

# Parts Replacement Manual For HYDROIL™ TORQUE-ARM™ Speed Reducers Taper Bushed For Char-Lynn®\* H, S, T and 2000 Series 6B Spline Motors

## SIZES: HXT305A, HXT405A, HXT505A

These instructions must be read thoroughly before installation or operation. This instruction manual was accurate at the time of printing. Please see [baldor.com](http://baldor.com) for updated instruction manuals.

**Note!** The manufacturer of these products, Baldor Electric Company, became ABB Motors and Mechanical Inc. on March 1, 2018. Nameplates, Declaration of Conformity and other collateral material may contain the company name of Baldor Electric Company and the brand names of Baldor-Dodge and Baldor-Reliance until such time as all materials have been updated to reflect our new corporate identity.

**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.

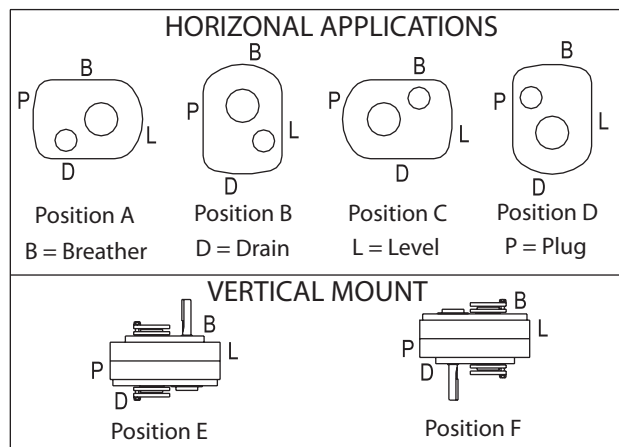
**NOTE:** This reducer is compatible with the ABB Smart Sensor that can be installed in the adapter plug labeled "smart sensor". The plug and sensor can be moved to different locations as required by mounting position.

**Horizontal Installations**—Install the magnetic drain plug in the hole closest to the bottom of the reducer. Install vent plug in topmost hole. Of the 2 remaining plugs on the sides of the reducer, the lowest one is the minimum oil level plug.

### REDUCER INSTALLATION

1. On sizes HXT305A, HXT405A, and HXT505A use lifting lug to lift reducers.
2. Determine the running positions of the reducer. (See Fig. 1) Note that the reducer is supplied with either 6 plugs; 4 around the sides for horizontal installations and 1 on each face for vertical installations. These plugs must be arranged relative to the running positions as follows:

**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 ABB nor are the responsibility of ABB. 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.



**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.

The running position of the reducer in a horizontal application is not limited to the four positions shown in Figure 1. However, if running position is over 20° 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° in positions "B" and "D" or 5° in positions "A" and "C" of the possible 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 gages as required.

3. Mount Taper Bushed reducer on driven shaft per instructions packed with tapered bushings.

4. Install torque arm and adapter plates using the long reducer bolts. The bolts may be shifted to any of the holes on the input end of the reducer.
5. 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.

### CHAR-LYNN H, S, T AND 2000 SERIES 6B SPLINE MOTOR INSTALLATION

Consult the local Char-Lynn Motor dealer for hydraulic motor information.

## REDUCER LUBRICATION

**CAUTION: Extreme pressure (EP) lubricants are not recommended for average operating conditions. Failure to observe these precautions could result in damage to, or destruction of, the equipment.**

**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—see tables. 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: Do not use oils containing slippery additives such as graphite or molybdenum disulphide in the reducer when backstop is used. These additives will destroy sprag action. Failure to observe these precautions could result in damage to, or destruction of, the equipment.**

**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 damage to or destruction of the equipment.**

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.

Table 1 – Oil Volumes

Reducer Size	Volume of Oil Required to Fill Reducer to Oil Level Plug											
	① Position A			① Position B			① Position C			① Position D		
	Fluid Ounces (Approx)	② Quarts (Approx)	Liters (Approx)	Fluid Ounces (Approx)	② Quarts (Approx)	Liters (Approx)	Fluid Ounces (Approx)	② Quarts (Approx)	Liters (Approx)	Fluid Ounces (Approx)	② Quarts (Approx)	Liters (Approx)
HXT305A	28	7/8	.83	48	1-1/2	1.42	44	1-3/8	1.30	44	1-3/8	1.30
HXT405A	24	1-1/2	1.42	72	2-1/4	2.13	68	2-1/8	2.01	60	1-7/8	1.77
HXT505A	108	3-3/8	3.19	136	4-1/4	4.02	124	3-7/8	3.67	120	3-3/4	3.54

① Refer to Figure 1 for mounting positions

② U.S. Measure: 1 quart = 32 fluid ounces = .94646 liters.

NOTE: If reducer position is to vary from those shown in Figure 1 either more or less oil may be required. Contact Dodge Product Support.

## Minimum Oil Recommendations for Average Operating Conditions

**Table 2 — Lubrication Recommendations**  
ISO Grades for Ambient Temperatures of 15° to 60°

Output RPM	Reducer Size													
	1	2	3	4	5	6	7	8	9	10	12	13	14	15
301–400	220	220	150	150	150	150	150	150	150	150	150	150	150	150
201–300	220	220	150	150	150	150	150	150	150	150	150	150	150	150
151–200	220	220	150	150	150	150	150	150	150	150	150	150	150	150
126–150	220	220	220	150	150	150	150	150	150	150	150	150	150	150
101–125	220	220	220	220	150	150	150	150	150	150	150	150	150	150
81–100	220	220	220	220	220	150	150	150	150	150	150	150	150	150
41–80	220	220	220	220	220	150	150	150	150	150	150	150	150	150
11–40	220	220	220	220	220	220	220	220	220	220	150	150	150	150
1–10	220	220	220	220	220	220	220	220	220	220	220	220	220	220

Below – 23°F call application engineering.  
20°F to -22°F use Mobil SHC 627  
Above 125°F use Mobil SHC 634.

**Table 3 — Lubrication Recommendations**

Output RPM	ISO Grades for Ambient Temperatures of 15° to 125°													
	1	2	3	4	5	6	7	8	9	10	12	13	14	15
301–400	320	320	220	220	220	220	220	220	220	220	220	220	220	220
201–300	320	320	220	220	220	220	220	220	220	220	220	220	220	220
151–200	320	320	220	220	220	220	220	220	220	220	220	220	220	220
126–150	320	320	320	220	220	220	220	220	220	220	220	220	220	220
101–125	320	320	320	320	220	220	220	220	220	220	220	220	220	220
81–100	320	320	320	320	320	220	220	220	220	220	220	220	220	220
41–80	320	320	320	320	320	220	220	220	220	220	220	220	220	220
11–40	320	320	320	320	320	320	320	320	320	320	220	220	220	220
1–10	320	320	320	320	320	320	320	320	320	320	220	220	220	220

**NOTES:**

Pour point of lubricant selected should be at least 10°F lower than expected minimum ambient starting temperature.

See Oil Viscosity Equivalency Chart for lubricant viscosity classification equivalents.

Special lubricants may be required for food and drug industry applications where contact with the product being manufactured may occur. Consult a lubrication manufacturer's representative for a recommendation.

## 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 the 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 the 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 air tight. Replace the vent plug with a standard pipe plug and wire the vent to the unit.
3. Cover the shaft extension with a waxy rust preventative compound that will keep oxygen away from the bare metal. (Non-Rust X-110 by Daubert Chemical Co.).
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 the 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.
4. Follow the installation instructions provided in this manual.

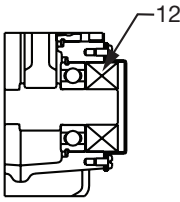
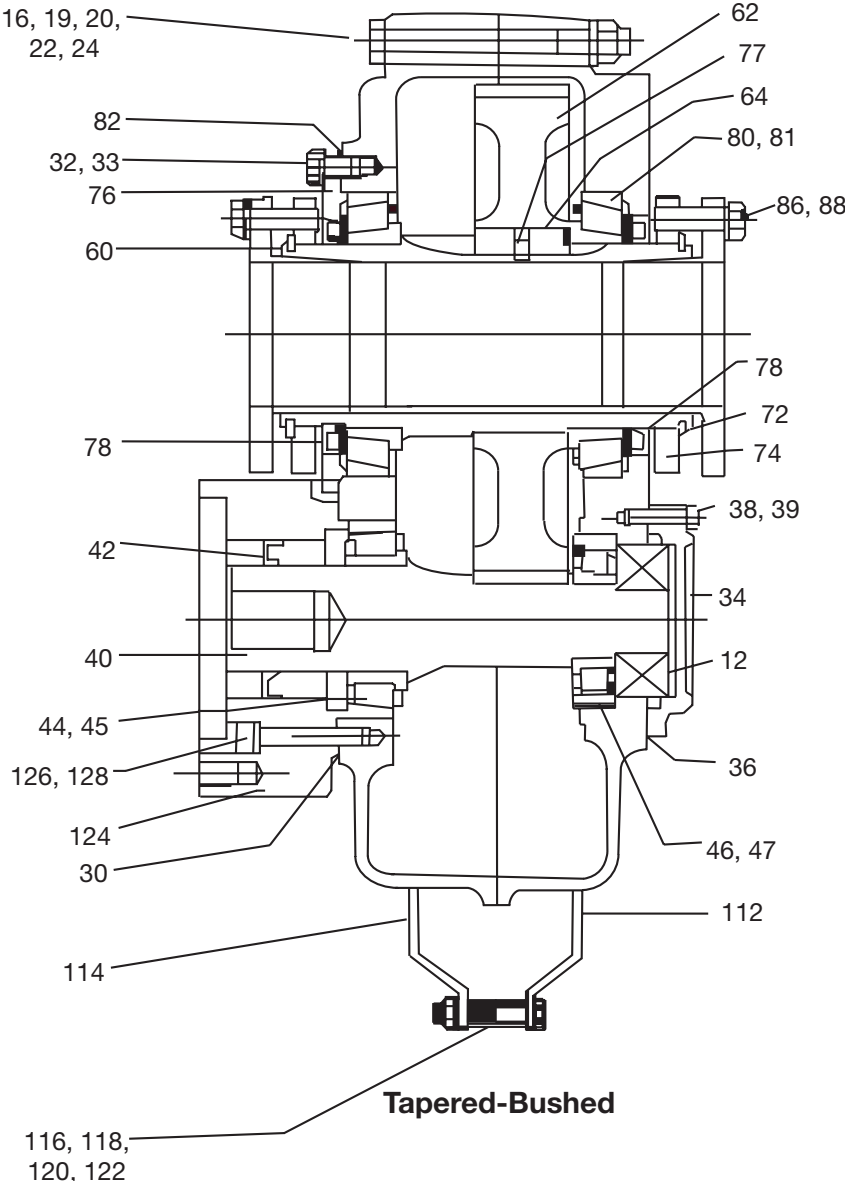
Table 4—Quantities of VCI #105 Oil

Case Size	Quarts or Liters
HXT305A	.1
HXT405A	.2
HXT505A	.3

VCI #105 & #10 are interchangeable.

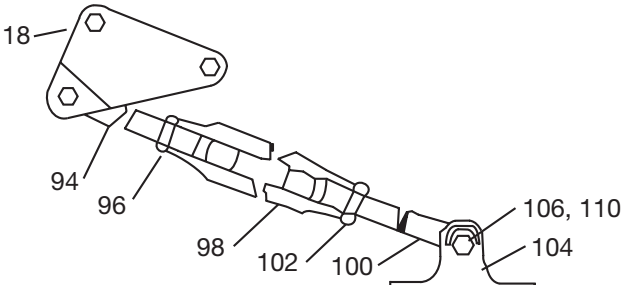
VCI #105 is more readily available.

**Parts for HXT305A, HXT405A and HXT505A  
Taper Bushed Hydroil Speed Reducers**



**BACKSTOP  
Assembly**

**Tapered-Bushed**



**TORQUE-ARM Assembly**

**Parts for HXT305A, HXT405A and HXT505A  
Taper Bushed Hydroil Speed Reducers**

Reference	Name of Part	Number Required	HXT305A Part No.	HXT405A Part No.	HXT505A Part No.
12	Backstop Assembly	1	243102	244148	245154
	HOUSING	1	253165	254218	255216
①	Air Vent	1	900287	900287	904287
16	Housing Bolt	6	411440	411442	411464
18	Adapter Housing Bolt	2	411442	411444	411466
19	Washer	4	419094	419094	419096
20	Lockwasher	6	419012	419012	419013
22	Hex Nut	8	407089	407089	407091
24	Dowel Pin	2	420055	420055	420110
①	Pipe Plug	1	430031	430031	430033
①	Magnetic Plug	1	430060	430060	430062
①	Smart Sensor Adapter	1	966905	966905	966906
30④	Input Shaft Bearing Shim Pack	2 ②	389723	389724	389725
	.002" Thick	③	427853	254226	427833
	.005" Thick	③	427854	254227	427834
	.010" Thick	③	427855	254228	427835
	.025" Thick	③	427856	254229	427836
32	Carrier and Cover Screws	10	411390	411407	411407
33	Lockwasher	10	419010	419011	419011
34	Backstop Cover	1	253175	254223	255019
38	Backstop Cover Screw	6	416524	411035	411406
39	Lockwasher	6	419007	419009	419009
40④	Input Shaft with	1	253141	254141	255161
44④	Pinion	Cone	402190	402179	402270
45④	Input Shaft Bearing	Cup	403132	403006	403026
46④	(Input Side)	Cone	402271	402285	402266
47④	Input Shaft Bearing (Backstop Side)	Cup	403101	403125	403073
	OUTPUT HUB ASSEMBLY⑤				
	Taper Bushed	1	389703	389710	389717
60④	⑥Output Hub Taper Bushed	1	243556	244588	245590
62④	⑥Output Gear	1	243570	244188	245186
64④	⑥Output Gear Key	2	243216	244217	355064
72	Bushing Back-up Plate	2	243308	244099	245114
74	Retaining Ring	2	421109	421108	421107
	Output Hub Seal				
76	Carrier (Input Side)	1	243547	244591	245592
77	Roll Pin	1	409022	409022	409022
80④	Output Hub	Cone	402272	402268	402193
81④	Bearing	Cup	403127	403163	403016
82④	Output Shaft Bearing Shim Pack	2②	389706	389713	389719
	.002" Thick	③	427849	244616	427825
	.005" Thick	③	427850	244617	427826
	.010" Thick	③	427851	244618	427827
	.025" Thick	③	427852	244619	427828
36④	SEAL KIT ④ ⑤	1	389726	389727	389728
42④	Backstop Cover Gasket	1	253176	254221	255020
78④	Input Shaft Seal	1	351123	334277	245546
	Output Hub Seal	2	902286	A73109	904286
	SEAL KIT ④ ⑤	1	389726	389727	389728
36④	Backstop Cover Gasket	1	253176	254221	255020
42④	Input Shaft Seal	1	351123	334277	245546
78④	Output Hub Seal	2	902286	A73109	904286
①	RTV Sealant, Tube	1	465044	465044	465044

**Parts for HXT305A, HXT405A and HXT505A  
Taper Bushed Hydroil Speed Reducers**

Reference	Name of Part	Number Required	HXT305A Part No.	HXT405A Part No.	HXT505A Part No.	
84	BUSHING ⑤ ASSEMBLY	1-5/16" Bore	1	243282	.....	.....
		1-3/8" Bore	1	243284	.....	.....
		1-7/16" Bore	1	243260	244079	.....
		1-1/2" Bore	1	243262	244081	.....
		1-5/8" Bore	1	243264	244083	.....
		1-11/16" Bore	1	243268	244085	.....
		1-3/4" Bore	1	243266	244087	.....
		1-7/8" Bore	1	243270	244089 244093	245084
		1-15/16" Bore	1	243272	244095	245086
		2" Bore	1	243274	244109	245088
		2-1/8" Bore	1	.....	244111	.....
		2-3/16" Bore	1	243276	244113	245090
		2-1/4" Bore	1	.....	244115	245092
		2-7/16" Bore	1	.....	.....	245094
		2-1/2" Bore	1	.....	.....	245099
		2-11/16" Bore	1	.....	.....	245110
2-15/16" Bore	1	.....	.....	245112		
86	⑥Bushing Screw	6	411407	411408	419012	
88	⑥Lockwasher	6	419011	419011	411435	
90	⑥Key, Bushing to Shaft	1-5/16" Bore	1	443264	.....	.....
		1-3/8" Bore	1	443264	.....	.....
		1-7/16" Bore	1	443265	443254	.....
		1-1/2" Bore	1	443265	443254	.....
		1-5/8" Bore	1	443265	443254	.....
		1-11/16" Bore	1	443266	443254	.....
		1-3/4" Bore	1	443266	443254	.....
		1-7/8" Bore	1	443267	443255	443251
		1-15/16" Bore	1	443269	443255	443251
		2" Bore	1	443268	443255	443251
		2-1/8" Bore	1	.....	443258	.....
		2-3/16" Bore	1	443270	443259	443251
		2-1/4" Bore	1	.....	443260	443251
		2-7/16" Bore	1	.....	443261	443243
		2-1/2" Bore	1	.....	.....	443244
		2-11/16" Bore	1	.....	.....	443245
2-15/16" Bore	1	.....	.....	443250		
①	⑥ Key, Bushing to Output Hub	1⑦	443262	443257	443202	
①	⑥ Key, Bushing to Output Hub	1⑧	.....	443256	.....	
	TORQUE-ARM ASSEMBLY ⑤	1	243097	245097	245097	
94	⑥Rod End	1	243245	245245	245245	
96	⑥Hex Nut	1	407095	407097	407097	
98	⑥Tumbuckle	1	243246	245246	245246	
100	⑥Extension	1	243247	245247	245247	
102	⑥L.H. Hex Nut	1	407244	407246	407246	
104	⑥Fulcrum	1	243249	246249	246249	
106	⑥Fulcrum Screw	1	411484	411484	411484	
110	⑥Hex Nut	1	407093	407093	407093	

**Parts for HXT305A, HXT405A and HXT505A  
Taper Bushed Hydroil Speed Reducers**

Reference	Name of Part	Number Required	HXT305A Part No.	HXT405A Part No.	HXT505A Part No.
	ADAPTER ASSEMBLY ⑤	1	259153	259154	259155
112	⑥ R.H. Adapter Plate	1	243242	244244	245242
114	⑥ L.H. Adapter Plate	1	243241	244243	245241
116	⑥ Adapter Bushing	1	243243	245243	245243
118	⑥ Adapter Bolt	1	411437	411460	411460
120	⑥ Lockwasher	1	419012	419013	419013
122	⑥ Hex Nut	1	407089	407091	407091
124	Motor Adapter	1	253142	254142	255162
126	Adapter Screw	4 ⑧	417081	417108	417108
128	Lockwasher	4 ⑨	419046	419047	419047

① Not shown on drawing.

② One set consists of one each of the shims listed immediately below.

③ 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.

④ Recommended spare parts

⑤ Includes parts listed immediately below. HXT505A housing assembly also includes a two-piece housing. Bushing assemblies include 2 bushings.

⑥ Parts marked make up the assemblies under which they are listed.

⑦ On size HXT305A for 1-5/16" thru 1-3/4" bores; HXT405A for 1-7/18" thru 1-7/8" bores; HXT505A for 1-7/8" thru 2-1/4" bores.

⑧ One size — HXT405A for 1-15/16" bores and 2" bores

⑨ Requires 5 bolts.



## REPLACEMENT OF PARTS

**NOTE:** Using tools normally found in a maintenance department, a HYDROIL 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 should be available for shrinking these parts on shafts.

The oil seals are of the rubbing type, and 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, part name, part number and quantity.

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

If the large gear on the output hub must be replaced, it is recommended that an output hub assembly of a gear assembled on a hub be ordered to secure undamaged surfaces on the output hub where the oil 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 outer race 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 TAPER BUSHED REDUCER FROM SHAFT

**WARNING:** To ensure that drive is not unexpectedly started, turn off and lock out or tag power source before proceeding. Failure to observe this precaution could result in bodily injury.

**WARNING:** External loads may cause machine movement. Block machine before removing any drive train components. Failure to observe these precautions could result in bodily injury.

1. Remove bushing screws. 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.
2. Remove the outside bushing, the reducer and then the inboard bushing.

### DISASSEMBLY

1. Remove all bolts from housing. Drive back hollow dowel pins on either side of housing. Remove back-up plates and snap rings on the output hub on taper-bushed reducers. Open housing evenly to prevent damage to parts inside.
2. Lift shaft, gear and bearing assemblies from housing.
3. Remove seals, seal carriers and bearing cups from housing.

### REASSEMBLY

1. Output Hub Assembly: Heat gear to 325° to 350°F for shrinking onto output hub. Heat bearing cones to 270° to 290°F for shrinking onto output hub.
2. Input Shaft Assembly: Shaft and pinion are integral. Heat bearing cones to 270° to 290°F for shrinking onto shaft.
3. Drive the dowel pins back into position in the right hand housing half. Place housing half on blocks to allow for protruding end of output hub. Install bearing cups in right-hand housing half making sure they are properly seated.
4. Mesh output hub gear and input shaft assembly together and set in place in housing. Make sure bearing rollers (cones) are properly seated in their cups. Set bearing cups for left-hand housing half in place on their rollers.
5. Clean housing flange surfaces on both halves, making sure not to nick or scratch flange face. Place a new bead of gasket eliminator 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 (rawhide not lead hammer) until housing bolts can be used or draw housing halves together. Torque housing bolts per torque values listed below.
6. Place output hub seal carrier in position without shims and install two carrier screws diametrically opposed. Torque each screw to 25 lb.-ins. Rotate the output hub to roll in the bearings and then torque each screw once to 50 lb.-ins.

**NOTE:** Do not re-torque screws.

Again turn output hub to roll in the bearings. With a feeler

or taper gage, measure the gap between the housing and the carrier, clockwise from and next to each screw. To determine the required shim thickness, take the average of the two feeler gage readings. Remove carrier and install the required shims.

**Note: Total shim thickness per carrier should not include more than .009" plastic shims and each plastic shim should be inserted between two metal shims.**

Place a 1/8" diameter bead of Dow Corning RTV732 sealant on the face around the I.D. of the end shim (sealant is to be between reducer housing and shim) and install carrier on reducer housing. Torque carrier bolts to value shown in Table 7. Output hub should have an axial end play of .001" to .003".

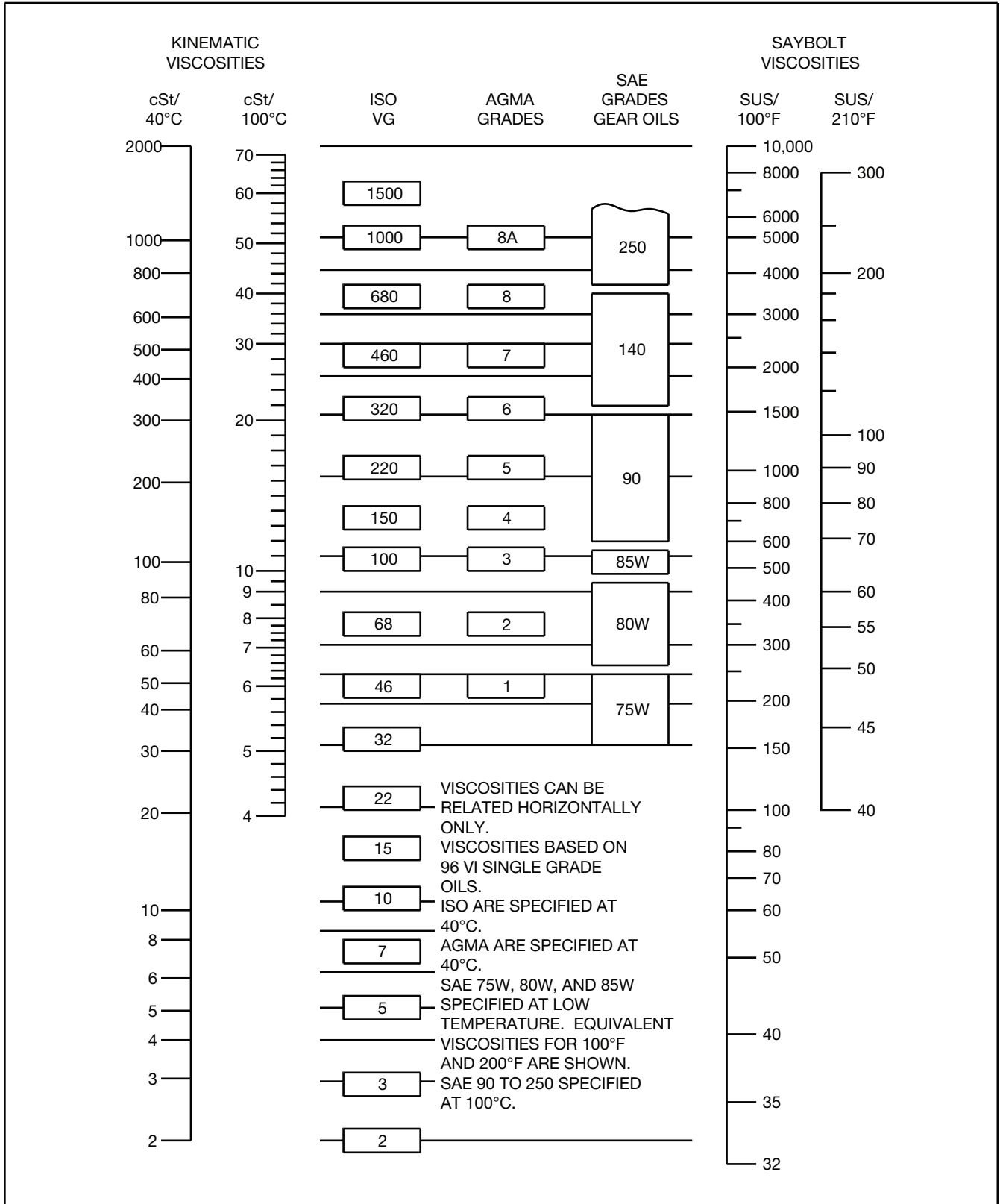
- Using the same procedure as in step 6, adjust the input shaft bearings, except the axial end play should be .002" to .004".

**Table 7 - Bolt Tightening Torque Values**

Reducer Size	Housing Bolts (in.-lbs.)	Seal Carrier Bolts (in.-lbs.)
HXT305A	600	204
HXT405A	600	360
HXT505A	900	360

- Apply sealant to the input shaft cover gasket and install input shaft cover in right-hand housing half. Install input and output seals. Extreme care should be used when installing seals to avoid damage due to contact with sharp edges on the input shaft or output hub. This danger of damage and consequent oil leakage can be decreased by covering all sharp edges with tape or paper prior to seal installation. Fill cavity between seal lips with grease. Seals should be pressed or tapped with a soft hammer evenly into place in the carrier applying pressure only on the outer edge of the seals. A slight oil leakage at the seals may be evident during initial running in but should disappear unless seals have been damaged.
- Install bushing back-up plate and snap rings.

# OIL VISCOSITY EQUIVALENCY CHART



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**ABB Motors and Mechanical Inc.**

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