



ELECTRIC MOTORS, GEARMOTORS AND DRIVES

# Speed Reducers Installation, Lubrication and Maintenance Instructions



# Bravo<sup>®</sup>

ALUMINUM GEAR REDUCERS



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**IMPORTANT INFORMATION  
FOR GEAR REDUCERS  
PLEASE READ CAREFULLY**



The following **WARNING** and **CAUTION** information is supplied to you for your protection and to provide you with many years of trouble free and safe operation of your **LEESON Electric** product:

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 LEESON Electric 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.
- 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.



- 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.

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 and cautions above in a conspicuous place and in a conspicuous manner in writing to instruct users on the safe usage of the product.

This information should be read together with all other printed information supplied by LEESON Electric.

**IMPORTANT INFORMATION  
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 **WARNING**

- Disconnect power and lock out driven equipment before working on a motor.
- Always keep hands and clothing away from moving parts.
- The lifting support on the motor is not to be used to lift the entire machine. Only the motor attached directly to the support may be safely lifted by the support.
- Install and ground per local and national codes.
- Discharge all capacitors before servicing a single phase motor.
- Misapplication of a motor in hazardous environment can cause fire or an explosion and result in serious injury. Only the end user, local authority having jurisdiction, and/or insurance underwriter are qualified to identify the appropriate class(es), group(s), division and temperature code LEESON Electric personnel cannot evaluate or recommend what motors may be suitable for use in hazardous environments. If a motor is name plated for hazardous locations, do not operate the motor without all of the grease and drain plugs installed.
- Never attempt to measure the temperature rise of a motor by touch. Temperature rise must be measured by thermometer, resistance, resistance, imbedded detector or thermocouple.
- Motors with automatic reset thermal protectors will automatically restart when the protector temperature drops sufficiently. Do not use motors with automatic reset thermal protectors in applications where automatic restart will be hazardous to personnel or equipment.
- Motors with manual reset thermal protectors may start unexpectedly after the protector trips when the surrounding air is at +20° Fahrenheit or lower. If the manual reset protector trips, disconnect motor from its power supply. After the protector cools (five minutes or more), it can be reset and power may be applied to the motor.
- Connect all protective device leads, marked P1, P2, etc., per instructions supplied with the motor.
- Operation of a motor at other than its nameplate rating may result in fire, damage to equipment or serious injury to personnel.
- 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.

 **CAUTION**

- Consult qualified personnel with questions and all electrical repairs must be performed by trained and qualified personnel only.
- For motors nameplated as "belted duty only", do not operate the motor without belts properly installed.
- Motors and/or driven equipment should not be operated faster than their rated speed.
- For inverter applications, follow the inverter manufacturer's installation guidelines.
- Make sure the motor is properly secured and aligned before operation.

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This information should be read together with all other printed information supplied by LEESON Electric.

For more information contact: **LEESON Electric**, Subsidiary of REGAL-BELOIT CORPORATION, 2100 Washington Street, Grafton, WI 53024  
Phone: 262-377-8810 or Fax: 262-377-3440

## General Operation

1. Run the motor which drives the reducer and check the direction of reducer output shaft rotation. Consult motor nameplate for instructions to reverse the direction of shaft 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.

**CAUTION** 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.

**CAUTION** If the reducer is painted, extreme care should be taken to mask the shaft extensions and the rubber seals. Paint on the shaft adjacent to the seal or on the seal lip will cause leakage.

## Installation Instructions

The following instructions apply to standard Leeson Bravo® type reducers with base or flange mounting in motorized and non-motorized single and double reduction options.

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. Carefully follow lubrication instructions and installation manual furnished with the gear reducer. All standard Bravo® reducers are properly filled at LEESON with sufficient lubricant quantity for nearly any mounting position.

**Series 512-525:** Series 512-525 utilize a vent-free design and are Factory filled with synthetic semi-fluid grease formulated for lifetime lubrication & wide operating temperature range (+5°F to +220°F). It is not necessary to change the lubricant in reducer series 512-525 unless the reducer is used in a severe environment. If these reducers will be used in severe environment or if lubricant must be replaced, contact LEESON.

**Series 534:** Series 534 utilizes a vent and is Factory filled with Mobil SHC-634 oil, a synthesized hydrocarbon formulated for long life & wide operating temperature range (-25°F to +220°F).

Do not confuse Mobil SHC-634 with Mobilgear 634. Mobilgear 634 is an EP type gear oil not suitable for use in the Bravo® worm reducers.

3. Connect motor to speed reducer.

**Quill Input Style:** Discard motor key. Use only special key provided with reducer.

**Step 1:** Position key in reducer input worm bore. Apply anti-seize compound (included with reducer) to the motor shaft. Line up key with motor keyway and slip motor shaft into reducer worm bore.

**Step 2:** Tighten the bolts (supplied) with lockwashers evenly for a solid fit between motor and reducer "C" Flange.

**Note:** A bushing may be supplied for use between the motor shaft and the reducer input shaft. Apply anti-seize compound to inside and outside of bushing.

**CAUTION** Do not operate the reducer without making sure it contains the correct amount of lubricant. Confirm that mounting position on nameplate matches application requirement. Do not overfill or underfill with oil, or injury to personnel, reducer or other equipment may result.

**CAUTION** 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)

**CAUTION** 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

Carefully follow lubrication instructions and installation manual furnished with the gear reducer. All standard Bravo® reducers are properly filled at LEESON with sufficient lubricant quantity for nearly any mounting position.

Change oil only when performing maintenance that requires gearbox disassembly or if the reducer is operated in a severe environment. If oil must be replaced in Series 534 reducers, use only Mobil SHC-634.

**CAUTION** Lubricant should be changed more often if gear reducer is used in a severe environment. (ie: humid, wet, caustic, etc)

**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.

**CAUTION** Do not mix different lubricants in the reducer.

### SPECIAL LUBRICATION REQUIREMENTS — Sizes 518-534

- Reducer is mounted with input worm shaft vertical
- Input speed is sustained less than 900 RPM

**NOTE:** The reducer may require modifications to assure proper lubrication in these applications. Contact LEESON for more detail.

For lubrication requirements of helical reducers (primaries of helical worm reducers and ratio multipliers), contact LEESON.

Lubrication type	Series				
	512	518	520	525	534
Grease (lbs)	0.14	0.2	0.35	0.84	--
Oil (ounces)	--	--	--	--	41

16 oz. = 1 pint	1 quart = .9463 liter
2 pints = 1 quart	1 gallon = 3.785 liter
4 quarts = 1 gallon	1 lb = .4535 kg.
1 gallon = 128 oz.	

## Maintenance

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

Inspect the vent plug often (Size 534 only) to insure it is clean and operating.

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

**Seals:** The **BRAVO**® 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 below.

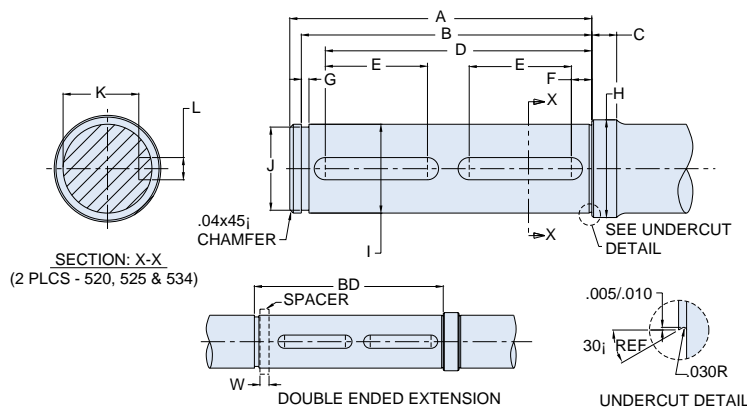
1. Remove the worn seal without damaging the shaft surface or the seal bore. This can be done by drilling a .062" diameter hole in the seal casing (being careful not to drill into the bearing behind the seal). Screw a #10 sheet metal screw into the hole and pry out the seal.
2. Clean the seal bore of 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 onto 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.

If seal leakage has resulted in the loss of a significant amount of lubricant, it may be necessary to add more. Contact LEESON for more detail.

**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.

## Gear Reducer Drive Shaft Recommendations



There are several possible methods to retain a drive shaft into the hollow bore of a gear reducer. A few common options are listed below:

- Retain drive shaft with a retaining ring (illustrated above)
- Retain drive shaft with a locknut
- Retain drive shaft with a thrust plate and fastener
- Retain drive shaft with a collar and setscrew
- Retain drive shaft with a recessed plate and fastener

### DRIVEN SHAFT RECOMMENDATIONS ● HOLLOW BORE IN INCHES

Dimensions - Inches

Series	A	B +/- 0.0025	C	D	F	Retaining Ring Groove		Mfg. No. (Waldes Truarc)	H	I +/- 0.0005	Keyway			Double Extension Details	
						G +0.005/- 0.000	J +/- 0.002				E	K +/- 0.0025	L +/- 0.001	BD +/- 0.0025	W * +/- 0.001
518	2.80	2.6445	0.43	N/A	0.18	0.086	0.703	5160-75	0.88	0.749	1.15	0.6365	0.1875	3.0755	0.430
520	3.50	3.2725	0.30	3.00	0.23	0.086	0.937	5160-98	1.12	0.999	1.15	0.8565	0.250	3.5735	0.300
525	5.00	4.8225	0.13	4.25	0.22	0.103	1.058	5160-112	1.25	1.124	1.53	0.9785	0.250	4.9535	0.130
534	5.65	5.4315	0.53	5.00	0.28	0.120	1.405	5160-150	1.75	1.499	1.65	1.2815	0.375	5.9625	0.530

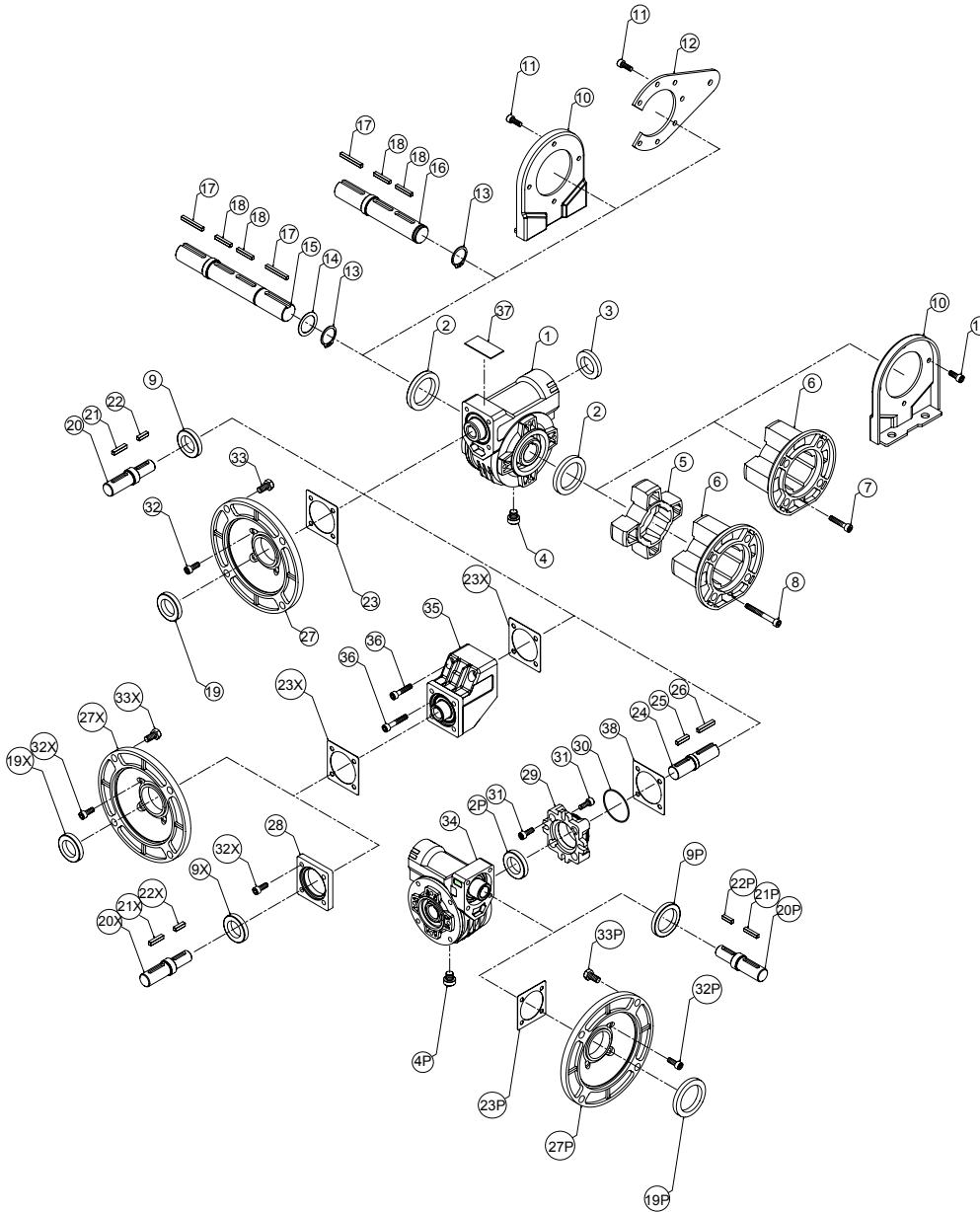
\* Dimension "W" refers to the width of spacer used.

### DRIVEN SHAFT RECOMMENDATIONS ● HOLLOW BORE IN MILLIMETERS

Dimensions - MM

Series	A	B +/- 0.064	C	D	F	Retaining Ring Groove		Mfg. No. (Waldes Truarc)	H	I - 0.005/ -0.020	Keyway			Double Extension Details	
						G +0.12/- 0.00	J +/- 0.05				E	K +/- 0.05	L + 0.015/-0.000	BD +/- 0.064	W * +/- 0.02
512	60.5	56.223	10	N/A	5	1.1	13	5100-55	19.1	14	20.2	10.8	5	66.383	10.16
518	71.1	67.170	11	N/A	5	1.4	16	5160-66	22.4	18	30.2	14.5	6	78.118	10.92
520	88.9	83.120	8	76.2	5	2.3	23.5	5160-98	28.4	25	30.2	21.0	8	90.767	7.62
525	127.0	122.492	3	108.0	8	2.6	26	5160-106	31.8	28	40.2	24.0	8	125.819	3.30
534	143.5	137.960	14	127.0	9	2.6	32.8	5160-137	44.5	35	50.2	30.0	10	151.448	13.46

\* Dimension "W" refers to the width of spacer used.



ITEM #	DESCRIPTION
1	GEAR MODULE
2,2P	OIL SEAL - OUTPUT
3	RCA SEAL PLUG
4,4P	DRAIN PLUG
5	FL-SPACER
6	F-FLANGE
7	SOCKET HEAD CAPSCREW
8	SOCKET HEAD CAPSCREW
9,9P,9X	OIL SEAL - NON-MOTORIZED INPUT
10	HORIZONTAL BASE
11	SOCKET HEAD CAPSCREW
12	REACTION ARM
13	RETAINING RING
14	SPACER
15	OUTPUT SHAFT - DOUBLE EXTENSION
16	OUTPUT SHAFT - SINGLE EXTENSION
17	KEY-OUTPUT (EXTENSION)
18	KEY-OUTPUT (INTERNAL)
19,19P,19X	OIL SEAL - MOTORIZED INPUT
20,20P,20X	INPUT SHAFT - NON-MOTORIZED INPUT
21,21P,21X	KEY - INPUT (EXTENSION)
22,22P,22X	KEY -INPUT (INTERNAL)
23,23P,23X	GASKET
24	CONNECTOR SHAFT
25	KEY
26	KEY
27,27P,27X	FLANGE - MOTORIZED INPUT
28	INPUT COVER
29	CONNECTOR FLANGE - DOUBLE REDUCTION
30	O-RING
31	SOCKET HEAD CAPSCREW
32,32P,32X	SOCKET HEAD CAPSCREW
33,33P,33X	HEX HEAD CAPSCREW
34	PRIMARY GEAR MODULE - DOUBLE REDUCTION
35	HELICAL STEP MODULE - DOUBLE REDUCTION
36	SOCKET HEAD CAPSCREW
37	NAMEPLATE
38	GASKET

## Class of Service

All capacity ratings are based on proper application of American Gear Manufacturers Association (AGMA) service factors as given on page 172 of the LEESON Aluminum Gear Reducer 7050 Catalog. Load conditions must be within cataloged ratings published in the current LEESON Catalog (available upon request).

**Warranty From LEESON Electric** - See 7050 catalog pages 177-178 for warranty terms and conditions.



A REGAL-BELOIT COMPANY

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