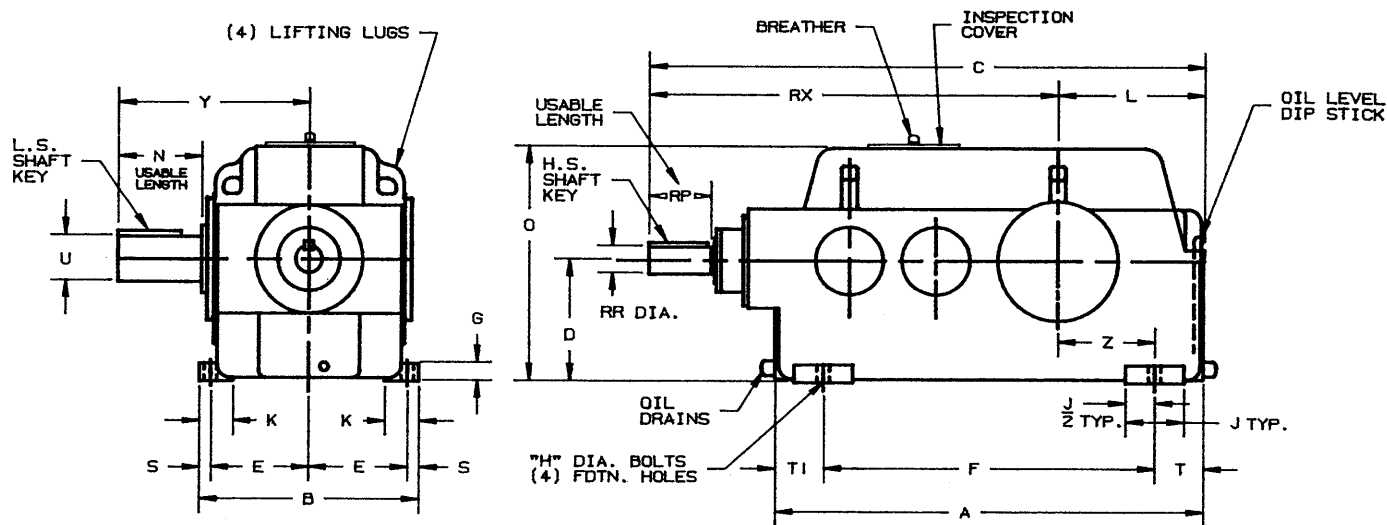
# Type TDS Right Angle Shaft Speed Reducers Triple Reduction

Section 340

Page 3

Dimensions

TR7 to TR9



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

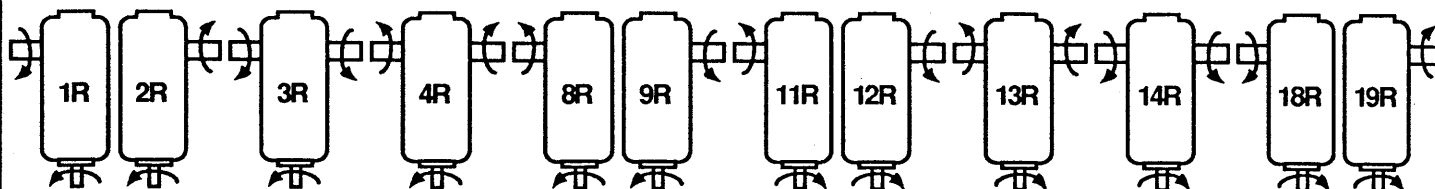
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	J	K	L	O	S	T	T1	Z	APPROX WT. LBS.
TR7	27.0	12.8	35.6	8.25	5.5	20.00	1.1	0.75	3.5	2.4	9.1	15.8	0.9	3.0	4.0	6.00	650
TR8	35.4	15.0	42.4	10.25	6.5	25.50	1.5	1.00	4.0	2.8	11.1	20.0	1.0	3.8	6.1	7.25	1,000
TR9	35.4	15.0	45.4	10.25	6.5	25.50	1.5	1.00	4.0	2.8	11.1	20.0	1.0	3.8	6.1	7.25	1,200

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
TR7	2.875	.750 x .750 x 4.0	5.0	11.3		1.125	.250 x .250 x 2.5	3.3	26.5
TR8	3.375	.875 x .875 x 4.5	6.0	13.6		1.125	.250 x .250 x 2.5	3.3	31.3
TR9	3.875	1.000 x 1.000 x 5.3	6.6	14.3		1.375	.312 x .312 x 2.5	3.5	34.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

## STANDARD ASSEMBLY POSITIONS



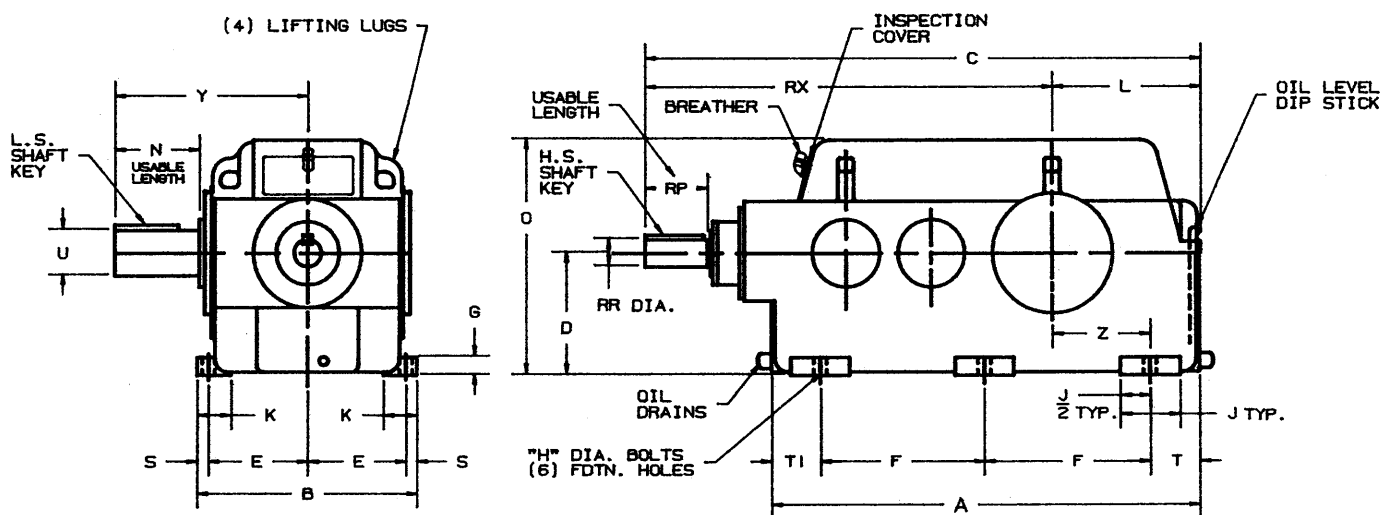
Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:		ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:		

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

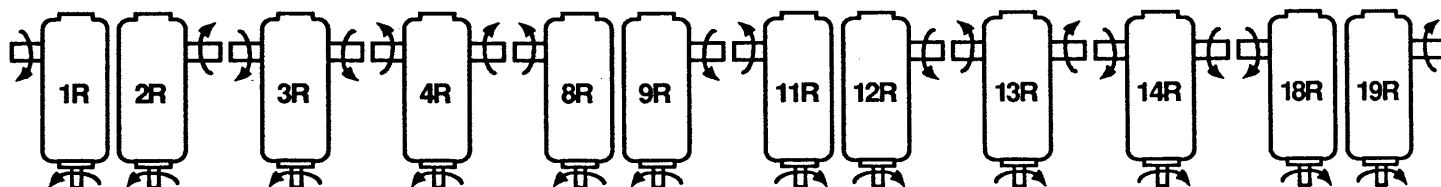
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	J	K	L	O	S	T	T1	Z	APPROX WT. LBS.
TR11	42.3	21.0	53.5	11.50	9.25	14.75	1.8	1.00	5.8	3.8	14.0	23.0	1.3	5.0	7.8	8.88	1,950
TR12	44.5	23.0	58.3	12.50	10.25	16.25	2.0	1.25	6.5	3.8	15.3	25.0	1.3	5.3	6.8	9.88	2,650
TR13	49.5	23.8	64.1	13.50	10.63	18.25	2.0	1.25	6.5	3.8	16.2	27.0	1.3	5.4	7.6	10.70	3,200
TR15	54.0	25.0	69.5	15.00	11.00	19.25	2.3	1.50	7.3	4.3	17.4	30.0	1.5	5.5	10.6	11.75	3,700
TR16	58.8	28.5	75.1	16.50	12.50	21.88	2.5	1.50	7.5	5.0	19.6	33.0	1.8	5.9	9.1	13.62	5,150
TR18	66.0	29.0	82.3	18.00	12.75	23.00	2.8	1.75	8.5	5.0	20.8	35.5	1.8	6.4	13.6	14.25	6,050
TR20	70.3	31.0	87.3	20.00	13.75	25.50	3.0	1.75	9.3	5.8	23.1	39.5	1.8	7.1	12.4	15.88	6,300
TR22	78.8	33.0	96.3	22.00	14.50	26.50	3.3	2.00	9.8	6.3	24.6	43.5	2.0	7.6	18.2	16.88	7,500

UNIT SIZE	U <sup>①</sup>	LOW SPEED SHAFT KEY	N	Y	RR <sup>①</sup>	HIGH SPEED SHAFT KEY	RP	RX
TR11	4.500	1.000 x 1.000 x 6.0	7.8	18.5	1.375	.312 x .312 x 2.5	3.5	39.5
TR12	4.750	1.250 x 1.250 x 6.8	8.5	20.3	1.625	.375 x .375 x 2.8	3.8	43.0
TR13	5.000	1.250 x 1.250 x 7.0	9.1	21.3	1.625	.375 x .375 x 2.8	4.0	47.9
TR15	5.250	1.250 x 1.250 x 7.8	9.5	22.0	1.875	.500 x .500 x 3.0	4.0	52.1
TR16	5.500	1.250 x 1.250 x 8.3	9.5	23.5	2.125	.500 x .500 x 3.0	4.0	55.5
TR18	6.000	1.500 x 1.500 x 8.8	10.5	25.0	2.125	.500 x .500 x 3.5	4.5	61.5
TR20	6.500	1.500 x 1.500 x 9.3	11.3	26.5	2.375	.625 x .625 x 3.8	4.8	64.2
TR22	7.000	1.750 x 1.750 x 9.8	12.0	28.8	2.625	.625 x .625 x 4.0	5.3	72.2

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER: \_\_\_\_\_ ITEM NO.: \_\_\_\_\_ S.O. NO.: \_\_\_\_\_ UNIT SIZE: \_\_\_\_\_ ASSEMBLY: \_\_\_\_\_  
PRELIMINARY ☐ CERTIFIED ☐ BY: \_\_\_\_\_ DATE: \_\_\_\_\_

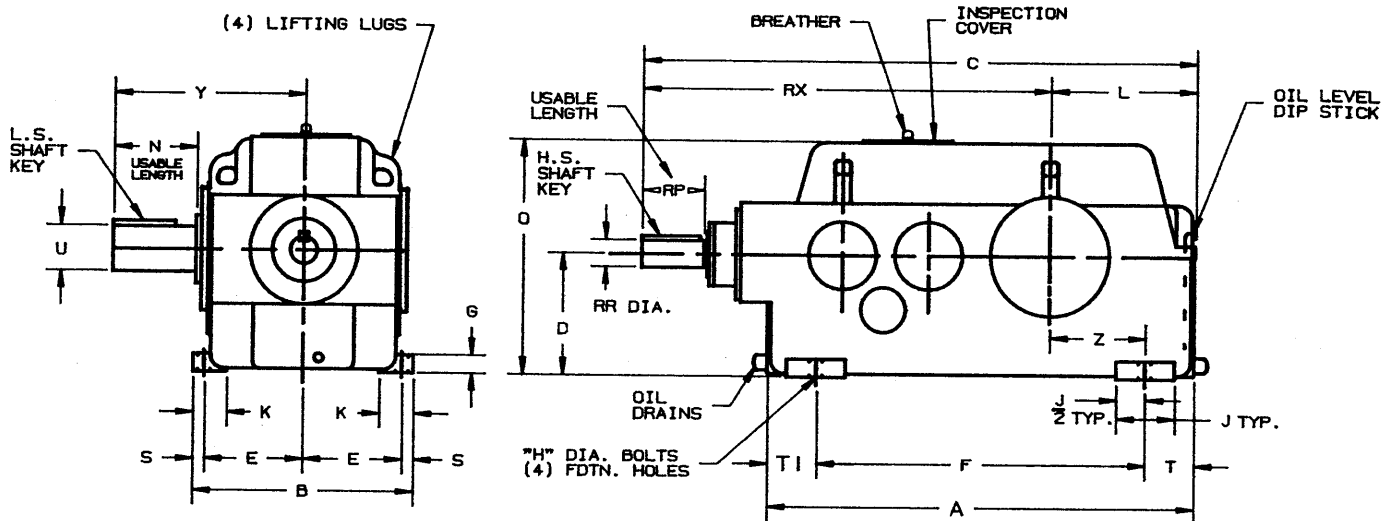
# Type TDS Right Angle Shaft Speed Reducers Quadruple Reduction

Section 340

Page 5

Dimensions

QR7 to QR9



ALL UNITS FURNISHED WITH SINGLE END SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

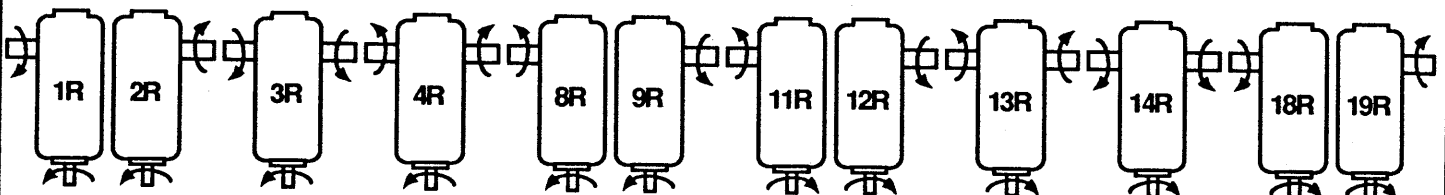
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	J	K	L	O	S	T	T1	Z	APPROX WT. LBS.
QR7	27.0	12.8	35.6	8.25	5.5	20.00	1.1	0.75	3.5	2.4	9.1	15.8	0.9	3.0	4.0	6.00	700
QR8	35.4	15.0	42.4	10.25	6.5	25.50	1.5	1.00	4.0	2.8	11.1	20.0	1.0	3.8	6.1	7.25	1,050
QR9	35.4	15.0	45.4	10.25	6.5	25.50	1.5	1.00	4.0	2.8	11.1	20.0	1.0	3.8	6.1	7.25	1,300

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
QR7	2.875	.750 x .750 x 4.0	5.0	11.3		1.125	.250 x .250 x 2.5	3.3	26.5
QR8	3.375	.875 x .875 x 4.5	6.0	13.6		1.125	.250 x .250 x 2.5	3.3	31.3
QR9	3.875	1.000 x 1.000 x 5.3	6.6	14.3		1.375	.312 x .312 x 2.5	3.5	34.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

## STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

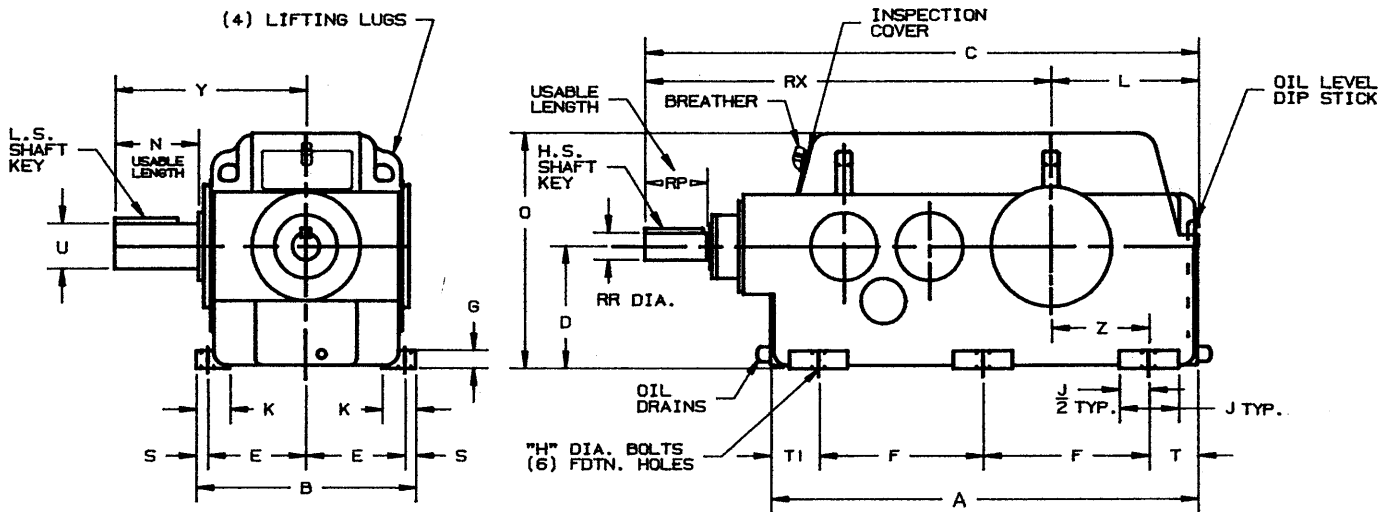
CUSTOMER ORDER:		ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:		



# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction



ALL UNITS FURNISHED WITH SINGLE END SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

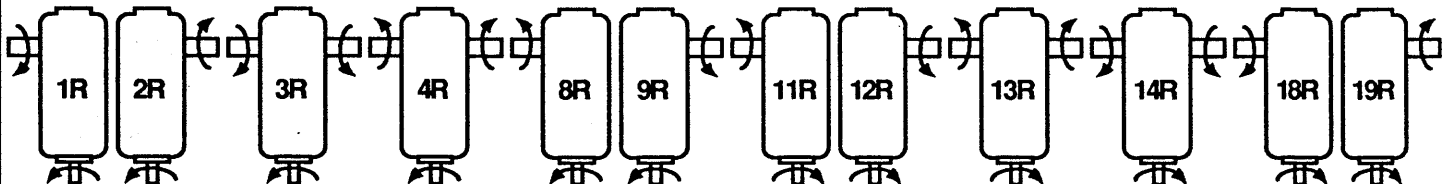
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	J	K	L	O	S	T	T1	Z	APPROX WT. LBS.
QR11	42.3	21.0	53.5	11.50	9.25	14.75	1.8	1.00	5.8	3.8	14.0	23.0	1.3	5.0	7.8	8.88	2,050
QR12	44.5	23.0	58.3	12.50	10.25	16.25	2.0	1.25	6.5	3.8	15.3	25.0	1.3	5.3	6.8	9.88	2,750
QR13	49.5	23.8	64.1	13.50	10.63	18.25	2.0	1.25	6.5	3.8	16.2	27.0	1.3	5.4	7.6	10.70	3,350
QR15	54.6	25.0	69.5	15.00	11.00	19.25	2.3	1.50	7.3	4.3	17.4	30.0	1.5	5.5	10.0	11.75	3,850
QR16	58.8	28.5	75.1	16.50	12.50	21.88	2.5	1.50	7.5	5.0	19.6	33.0	1.8	5.9	9.1	13.62	5,300
QR18	65.8	29.0	82.3	18.00	12.75	23.00	2.8	1.75	8.5	5.0	20.8	35.5	1.8	6.4	13.4	14.25	6,250
QR20	70.5	31.0	87.3	20.00	13.75	25.50	3.0	1.75	9.3	5.8	23.1	39.5	1.8	7.1	12.2	15.88	6,500
QR22	78.8	33.0	96.8	22.00	14.50	26.50	3.3	2.00	9.8	6.3	24.6	43.5	2.0	7.6	17.7	16.88	7,750

UNIT SIZE	LOW SPEED SHAFT				HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y	RR <sup>①</sup>	KEY	RP	RX
QR11	4.500	1.000 x 1.000 x 6.0	7.8	18.5	1.375	.312 x .312 x 2.5	3.5	39.5
QR12	4.750	1.250 x 1.250 x 6.8	8.5	20.3	1.625	.375 x .375 x 2.8	3.8	43.0
QR13	5.000	1.250 x 1.250 x 7.0	9.1	21.3	1.625	.375 x .375 x 2.8	4.0	47.9
QR15	5.250	1.250 x 1.250 x 7.8	9.5	22.0	1.875	.500 x .500 x 3.0	4.0	52.1
QR16	5.500	1.250 x 1.250 x 8.3	9.5	23.5	2.125	.500 x .500 x 3.0	4.0	55.5
QR18	6.000	1.500 x 1.500 x 8.8	10.5	25.0	2.125	.500 x .500 x 3.5	4.5	61.5
QR20	6.500	1.500 x 1.500 x 9.3	11.3	26.5	2.375	.625 x .625 x 3.8	4.8	64.2
QR22	7.000	1.750 x 1.750 x 9.8	12.0	28.8	2.625	.625 x .625 x 4.0	5.3	72.2

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS

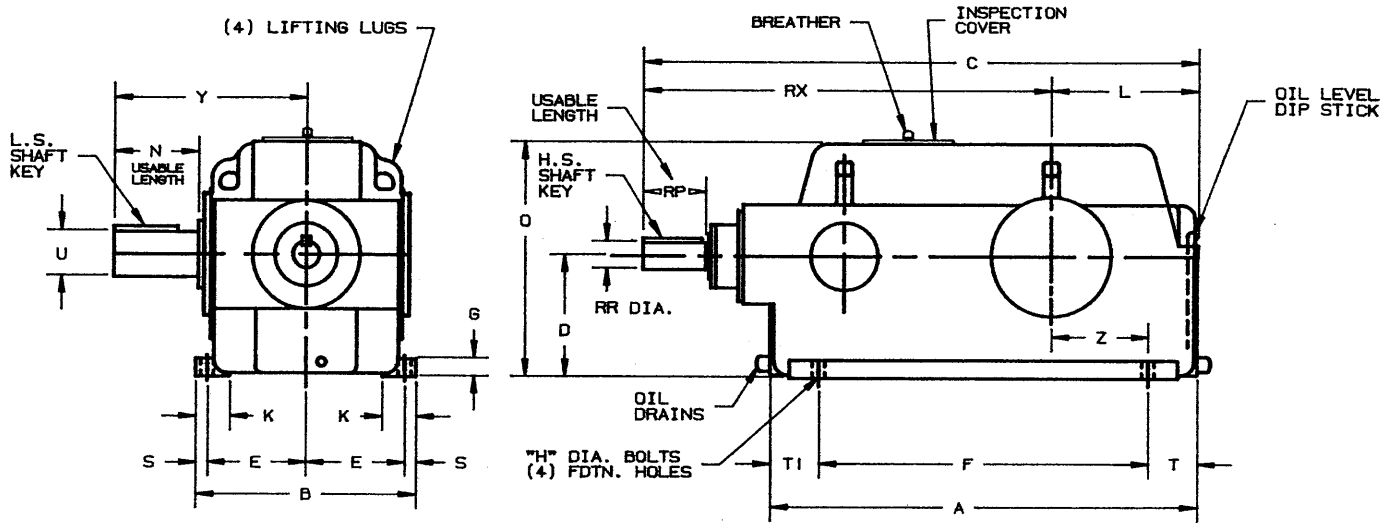


Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

# Type TDS Right Angle Shaft Speed Reducers Double Reduction-Steel Construction

Section 340  
Page 7  
Dimensions  
WDR7 to WDR9



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

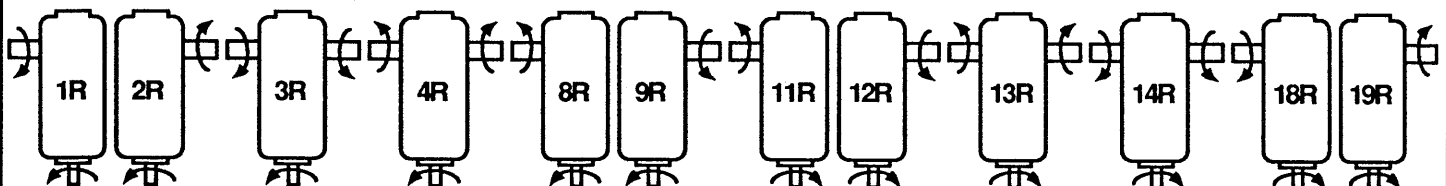
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WDR7	27.0	15.3	33.7	8.25	6.75	20.00	1.1	0.75	3.7	9.1	15.8	0.9	3.0	4.0	6.00	800
WDR8	35.4	18.0	41.9	10.25	8.00	25.50	1.5	1.00	4.3	11.1	20.0	1.0	3.8	6.1	7.25	1,150
WDR9	35.4	18.0	43.4	10.25	8.00	25.50	1.5	1.00	4.3	11.1	20.0	1.0	3.8	6.1	7.25	1,300

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
WDR7	2.875	.750 x .750 x 4.0	5.0	11.3		1.375	.312 x .312 x 2.5	3.5	24.6
WDR8	3.375	.875 x .875 x 4.5	6.0	13.6		1.500	.375 x .375 x 2.5	3.7	30.8
WDR9	3.875	1.000 x 1.000 x 5.3	6.6	14.3		1.875	.500 x .500 x 3.0	4.0	32.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

## STANDARD ASSEMBLY POSITIONS



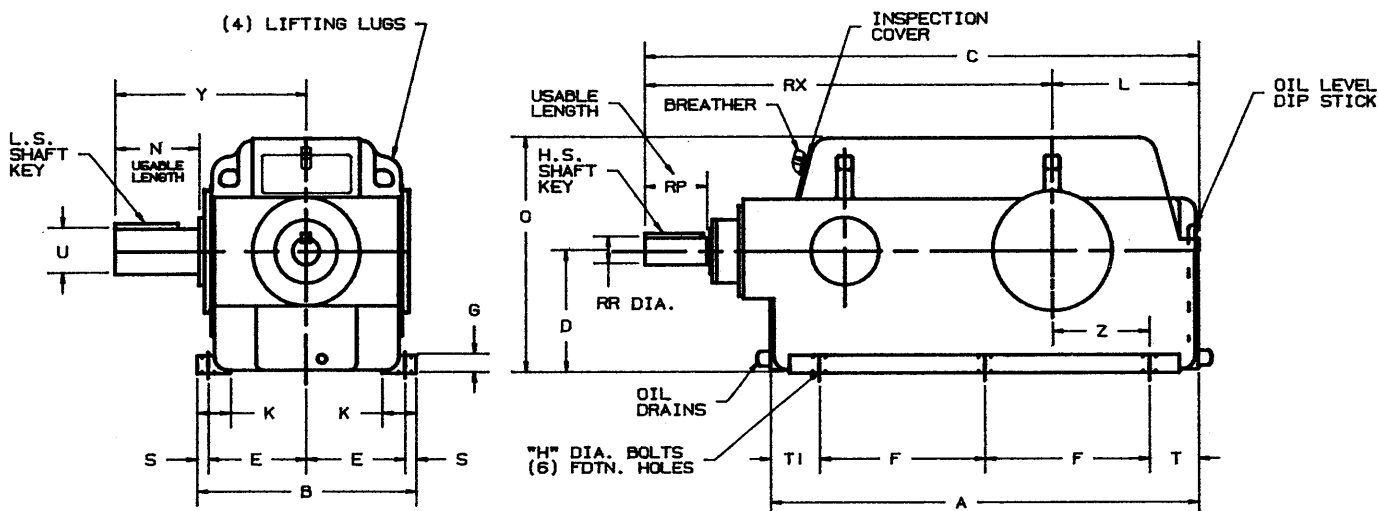
Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

# Type TDS

## Right Angle Shaft Speed Reducers

### Double Reduction-Steel Construction



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

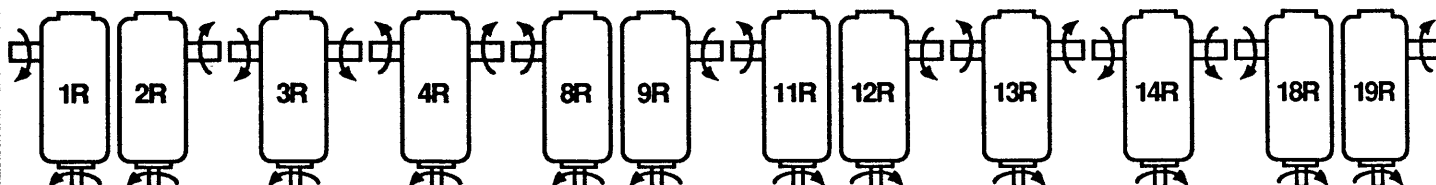
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WDR11	42.3	25.0	51.2	11.50	11.25	14.75	1.8	1.00	5.8	14.0	23.0	1.3	5.0	7.8	8.88	2,200
WDR12	44.5	27.0	54.9	12.50	12.25	16.25	2.0	1.25	5.8	15.3	25.0	1.3	5.3	6.8	9.88	3,050
WDR13	49.5	28.0	60.1	13.50	12.75	18.25	2.0	1.25	5.9	16.2	27.0	1.3	5.4	7.6	10.70	3,550
WDR15	54.6	29.5	66.8	15.00	13.25	19.25	2.3	1.50	6.5	17.4	30.0	1.5	5.5	10.6	11.75	4,150
WDR16	58.8	33.0	71.1	16.50	14.75	21.88	2.5	1.50	7.3	19.6	33.0	1.8	5.9	9.1	13.62	5,800
WDR18	66.0	29.0	78.3	18.00	12.75	23.00	2.8	1.75	5.0	20.8	35.5	1.8	6.4	13.6	14.25	6,850
WDR20	70.5	31.0	83.3	20.00	13.75	25.50	3.0	1.75	5.8	23.1	39.5	1.8	7.1	12.4	15.88	7,300
WDR22	78.8	33.0	92.8	22.00	14.50	26.50	3.3	2.00	6.3	24.6	43.5	2.0	7.6	18.2	16.88	8,750
WDR25	83.0	35.0	97.6	25.00	15.25	30.50	3.5	2.25	7.0	27.1	49.5	2.3	8.3	13.7	18.75	10,450

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
WDR11	4.500	1.000 x 1.000 x 6.0	7.8	18.5		2.125	.500 x .500 x 3.5	4.5	37.2
WDR12	4.750	1.250 x 1.250 x 6.8	8.5	20.3		2.625	.625 x .625 x 4.0	5.3	39.6
WDR13	5.000	1.250 x 1.250 x 7.0	9.1	21.3		2.875	.750 x .750 x 4.3	5.6	43.9
WDR15	5.250	1.250 x 1.250 x 7.8	9.5	22.0		3.125	.750 x .750 x 4.8	6.0	49.4
WDR16	5.500	1.250 x 1.250 x 8.3	9.5	23.5		3.375	.875 x .875 x 4.8	6.0	51.5
WDR18	6.000	1.500 x 1.500 x 8.8	10.5	25.0		3.375	.875 x .875 x 5.0	6.5	57.5
WDR20	6.500	1.500 x 1.500 x 9.3	11.3	26.5		3.375	.875 x .875 x 5.0	6.5	60.2
WDR22	7.000	1.750 x 1.750 x 9.8	12.0	28.8		3.625	.875 x .875 x 5.0	7.0	68.2
WDR25	8.000	2.000 x 2.000 x 10.8	13.5	30.8		3.875	1.000 x 1.000 x 5.8	7.3	71.5

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:

ITEM NO.:

S.O. NO.:

UNIT SIZE:

ASSEMBLY:

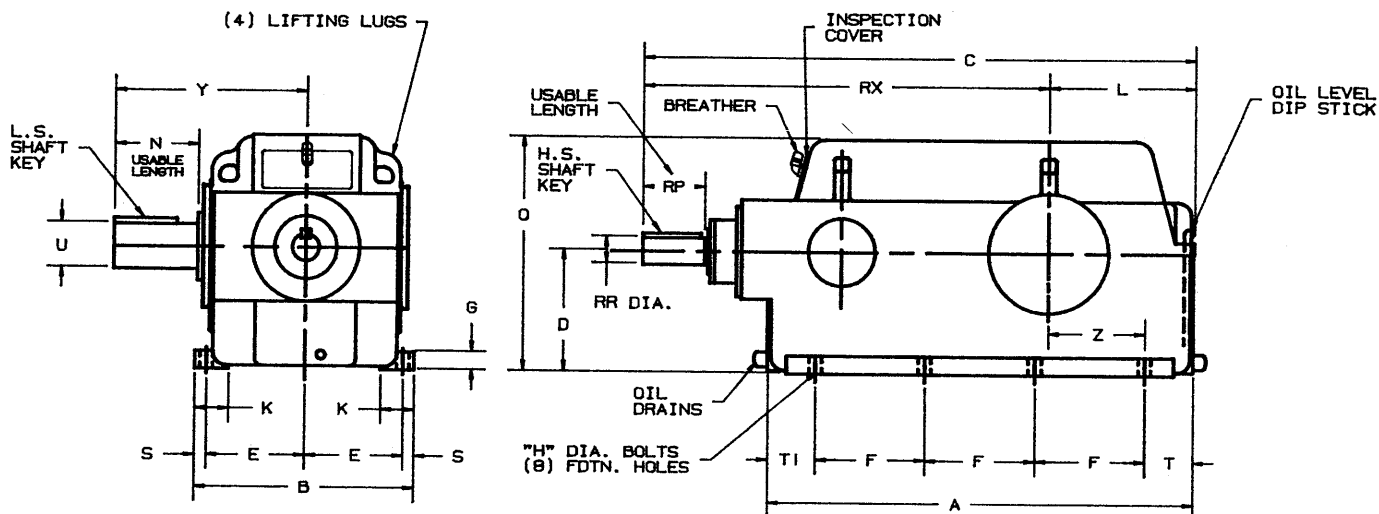
PRELIMINARY ☐CERTIFIED ☐

BY:

DATE:

# Type TDS Right Angle Shaft Speed Reducers Double Reduction-Steel Construction

Section 340  
Page 9  
Dimensions  
WDR28 to WDR40



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

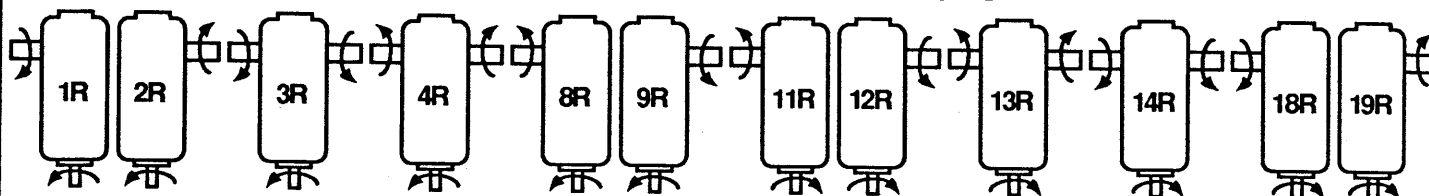
UNIT SIZE	A	B	C	D <sup>(2)</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WDR28	95.3	40.5	114.0	28.00	17.75	23.50	3.5	2.25	7.5	30.6	55.5	2.5	8.8	16.0	21.75	12,100
WDR30	103.0	42.8	121.0	30.00	18.62	24.50	3.6	2.50	8.1	32.9	59.0	2.8	9.8	19.8	23.00	15,100
WDR32	106.2	45.0	124.2	32.0	19.75	25.75	3.1	2.50	8.3	34.3	63.0	2.8	11.7	17.3	21.55	18,800
WDR34	117.8	47.5	137.8	34.0	20.75	27.00	3.1	2.75	9.0	36.0	67.0	3.0	12.3	24.5	23.50	22,050
WDR36	121.3	49.0	141.3	36.0	21.50	29.50	3.1	2.75	9.0	37.5	71.0	3.0	12.8	20.0	24.50	26,050
WDR38	126.3	51.0	146.3	38.0	22.25	30.50	3.1	3.00	9.8	39.0	75.0	3.3	12.8	22.0	26.00	30,450
WDR40	130.1	53.0	150.1	40.0	23.25	32.00	3.1	3.00	9.8	40.8	79.0	3.3	12.8	21.4	27.75	36,100

UNIT SIZE	LOW SPEED SHAFT				HIGH SPEED SHAFT			
	U <sup>(1)</sup>	KEY	N	Y	RR <sup>(1)</sup>	KEY	RP	RX
WDR28	9.000	2.500 x 2.500 x 12.3	15.0	34.3	4.500	1.000 x 1.000 x 6.0	8.0	83.4
WDR30	9.500	2.500 x 2.500 x 12.5	15.8	35.5	5.000	1.250 x 1.250 x 7.0	9.0	88.1
WDR32	10.500	2.500 x 2.500 x 13.5	17.0	38.3	5.000	1.250 x 1.250 x 7.0	9.0	90.0
WDR34	11.500	3.000 x 3.000 x 14.3	18.0	40.3	5.250	1.250 x 1.250 x 8.0	10.0	101.8
WDR36	12.500	3.000 x 3.000 x 15.0	19.0	43.0	5.500	1.500 x 1.500 x 8.0	10.0	103.8
WDR38	13.250	3.500 x 3.500 x 16.0	20.0	45.0	5.750	1.500 x 1.500 x 8.0	10.0	107.3
WDR40	14.000	3.500 x 3.500 x 17.0	21.0	47.0	5.750	1.500 x 1.500 x 8.0	10.0	109.3

① TOLERANCE = +.0000, - .0005 for diameters up to and including 2 inches; +.000, - .001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

## STANDARD ASSEMBLY POSITIONS



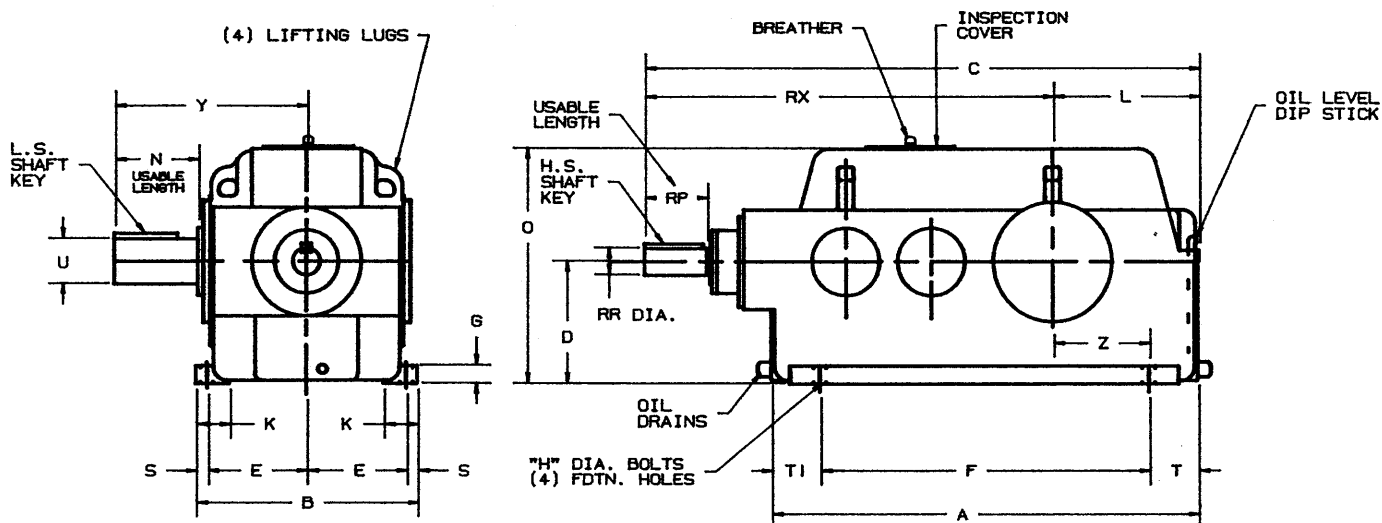
Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction-Steel Construction



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

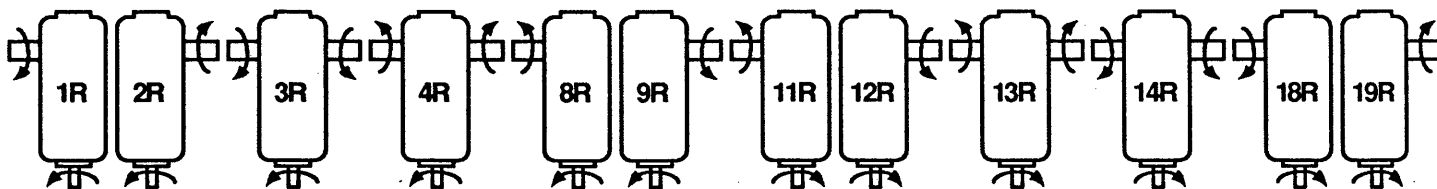
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WTR7	27.0	15.3	35.6	8.25	6.75	20.00	1.1	0.75	3.7	9.1	15.8	0.9	3.0	4.0	6.00	850
WTR8	35.4	18.0	42.4	10.25	8.00	25.50	1.5	1.00	4.3	11.1	20.0	1.0	3.8	6.1	7.25	1,200
WTR9	35.4	18.0	45.4	10.25	8.00	25.50	1.5	1.00	4.3	11.1	20.0	1.0	3.8	6.1	7.25	1,400

UNIT SIZE	LOW SPEED SHAFT				HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y	RR <sup>①</sup>	KEY	RP	RX
WTR7	2.875	.750 x .750 x 4.0	5.0	11.3	1.125	.250 x .250 x 2.5	3.3	26.5
WTR8	3.375	.875 x .875 x 4.5	6.0	13.6	1.125	.250 x .250 x 2.5	3.3	31.3
WTR9	3.875	1.000 x 1.000 x 5.3	6.6	14.3	1.375	.312 x .312 x 2.5	3.5	34.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

# Type TDS

## Right Angle Shaft Speed Reducers

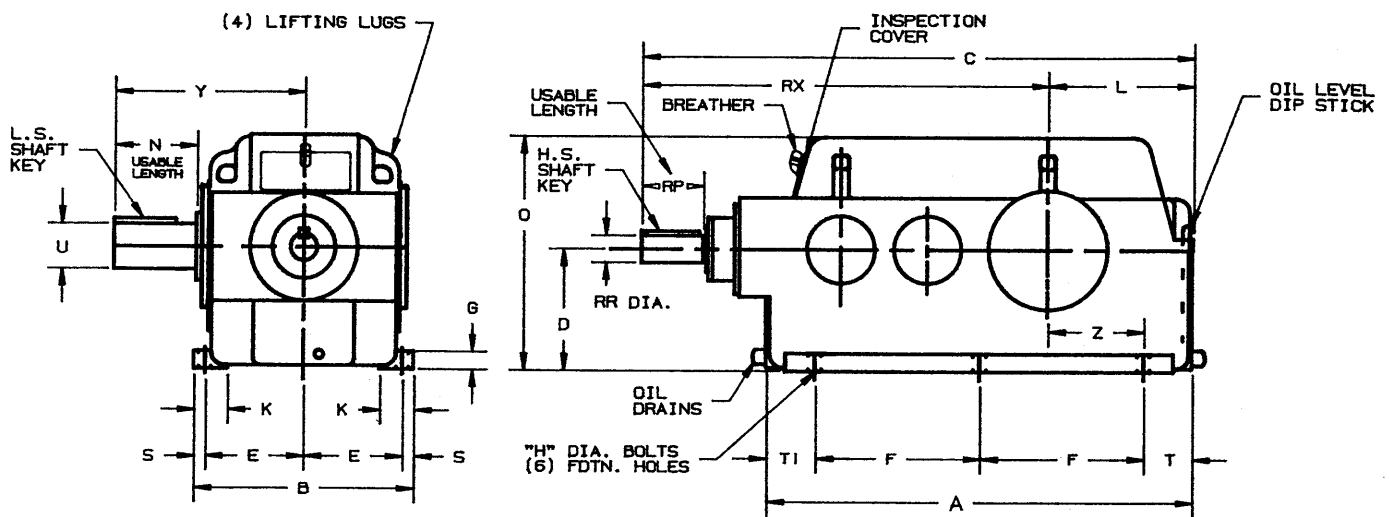
### Triple Reduction-Steel Construction

Section 340

Page 11

Dimensions

WTR11 to WTR25



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

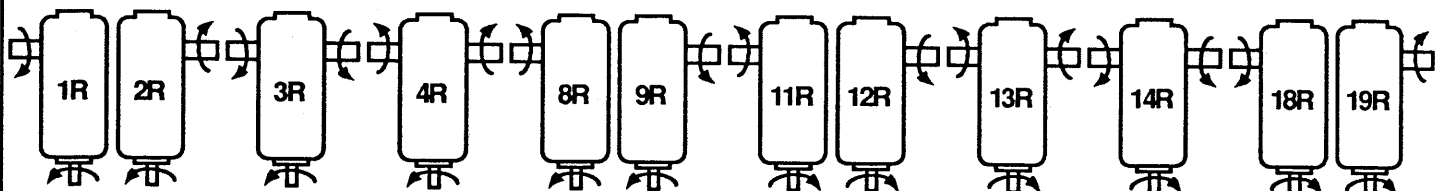
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WTR11	42.3	25.0	53.5	11.50	11.25	14.75	1.8	1.00	5.8	14.0	23.0	1.3	5.0	7.8	8.88	2,300
WTR12	44.5	27.0	58.3	12.50	12.25	16.25	2.0	1.25	5.8	15.3	25.0	1.3	5.3	6.8	9.88	3,150
WTR13	49.5	28.0	64.1	13.50	12.75	18.25	2.0	1.25	5.9	16.2	27.0	1.3	5.4	7.6	10.70	3,750
WTR15	54.6	29.5	69.5	15.00	13.25	19.25	2.3	1.50	6.5	17.4	30.0	1.5	5.5	10.6	11.75	4,300
WTR16	58.8	33.0	75.1	16.50	14.75	21.88	2.5	1.50	7.3	19.6	33.0	1.8	5.9	9.1	13.62	5,850
WTR18	66.0	29.0	82.3	18.00	12.75	23.00	2.8	1.75	5.0	20.8	35.5	1.8	6.4	13.6	14.25	7,050
WTR20	70.5	31.0	87.3	20.00	13.75	25.50	3.0	1.75	5.8	23.1	39.5	1.8	7.1	12.4	15.88	7,500
WTR22	78.8	33.0	96.8	22.00	14.50	26.50	3.3	2.00	6.3	24.6	43.5	2.0	7.6	18.2	16.88	9,000
WTR25	84.0	35.0	103.2	25.00	15.25	30.50	3.5	2.25	7.0	27.1	49.5	2.3	8.3	14.8	18.75	10,750

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
WTR11	4.500	1.000 x 1.000 x 6.0	7.8	18.5		1.375	.312 x .312 x 2.5	3.5	39.5
WTR12	4.750	1.250 x 1.250 x 6.8	8.5	20.3		1.625	.375 x .375 x 2.8	3.8	43.0
WTR13	5.000	1.250 x 1.250 x 7.0	9.1	21.3		1.625	.375 x .375 x 2.8	4.0	47.9
WTR15	5.250	1.250 x 1.250 x 7.8	9.5	22.0		1.875	.500 x .500 x 3.0	4.0	52.1
WTR16	5.500	1.250 x 1.250 x 8.3	9.5	23.5		2.125	.500 x .500 x 3.0	4.0	55.5
WTR18	6.000	1.500 x 1.500 x 8.8	10.5	25.0		2.125	.500 x .500 x 3.5	4.5	61.5
WTR20	6.500	1.500 x 1.500 x 9.3	11.3	26.5		2.375	.625 x .625 x 3.8	4.8	64.2
WTR22	7.000	1.750 x 1.750 x 9.8	12.0	28.8		2.625	.625 x .625 x 4.0	5.3	72.2
WTR25	8.000	2.000 x 2.000 x 10.8	13.5	30.8		2.875	.750 x .750 x 4.0	5.5	76.1

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS



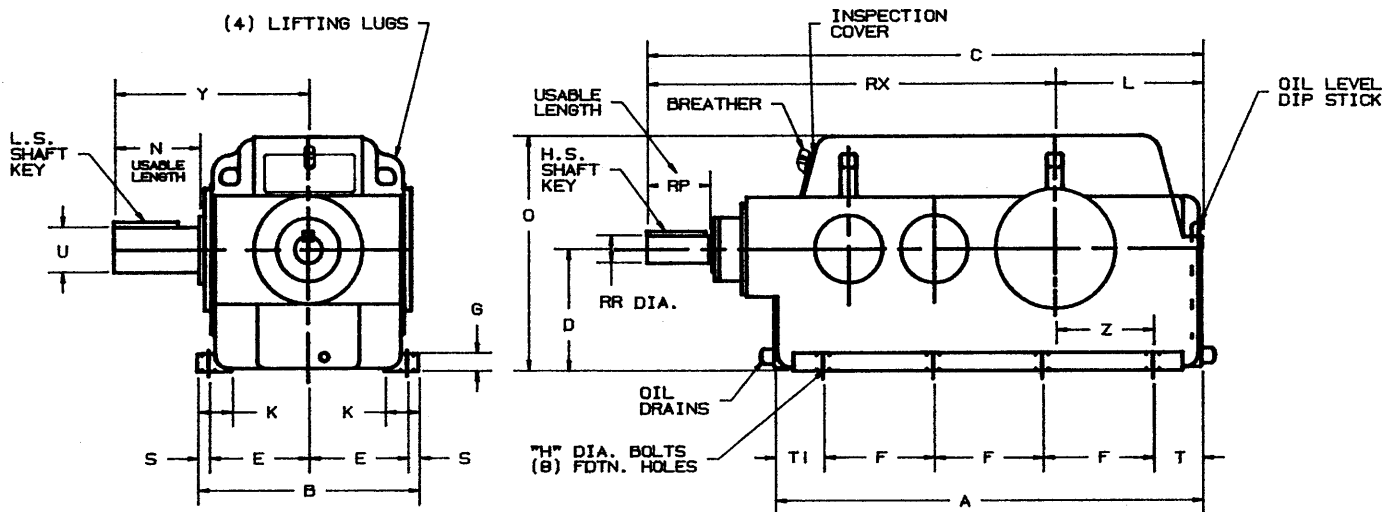
Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER: \_\_\_\_\_ ITEM NO.: \_\_\_\_\_ S.O. NO.: \_\_\_\_\_ UNIT SIZE: \_\_\_\_\_ ASSEMBLY: \_\_\_\_\_  
 PRELIMINARY ☐ CERTIFIED ☐ BY: \_\_\_\_\_ DATE: \_\_\_\_\_

# Type TDS

## Right Angle Shaft Speed Reducers

### Triple Reduction-Steel Construction



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

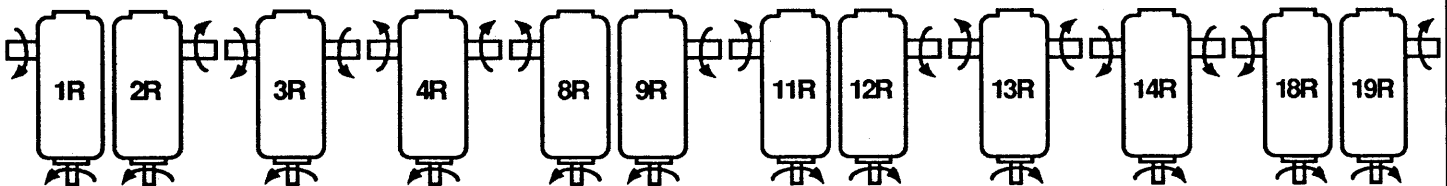
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WTR28	95.3	40.5	117.8	28.00	17.75	23.50	3.5	2.25	7.5	30.6	55.5	2.5	8.8	16.0	21.75	12,450
WTR30	103.0	42.8	127.5	30.00	18.62	24.50	3.6	2.50	8.1	32.9	59.0	2.8	9.8	19.8	23.00	15,450
WTR32	106.2	45.0	130.7	32.00	19.75	25.75	3.1	2.50	8.4	34.0	61.00	2.8	11.7	17.2	21.55	19,200
WTR34	117.8	47.5	142.3	34.00	20.75	26.75	3.1	2.75	8.0	36.0	67.00	2.8	11.7	25.9	23.65	22,450
WTR36	121.3	49.0	149.3	36.00	21.50	29.00	3.1	2.75	8.0	37.5	69.00	2.8	11.0	23.3	25.75	26,500
WTR38	126.3	51.0	154.3	38.00	22.25	30.50	3.1	3.00	8.0	39.0	71.00	2.8	11.3	23.5	27.00	30,900
WTR40	130.1	53.0	158.1	40.00	23.25	32.00	3.1	3.00	8.0	40.8	73.00	2.8	11.5	22.6	28.55	36,600

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U <sup>①</sup>	KEY	N	Y		RR <sup>①</sup>	KEY	RP	RX
WTR28	9.000	2.500 x 2.500 x 12.3	15.0	34.3		3.375	.875 x .875 x 4.5	6.5	87.1
WTR30	9.500	2.500 x 2.500 x 12.5	15.8	35.5		3.625	.875 x .875 x 5.0	7.0	94.6
WTR32	10.500	2.500 x 2.500 x 13.5	17.0	38.0		3.625	.875 x .875 x 5.0	7.0	96.7
WTR34	11.500	3.000 x 3.000 x 14.3	18.0	40.0		3.625	.875 x .875 x 5.0	7.0	106.3
WTR36	12.500	3.000 x 3.000 x 15.0	19.0	43.0		3.875	1.00 x 1.00 x 5.5	8.0	111.8
WTR38	13.250	3.500 x 3.500 x 16.0	20.0	45.0		3.875	1.00 x 1.00 x 5.5	8.0	115.3
WTR40	14.000	3.500 x 3.500 x 17.0	21.0	47.0		3.875	1.00 x 1.00 x 5.5	8.0	117.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS

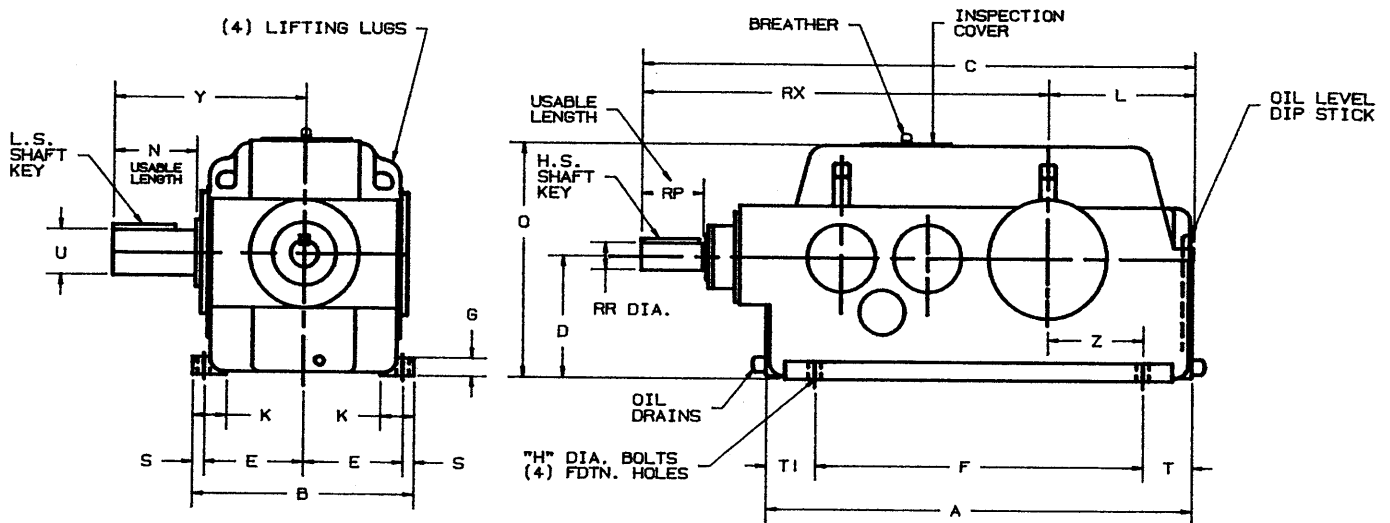


Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER: \_\_\_\_\_ ITEM NO.: \_\_\_\_\_ S.O. NO.: \_\_\_\_\_ UNIT SIZE: \_\_\_\_\_ ASSEMBLY: \_\_\_\_\_  
PRELIMINARY ☐ CERTIFIED ☐ BY: \_\_\_\_\_ DATE: \_\_\_\_\_

# Type TDS Right Angle Shaft Speed Reducers Quadruple Reduction-Steel Construction

Section 340  
Page 13  
Dimensions  
WQR7 to WQR9



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

## DIMENSIONS - INCHES

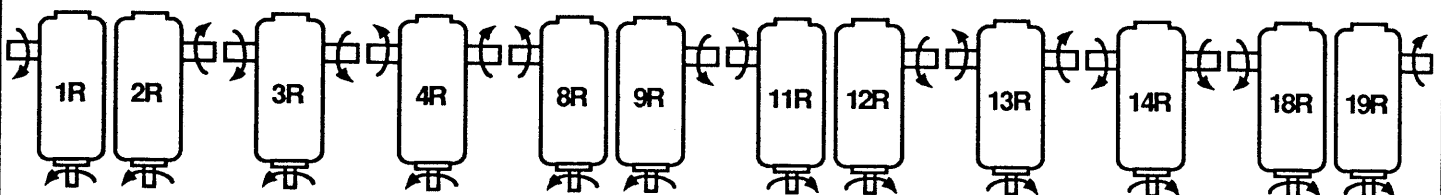
UNIT SIZE	A	B	C	D <sup>②</sup>	E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WQR7	27.0	15.3	35.6	8.25	6.75	20.00	1.1	0.75	3.7	9.1	15.8	0.9	3.0	4.0	6.00	900
WQR8	35.4	18.0	42.4	10.25	8.00	25.50	1.5	1.00	4.3	11.1	20.0	1.0	3.8	6.1	7.25	1,250
WQR9	35.4	18.0	45.4	10.25	8.00	25.50	1.5	1.00	4.3	11.1	20.0	1.0	3.8	6.1	7.25	1,500

UNIT SIZE	LOW SPEED SHAFT						HIGH SPEED SHAFT									
	U ①	KEY			N	Y	RR ①	KEY			RP	RX				
WQR7	2.875	.750	x	.750	x	4.0	5.0	11.3	1.125	.250	x	.250	x	2.5	3.3	26.5
WQR8	3.375	.875	x	.875	x	4.5	6.0	13.6	1.125	.250	x	.250	x	2.5	3.3	31.3
WQR9	3.875	1.000	x	1.000	x	5.3	6.6	14.3	1.375	.312	x	.312	x	2.5	3.5	34.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

## STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

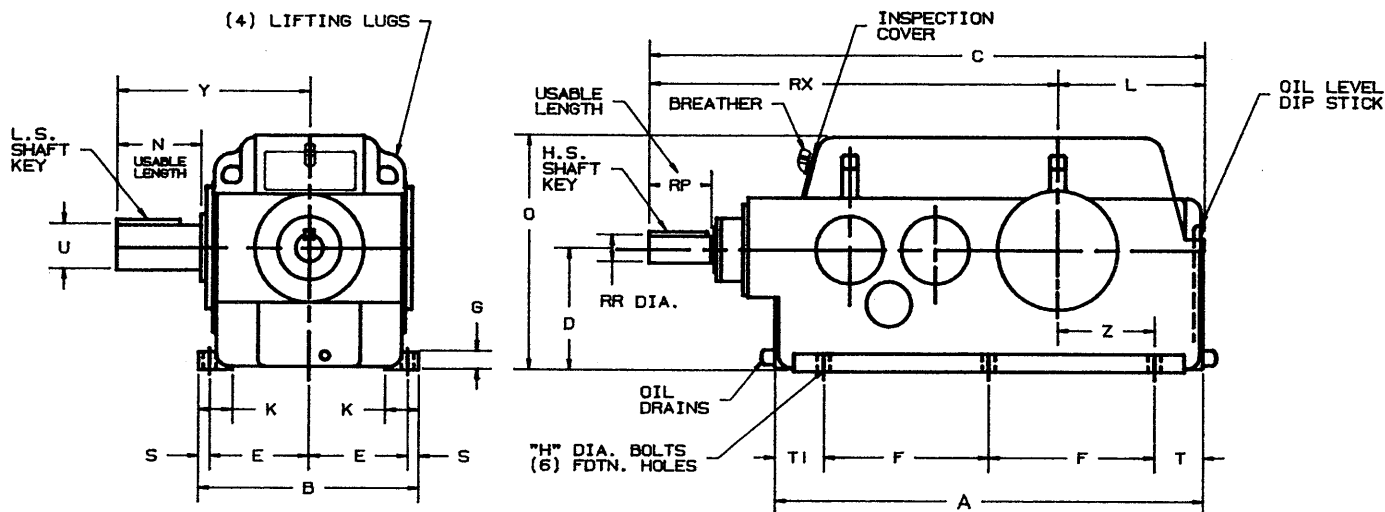
CUSTOMER ORDER: \_\_\_\_\_ ITEM NO.: \_\_\_\_\_ S.O. NO.: \_\_\_\_\_ UNIT SIZE: \_\_\_\_\_ ASSEMBLY: \_\_\_\_\_  
PRELIMINARY ☐ CERTIFIED ☐ BY: \_\_\_\_\_ DATE: \_\_\_\_\_



# Type TDS

## Right Angle Shaft Speed Reducers

### Quadruple Reduction-Steel Construction



ALL UNITS FURNISHED WITH SINGLE END  
SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

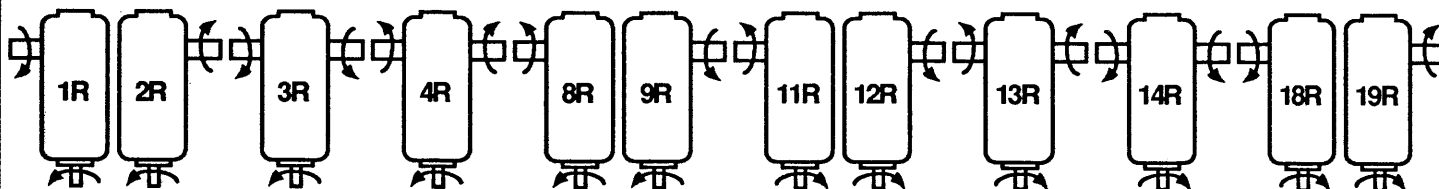
UNIT SIZE	A	B	C	D	②E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WQR11	42.3	25.0	53.5	11.50	11.25	14.75	1.8	1.00	5.8	14.0	23.0	1.3	5.0	7.8	8.88	2,400
WQR12	44.5	27.0	58.3	12.50	12.25	16.25	2.0	1.25	5.8	15.3	25.0	1.3	5.3	6.8	9.88	3,250
WQR13	49.5	28.0	64.1	13.50	12.75	18.25	2.0	1.25	5.9	16.2	27.0	1.3	5.4	7.6	10.70	3,850
WQR15	54.6	29.5	69.5	15.00	13.25	19.25	2.3	1.50	6.5	17.4	30.0	1.5	5.5	10.0	11.75	4,450
WQR16	58.8	33.0	75.1	16.50	14.75	21.88	2.5	1.50	7.3	19.6	33.0	1.8	5.9	9.1	13.62	6,000
WQR18	66.0	29.0	82.3	18.00	12.75	23.00	2.8	1.75	5.0	20.8	35.5	1.8	6.4	13.4	14.25	7,250
WQR20	70.5	31.0	87.3	20.00	13.75	25.50	3.0	1.75	5.8	23.1	39.5	1.8	7.1	12.2	15.88	7,700
WQR22	78.8	33.0	96.8	22.00	14.50	26.50	3.3	2.00	6.3	24.6	43.5	2.0	7.6	14.8	16.88	9,250
WQR25	84.0	35.0	103.2	25.00	15.25	30.50	3.5	2.25	7.0	27.1	49.5	2.3	8.3	18.2	18.75	11,050

UNIT SIZE	LOW SPEED SHAFT				HIGH SPEED SHAFT			
	U ①	KEY	N	Y	RR ①	KEY	RP	RX
WQR11	4.500	1.000 x 1.000 x 6.0	7.8	18.5	1.375	.312 x .312 x 2.5	3.5	39.5
WQR12	4.750	1.250 x 1.250 x 6.8	8.5	20.3	1.625	.375 x .375 x 2.8	3.8	43.0
WQR13	5.000	1.250 x 1.250 x 7.0	9.1	21.3	1.625	.375 x .375 x 2.8	4.0	47.9
WQR15	5.250	1.250 x 1.250 x 7.8	9.5	22.0	1.875	.500 x .500 x 3.0	4.0	52.1
WQR16	5.500	1.250 x 1.250 x 8.3	9.5	23.5	2.125	.500 x .500 x 3.0	4.0	55.5
WQR18	6.000	1.500 x 1.500 x 8.8	10.5	25.0	2.125	.500 x .500 x 3.5	4.5	61.5
WQR20	6.500	1.500 x 1.500 x 9.3	11.3	26.5	2.375	.625 x .625 x 3.8	4.8	64.2
WQR22	7.000	1.750 x 1.750 x 9.8	12.0	28.8	2.625	.625 x .625 x 4.0	5.3	72.2
WQR25	8.000	2.000 x 2.000 x 10.8	13.5	30.8	2.875	.750 x .750 x 4.0	5.5	76.1

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER: \_\_\_\_\_ ITEM NO.: \_\_\_\_\_ S.O. NO.: \_\_\_\_\_ UNIT SIZE: \_\_\_\_\_ ASSEMBLY: \_\_\_\_\_  
PRELIMINARY ☐ CERTIFIED ☐ BY: \_\_\_\_\_ DATE: \_\_\_\_\_

# Type TDS

## Right Angle Shaft Speed Reducers

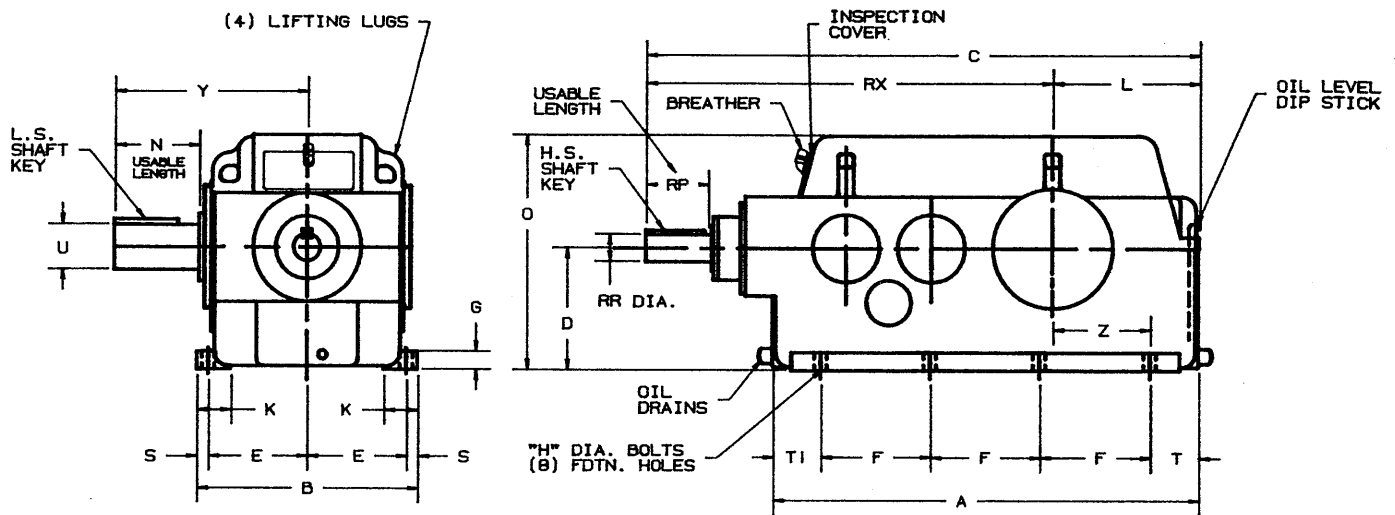
### Quadruple Reduction-Steel Construction WQR28 to WQR40

Section 340

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Dimensions

WQR28 to WQR40



ALL UNITS FURNISHED WITH SINGLE END SHAFT EXTENSION UNLESS OTHERWISE SPECIFIED.

#### DIMENSIONS - INCHES

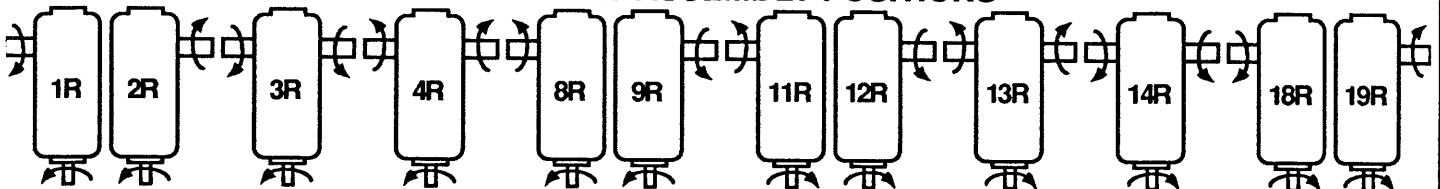
UNIT SIZE	A	B	C	D	②E	F	G	H	K	L	O	S	T	T1	Z	APPROX WT. LBS.
WQR28	95.3	40.5	117.8	28.00	17.75	23.50	3.5	2.25	7.5	30.6	55.5	2.5	8.8	16.5	21.75	12,800
WQR30	103.0	42.8	127.5	30.00	18.62	24.50	3.6	2.50	8.1	32.9	59.0	2.8	9.8	19.8	23.00	15,800
WQR32	106.2	45.0	130.7	32.00	19.75	25.75	3.1	2.50	8.3	34.3	63.0	2.8	11.7	17.3	23.25	19,600
WQR34	117.8	47.5	142.3	34.00	20.75	27.00	3.1	2.75	9.0	36.0	67.0	3.0	12.3	24.5	23.50	22,850
WQR36	121.3	49.0	149.3	36.00	21.50	29.50	3.1	2.75	9.0	37.5	71.0	3.0	12.8	20.0	24.50	26,950
WQR38	126.3	50.5	154.3	38.00	22.25	30.50	3.1	3.00	9.8	39.0	75.0	3.3	12.8	22.0	26.00	31,350
WQR40	130.1	53.0	158.1	40.00	23.25	32.00	3.1	3.00	9.8	40.8	79.0	3.3	12.8	21.4	27.75	37,100

UNIT SIZE	LOW SPEED SHAFT					HIGH SPEED SHAFT			
	U①	KEY	N	Y		RR①	KEY	RP	RX
WQR28	9.000	2.500 x 2.500 x 12.3	15.0	34.3		3.375	.875 x .875 x 4.5	6.5	87.1
WQR30	9.500	2.500 x 2.500 x 12.5	15.8	35.5		3.625	.875 x .875 x 5.0	7.0	94.6
WQR32	10.50	2.500 x 2.500 x 13.5	17.0	38.3		3.625	.875 x .875 x 5.0	7.0	96.5
WQR34	11.50	3.000 x 3.000 x 14.3	18.0	40.3		3.625	.875 x .875 x 5.0	7.0	106.3
WQR36	12.50	3.000 x 3.000 x 15.0	19.0	43.0		3.875	1.000 x 1.000 x 5.5	8.0	111.8
WQR38	13.25	3.500 x 3.500 x 16.0	20.0	45.0		3.875	1.000 x 1.000 x 5.0	8.0	115.3
WQR40	14.00	3.500 x 3.500 x 17.0	21.0	47.0		3.875	1.000 x 1.000 x 5.5	8.0	117.3

① TOLERANCE = +.0000, -.0005 for diameters up to and including 2 inches; +.000, -.001 for dimensions above 2 inches.

② THIS DIMENSION will never be exceeded. When exact dimension is required, shims up to 1/16 inch may be necessary.

#### STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

Effective: 15 SEPT 1993  
Supersedes: NEW

# Type TDS Right Angle Shaft Speed Reducers

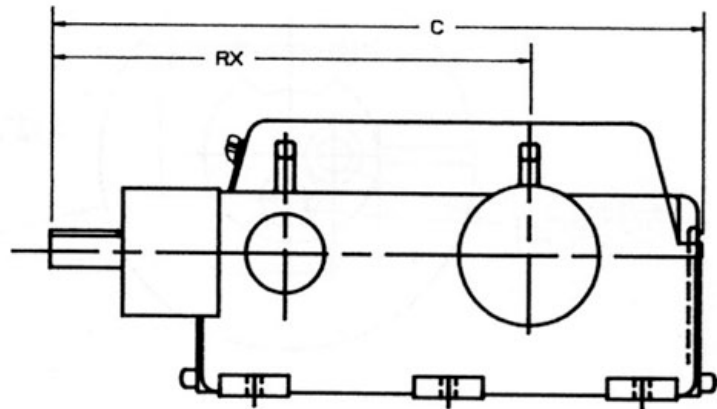
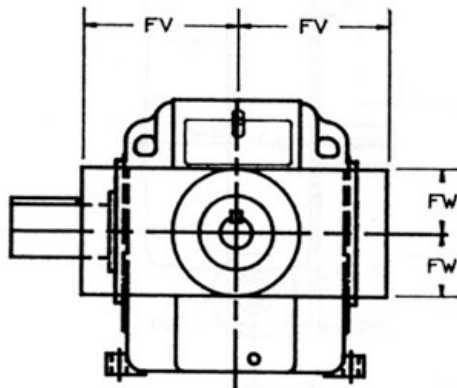
## NOTES

# Type TDS Right Angle Shaft Speed Reducers Fan Cooled

Section 340

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Dimensions



① H.S. SHAFT length is longer than standard on fan cooled units to accommodate the fan and maintain usable shaft length.

## DOUBLE AND TRIPLE REDUCTION

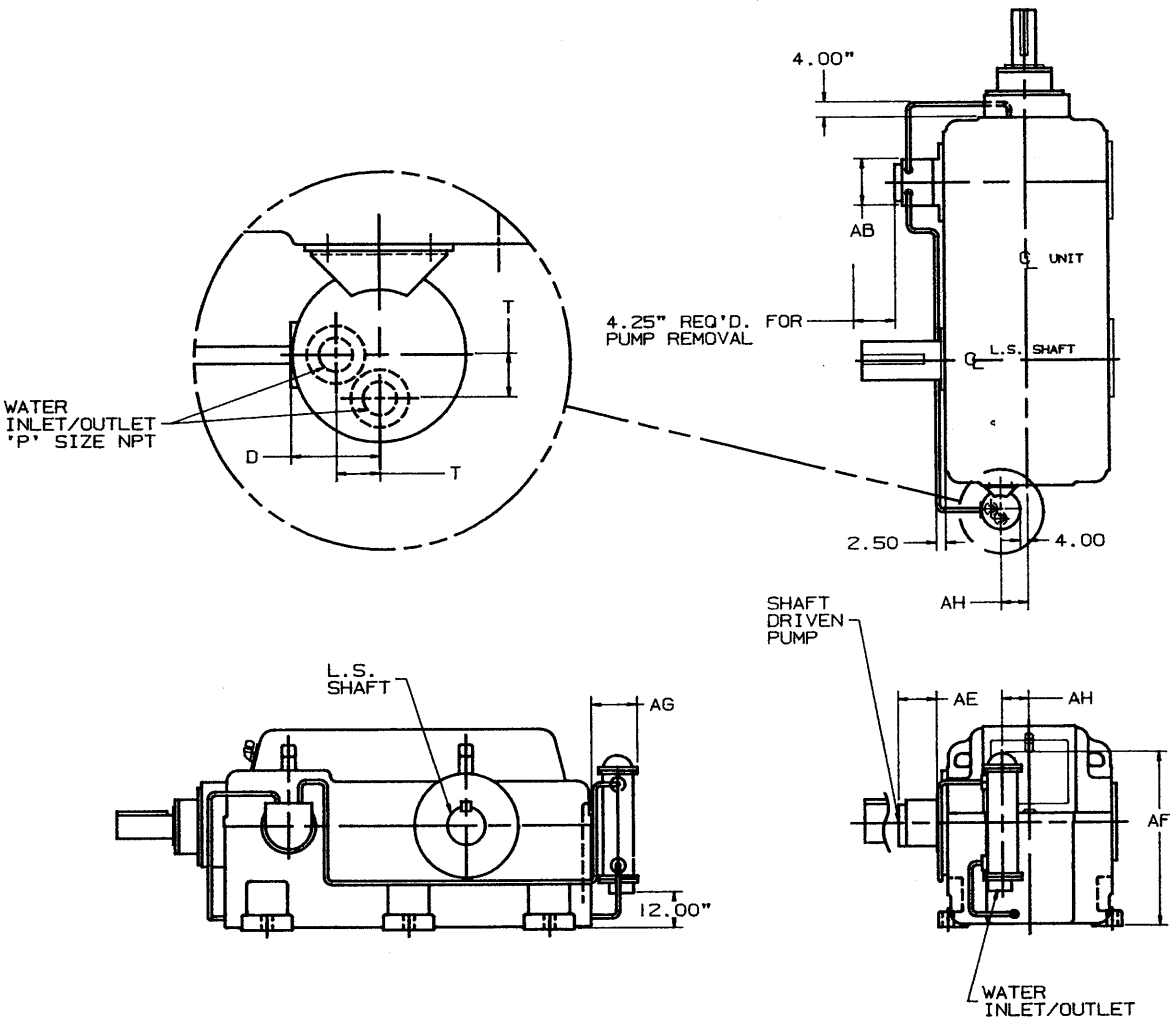
UNIT SIZE			DOUBLE		TRIPLE	
	FV	FW	C	RX <sup>①</sup>	C	RX <sup>①</sup>
7	6.5	5.0	36.8	24.7	38.8	29.6
8	7.5	7.0	45.8	34.7	46.3	35.2
9	7.5	7.0	47.3	36.2	49.3	38.2
11	10.5	7.0	55.0	41.0	57.3	43.3
12	11.5	8.0	59.5	44.3	62.8	47.5
13	11.9	8.0	64.8	48.6	68.8	52.6
15	12.3	8.0	71.3	53.9	74.0	56.6
16	13.8	9.5	76.5	56.9	80.5	60.9
18	14.0	9.5	83.5	62.8	87.5	66.8
20	15.0	9.5	88.5	65.4	92.5	69.4
22	16.3	11.0	98.5	73.9	102.5	77.9
25	16.8	11.0	104.5	77.4	109.0	81.9
28	18.8	12.0	120.0	89.4	123.8	93.1
30	19.4	12.0	127.3	94.4	133.8	100.9
32	21.0	14.0	131.2	97.0	137.7	103.5
34	22.0	14.0	144.8	108.8	149.3	113.3
36	23.0	16.0	149.3	111.8	157.3	119.8
38	24.0	16.0	154.3	115.3	162.3	123.3
40	25.3	16.0	158.1	117.4	166.1	125.4

Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

Effective: 15 SEPT 1993  
Supersedes: NEW

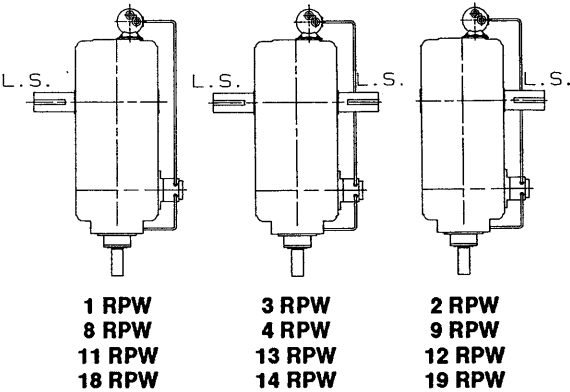
Type TDS  
Right Angle Shaft Speed Reducers  
Water Cooled Units



DIMENSIONS IN INCHES

UNIT SIZE	AB	AE	AF	AG	AH	D	T	P
1	5.2	2.8	39.2	5.6	6.3	2.31	1.00	0.75
2	5.2	2.8	29.2	5.6	6.3	2.31	1.00	0.75
3	6.6	3.4	39.9	7.1	7.0	3.13	1.25	0.75
4	6.6	3.4	39.2	5.6	6.3	2.31	1.00	0.75
5	6.5	4.1	52.8	8.0	7.4	3.44	1.69	1.00
6	6.5	4.1	40.8	8.0	7.4	3.44	1.69	1.00

STANDARD ASSEMBLY POSITIONS



See Unit Dimension Page for Relative Shaft Rotations

Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

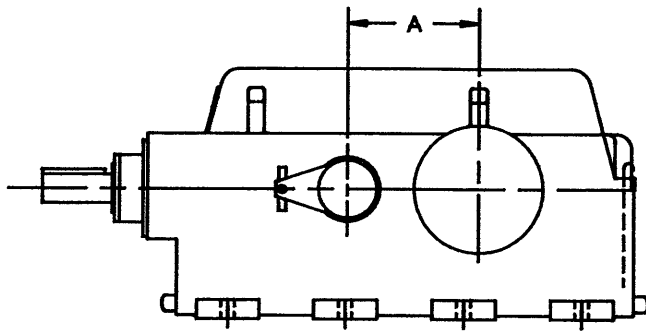
# Type TDS Right Angle Shaft Speed Reducers Backstops

Section 340

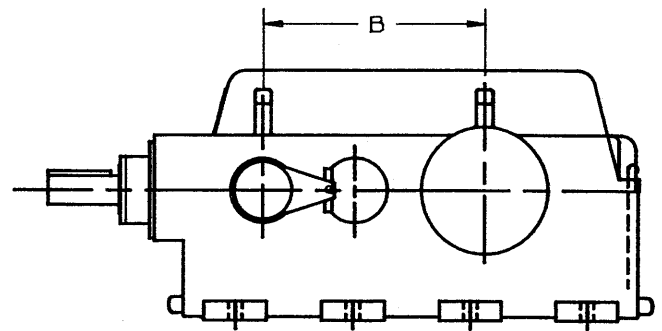
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Dimensions

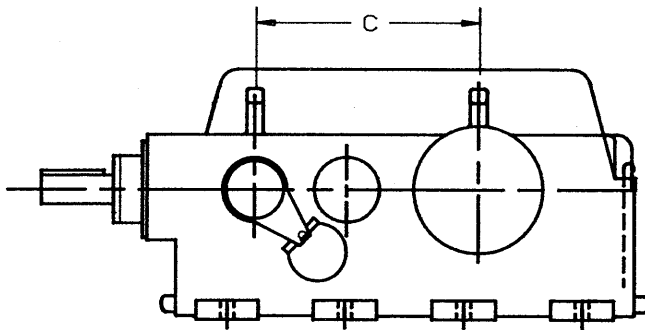
Size 7 thru 18



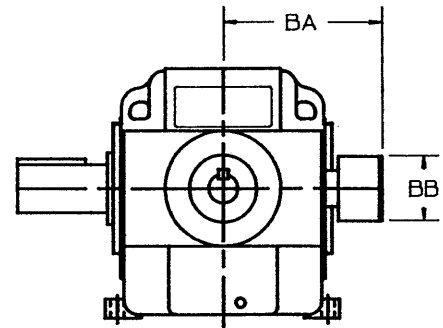
**DOUBLE REDUCTION**



**TRIPLE REDUCTION**



**QUADRUPLE REDUCTION**



**ALL UNITS**

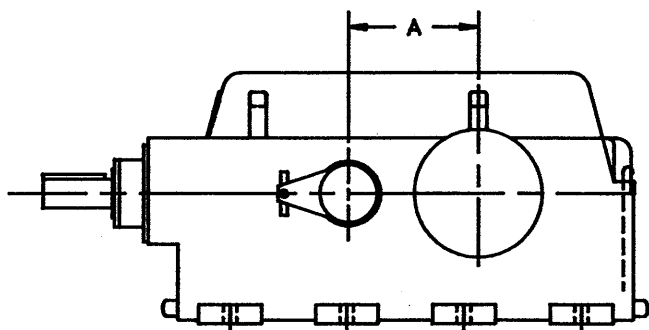
		BACKSTOP MODEL NUMBER						
TORQUE (x1000 IN. LBS.)		B20	B50	B80	B110	B120	B130	B150
MAXIMUM RPM		2900	2650	2300	2000	1800	1400	1300
BB DIMENSION		3.5	4.3	5.4	7.2	8.8	10.0	12.0
UNIT	A B C	BA DIMENSIONS						
7	7.50 13.50 13.50	12.3	14.0					
8	8.55 14.55 14.55	13.3	15.0					
9	9.50 17.00 17.00	13.3	15.0					
11	11.14 19.67 19.67	16.8	18.5	18.8				
12	12.32 21.82 21.82	17.8	19.5	19.8				
13	13.47 24.61 24.61	18.2	19.9	20.2				
15	15.02 27.34 27.34	18.6	20.3	20.6				
16	16.58 28.90 28.90	20.1	21.8	22.1	24.3	26.3		
18	18.13 33.16 33.16	20.3	22.0	22.3	24.5	26.5		

Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

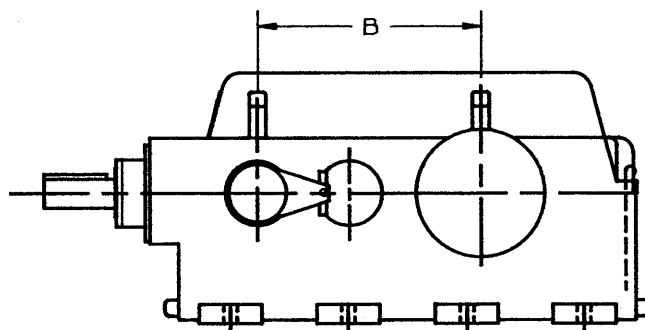
CUSTOMER ORDER: \_\_\_\_\_ ITEM NO.: \_\_\_\_\_ S.O. NO.: \_\_\_\_\_ UNIT SIZE: \_\_\_\_\_ ASSEMBLY: \_\_\_\_\_  
 PRELIMINARY ☐ CERTIFIED ☐ BY: \_\_\_\_\_ DATE: \_\_\_\_\_

Effective: 15 SEPT 1993  
 Supersedes: NEW

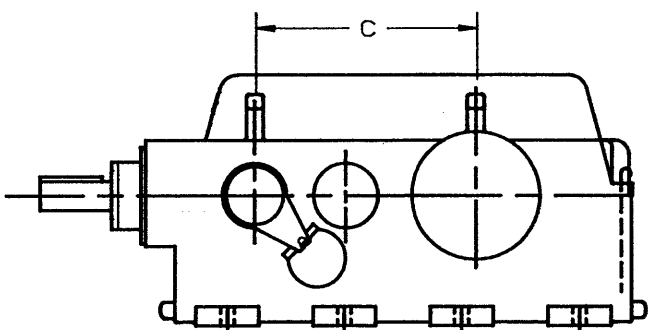
# Type TDS Right Angle Shaft Speed Reducers Backstops



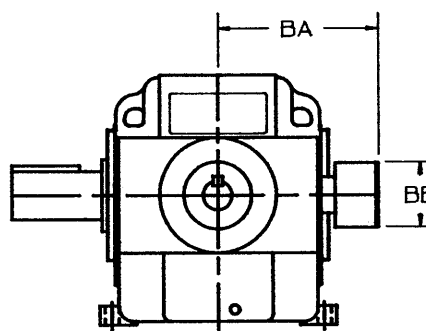
**DOUBLE REDUCTION**



**TRIPLE REDUCTION**



**QUADRUPLE REDUCTION**



**ALL UNITS**

		BACKSTOP MODEL NUMBER						
		B20	B50	B80	B110	B120	B130	B150
<b>TORQUE</b> (x1000 IN. LBS.)		3.6	12.0	26.4	48.0	81.6	138	216
<b>MAXIMUM RPM</b>		2950	2650	2300	2000	1800	1400	1300
<b>BB DIMENSION</b>		3.5	4.3	5.4	7.2	8.8	10.0	12.0
UNIT	A	B	C	BA DIMENSIONS				
20	20.21	35.23	35.23	21.3	23.0	23.3	25.5	27.5
22	21.76	37.89	37.89	22.6	24.3	24.6	26.8	28.8
25	24.87	43.00	43.00	23.1	24.8	25.1	27.3	29.3
28	27.98	48.18	48.18	24.8	26.5	26.8	29.0	31.0
30	30.05	50.25	50.25	25.6	27.3	27.6	29.8	31.8
32	32.12	53.88	53.88	26.8	28.5	28.8	31.0	33.0
34	34.19	59.06	59.06	27.8	29.5	29.8	32.0	34.0
36	36.00	61.13	61.13	28.8	30.5	30.8	33.0	35.0
38	38.00	62.87	62.87	29.8	31.5	31.8	34.0	36.0
40	40.00	64.87	64.87	30.8	32.5	32.8	35.0	37.0

Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

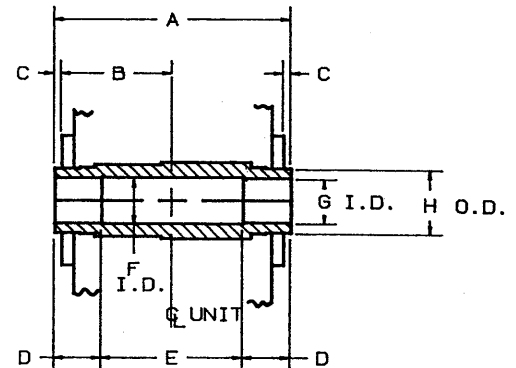
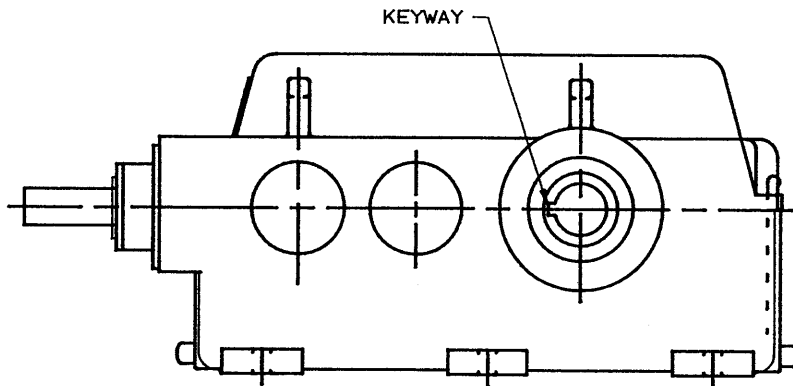
<b>CUSTOMER ORDER:</b>	<b>ITEM NO.:</b>	<b>S.O. NO.:</b>	<b>UNIT SIZE:</b>	<b>ASSEMBLY:</b>
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	

# Type TDS Right Angle Shaft Speed Reducers Hollow Shaft Construction

Section 340

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Dimensions



UNIT SIZE <sup>①</sup>	A	B	C	D	E	F	G	H	KEYS <sup>②</sup>
7	13.1	6.3	.25	3.3	6.50	3.125	2.875	4.250	.750 x .750 x 3.1
8	15.7	7.6	.25	3.9	7.90	3.625	3.375	5.000	.875 x .875 x 3.7
9	15.9	7.7	.25	4.0	7.90	4.125	3.875	5.750	1.000 x 1.000 x 3.8
11	21.9	10.7	.25	5.5	10.90	4.750	4.500	6.750	1.000 x 1.000 x 5.3
12	24.1	11.8	.25	6.0	12.10	5.000	4.750	7.000	1.250 x 1.250 x 5.8
13	24.9	12.2	.25	6.2	12.50	5.250	5.000	7.500	1.250 x 1.250 x 6.0
15	25.5	12.5	.25	6.4	12.70	5.500	5.250	8.000	1.250 x 1.250 x 6.2
16	29.0	14.0	.50	7.3	14.40	5.750	5.500	8.250	1.250 x 1.250 x 7.1
18	30.0	14.5	.50	7.5	15.00	6.250	6.000	9.000	1.500 x 1.500 x 7.3
20	31.4	15.2	.50	7.9	15.60	6.750	6.500	9.750	1.500 x 1.500 x 7.7
22	34.6	16.8	.50	8.6	17.40	7.250	7.000	10.500	1.750 x 1.750 x 8.4
25	35.6	17.3	.50	8.9	17.80	8.250	8.000	12.000	2.000 x 2.000 x 8.7
28	40.6	19.3	1.00	10.1	20.40	9.250	9.000	13.500	2.500 x 2.500 x 9.9
30	41.4	19.7	1.00	10.3	20.80	9.750	9.500	14.000	2.500 x 2.500 x 10.1
32	44.6	21.3	1.00	11.1	22.40	10.750	10.500	16.000	2.500 x 2.500 x 10.9
34	46.6	22.3	1.00	11.6	23.40	11.750	11.500	17.000	3.000 x 3.000 x 11.4
36	50.0	24.0	1.00	12.5	23.00	12.750	12.500	18.750	3.000 x 3.000 x 12.3
38	52.0	25.0	1.00	13.0	25.24	13.500	13.250	20.000	3.500 x 3.500 x 12.8
40	54.0	26.0	1.00	13.5	25.74	14.250	14.000	21.000	3.500 x 3.500 x 13.3

① Above dimensions for multiple reduction units only. For single reduction, please contact Nuttall Gear

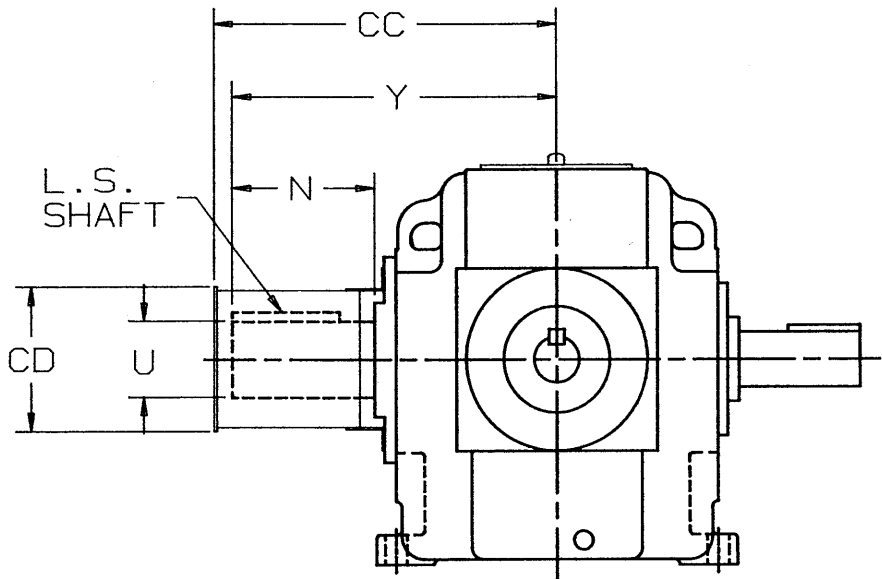
② 2 Keys Supplied

Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	



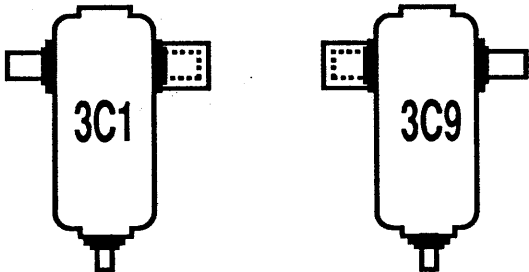
Type TDS  
Right Angle Shaft Speed Reducers  
Shaft Covers



UNIT SIZE ①	CC	CD
7	11.5	5.12
8	13.9	6.62
9	14.5	6.62
11	18.8	7.12
12	21.5	8.62
13	21.6	8.62
15	23.3	8.62
16	23.8	10.62
18	26.9	10.62
20	28.4	12.12
22	30.5	12.12
25	32.8	12.62
28	35.0	14.62
30	36.0	11.12
32	38.5	12.12
34	40.5	12.12
36	43.5	13.12
38	45.5	14.12
40	47.5	15.12

① NOTE: For Dimensions  
U, N, Y,  
see appropriate unit drawing.

STANDARD ASSEMBLY POSITIONS



Not to be used for construction unless both appropriate unit and supplemental dimensions are CERTIFIED.

CUSTOMER ORDER:	ITEM NO.:	S.O. NO.:	UNIT SIZE:	ASSEMBLY:
PRELIMINARY <input type="checkbox"/>	CERTIFIED <input type="checkbox"/>	BY:	DATE:	