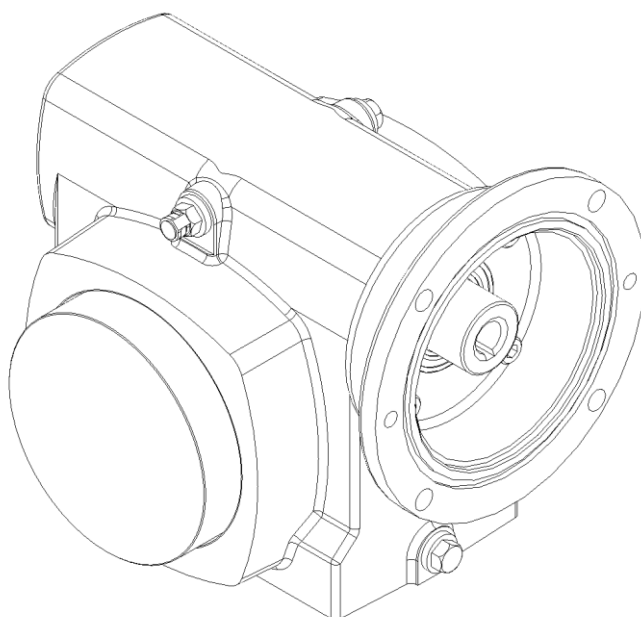


STERLING
ELECTRIC, INC.

2000RA[®]

SMOOTH BODY WORM GEAR REDUCER



INSTALLATION AND MAINTENANCE MANUAL

June 26, 2017

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2000RA SMOOTH BODY WORM GEAR REDUCER INSTRUCTION MANUAL

SELECTION INFORMATION

Read ALL instructions prior to operating reducer. Improper maintenance or operation may cause injury to personnel or reducer failure.

Written authorization from Sterling 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. Information contained in this manual is considered correct at the time of publication and is subject to change without notice.

SAFETY ALERT

WARNING: For safety, purchaser 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.

WARNING: Hot oil or reducers can cause severe burns. Use extreme care when removing lubrication plugs and vents.

WARNING: 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.

WARNING: 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.

WARNING: Any brakes that are used in conjunction with a reducer must be sized or positioned in such a way as to not subject the reducer to loads beyond the catalog rating.

CAUTION: Test run unit to verify operation. If the unit tested is a prototype, that unit must be of current production.

CAUTION: 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. Reducers located in confined spaces may require forced air-cooling.

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 warranty or representations, expressed or implied, by operation of law or otherwise, as to the merchantability or fitness for a particular purpose of the good 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 manufacturer be liable for consequential, incidental or other 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 instruction manual should be read together with all other printed information such as catalogs, supplied by Sterling Electric.

GENERAL OPERATION

1. Run the motor, which drives the reducer, and check the direction of reducer output rotation. Consult motor nameplates 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.

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.

RUN-IN PERIOD

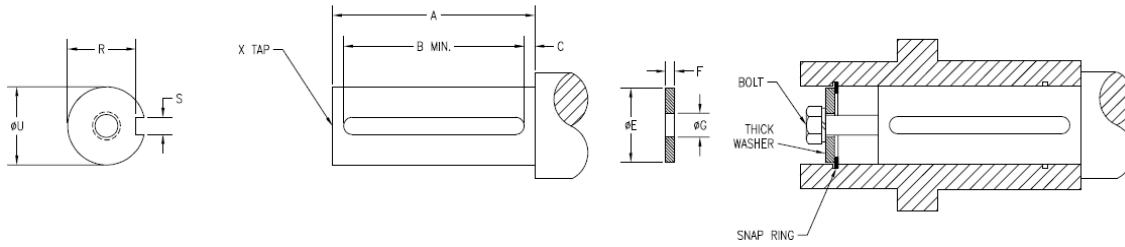
The maximum efficiency of worm reducers is obtained after a "Run-In" period. The length of time required will depend on the load applied and may be two to four hours at rated load and will be considerably longer at lighter loads. Overloading will not decrease the "Run-In" time but will cause severe wear and damage to the unit. During "Run-In", higher than normal motor current and temperatures along with lower efficiency and output torque can be expected.

SELF-LOCKING ABILITY

Under no condition should Sterling Electric, Inc. worm gear reducers be considered to hold a load at rest. The statement is made to cover the broad spectrum of variables effecting self-locking characteristics of a particular gear set in a particular application. Theoretically, a worm gear will not back drive if the friction angle is greater than the worm lead angle. However, the actual surface finish and lubrication may reduce this significantly. More important, vibration may cause motion at the point of mesh with further reduction in friction angle. No guarantee should be made and the customer should be advised that if these features are required, a properly sized, independent holding device, such as a brake, should be utilized in order to maintain a safe working environment. Sterling Electric, Inc. cannot accept liability for any damage to personnel or property that may occur from the application of worm gear reducers in which the self-locking ability is utilized to hold a load.

INSTALLATION

To properly mount the smooth body reducer, the customer shaft should be made to the dimensions noted below. Reducers are supplied with the proper mounting hardware based on output hollow shaft bore size.



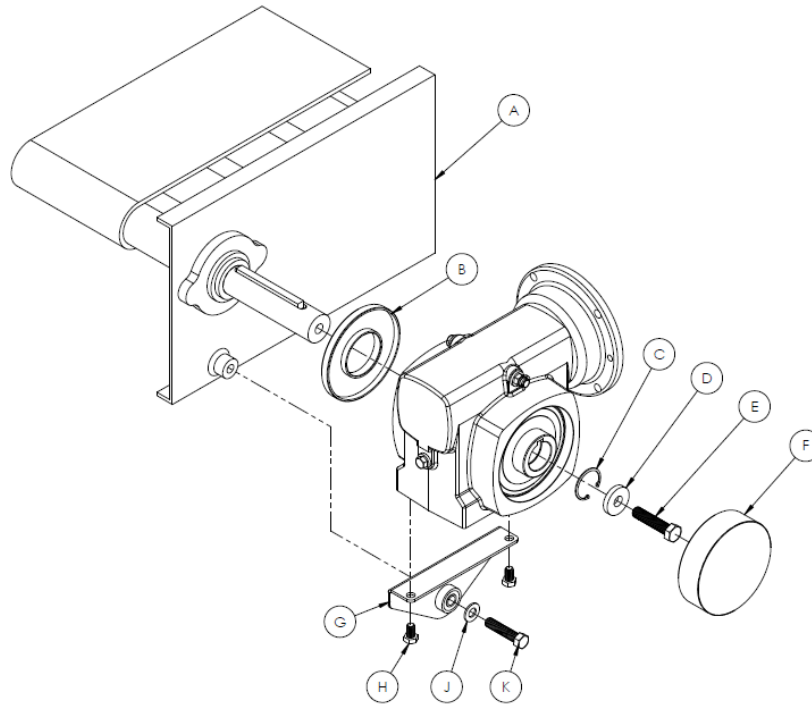
| ØU +0.000 -0.001 | S +0.002 -0.000 | R +0.000 -0.015 | X Tap | Thick Washer | | | Snap Ring | SS2175 | | | | SS2206 | | | | SS2238 | | | |
|------------------------|-----------------------|-----------------------|-------------------|--------------|------|------|-----------|--------|------|------|---------|--------|------|------|---------|--------|------|------|---------|
| | | | | ØE | F | ØG | | A | B | C | Bolt Lg | A | B | C | Bolt Lg | A | B | C | Bolt Lg |
| 1.000 | 0.250 | 0.859 | 1/2-20 x1.25Dp | 0.97 | 0.25 | 0.56 | HO-100-SS | 4.00 | 3.25 | 0.12 | 2.25 | 4.31 | 3.50 | 0.12 | 2.25 | 4.38 | 3.75 | 0.12 | 2.25 |
| 1.125 | 0.250 | 0.986 | | 1.10 | | | HO-112-SS | | | | | | | | | | | | |
| 1.187 | 0.250 | 1.049 | | 1.16 | | | HO-118-SS | | | | | | | | | | | | |
| 1.250 | 0.250 | 1.112 | | 1.22 | | | HO-125-SS | | | | | | | | | | | | |
| 1.375 | 0.313 | 1.201 | | 1.35 | | | HO-137-SS | | | | | | | | | | | | |
| 1.437 | 0.375 | 1.225 | | 1.41 | | | HO-143-SS | | | | | | | | | | | | |

| ØU +0.000 -0.001 | S +0.002 -0.000 | R +0.000 -0.015 | X Tap | Thick Washer | | | Snap Ring | SS2262 | | | | SS2325 | | | |
|------------------------|-----------------------|-----------------------|-------------------|--------------|------|------|-----------|--------|------|------|---------|--------|------|------|---------|
| | | | | ØE | F | ØG | | A | B | C | Bolt Lg | A | B | C | Bolt Lg |
| 1.000 | 0.250 | 0.859 | 1/2-20 x1.25Dp | 0.97 | 0.25 | 0.41 | HO-100-SS | 5.50 | 4.50 | 0.12 | 2.25 | 5.88 | 5.00 | 0.12 | 2.25 |
| 1.125 | 0.250 | 0.986 | | 1.10 | | | HO-112-SS | | | | | | | | |
| 1.187 | 0.250 | 1.049 | | 1.16 | | | HO-118-SS | | | | | | | | |
| 1.250 | 0.250 | 1.112 | | 1.22 | | | HO-125-SS | | | | | | | | |
| 1.375 | 0.313 | 1.201 | | 1.35 | | | HO-137-SS | | | | | | | | |
| 1.437 | 0.375 | 1.225 | | 1.41 | | | HO-143-SS | | | | | | | | |
| 1.500 | 0.375 | 1.289 | 5/8-18 x1.42Dp | 1.47 | 0.38 | 0.66 | HO-150-SS | 5.88 | 5.00 | 0.12 | 2.75 | | | | |
| 1.625 | 0.375 | 1.416 | | 1.60 | | | HO-162-SS | | | | | | | | |
| 1.687 | 0.375 | 1.478 | | 1.66 | | | HO-168-SS | | | | | | | | |
| 1.750 | 0.375 | 1.542 | | 1.72 | | | HO-175-SS | | | | | | | | |
| 1.875 | 0.500 | 1.591 | | 1.85 | | | HO-187-SS | | | | | | | | |
| 1.937 | 0.500 | 1.654 | | 1.91 | | | HO-193-SS | | | | | | | | |
| 2.000 | 0.500 | 1.718 | 1.97 | HO-200-SS | | | | | | | | | | | |

Notes:

1. Dimensions are in inches.
 2. Above customer shaft dimensions are based on standard hollow shaft bore sizes as stated in the catalog and assume square keys. For other types of mounting such as special bore sizes or rectangular keys, contact factory.
 3. Dimension B is minimum usable keyway length.
 4. Dimension A is minimum customer shaft engagement.
 5. The dimensions stated as minimum are to be used as a guideline only. Good engineering practice and safety considerations may require longer customer shaft engagement and key lengths.
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1. Refer to the following assembly diagram for proper mounting. Note that the following instructions assume the customer shaft is made to the dimensions noted above for the appropriate bore size and that the optional torque is being used.
 2. Once the orientation of the reducer is decided, the supplied extra seal (B) needs to be installed on the inboard side of the reducer closest to the conveyor (A). A generous amount of food grade grease (not supplied) needs to be applied to the inside diameter of the seal as well as the space in between the two seals to ensure the seal lip is properly lubricated during operation.
 3. Clean driven shaft extension and output bore of the unit.
 4. Apply anti-seize or anti-fretting compound (not supplied) to the hollow bore of the unit to aid removal at a later date.
 5. Locate the unit in position onto the driven shaft by using the supplied mounting hardware kit and optional torque arm (sold separately). The mounting kit consists of a snap ring (C), washer (D), and bolt (E). The optional torque arm consists of the torque arm with rubber bushing (G) and mounting bolts (H). The mounting bolt (J) and washer (K) used to attach the torque arm to the conveyor structure is supplied by the customer.
 6. Install and the shaft cover (F) to keep the hollow bore clean and free of any contaminants.
 7. Check the oil level referring to the **LUBRICATION** section.

8. Install the motor using the supplied hardware and O-ring. Make sure the O-Ring is properly located in the motor input flange groove.
9. If necessary, relocate the breather to the proper location. Make sure to remove the breather transportation lock as described in the **VENT PLUG LOCATION** section.
10. Fit guards in accordance with the relevant state and local safety regulations.



WARNING: **DO NOT RIGID MOUNT UNIT.** Mounting should be such to allow freedom of movement of the reducer to pivot around the driven shaft centerline without imposing excessive loads than can lead to driven shaft breakage, premature reducer bearing failure, cracking of the conveyor structure, and leaks. Consult factory if needed.

WARNING: For shipment, solid plugs are installed in the unit along with a vent plug with a transportation lock which is pre-installed assuming standard horizontal mounting (M1). The vent plug will need to be removed and relocated if the unit is to be mounted in any position other than the standard horizontal position as shown in the chart under **LUBRICATION**. After the unit is mounted, completely remove the transportation lock from the vent plug as directed under **VENT PLUG LOCATION**. 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.

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

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

CAUTION: 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.

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

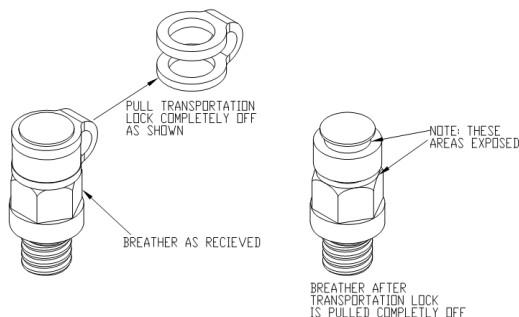
All Sterling Electric 2000RA smooth body right angle worm reducers supplied from the factory with Mobil Cibus 460 PAO Synthetic H1 Food Grade oil as standard. The design of the unit is such that it can be mounted in any position without adding additional oil. Oil level should still be checked after installation and before start-up to ensure it is at the proper level.

WARNING: PAO synthetic oils are not compatible with PAG synthetic oils. Mixing will cause immediate breakdown of performance causing catastrophic failure. The unit must be thoroughly flushed if a PAG synthetic oil is going to be used. Consult with the lubrication supplier regarding the use of PAG synthetics.

VENT PLUG LOCATION

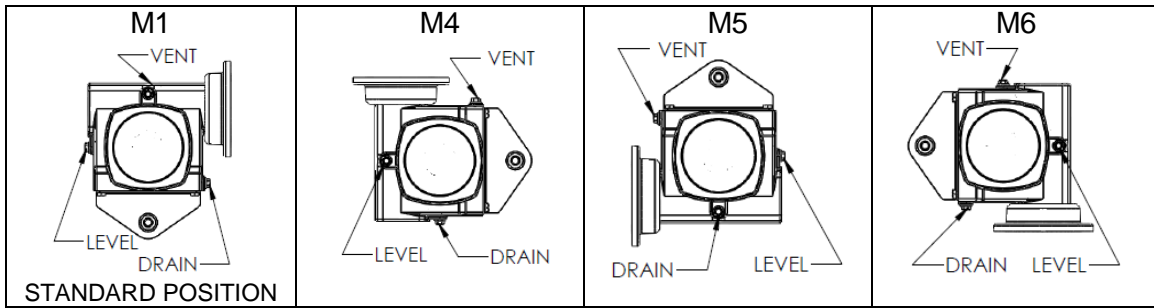
Sterling Electric 2000RA smooth body right angle worm reducers under continuous operation require ventilation of the oil bath in order to relieve excessive pressure build up due to normal operating temperatures.

Units are supplied with a Heinrichs Breather with a rubber transportation lock. The transportation lock must be completely removed before operation. Failure to do so may cause the unit to leak. See below.



Before putting the unit into operation, it may be necessary to relocate the vent plug for positions other than standard (M1). Substitute the vent plug for the solid plug at the position desired. Install the solid plug in the location the vent plug was removed from. Refer to the following chart for the recommended vent plug locations based on mounting position

VENT/ LEVEL/ DRAIN LOCATIONS



OIL & WEIGHT SPECIFICATIONS

| RECOMMENDED LUBRICATION OIL (ISO 150) | | | OIL CAPACITIES (FLUID OUNCE) | |
|---------------------------------------|----------------|---------------------------------|------------------------------|-------------|
| Mineral Oil | PAO† Synthetic | PAO† Synthetic H1 Food Grade | 56C/140TC | 180TC/210TC |
| Mobilgear 600XP-150 | Mobil SHC 150 | Mobil Cibus 150 | 14 | 16 |

†Do not mix with PAG synthetic oil or failure will occur.

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

Change Intervals: Synthetic lubricants should be changed every two years or 6000 hours, whichever comes first.

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.

SPECIAL LUBRICATION CONSIDERATIONS

If the unit will be 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.

The maximum input HP rating as shown in the published Rating Tables is based on using a PAO synthetic lubrication and a stabilized oil bath temperature not exceeding 200° F for normal ambient temperatures. Higher oil bath temperatures or continued operation in excess of rated input HP will tend to shorten the useful life of the lubricant. For high ambient temperatures in excess of 100° F, special lubricants or de-rating of the Gearmotor may be required. Consult the Factory or Local Office with complete application engineering data if this occurs.

Use of PAG synthetic oil will increase the efficiency of the unit resulting in a higher overall input horsepower rating and output torque rating. PAG synthetics require extra care as they can be easily contaminated, are hygroscopic, and are not compatible with standard mineral based oils or PAO synthetic oils. Consult the factory for rating tables using PAG synthetics. If a PAG synthetic is going to be used to replace a mineral based or PAO synthetic, the unit must be thoroughly flushed or catastrophic failure may occur. Consult with the lubrication supplier regarding the use of PAG synthetics.

MAINTENANCE

Your Sterling Electric reducer has been tested and adjusted at the factory. Dismantling or replacement of components must be done by Sterling Electric 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.

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

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 Sterling Electric Catalog (available upon request).

LONG-TERM STORAGE (6 MONTHS UP)

Units must be stored indoors, in a dry, warm temperature.

Completely fill the unit with oil.

Rotate the input shaft so that the output shaft rotates at least one revolution per month.

Completely cover the input and output shaft with grease.

At the time of start up, drain the storage oil, install the breather, and fill to the proper oil level with correct lubricant for the operating condition.

WARRANTY (LIMITED)

The warranty will cover all of the parts in the gearmotor or reducer unit for 12 months from the date of shipment.

The warranty is only for parts and labor. In no event shall our liability exceed the original price of the unit, nor does it cover cost of on site repair, installation, or freight.

Contact the service department for a complete explanation as to the full warranty policies and conditions of sale.

All dimensions, designs, and specifications are subject to change without notice.

2000RA SMOOTH BODY SEAL AND BEARING SIZES

Input Bearings

| Unit Size | Bearing Part Number and Size | | | | |
|-----------|------------------------------|---------|---------|------------|--------------|
| | Series | OD (mm) | ID (mm) | Width (mm) | Sterling P/N |
| SS2175 | 6304 | 52 | 20 | 15 | 400-0020-8 |
| SS2206 | 6305 | 62 | 25 | 17 | 400-0495-5 |
| SS2238 | 6305 | 62 | 25 | 17 | 400-0495-5 |
| SS2262 | 6306 | 72 | 30 | 19 | 400-0022-4 |
| SS2325 | 30306 | 72 | 30 | 20.75 | 400-0496-4 |

Hollow Shaft Output Bearings

| Unit Size | Bearing Part Number and Size | | | | |
|-----------|------------------------------|---------|---------|------------|--------------|
| | Series | OD (mm) | ID (mm) | Width (mm) | Sterling P/N |
| SS2175 | 30208 | 80 | 40 | 19.75 | 400-0503-7 |
| SS2206 | 32010 | 80 | 50 | 20 | 400-0505-5 |
| SS2238 | 32011 | 90 | 55 | 23 | 400-0513-7 |
| SS2262 | 32011 | 90 | 55 | 23 | 400-0513-7 |
| SS2325 | 32014 | 110 | 70 | 25 | 400-0514-6 |

Quill Style Input Seals

| Unit Size | Seal Part Number and Size | | | | |
|-----------|---------------------------|------------|-----------|------------|--------------|
| | NEMA Input | Shaft (mm) | Bore (mm) | Width (mm) | Sterling P/N |
| SS2175 | 56C | 30 | 45 | 7 | 404-0444-6 |
| | 140TC | 35 | 45 | 7 | 404-0331-9 |
| SS2206 | 56C | 30 | 50 | 7 | 404-0291-9 |
| | 140TC | 35 | 50 | 8 | 404-0292-8 |
| SS2238 | 56C | 30 | 50 | 7 | 404-0291-9 |
| | 140TC | 35 | 50 | 8 | 404-0292-8 |
| | 180TC | 45 | 60 | 8 | 404-0295-5 |
| SS2262 | 56C/140TC | 35 | 55 | 8 | 404-0294-6 |
| | 180TC | 45 | 60 | 8 | 404-0295-5 |
| SS2325 | 56C/140TC | 35 | 55 | 8 | 404-0294-6 |
| | 180TC | 45 | 60 | 8 | 404-0295-5 |
| | 210TC | 55 | 70 | 8 | 404-0235-5 |

Hollow Shaft Output Seals

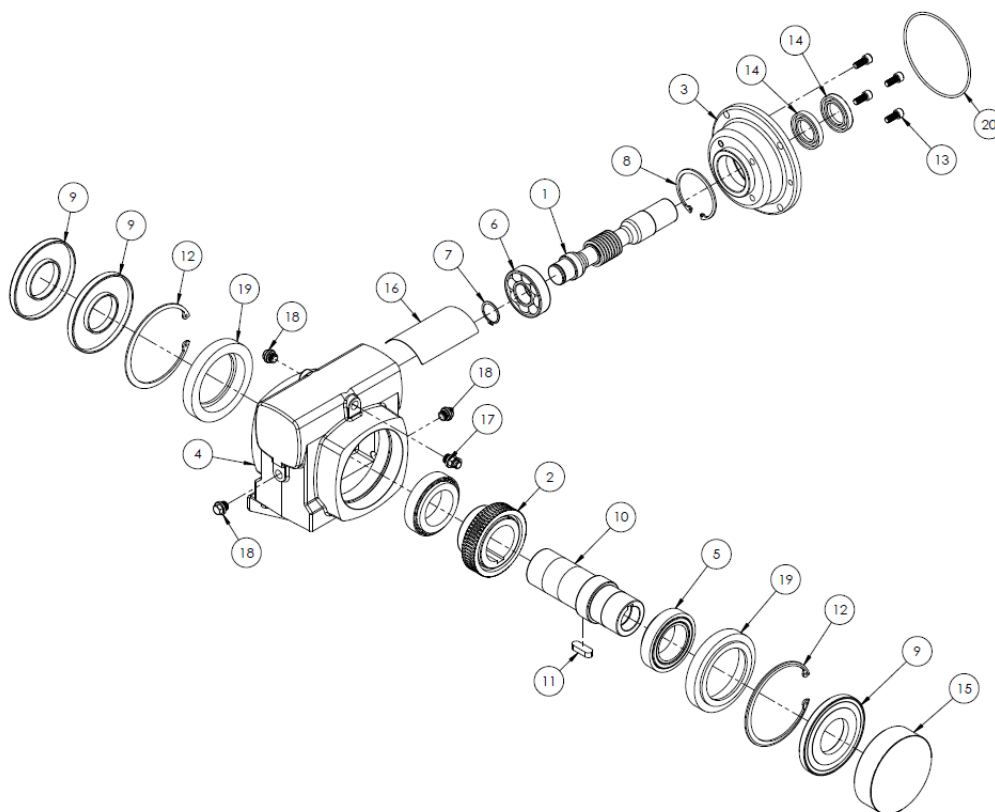
| Unit Size | Seal Part Number and Size | | | |
|-----------|---------------------------|-----------|------------|--------------|
| | Shaft (mm) | Bore (mm) | Width (mm) | Sterling P/N |
| SS2175 | 40 | 80.5 | 8 | 404-0465-5 |
| SS2206 | 50 | 90 | 10 | 404-0433-7 |
| SS2238 | 50 | 105 | 10 | 404-0462-8 |
| SS2262† | 55 | 120 | 10 | 404-0453-7 |
| SS2325 | 70 | 145 | 10 | 404-0456-4 |

† Early units have a 120.5mm OD seal part number 404-0460-0. Check seal OD before ordering from factory.

Parts List

| Item No. | Description | Qty | Item No. | Description | Qty |
|----------|------------------------|-----|----------|----------------------------|-----|
| 1 | Quill Input Worm Shaft | 1 | 11 | Metric Key | 1 |
| 2 | Hollow Output Gear | 1 | 12 | Internal Beveled Snap Ring | 2 |
| 3 | Motor Input Flange | 1 | 13 | Socket Head Cap Screw | 4 |
| 4 | Smooth Body Housing | 1 | 14 | Input Seal | 2 |
| 5 | Tapered Roller Bearing | 2 | 15 | Shaft Cover | 1 |
| 6 | Ball Bearing | 1 | 16 | Splash Guard | 1 |
| 7 | External Snap Ring | 1 | 17 | Breather | 1 |
| 8 | Internal Snap Ring | 1 | 18 | Seal Plug | 3 |
| 9 | Output Seal | 3 | 19 | Bearing Carrier* | 2 |
| 10 | Hollow Output Shaft | 1 | 20 | O-Ring | 1 |

*Bearing carrier not used on SS2175



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