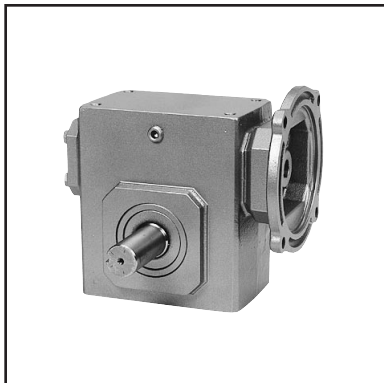
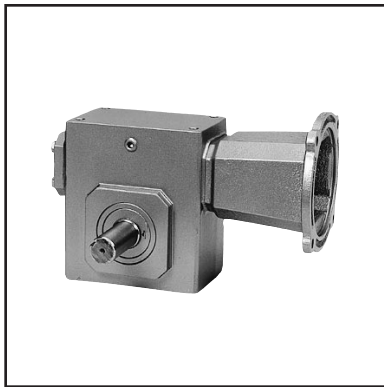
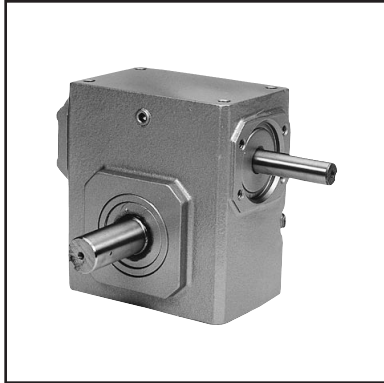


GROVE GEAR

FLEX-A-LINE SPEED REDUCERS



Installation, Lubrication and Maintenance Instructions

CONGRATULATIONS!

Your decision to purchase an American Crafted Speed Reducer from Grove Gear will provide you with many years of trouble free service if the following installation and maintenance instructions are adhered to.

Selection Information

Read ALL instructions prior to operating reducer. Injury to personnel or reducer failure may be caused by improper installation, maintenance or operation.

Written authorization from Grove Gear is required to operate or use reducers in man lift or people moving devices.

Check to make certain application does not exceed the allowable load capacities published in the current catalog.

Buyer shall be solely responsible for determining the adequacy of the product for any and all uses to which Buyer shall apply the product. The application by Buyer shall not be subject to any implied warranty of fitness for a particular purpose.

Safety Alert

WARNING

- For safety, Buyer or User should provide protective guards over all shaft extensions and any moving apparatus mounted thereon. The User is responsible for checking all applicable safety codes in his area and providing suitable guards. Failure to do so may result in bodily injury and/or damage to equipment.
- Hot oil and reducers can cause severe burns. Use extreme care when removing lubrication plugs and vents.
- Make certain that the power supply is disconnected before attempting to service or remove any components. Lock out the power supply and tag it to prevent unexpected application of power.
- Reducers are not to be considered fail safe or self-locking devices. If these features are required, a properly sized, independent holding device should be utilized. Reducers should not be used as a brake.
- Any brakes that are used in conjunction with a reducer must be sized or positioned in such a way so as to not subject the reducer to loads beyond the catalog rating.
- Lifting supports including eyebolts are to be used for vertically lifting the gearbox only and no other associated attachments or motors.
- Use of an oil with an EP additive on units with backstops may prevent proper operation of the backstop. Injury to personnel, damage to the reducer or other equipment may result.
- Overhung loads subject shaft bearings and shafts to stress which may cause premature bearing failure and/or shaft breakage from bending fatigue, if not sized properly.

CAUTION

- Test run unit to verify operation. If the unit tested is a prototype, that unit must be of current production.
- If the speed reducer cannot be located in a clear and dry area with access to adequate cooling air supply, then precautions must be taken to avoid the ingestion of contaminants such as water and the reduction in cooling ability due to exterior contaminants.
- Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Important Information

In the event of the resale of any of the goods, in whatever form, Resellers/Buyers will include the following language in a conspicuous place and in a conspicuous manner in a written agreement covering such sale:

The manufacturer makes no warranties or representations, express or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the goods sold hereunder. Buyer acknowledges that it alone has determined that the goods purchased hereunder will suitably meet the requirements of their intended use. In no event will the manufacturer be liable for consequential, incidental or other damages. Even if the repair or replacement remedy shall be deemed to have failed of its essential purpose under Section 2-719 of the Uniform Commercial Code, the manufacturer shall have no liability to Buyer for consequential damages.

Resellers/Buyers agree to also include this entire document including the warnings above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This instructions manual should be read together with all other printed information such as catalogs, supplied by Grove Gear.

General Operation

1. Run the motor which drives the reducer and check the direction of reducer output rotation. Consult motor nameplate for instructions to reverse the direction of rotation.
2. Attaching the load: On direct coupled installations, check shaft and coupling alignment between speed reducer and loading mechanism. On chain/sprocket and belt/pulley installation, locate the sprocket or pulley as close to the oil seal as possible to minimize overhung load. Check to verify that the overhung load does not exceed specifications published in the catalog.
3. High momentum loads: If coasting to a stop is undesirable, a braking mechanism should be provided to the speed reducer output or the driven mechanism.



The system of connected rotating parts must be free from critical speed, torsional or other type vibration, no matter how induced. The responsibility for this system analysis lies with the purchaser of the speed reducer.

Installation

1. Mount the unit to a rigid flat surface using grade 5 or higher fasteners. The mounting fasteners should be the largest standard size that will fit in the base mounting hole. Shim as required under flange or base feet which do not lie flat against the mounting surface.
2. For shipment, pipe plugs are installed in the unit and a vent plug is packed separately. After mounting the unit in position, remove the appropriate pipe plug and install the vent plug in the location shown on page 5. On double reduction units both the primary and the secondary must be vented. Failure to vent the unit can cause premature seal wear or loss of seal and oil. These conditions are not covered by warranty. Check for correct oil level. Contact the factory for level and vent recommendations on non-standard mounting positions. **Grove Gold** units with optional internal pressure compensating system do not use vents. See (internal pressure compensating system) under **Lubrication** for further information.
3. **Grove Gold** units include synthetic oil and an internal pressure compensation system pre-installed at the factory. It is not necessary to vent these units, and they can be used as supplied from the factory. Do not loosen the nut holding the stem of the pressure compensator, and do not block the hole in the stem. Do not blow pressurized air into the hole, and avoid spraying washdown chemicals directly into the hole.
4. Connect motor to speed reducer.



Depending upon gear geometry and operating conditions worm gear reducers may or may not backdrive. Special consideration should be given to high inertia loads connected to the output shaft. Consult the factory for further details.



DO NOT CHANGE MOUNTING POSITIONS WITHOUT CONTACTING FACTORY.
Altering the mounting position may require special lubrication provisions which must be factory installed.



Do not operate the reducer without making sure it contains the correct amount of oil. Do not overfill or underfill with oil, or injury to personnel, reducer or other equipment may result. **Grove Gold** units are lubed and sealed for life, so in most applications it will not be necessary to drain or re-fill the unit.



A unit cannot be used as an integral part of a machine superstructure which would impose additional loads on the unit other than those imposed by the torque being transmitted either through a shaft-mounted arrangement, and any shaft mounted power transmitting device. (e.g., sprockets, pulleys, couplings)



For safe operation and to maintain the unit warranty, when changing a factory installed fastener for any reason, it becomes the responsibility of the person making the change to properly account for fastener grade, thread engagement, load, tightening torque and the means of torque retention.

Lubrication - Standard Units

With the exception of unit sizes 2700, 2800 and 21000 which are shipped dry, all standard reducers ordered from the factory are filled with lubricant to operate within a 30° to 100° F ambient temperature range. Double and triple reduction units have separate oil sumps and must be filled/checked independently. Prior to startup, verify that the oil is at the level shown on the drawings on page 5. If the ambient temperature will be outside the range for the lubricant installed at the factory, drain and refill the reducer with the proper viscosity lubricant prior to use. Consult the chart on page 4 or the factory for alternate lubricants.

Change Intervals: Standard compounded lubricants should be changed every six months or 2500 operating hours, whichever comes first. Factory installed synthetic lubricants should be changed every two years or 6000 hours, whichever comes first.

Internal pressure compensating system: **Grove Gold** and stainless steel reducers come standard with an internal pressure compensating system and synthetic oil pre-installed at the factory. It is not necessary to vent these reducers, and they can be used as supplied from the factory.

CAUTION Oil should be changed more often if reducer is used in a severe environment. (i.e. dusty, humid)

CAUTION In the Food and Drug Industry (including animal food), consult the lubrication supplier for recommendation of lubricants which are acceptable to the Food and Drug Administration and/or other authoritative bodies having jurisdiction. Factory supplied oil is not suitable for these applications or this industry.

CAUTION Do not mix different oils in the reducer. Oils should be compatible with Viton® seal material.

Special Lubrication Requirements - Sizes 218 & Larger

Units shipped from the factory are assembled to properly lubricate all internal components based on a specific assumed mounting orientation. The factory assumed mounting orientations are given below. If a size 218 or larger unit will be mounted in a different orientation than listed below, or run with sustained input speeds less than 900 RPM, it should be specified with the order. The unit can then be modified to assure proper lubrication.

Factory Assumed Mounting Orientation	Applicable Unit Styles*	
Worm Over	B, T, F, H, FH, C, D, DT, DF, DH, DFH DX, DXT, DXH, DXFH, TT	Single Reduction Double Reduction Worm-Worm Double Reduction Helical-Worm Triple Reduction Worm-Worm-Worm
Worm Under	U DU	Single Reduction Double Reduction Worm-Worm
Vertical Output	VL/VH, FE DVL/DVH, DFE DXVL/DXVH, DXFE	Single Reduction Double Reduction Worm-Worm Double Reduction Helical-Worm
Vertical Input	J DJ DXJ	Single Reduction Double Reduction Worm-Worm Double Reduction Helical-Worm

* Includes "M" and "MQ" versions of all styles listed

The precision-made gears and bearings in Grove Gear Speed Reducers require high-grade lubricants of the proper viscosity to maintain trouble-free performance. For best results, use lubricants on the following chart for worm gear reducers:

Manufacturer	30° to 100° F Ambient Temperature AGMA Compounded No. 7	50° to 125° F Ambient Temperature AGMA Compounded No. 8
Amoco Oil Co.	Worm Gear Oil	Cylinder Oil #680
Chevron USA, Inc.	Cylinder Oil #460X	Cylinder Oil #680X
Exxon Co. USA	Cyclesstic TK-460	Cyclesstic TK-680
Gulf Oil Co.	Senate 460	Senate 680D
Mobile Oil Corp.	600 W Super Cylinder	Extra Hecla Super
Shell Oil Co.	Valvata Oil J460	Valvata Oil J680
Sun Oil Co.	Gear Oil 7C	Gear Oil 8C
Texaco	Honor Cylinder Oil	650T Cylinder Oil
Union Oil Co. of CA	Steaval A	Worm Gear Lube 140

Standard factory-installed lubricant, shipped with 6.00" C.D. and smaller units.

Some gear lubricants contain E.P. additives that can be corrosive to gear bronze. Avoid lubricants that are compounded with sulfur and/or chlorine.

For temperature ranges not shown, contact factory.

For lubrication requirements of **Grove Gold** or helical reducers (primaries of helical/worm reducers, ratio multipliers, and styles BAMCQ, BAMC, and BA), contact factory.

Oil Capacities (pints) - Standard Units

Mounting Position	UNIT SIZE													
	213	215	217	220	224	226	230	232	242	252	2600	2700*	2800*	21000*
Worm Over	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5	8 1/4	12 1/2	19 1/2	35	48	72
Worm Under	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5 1/2	8	13 1/2	20 1/2	32 3/4	51 1/4	80
Vertical Output	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5	8	13 1/2	20	20 3/4	28 3/4	40
Vertical Input	1/2	3/4	1	1 1/2	1 3/4	3	3 3/4	5	8	13 1/2	20 1/3	36 1/2	50	75
Extended Bearing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8	12	17	27	40	63	102
Worm over on Secondary Unit of Double Reduction				N/A	N/A	N/A	N/A	12	19 1/4	20	30 1/3	50 1/3	71 1/2	107 1/4

*Shipped Dry

16 oz. = 1 pint
 2 pints = 1 quart
 4 quarts = 1 gallon
 1 gallon = 128 oz. = 231 cu. in.

CAUTION Always check for proper oil level after filling. Capacities vary somewhat with model and mounting position. Oil should rise to bottom edge of level hole. Do not overfill.

Synthetic Lubricants

Synthetic lubricants provide the potential for numerous benefits including wider temperature range and increased interval between changes. Use of synthetics can cause problems if they are not compatible with the seals or the conventional lubricants they replace. For continuous duty at normal ambient temperatures (-10°F to 105°F) we recommend the use of Mobil SHC 634 which is compatible with the standard compounded oil shipped in our product and the Viton® seal material used through size 252. For other temperatures, or for intermittent operation below 20° F, contact the factory for a recommendation.

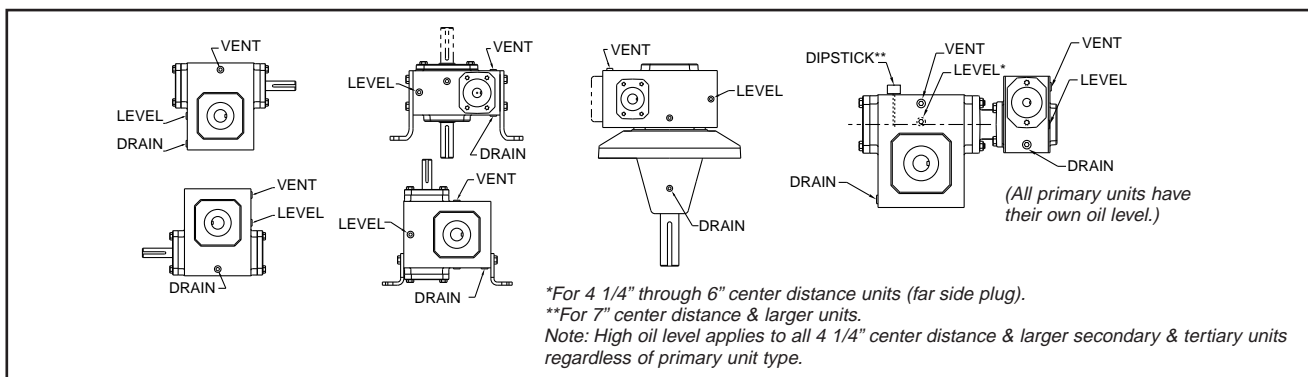
For synthetic lubrication to be used in helical reducers (primaries of helical/worm reducers, ratio multipliers, and styles BAMCQ, BAMC, and BA), contact factory.

Lubrication - Grove Gold

All **Grove Gold** reducers are shipped from the factory filled with synthetic lubricant suitable for continuous operation within a -10° F to 105° F ambient environment. If ambient temperature will be outside the above range, or if operation will be intermittent at temperatures below 20° F, consult the factory for lubrication recommendations. The unit is factory filled with the correct amount of oil for most mounting positions. If the unit will operate at input speeds below 900 RPM, or if a 230 or larger unit is to operate with one of its shafts in a vertical position, consult the factory for special lubrication considerations.

CAUTION In the Food and Drug Industry (including animal food), consult the lubrication supplier for recommendation of lubricants which are acceptable to the Food and Drug Administration and/or other authoritative bodies having jurisdiction. Factory supplied oil is not suitable for these applications or this industry.

Standard Speed Reducer Mounting Positions & Vent Plug, Level and Drain Locations



Maintenance - Standard Units

Your Grove Gear reducer has been tested and adjusted at the factory. Dismantling or replacement of components must be done by Grove Gear to maintain the warranty.

Frequently check the oil level of the reducer. If oil level is low, (refer to reducer vent and level position chart) add proper lubrication through the filler plug until it comes out the oil level plug.

Inspect vent plug often to insure it is clean and operating.

Instruction Manual

CAUTION Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Seals: The Grove Gear line of speed reducers utilize premium quality seals which are the state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Replacement can be easily accomplished by following the steps below:

1. Remove the worn seal without damaging the shaft surface or the seal bore. This can be done by drilling a .062 diameter hole in the seal casing (being careful not to drill into the bearing behind the seal). Screw a #10 sheet metal screw into the hole and pry out the seal.
2. Clean the seal bore of sealant.
3. Before installing the new seal, use electrical tape to cover any keyways on the shaft to prevent seal lip damage.
4. Grease the seal lips with bearing grease and apply a sealant to the seal bore.
5. Slide the seal into the shaft being careful not to fold the inner lip over on any shaft steps.
6. Press the seal into its bore with a sleeve that presses on the seal casing, being careful to keep the seal square in its bore.

Maintenance - Grove Gold

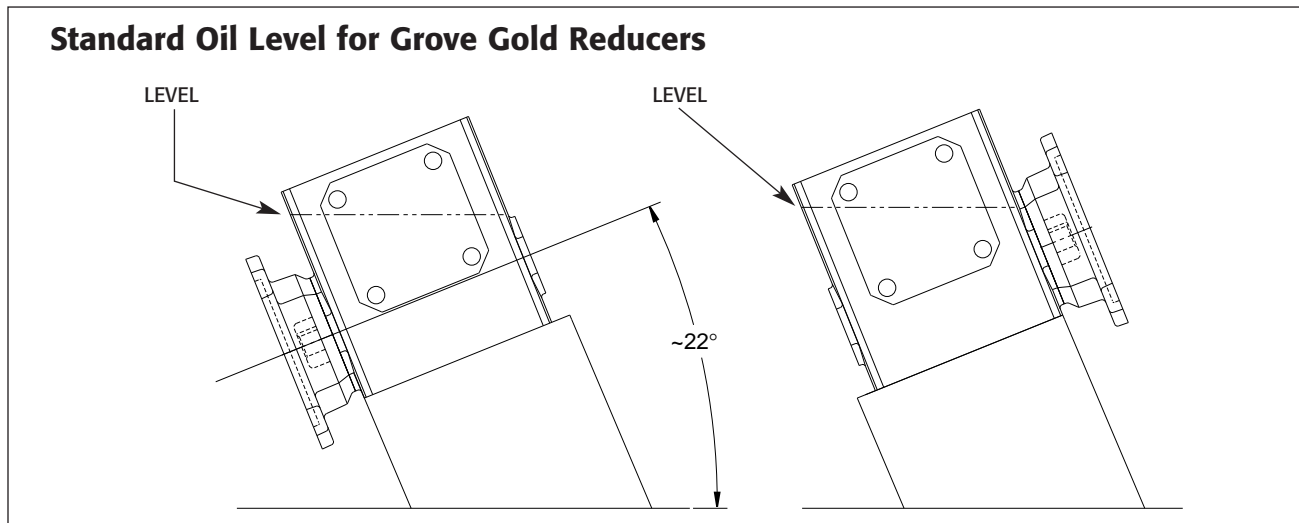
Your **Grove Gold** reducer has been tested and adjusted at the factory. Dismantling or replacement of components must be done by Grove Gear to maintain the warranty.

Inspect the stem of the pressure compensating system often to ensure it is clean and operating properly.

CAUTION Mounting bolts should be routinely checked to ensure that the unit is firmly anchored for proper operation.

Seals: The **Grove Gold** line of speed reducers utilize premium quality seals which are state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Replacement can easily be accomplished by following the procedure given under **Maintenance - Standard Units** above.

If seal leakage has resulted in the loss of a significant amount of oil, it may be necessary to add more lubricant. For normal ambient temperature conditions, Grove Gear recommends Mobil SHC 634 synthetic gear oil for worm drives, and Mobil SHC 150 for helical drives. For all worm drives, fill the gearbox to the level indicated in the diagram below.



CAUTION Always check for proper oil level after filling. Do not overfill or underfill with oil, or injury to personnel, reducer, or other equipment may result.

CAUTION Do not mix different oils in the reducer.

Class of Service

All capacity ratings are based on American Gear Manufacturers Association (AGMA) Standards. Load conditions must be within cataloged ratings published in the current Grove Gear Catalog (available upon request).

Warranty From Grove Gear - See catalog pages 192-195 for warranty terms and conditions.

GROVE GEAR

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