

Torque-Arm™ Speed Reducers Taper Bushed Instruction Manual

TDT13 TDT14 TDT15

These instructions must be read thoroughly before installation or operation. This instruction manual was accurate at the time of printing. Please see dodgeindustrial.com for updated instruction manuals.

WARNING: To ensure the drive is not unexpectedly started, turn off and lock-out or tag power source before proceeding. Failure to observe these precautions could result in bodily injury.

WARNING: All products over 25 kg (55 lbs) are noted on the shipping package. Proper lifting practices are required for these products.

This reducer is compatible with the Dodge Sensor that can be installed in the adapter plug labelled “smart sensor”. The plug and sensor can be moved to different locations as required by mounting position.

INSTALLATION

1. If applicable, remove the plastic plugs that protect the threaded holes in the sides of the reducer housing and install the lifting brackets supplied with the reducer.
2. Determine the running position of the reducer (Figure 1). Note that the reducer housing has been machined for pipe plugs around the sides of the reducer for horizontal applications and in each face for vertical applications. The plugs must be arranged relative to the running position as follows:

Horizontal Installations—Install the magnetic drain plug in the hole closest to the bottom of the reducer. Throw away the tape that covers the filter/ ventilation plug in shipment and install plug in topmost hole. Of the remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

Vertical Installations—Install the filter/ventilation plug in the hole provided in the top face of the reducer housing. Use the hole in the bottom face for the magnetic drain plug. Of the remaining holes on the sides of the reducer, use a plug in the upper housing half for the minimum oil level plug.

WARNING: Because of the possible danger to person(s) or property from accidents which may result from the improper use of products, it is important that correct procedures be followed. Products must be used in accordance with the engineering information specified in the catalog. Proper installation, maintenance and operation procedures must be observed. The instructions in the instruction manuals must be followed. Inspections should be made as necessary to assure safe operation under prevailing conditions. Proper guards and other suitable safety devices or procedures as may be desirable or as may be specified in safety codes should be provided, and are neither provided by Dodge® nor are the responsibility of Dodge. This unit and its associated equipment must be installed, adjusted and maintained by qualified personnel who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. When risk to persons or property may be involved, a holding device must be an integral part of the driven equipment beyond the speed reducer output shaft.

The running position of the reducer in a horizontal application is not limited to the four position shown in Figure 1. However, if running position is over 20° in position “B” and “D” or 5° in position “A” and “C” either way from sketches, the oil level plug cannot be safely used to check the oil level, unless during the checking the torque arm is disconnected and the reducer is swung to within 20° for position “B” or “D” or 5° for position “A” or “C” of the positions shown in Figure 1. Because of the many possible positions of the reducer, it may be necessary or desirable to make special adaptations using the lubrication fitting holes furnished along with other standard pipe fittings, stand pipes and oil level gauges as required.

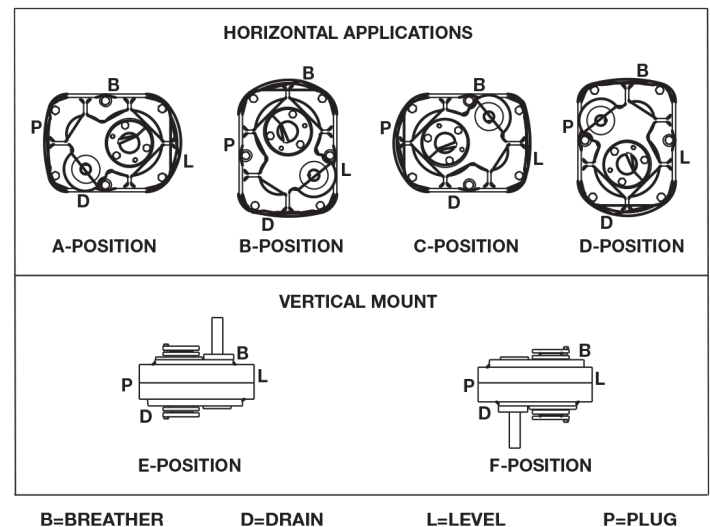


Figure 1 - Mounting Positions

CAUTION: Unit is shipped without oil. Add proper amount of recommended lubricant before operating. Failure to observe these precautions could result in damage to, or destruction of, the equipment.

TDT13 AND TDT14

Refer to instruction manual packed with tapered bushings for installation then go to step 9.

TDT15 ONLY:

CAUTION: DO NOT USE LUBRICANTS OR ANTI-SEIZE WHEN INSTALLING TWIN TAPERED BUSHINGS. The use of lubricants or anti-seize could result in over tightening of the bushing assembly. This may result in bushing assembly damage or future bushing removal issues.

3. Place the inboard bushing on the shaft and position it 3-1/2 inches away from the bearing.
4. Place output hub key on shaft and in bushing. Stake key in position.
5. Hoist reducer into position and slide it onto shaft aligning hub keyway with key.
6. Align unthreaded holes of inboard bushing with threaded holes of bushing back-up plate. If necessary, rotate the bushing back-up plate to align holes. Insert screws and tighten lightly.
7. Place the outboard bushing in position on the shaft aligning the bushing keyway with the key. Align the unthreaded holes in the bushing with the threaded holes in the back-up plate, rotating the back-up plate if necessary. Insert bushing screws and tighten lightly.
8. Tighten the screws in both bushings alternately and evenly to 1600 inch-pounds wrench torque.

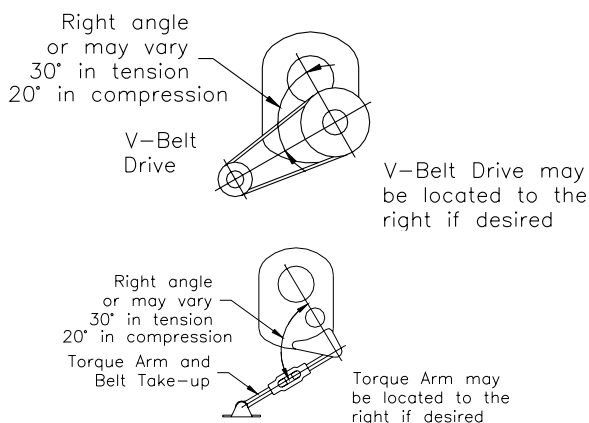


Figure 2 - Positioning

9. Install sheave on input shaft as close to reducer as possible.
10. Install motor and V-belt drive so belt pull will be roughly at right angles to the center line between driven and input shaft (Figure 2). This will permit tightening V-belt drive with the torque-arm.
11. Install torque-arm adaptor plates on the input end of the reducer.
12. Install torque-arm fulcrum on a rigid support so that the torque-arm will be approximately at right angles to the center line through the driven shaft and the torque-arm anchor screw (Figure 2). Make sure that there is sufficient take-up in the turnbuckle for belt tension adjustment when using V-belt drives.
13. Retighten bolts and pipe plugs after a few days' operation. This prevents oil leakage.

LUBRICATION

NOTE: Because reducer is shipped without oil, it is necessary to add the proper amount of oil before running.

Use a high-grade petroleum-base, rust and oxidation inhibited (R&O) gear oil (Tables 1 and 2). Follow instructions on reducer nameplate, warning tags and in the installation manual. Under average industrial operating conditions, the lubricant should be changed every 2500 hours of operation or every 6 months, whichever occurs first. Drain reducer and flush with kerosene, clean magnetic drain plug and refill to proper level with new lubricant.

CAUTION: Extreme pressure (EP) lubricants are not recommended for average operating conditions. Failure to observe these precautions could result in bodily injury.

CAUTION: Too much oil will cause overheating and too little will result in gear failure. Check oil level regularly. Failure to observe this precaution could result in bodily injury. Under extreme operating conditions, such as rapid rise and fall of temperature, dust, dirt, chemical particles, chemical fumes, or oil sump temperatures above 200°F, the oil should be changed every 1 to 3 months depending on severity of conditions.

CAUTION: Do not use EP oils or oils containing slippery additives such as graphite or molybdenum disulphide in the reducer when backstop is used. These additives will destroy sprag action.

Table 1—Oil Volumes

Reducer Size	Volume of Oil to Fill Reducer to Oil Level Plug ① ④								
	② Position A			② Position B			② Position C		
	Fluid Ounces	③ Quarts	Liters	Fluid Ounces	③ Quarts	Liters	Fluid Ounces	③ Quarts	Liters
TDT13	2752	86	81.0	1984	62	59	2752	86	81.0
TDT14	3840	120	114.0	2816	88	83	3840	120	114.0
TDT15	6304	197	186.0	4416	138	131	6144	192	182.0
Reducer Size	Volume of Oil to Fill Reducer to Oil Level Plug ① ④								
	② Position D			② Position E			② Position F		
	Fluid Ounces	③ Quarts	Liters	Fluid Ounces	③ Quarts	Liters	Fluid Ounces	③ Quarts	Liters
TDT13	1888	59	56.0	3520	110	104	3520	110	104
TDT14	1952	61	58.0	4800	150	142	4800	150	142
TDT15	5440	170	161.0	8992	281	266	8992	281	266

NOTES:

① Oil quantity is approximate. Service with lubricant until oil runs out of oil level hole.

② Refer to Figure 1 for mounting positions.

③ US measure: 1 quart = 32 fluid ounces = .94646 liters.

④ Below 20 RPM output speed, oil level must be adjusted to reach the highest oil level plug (P). If reducer position is to vary from those shown in Figure 1, either more or less oil may be required. Consult Product Support, Simpsonville, SC.

Table 2—Lubrication Recommendations - ISO Grades *

Output RPM	ISO Grades For Ambient Temperatures of 15°F to 60°F		
	Torque-Arm Reducer Size		
	TD13	TD14	TD15
301 – 400	150	150	150
201 – 300	150	150	150
151 – 200	150	150	150
126 – 150	150	150	150
101 – 125	150	150	150
81 – 100	150	150	150
41 – 80	150	150	150
11 – 40	150	150	150
1 – 10	220	220	220

Output RPM	ISO Grades For Ambient Temperatures of 50°F to 125°F		
	Torque-Arm Reducer Size		
	TD13	TD14	TD15
301 – 400	220	220	220
201 – 300	220	220	220
151 – 200	220	220	220
126 – 150	220	220	220
101 – 125	220	220	220
81 – 100	220	220	220
41 – 80	220	220	220
11 – 40	220	220	220
1 – 10	320	320	320

NOTES:

Below – 23 °F call application engineering.

20 °F to -22 °F use Mobil SHC 627.

Above 125 °F use Mobil SHC 634.

GUIDELINES FOR TORQUE-ARM REDUCER LONG-TERM STORAGE

During periods of long storage, or when waiting for delivery or installation of other equipment, special care should be taken to protect a gear reducer to have it ready to be in the best condition when placed into service.

By taking special precautions, problems such as seal leakage and reducer failure due to lack of lubrication, improper lubrication quantity, or contamination can be avoided. The following precautions will protect gear reducers during periods of extended storage:

PREPARATION

1. Drain oil from the unit. Add a vapor phase corrosion inhibiting oil (VCI-105 oil by Daubert Chemical Co.) in accordance with Table 3.
2. Seal the unit airtight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover all unpainted exterior parts with a waxy rust preventative compound that will keep oxygen away from the bare metal. (Non-Rust X-110 by Daubert Chemical Co. or equivalent).
4. The instruction manuals and lubrication tags are paper and must be kept dry. Either remove these documents and store them inside, or cover the unit with a durable waterproof cover which can keep moisture away.
5. Protect reducer from dust, moisture, and other contaminants by storing the unit in a dry area.

6. In damp environments, the reducer should be packed inside a moisture-proof container or an envelope of polyethylene containing a desiccant material. If the reducer is to be stored outdoors, cover the entire exterior with a rust preventative.

WHEN PLACING THE REDUCER INTO SERVICE:

1. Assemble the vent plug into the proper hole.
2. Clean the shaft extensions with petroleum solvents.
3. Fill the unit to the proper oil level using a recommended lubricant. The VCI oil will not affect the new lubricant.

Follow the installation instructions provided in this manual.

Table 3—Quantities of VCI #105 Oil

Reducer Size	Ounces
TD13	12
TD14 and TD15	16

VCI #105 and #10 are interchangeable.

VCI #105 is more readily available.

MOTOR MOUNTS

The motor mount must be installed on output end of reducer as shown in Figure 3.

Remove two or three (as required) housing bolts on output end of reducer. Install back support 1 and front support 2 with new housing bolts 8. Install mounting bolts 3.

Install mounting plate 5 with adjusting studs 4 as shown in Figure 3. Assemble one motor rail 6 by loosely bolting through the two front holes on each side of mounting plate (Figure 3) with mounting rail bolts 7.

Measure the distance between front and rear mounting holes of motor. Position the rear motor rail to this distance and loosely bolt to the mounting plate.

Center the motor on the motor rails. Use a plain washer under each slot in the motor rails when the motor mounting bolts are less than diameter. Bolt motor snugly to motor rails.

Install motor sheave and reducer sheave on their shafts as close as possible to the motor and reducer housings. Note: The motor rails may be moved forward or backward from the position shown in Figure 3 to permit alignment of the V-belt sheaves. It is permissible for the front motor rail to extend beyond the mounting plate 5. Align the V-belt sheaves carefully and tighten all bolts securely.

Install V-belts and adjust belt tension. Figure 3 shows the mount near the minimum belt center position. To increase the center distance, loosen the four nuts "A" on the adjusting studs and tighten the four nuts "B" alternately and evenly until the belts are properly tensioned.

Check all bolts to see that they are securely tightened.

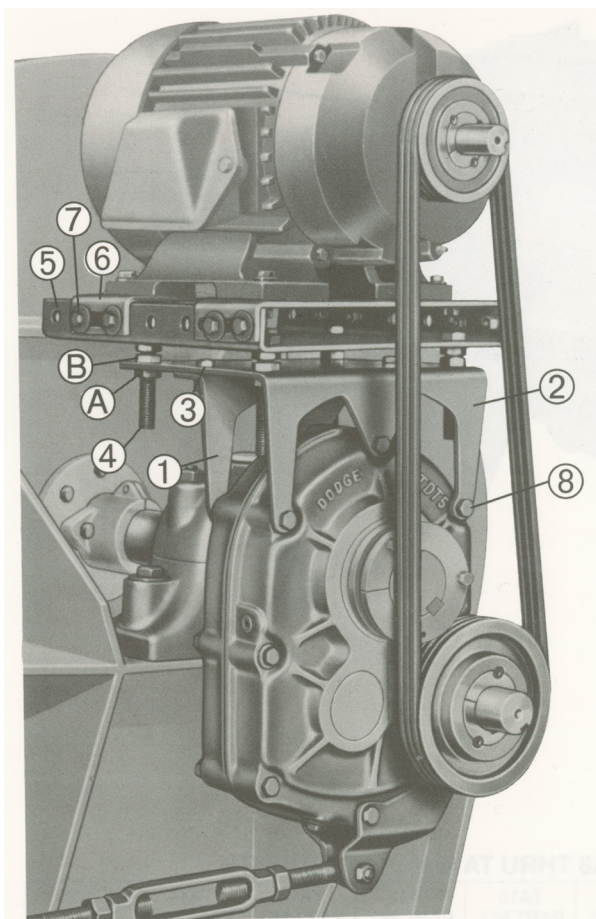


Figure 3 - Complete Drive

NOTE: Belt guard removed for photographic purposes.

WARNING: Do not operate if belt guard is not in place.

REPLACEMENT OF PARTS

NOTE: Using tools normally found in a maintenance department, a Torque-Arm speed reducer can be disassembled and reassembled by careful attention to the instructions following.

Cleanliness is very important to prevent the introduction of dirt into the bearings and other parts of the reducer. A tank of clean solvent, an arbor press, and equipment for heating bearings and gears (for shrinking these parts on shafts) should be available.

The oil seals are contact lip seals. Considerable care should be used during disassembly and reassembly to avoid damage to the surface on which the seals rub.

The keyseat in the input shaft, as well as any sharp edges on the output hub should be covered with tape or paper before disassembly or reassembly. Also, be careful to remove any burrs or nicks on surfaces of the input shaft or output hub before disassembly or reassembly.

ORDERING PARTS

When ordering parts for reducer, specify reducer size number, reducer model number, part name, part number, and quantity.

It is strongly recommended that, when a pinion or gear is replaced, the mating pinion or gear also be replaced.

If the large gear on the output hub must be replaced, it is recommended that an output hub assembly consisting of a gear assembled on a hub be ordered to ensure undamaged surfaces

on the output hub where the output seals rub. However, if it is desired to use the old output hub, press the gear and bearing off and examine the rubbing surface under the oil seal carefully for possible scratching or other damage resulting from the pressing operation. To prevent oil leakage at the shaft oil seals, the smooth surface of the output hub must not be damaged.

If any parts must be pressed from a shaft or from the output hub, this should be done before ordering parts to make sure that none of the bearings or other parts are damaged in removal. Do not press against rollers or cage of any bearing.

Because old shaft oil seals may be damaged in disassembly, it is advisable to order replacements for these parts.

If replacing a bearing or a shaft, it is advisable to order a set of shims for adjustment of bearings on the shaft assembly. If replacing a housing, a set of shims should be ordered for each shaft assembly because the adjustment of the bearings on each shaft assembly is affected.

REMOVING REDUCER FROM SHAFT

WARNING: To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Remove all external loads from drive before removing or servicing drive or accessories. Support reducer by external means before removing from shaft. Failure to observe these precautions could result in bodily injury.

1. Disconnect and remove belt guard, V-drive, and motor mount as required. Disconnect torque arm rod from reducer adapter.
2. Remove bushing screws.
3. Place the screws in the threaded holes provided in the bushing flanges. Tighten the screws alternately and evenly until the bushings are free on the shaft. For ease of tightening screws, make sure screw threads and threaded holes in bushing flanges are clean. A tap can be used to clean out the threads. Use caution to use the proper size tap to prevent damage to the threads.
4. Remove the outside bushing, the reducer, and then the inboard bushing.

DISASSEMBLY

1. Drain all oil from the reducer.
2. Remove retaining rings from output hub. Remove bushing back-up plates.
3. Remove all bolts from housing. Open housing evenly to prevent damage to parts inside.
4. Lift shaft, gear and bearing assemblies from housing.
5. Remove seals, bearing covers, seal carriers, backstop carrier and bearing cups from housing.

REASSEMBLY

1. **Output Hub Assembly:** Heat gear to 325°F to 350°F to shrink onto hub. Heat bearings to 270°F to 290°F to shrink onto hub. Any injury to the hub surfaces where the oil seals rub will cause leakage, making it necessary to use a new hub. Press output hub wear rings onto the hub until the distance from the hub end to the far side of the wear ring flange is: 2-7/32" on TDT13; 2-15/32" on TDT14; or 3-3/32" on TDT15.
2. **Countershaft Assembly:** Shaft and pinion are integral. Heat gear to 325°F to 350°F to shrink on shaft. Heat bearing cones to 270°F to 290°F to shrink on shaft.
3. **Input Shaft Assembly:** Slide pinion on shaft. Heat bearing cones to 270°F–290°F to shrink on shaft. Press input shaft wear ring onto shaft until the distance from the shaft end to the far side of the wear ring flange is: 9-11/16" on TDT13; 12-3/4" on TDT14; or 14-7/32" on TDT15.

4. Install a .025 shim on input backstop carrier, countershaft bearing carriers and output seal carrier. Apply a bead of RTV732 inside carriers at shim I.D. to prevent leaks. Install the carriers on R.H. housing half and torque to values in Table 4. Install the input, countershaft and output bearing cups. Insure cups are seated properly. Place housing on blocks to allow clearance for protruding end of output hub.
5. Mesh output hub assembly and countershaft assemblies together and place in housing half. Place input shaft assembly in position. Make sure rollers are properly seated in bearing cups. Input pinion and countershaft gears must be timed for proper sharing of loads. With reducer laying flat on table viewing input shaft, lift up input shell pinion on input shaft (pinion should slide freely on shaft). Notice the countershaft gears should rotate equal amounts in opposite directions. If this occurs, check the shell pinion on the input shaft for being approximately centered between the bearings. Using the large gear rotate the gears (in both directions) and check for smoothness of rotation. No binding should exist. If countershaft gears rotate equal amounts in opposite directions, the input shell pinion is approximately center of the bearings, and gears rotate smoothly. The gears should be timed properly. If all the above does not occur, lift one of the countershaft gear sets and rotate one tooth in either direction and re-mesh gears. Repeat timing check process. Repeat this procedure until the timing is correct. Timing of gears is a must for proper operation of the reducer. Consult Dodge Engineering in Simpsonville, SC for assistance.
6. Clean housing flange surfaces on both halves, making sure not to nick or scratch flange face. Place a new bead of gasket RTV 732 on flange face and spread evenly over entire flange leaving no bare spots. Place other housing half into position and tap with a soft hammer until housing bolts can be used to draw housing halves together. Torque housing bolts per torque values listed in Table 4.
7. Place output seal carrier into position without shims. Install four bolts and torque to 25 lb-ins. Rotate output hub assembly to seat bearings. Torque bolts to 50 lb-ins. Again rotate the output hub to seat bearings (tap down on output hub with rawhide mallet while rotating). Using feeler gauge check gap between carrier flange and housing. Remove carrier, add gap measurement plus .002 shims, reinstall carrier and torque bolts to values in Table 4. Using dial indicator check end play of hub assembly. End play value is .001 to .003. Add or remove shims to obtain proper setting.
8. Repeat process for the countershaft assemblies. End play value is .001 to .003.
9. Repeat the process for the input shaft. End play value is .002 to .004.

NOTE: Apply 1/8" bead of RTV732 inside carriers at I.D. of shims to prevent leaks.

10. Extreme care should be used in installing seals on input shaft and output hub to avoid damage which would result in oil leakage. This danger of damage and consequent oil leakage can be decreased by covering the keyseat and retaining ring groove with scotch tape or paper which can be removed subsequently. Chamfer or burr housing bore if end of bore is sharp or rough. Fill cavity between lips of seat with grease. Seals should be pressed or tapped with a soft hammer evenly into place in the housing, applying force only on outer corner of seals. A slight oil leakage at the seals may be evident during initial running in, but will disappear unless the seals have been damaged.

Table 4–Recommended Torque Values (lb-in)

Reducer Size	Housing Bolts	Output Hub Seal Carrier	Countershaft & Input Shaft Carrier & Cover
TDT13	1620	3120	1800
TDT14	3120	5160	3120
TDT15	3120	5160	3120

Table 5–Replacement Output Hub Bearings

Reducer Size	Part No.	
	Cone	Cup
TDT13	402230	402229
TDT14	402239	403133
TDT15	402009	403013

Table 6–Replacement Countershaft Bearings

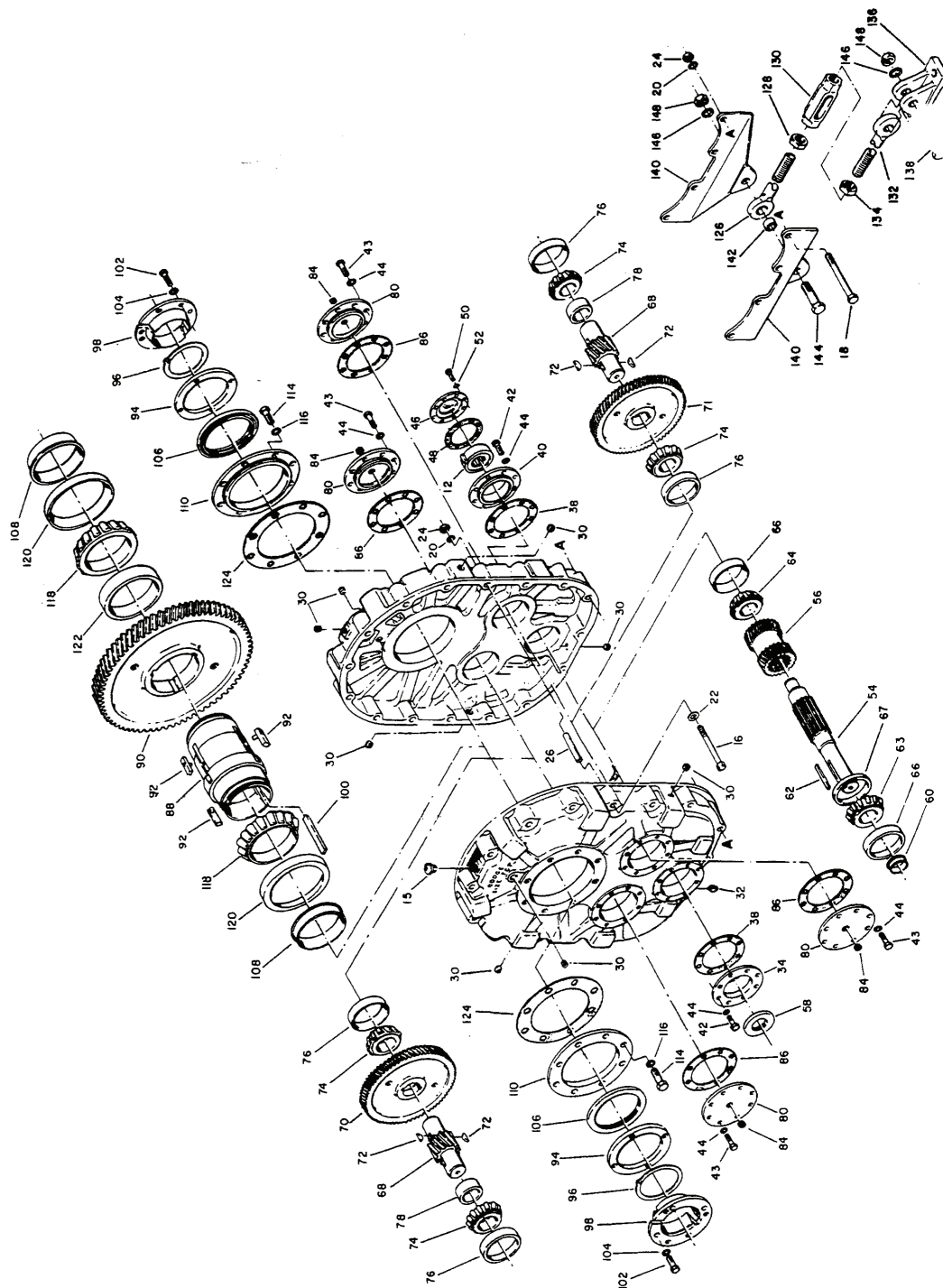
Reducer Size	Part No.	
	Cone	Cup
TDT13	402234	402233
TDT14	402240	403134
TDT15	402011	403014

Table 7–Replacement Input Shaft Bearings

Reducer Size	Input End Part No.		Backstop End Part No.	
	Cone	Cup	Cone	Cup
TDT13	402232	402231	402232	402231
TDT14	402241	402233	402241	402233
TDT15	402234	402233	402241	402233

Parts for TDT13, TDT14, and TDT15 Taper Bushed Reducers

NOTE: The two-digit numbers are for reference use. Order parts by the six-digit part numbers in the Parts List whenever possible. Each six digit number is a complete identification of the part of the assembly.



OIL VISCOSITY EQUIVALENCY CHART

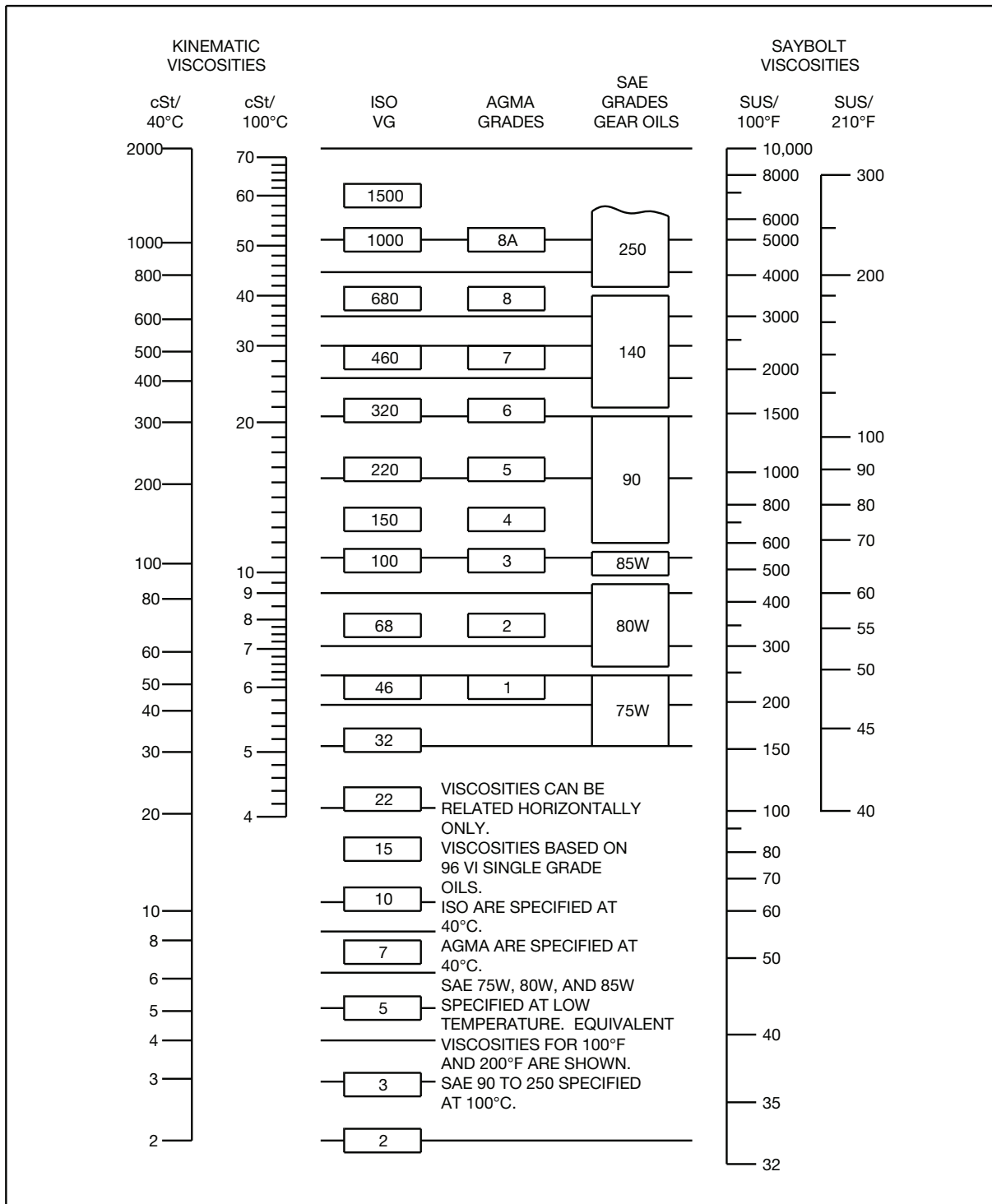


Figure 4 - Oil Viscosity Equivalency Chart

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