PART 1
HELICAL BEVEL GEAR REDUCER

PART 2
RIGHT ANGLE WORM REDUCER

INSTALLATION AND MAINTENANCE MANUAL

January 22, 2018

SECTION 1
HELICAL BEVEL UNIT ONLY

SELECTION INFORMATION

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

Written authorization from D&F Equipment Sales is required to operate or use this unit 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: Lifting devices that may be supplied with reducers are for lifting and placing the reducer **only**. Do not use lifting devices to lift **any** other objects or additional weight such as motors, pumps, skids, etc. Using lifting devices to lift other objects or additional weight may cause lifting devices to fail and resulting in death, serious personal injury or property damage.

WARNING: Hot oil or gear units 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: Any brakes that are used in conjunction with this unit must be sized or positioned in such a way as to not subject the unit 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 unit 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. Units 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 D&F Equipment Sales.

GENERAL OPERATION

1. Run the motor, which drives the unit, and check the direction of unit 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 unit 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 unit 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.

INSTALLATION – FOOT MOUNTED

The following procedure is recommended for all foot mounted units with solid output shafts.

1. Clean shaft extensions.

2. Mount the unit using grade 5 or higher fasteners.

3. The ground footing, foundation, or bas plate on which unit is installed must be rigid and stable and not susceptible to vibration from surrounding equipment or distortion which may cause premature failure of the unit.

4. Align unit with driven shaft and install flexible coupling – **DO NOT USE** rigid couplings.

5. Check angular alignment by using a feeler gauge between coupling hubs at four points, 90 degrees apart. Position the unit to obtain best possible alignment and correct coupling hub separation. Consult factory, equipment supplier, or coupling manufacturer for proper values.

6. Check the offset alignment between the two shafts. Use a dial indicator mounting on one hub (unit side, for example), with the dial indicator button contacting the alignment surface of the opposite hub. Rotate the opposite shaft slowly by hand and take a reading on at least four equally spaced points. Move unit until the indicator movement does not exceed 0.002 in. Transfer indicator to opposite hub and recheck. Recheck angular alignment as described above.

7. Fit guards in accordance with the relevant state and local safety regulations.

8. Check the oil level and install the breather vent (if required) as described in **LUBRICATION**.

9. Install the motor as described in **MOTOR INSTALLATION**.

INSTALLATION – SHAFT MOUNT

The following procedure is recommended for all straight bore shaft mounted units with standard torque arm. Refer to the Helical Bevel catalog for torque arm mounting and customer shaft dimensions when using the straight bore shaft mounting option.

1. Clean driven shaft extension and output bore of the unit.

2. Apply anti-seize or anti-fretting compound (not supplied) to the hollow bore of the unit to aid removal at a later date.

3. Locate the unit in position onto the driven shaft by the most convenient method using good engineering practices; ensuring it is as close as possible to the bearing on the driven equipment.

4. Anchor the unit to a secure point on the structure by means of the torque arm or other flexible device.

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.

5. Fit guards in accordance with the relevant state and local safety regulations.

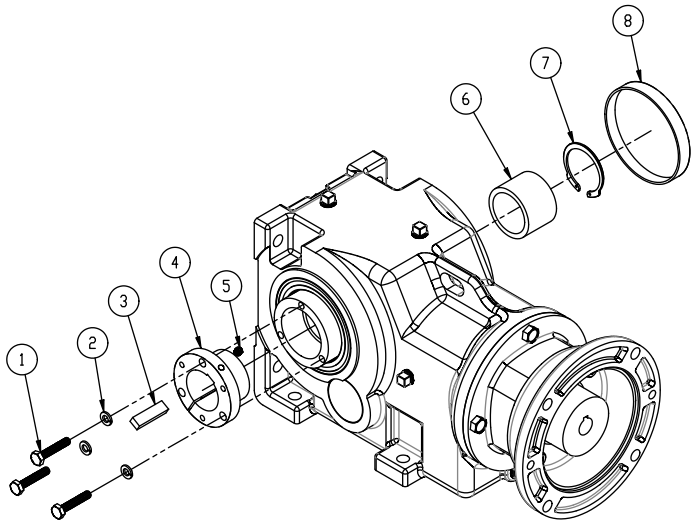
6. Check the oil level and install the breather vent (if required) as described in **LUBRICATION**.

7. Install supplied shaft cover.

8. Install the motor as described in **MOTOR INSTALLATION**

INSTALLATION – TAPER LOCK BUSHING
HELICAL BEVEL UNIT ONLY

The following procedure is recommended for all shaft mounted units using a taper lock bushing and standard torque arm. All taper lock bushing kits are supplied with bushing, mounting hardware, centering ring, snap ring, and shaft key. Refer to the Helical Bevel catalog for torque arm mounting and customer shaft dimensions when using the taper lock bushing mounting option. Refer to illustration below when installation units with taper lock bushings.



Item No.	Description	Qty	Item No.	Description	Qty
1	Hex Head Screw	3	5	Set Screw	1
2	Lock Washer	3	6	Centering Ring	1
3	Shaft Key	1	7	Internal Snap Ring	1
4	Taper Lock Bushing	1	8	Shaft Cover	1

1. Clean driven shaft extension and output bore of the unit.

2. Taper lock bushings should always be installed onto the driven shaft as close as possible to the bearing on the driven equipment.

3. Install the supplied centering ring and snap ring opposite the hollow shaft hub.

4. Install the supplied shaft key.

CAUTION: Taper lock bushings are meant to be dry mounted. **DO NOT USE** lubricants, anti-seize, or anti-fretting compounds on the bushing and shaft mounting area.

5. Align tapped holes in hollow shaft hub with drilled through holes in tapered bushing.

6. Insert hex head screws (supplied) through the drilled holes in tapered bushing and thread loosely into tapped holes in hollow shaft hub.

7. Position assembly on driven shaft. Make sure the key is in contact with the full length of the tapered busing. Tighten hex head screws in a progressively and uniformly manner to the torque value listed below.

Unit size	Screw Size	Tightening Torque
K04	1/4-20	9 ft-lbs
K06	5/16-18	15 ft-lbs
K07	3/8-16	30 ft-lbs

WARNING: The tightening force on the hex head screws is multiplied many times by the wedging action of the tapered surface. If extreme tightening force is applied, or if a lubricant is used, bursting pressures will be created in the hollow shaft hub of the mating part.

8. Install set screw over shaft key and tighten.

9. Anchor the unit to a secure point on the structure by means of the torque arm.

10. Fit guards in accordance with the relevant state and local safety regulations.

11. Check the oil level and install the breather vent (if required) as described in **LUBRICATION**.

12. Install supplied shaft cover.

13. Install the motor as described in **MOTOR INSTALLATION**.

REMOVAL – TAPER LOCK BUSHING

WARNING: Hot oil or gear units 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.

1. Remove shaft cover.

2. To remove the unit, loosen set screw over the shaft key.

3. Loosen and remove hex head screws. These will be used as jack screws in the tapped holes in the taper lock bushing.

4. Insert hex head screws in the tapped holes in the taper lock bushing and progressively tighten each one until hollow shaft hub is loose on bushing.

5. Remove unit using caution.

MOTOR INSTALLATION

1. Mount the motor using the hardware supplied.

   NOTE: With every C-face input bevel reducer, D&F Equipment Sales supplies the motor coupling half, a key, and a flexible coupling spider. In order to aid removal at a later date, anti-seize compound (not supplied) can be applied to the motor shaft and C-face pilot diameter.

   NOTE: The motor coupling must be mounted with the supplied parts. Failure to use the supplied parts could void the D&F Equipment Sales Warranty.

2. Remove any dirt or adhesive residue from the motor shaft.

3. The supplied key is to be placed in the motor keyway and should be located under the motor coupling.

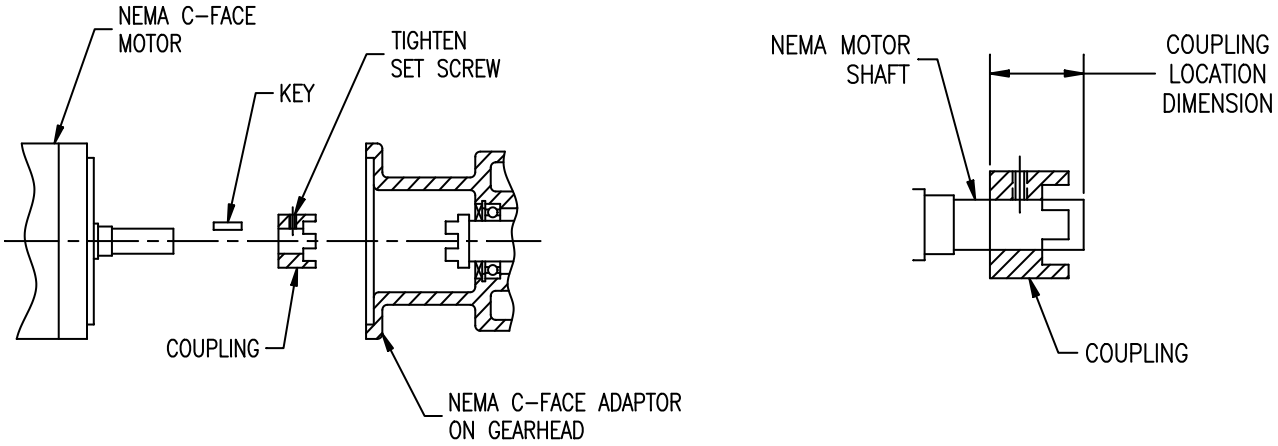
   NOTE: the key is not to extend beyond the coupling bore on EITHER side.

4. The motor coupling is to be mounted on the motor shaft and is to be located accordingly to the dimension specified in **NEMA Adapter Coupling Location**.

5. Tighten the setscrew located on the motor coupling.

6. Place the flexible motor spider between the jaws of the motor coupling. Align the motor coupling so that the jaws on the reducer coupling mesh with the motor coupling. The motor shaft will extend into the bore of the reducer coupling. Secure the flanged motor to the C-face adapter with the supplied hardware unless otherwise specified by the motor manufacturer.

NEMA Adapter Coupling Location



NEMA Frame Size	*Coupling location Dimension (in)		
	K043	K063	K073†
56C	1.79	1.90	
143TC / 145TC	1.85	1.97	1.79
182TC / 184TC	2.31	2.03	2.29
213TC / 215TC		N/A**	N/A**
254TC / 256TC			N/A**

*Coupling Location Dimension Tolerance is –0.0/+0.031
** Quill style input, only special key required.
† No special key required on R0702.

7. 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 in the chart under **LUBRICATION**. 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: **Prior to startup, verify that the unit is filled with the proper amount of oil based on the mounting position shown in the LUBRICATION section. Failure to do so will void the warranty.**

CAUTION: Do not operate the unit 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 standard helical bevel gear reducers ordered from the factory are shipped with standard compounded lubricant and is good for ambient temperature ranges of 30° F to 104° F. Beginning with a May, 2012 manufacture date, all washdown and stainless steel helical gear reducers ordered from the factory are shipped with synthetic NSF H1 Food Grade lubricant and is good for ambient temperature ranges of -10° F to 105° F. Position M1 is considered standard.

CAUTION: Use of synthetics can cause problems if they are not compatible with the seals or the conventional lubes they replace.

CAUTION: 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.

RECOMMENDED LUBRICATION OILS

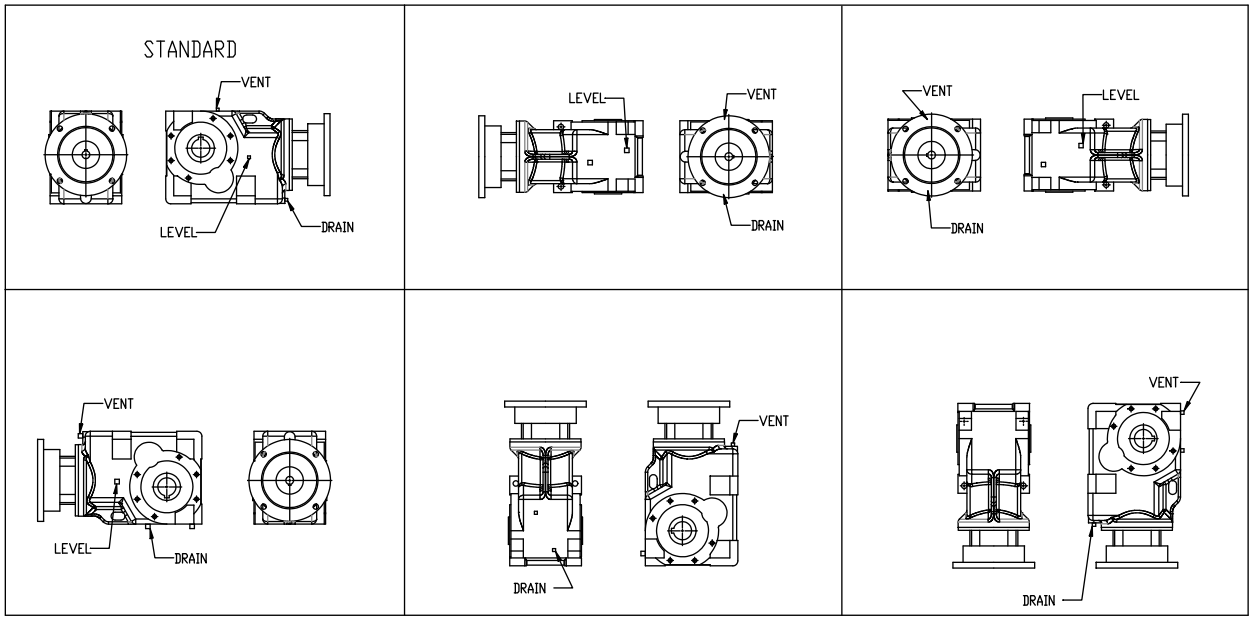
Mineral Oils			
Manufacturer	**ISO Viscosity / AGMA No.**		
	220 / 5EP	**320 / 6EP**	**460 / 7EP**
	Ambient Temperature Range		
	-5 to 25 °C (23 to 77 °F)	**0 to 40 °C (32 to 104 °F)**	**10 to 50 °C (50 to 122 °F)**
Chevron USA, Inc.	Gear Compound EP220	Gear Compound EP320	Gear Compound EP460
Exxon CO. USA	Spartan EP220	Spartan EP320	Spartan EP460
Mobil Oil Co.	Mobilgear 630X	Mobilgear 632X	Mobilgear 634X
Shell Oil Co.	Omala 220	Omala 320	Omala 460
Synthetic Oils			
Manufacturer	**ISO Viscosity / AGMA No.**		
	220 / 5EP	**320 / 6EP**	**460 / 7EP**
	Ambient Temperature Range		
	-5 to 25 °C (23 to 77 °F)	**0 to 40 °C (32 to 104 °F)**	**10 to 50 °C (50 to 122 °F)**
Chevron USA, Inc.	Tegra Synthetic EP220	Tegra Synthetic EP320	Tegra Synthetic EP460
Exxon CO. USA	Spartan SEP220	Spartan SEP320	Spartan SEP460
Mobil Oil Co.	Mobil Cibus SHC630	Mobil Cibus SHC632	Mobil Cibus SHC 634
Shell Oil Co.	Omala HD220	Omala HD320	Omala HD460
Summit Industrial	Syngear SH-7220	Syngear SH-7320	Syngear SH-7460

OIL CAPACITIES (FLUID OUNCE)

Mounting Position	Unit Size		
	K043	K063	K073
M1	34	58	118
M2	44	95	196
M3	44	95	196
M4	58	112	230
M5	75	142	294
M6	44	98	196

16 fl-oz = 1 pint
2 pints = 1 quart
4 quarts = 1 US gallon

VENT / LEVEL / DRAIN LOCATIONS



NOTE: The unit is filled at the factory with the proper amount of oil for the **STANDARD** mounting position. A level plug is provided for this position only so the unit can be checked for proper oil level prior to installation and start-up. All other mounting positions will require the oil level to be measured out prior to filling the unit based on the values in the table labeled **OIL CAPACITIES** above.

VENT PLUG LOCATION

Before putting the unit into operation, substitute the vent plug for the solid plug at the position desired. Arrows indicate the recommended vent plug locations. For washdown and stainless steel units with PAO synthetic oil, a vent is not required for normal operating conditions.

Change Intervals: Standard compounded lubricants should be changed every 10,000 operating hours. Synthetic lubricants should be changed every 20,000 operating hours.

CAUTION: Oil should be changed more often if the unit 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.

MAINTENANCE

Your D&F Equipment Sales unit has been tested and adjusted at the factory. Dismantling or replacement of components must be done by D&F Equipment Sales to maintain the warranty.

Frequently check the oil level of the unit. If oil level is low, (refer to the 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.

Seals: The D&F Equipment Sales line of speed reducers utilizes premium quality Viton® seals which are the state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Replacement of the seals 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 or sharp edges 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.

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 D&F Equipment Sales 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

SEAL AND BEARING SIZES

Input Bearings
(Item #17)

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
K043	6207LLC3	72	35	17	
K063	6208LLC3	80	40	18	

(Item #22)

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
K043	6305	62	25	17	
K063	6306	72	30	19	

Intermediate Bearings
(Item #2)

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
K043	32004	42	20	15	
K063	32205	52	25	19.25	

Output Bearings
(Item #25)

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
K043	6011	90	55	18	
K063	6014	110	70	20	

Input Seal

Unit Size	Bearing Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
K043	35	62	7	
K063	40	72	7	

End Cap Seal

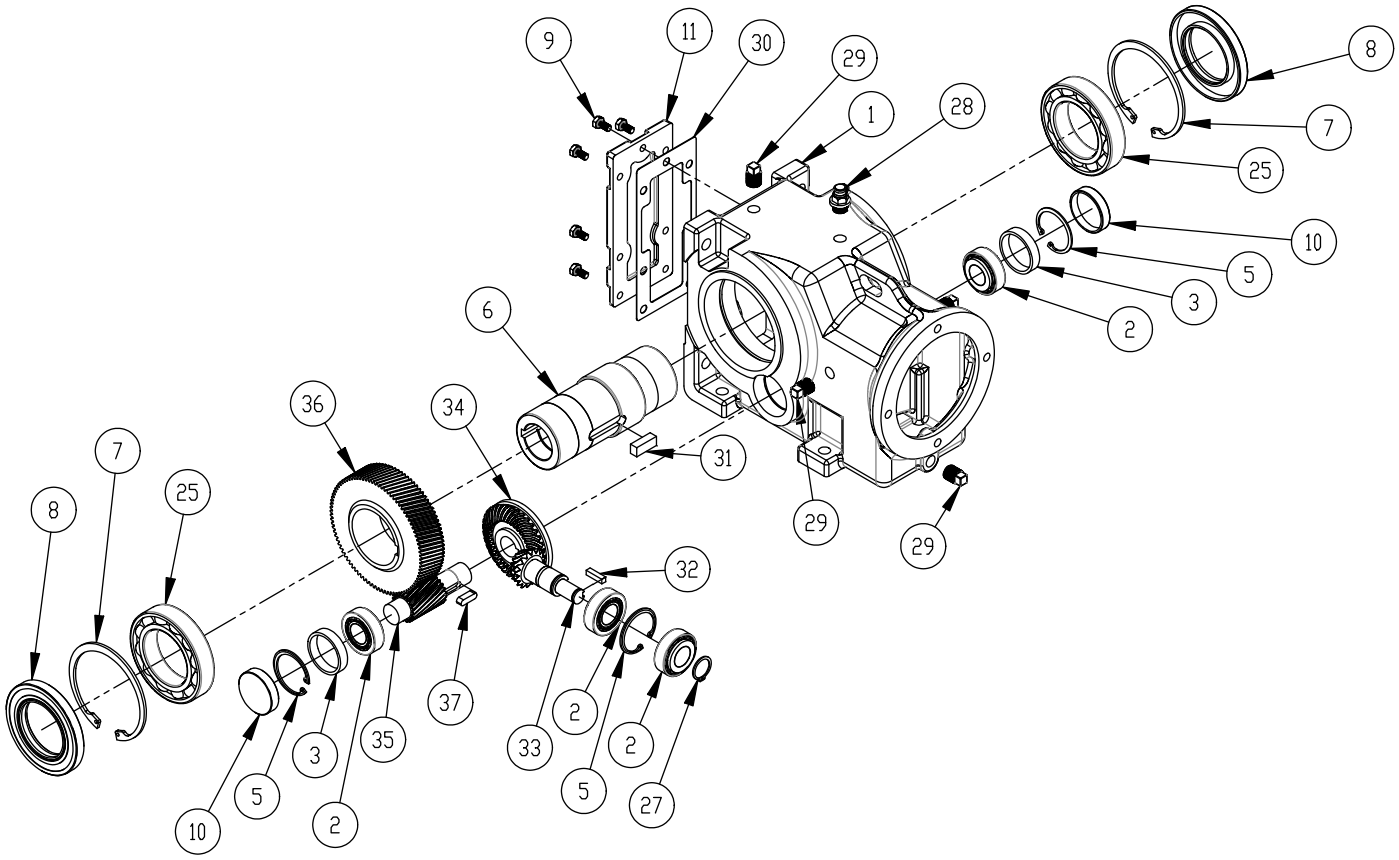
Unit Size	Bearing Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
K043	-	42	7	
K063	-	52	7	

Output Seal

Unit Size	Bearing Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
K043	55	90	10	
K063	70	110	10	

TRIPLE REDUCTION UNIT

Parts List



Item No.	Description	Qty	Item No.	Description	Qty	Item No.	Description	Qty
1	Gear Case Housing	1	14	Socket Head Screw	4	27	External Snap Ring	1
2	Tapered Roller Baring	4	15	Hex Head Screw	4	28	Breather / Vent	1
3	Spacer Ring	2	16	Input Shaft	1	29	NPT Plug	4
4	External Snap Ring	1	17	Double Sealed Ball Bearing	1	30	Cover Plate Gasket	1
5	Internal Bevel Ring	3	18	Motor Coupling Half	1	31	Key	1
6	Hollow Output	1	19	Input Seal	1	32	Key	1
7	Internal Snap Ring	2	20	Coupling Spider	1	33	Bevel Pinion	1
8	Output Seal	2	21	Internal Snap Ring	1	34	Bevel Gear	1
9	Hex Head Screw	7	22	Ball Bearing	1	35	Final Pinion Shaft	1
10	End Cap Seal	2	23	External Snap Ring	1	36	Final Gear	1
11	Cover Plate	1	24	Primary Pinion	1	37	Key	1
12	Input Adapter	1	25	Ball Bearing	2			
13	Input Motor Flange	1	26	Primary Gear	1			

NOTES: REPLACEMENT GEARS ARE AVAILABLE IN SETS ONLY. FOR EXAMPLE, A FINAL GEAR KIT WILL CONTAIN THE FINAL GEAR AND FINAL PINION SHAFT. A PRIMARY GEAR KIT WILL CONTAIN A PRIMARY GEAR AND A PRIMARY PINION. CONSULT FACTORY FOR PART NUMBERS. ALL BEVEL SETS MUST BE SHIMMED TO SET MOUNTING DISTANCE AND BEARING PRE-LOAD.

SECTION 2
RIGHT ANGLE WORM UNIT ONLY

SELECTION INFORMATION

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

Written authorization from D&F Equipment Sales 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 D&F Equipment Sales.

GENERAL OPERATION

4. 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.

5. 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.

6. 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 D&F Equipment Sales 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. D&F Equipment Sales 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-FOOT MOUNT

10. 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 that do not lie flat against the mounting surface.

11. Connect motor to speed reducer.

INSTALLATION – SHAFT MOUNT

9. Clean driven shaft extension and output bore of the unit.

10. Apply anti-seize or anti-fretting compound (not supplied) to the hollow bore of the unit to aid removal at a later date.

11. Locate the unit in position onto the driven shaft by the most convenient method using good engineering practices; ensuring it is as close as possible to the bearing on the driven equipment.

12. Anchor the unit to a secure point on the structure by means of the torque arm or other flexible device.

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.

13. Fit guards in accordance with the relevant state and local safety regulations.

14. Connect motor to speed reducer.

WARNING: 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 in the chart under **LUBRICATION**. 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.

WARNING: 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.

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.

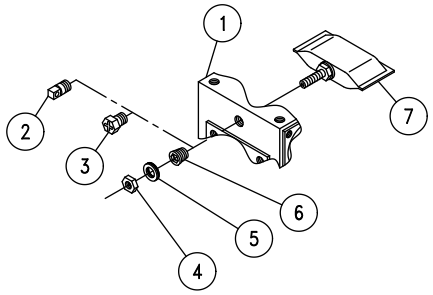
LUBRICATION AND VENTILATION

CAUTION: On **ALL** quill style input units, cast iron and stainless, single and double reduction, with a motor mounted vertical shaft up or worm under on the input will require a double input seal arrangement to prevent leakage or C-face coupled style units should be used. Consult factory.

D&F Equipment Sales 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. Standard cast iron units are supplied with a plastic breather that allows free exchange of air between the oil chamber and the outside environment. This type of breather is suitable for a majority of reducer applications and must be installed in the proper location based on the mounting position of the reducer. For washdown and stainless steel units, other types of ventilation noted below are utilized.

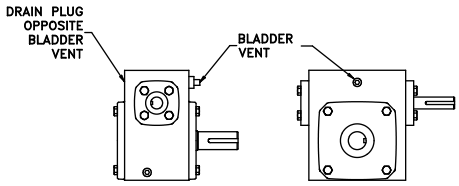
Pressure vent – This type of vent remains closed until a specified pressure is reached inside the reducer oil chamber. Once the pressure is reached, the vent will open and equalize the oil chamber pressure with that of the surrounding environment. Since this type of vent remains closed until it opens for an instant to equalize the pressure, it is recommended for applications were contamination of the oil chamber is possible if a traditional type of breather is used. Like the standard breather, the pressure vent must be installed in the proper location based on the mounting position of the reducer – refer the instruction manual for further details.

Bladder System – This type of vent consists of an internal bladder that seals the oil chamber from the outside environment at all times. As pressure builds inside the unit, the bladder contracts keeping the internal pressure to a minimum. The advantage to this type of vent system is that the internal oil chamber is completely sealed from the outside environment ensuring that contamination does not enter the oil chamber or that oil is not released causing contamination in the application. Since this vent system is sealed, the reducer can be mounted in any position without affecting the performance of the bladder. **This type of vent is standard on all washdown units up to 3.25CD and all stainless steel constructed units**. **4.25 CD and 5.25 CD units use the pressure vent for washdown applications**.

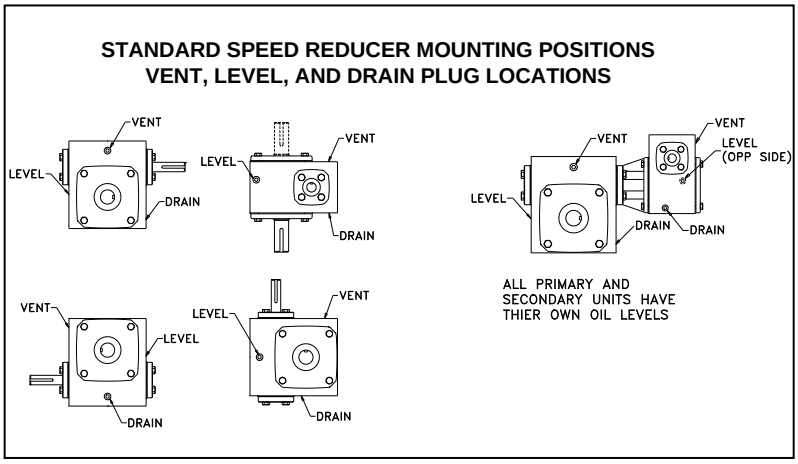


Item No.	Description	Part Number	Reducer Size
1	Reducer Housing		
2	Standard Plastic Breather*		All
3	Pressure Vent*		All
4	Nut		1-8
5	Seal Washer		1-8
6	Adapter plug		1-8
7	Internal Bladder		1-2
			3-5
			6-8

CAUTION: Units shipped with the bladder type pressure compensation system allow the unit to be mounted in any position without changing the location of the bladder vent. However, for the unit to work properly, the pressure must be equalized before installation or leaking may occur. To equalize pressure, place the unit on a flat surface. Remove and then reinstall the drain plug opposite the bladder vent.



WARNING: **With the exception of the bladder type vent system, the breather vent whether standard or pressure vent, will need to be installed by the customer in the proper location as noted by the diagram below. Failure to install the breather vent a will cause the unit to overheat and the oil seals to leak voiding the warranty.**



RECOMMENDED LUBRICATION OILS

Manufacturer	30° F to 100° F Ambient Temperature AGMA #7 (ISO 460)	30° F to 125° F Ambient Temperature AGMA #8 (ISO 680)
Amoco Oil Co.	Worm Gear Oil	Cylinder Oil #680
Chevron USA, Inc.	Cylinder Oil #460X	Cylinder Oil #680X
Exxon CO. USA	Cylesstik TK-460	Cylesstik TK-680
Gulf Oil Co.	Senate 460	Senate 680D
Mobil Oil Co.	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 of CA	Steaval A	Worm Gear Lube 140

Note: Some gear lubricants contain EP 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 helical reducers of helical/worm combinations, contact the factory.

OIL CAPACITIES (FLUID OUNCE)

Mounting Position	UNIT SIZE									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Worm Over	6	11	12	18	22	33	55	60	100	178
Worm Under	11	18	20	28	31	54	74	108	140	303
Vertical Output	10	17	17	26	29	51	67	91	105	220
Vertical Input	7	14	16	22	25	44	60	81	116	240

16 floz = 1 pint
2 pints = 1 quart
4 quarts = 1 US gallon

SYNTHETIC LUBRICANTS

All standard reducers ordered from the factory are shipped with Mobil SHC 634 or equal synthetic oil. Beginning with a May, 2012 manufacture date, all washdown and stainless steel reducers ordered from the factory are shipped with Mobil Cibus SHC 634 NSF H1 Food Grade or equal synthetic oil. Double reduction units have separate oil sumps and must be filled and checked independently. Synthetic lubricants provide the potential for numerous benefits including wider operating temperature range and increased interval between changes. Use of synthetics can cause problems if they are not compatible with the seals or conventional lubes they replace. The synthetic lubrication provided with the reducer is good for ambient temperature ranges of –10° F to 105° F and is compatible with standard compounded oil. For synthetic oil used in helical reducers of helical/worm combinations, contact the factory. **Prior to startup, verify that the oil is at the level shown on the drawings above.** 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 above or the factory for alternate lubricants.

Change Intervals: Standard compounded lubricants should be changed every six months or 2500 operating hours, whichever comes first. 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 REQUIREMENTS – SIZES 3 & LARGER

Units shipped from the factory are assembled to properly lubricate all internal components based on a specific assumed horizontal mounting orientation, worm over. If a size 3 or larger unit will be mounted in a different orientation, 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.

The maximum input HP rating as shown in the published Rating Tables is based on a stabilized oil bath temperature not exceeding 200º 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 a lubricant. For high ambient temperatures in excess of 100º 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.

MAINTENANCE

Your D&F Equipment Sales reducer has been tested and adjusted at the factory. Dismantling or replacement of components must be done by D&F Equipment Sales 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.

Seals: The D&F Equipment Sales line of speed reducers utilizes premium quality Viton® seals which are the state-of-the-art in sealing technology. Seals are, however, a wear item and eventually need to be replaced. Seal kits are available and contain all the necessary seals, O-rings, and shims for a given reducer size based on style. Refer to the parts list for available kits. Replacement of the seals can be easily accomplished by following the steps below:

7. 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.

8. Clean the seal bore of sealant.

9. Before installing the new seal, use electrical tape to cover any keyways on the shaft to prevent seal lip damage.

10. Grease the seal lips with bearing grease and apply a sealant to the seal bore.

11. Slide the seal into the shaft being careful not to fold the inner lip over on any shaft steps.

12. 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.

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 D&F Equipment Sales 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.

RIGHT ANGLE WORM SEAL AND BEARING SIZES

Input Quill or Solid Shaft Bearings

Unit Size		Bearing Part Number and Size				
		Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
1		6203	40	17	12	
2		6304	52	20	15	
3		6304	52	20	15	
4		6305	62	25	17	
5		6305	62	25	17	
6		6306	72	30	19	
7		6306	72	30	19	
8	Solid	30306	72	30	20.75	
	Quill	5306	72	30	30.2	
9†	Solid	30208	80	40	19.75	
	Quill	30208	80	40	19.75	
10‡	Solid	30309	100	45	27.25	
	Quill	30309	100	45	27.25	

† For input speeds greater than 2400RPM or use with mechanical variable speed drives, 7208 angular contact bearings are used.
‡ For input speeds greater than 2400RPM or use with mechanical variable speed drives, 7309 angular contact bearings are used.

Solid Shaft Output Bearings

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
1	30204	47	20	15.25	
2	30204	47	20	15.25	
3	30205	52	25	16.25	
4	30206	62	30	17.25	
5	30206	62	30	17.25	
6	30207	72	35	18.25	
7	30207	72	35	18.25	
8	30208	80	40	19.75	
9	32210	90	50	24.75	
10	32211	100	55	26.75	

Hollow Shaft Output Bearings

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
1	32005	47	25	15	
2	32006	55	30	17	
3	32008	68	40	19	
4	32010	80	50	20	
5	32011	90	55	23	
6	32011	90	55	23	
7	32014	110	70	25	
8	32014	110	70	25	
9	30214	125	70	26.25	
10¢	32022	170	110	38	

Solid Shaft Input Seals*

Unit Size	Seal Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
1	17	30	7	
2	20	35	7	
3	20	35	7	
4	22	40	7	
5	22	40	7	
6	25	40	7	
7	25	40	7	
8	25	40	7	
9	35	55	8	
10§	45	60	8	

Quill Style Input Seals*

Unit Size	Seal Part Number and Size				
	NEMA Input	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
1	56C	25	35	7	
2	56C	30	40	7	
3	56C	30	40	7	
	140TC	35	45	7	
4	56C	30	50	7	
	140TC	35	50	8	
5	56C	30	50	7	
	140TC	35	50	8	
	180TC	45	60	8	
6	56C/140TC	35	55	8	
	180TC	45	60	8	
7	56C/140TC	35	55	8	
	180TC	45	60	8	
	210TC	55	70	8	
8	56C/140TC	35	55	8	
	180TC	45	60	8	
	210TC	55	70	8	
9	56C/140TC	45	60	8	
	180TC/210TC	55	80	8	
10	56C/140TC	45	60	8	
	180TC/210TC	55	80	8	

Solid Shaft Output Seals*

Unit Size	Seal Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
1	20	35	7	
2	20	35	7	
3	25	40	7	
4	30	50	7	
5	30	50	7	
6	35	55	8	
7	35	55	8	
8	40	62	7	
9	50	65	8	
10	55	80	8	

Hollow Shaft Output Seals*

Unit Size	Seal Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
1	25	35	7	
2	30	40	7	
3	40	62	7	
4	50	65	8	
5	55	80	8	
6	55	80	8	
7	70	100	10	
8	70	100	10	
9	70	100	10	
10	110	130	12	

*SEALS ARE AVAILABLE IN KITS ONLY. SEE PAGE 9.

¢ EARLY STYLE UNITS HAVE 32024 TAPERED ROLLER BEARINGS (P/N 400-0527-3). CONTACT FACTORY WITH UNIT SERIAL NUMBER BEFORE ORDERING HOLLOW OUTPUT BEARINGS TO CONFIRM SIZE.

§ EARLY STYLE UNITS MAY HAVE 45X62X8 (P/N 404-0345-5) OR 45X68X8 (PN 404-0371-9) SIZE SOLID INPUT SEALS. CONTACT FACTORY WITH UNIT SERIAL NUMBER BEFORE ORDERING SEALS TO CONFIRM SIZE.

Parts List – Single Reduction

Item No.	Description	Qty	Item No.	Description	Qty
1	Housing	1	26	Bearing Shim	AR*
2	Solid Input Worm Shaft	1	27	Input Shim Gasket	AR*
3	Single Solid Output Shaft	1	110	Hollow Output Shaft Cover	2
3a	Double Solid Output Shaft	1	111	Hollow Output Shaft Seal	2
4	Solid Output Worm Gear	1	112	Hollow Shaft Output Bearing	2
5	DE Solid Shaft Input Cover	1	113	Hollow Output Shaft	1
6	ODE Input Shaft Cover (2 and Larger)	1	114	Hollow Output Worm Gear	1
7	DE Solid Shaft Output Cover	1	115	Key	1
8	ODE Solid Output Shaft Cover	1	116	Set Screw	6
9	Solid Shaft Input Bearing	2			
10	Input Oil Seal	1	120	Quill Style Input Flange	1
11	Solid Shaft Output Bearing	2	121	Flange Input Oil Seal	1
12	Output Oil Seal	1	122	Quill Style Input Worm Shaft	1
13	Input O-Ring	2	123	Retaining Ring (Housing)	1
14	Output O-Ring	2	124	Quill Style Input Bearing	1
15	Key	1	125	Retaining Ring (Shaft)	1
16	Key	1	126	Seal End Plug (1 Only)	1
17	Key	1	127	Socket Head Cap Screw	4
18	NPT Plug	4	128	Bolt	1
19	Internal Baffle (Splash Guard)	1	129	Washer	1
20	Bolt	8			
21	Bolt	8	140	C-Face Input Flange	1
22	Output Shim Gasket	AR*	141	Socket Head Cap Screw	4
23	Horizontal Base	1	142	Bore Coupling Half	1
24	Bolt	4	143	Coupling Insert	1
25	Breather Plug	1	144	Bore Coupling Half	1

* AR= As Required

Notes:

1. Shims are used as required.
2. Qty (2) of Item #123, Retaining Ring is required on unit size 1 with Item #126, Seal End Plug.
3. Qty (2) of Item # 5, DE Solid Output Shaft Cover is required in when using Item #3a, Double Output Shaft.
4. Qty (12) of Item #21, Bolt is required on unit size 6 to 10.
5. Qty (2) of item #124, Quill Style Input Bearing is required on unit size 9 to 10.

SEAL AND BEARING KITS

When rebuilding or refurbishing a unit, bearing or seal kits can be purchased which contains all necessary items from a given reducer style. Please contact the factory with model number for appropriate bearing or seal kit. If any internal parts are to be replaced other than bearings and seals, it will be necessary to adjust the bearing pre-load by measuring and installing shims. Shims are available from the factory.

Parts List – Double Reduction (Worm / Worm)

Item No.	Description	Qty	Item No.	Description	Qty
1	Housing (Primary or Secondary)	1	122	Quill Style Input Worm Shaft	1
4	Solid Output Worm Gear	1	123	Retaining Ring (Housing)	1
6	ODE Input Shaft Cover	1	124	Quill Style Input Bearing	1
8	ODE Solid Output Shaft Cover	1	125	Retaining Ring (Shaft)	1
11	Solid Shaft Output Bearing	2			
12	Output Oil Seal	1	200	Double Reduction Adapter	1
13	Input O-Ring	1	201	Dbl Reduction Primary Unit Output Shaft	1
14	Output O-Ring	2	202	Key	1
15	Key	1	203	Bolt	4
19	Internal Baffle (Splash Guard)	1			
20	Bolt	4			
21	Bolt	4			
22	Output Shim Gasket	AR*			
26	Bearing Shim	AR*			

* AR= As Required

Notes:

1. Shims are used as required.
2. The primary gearbox in the ratio combination is considered the input or motor end reducer.
3. The secondary gearbox in the ratio combination is considered the output or load end reducer.

Seal Kits

When Ordering seal kits for double reduction units, refer to the information for the single reduction units on the previous page. Double reduction units will take two seal kits, one for the primary and one for the secondary. The primary unit will take either the BR or BQ seal kit depending on the input configuration. The secondary unit will take either a BQ or HQ seal kit depending on the output configuration. All outputs for the primary units are solid shaft. All inputs for the secondary units are quill style.

Worm / Worm Ratio Combinations

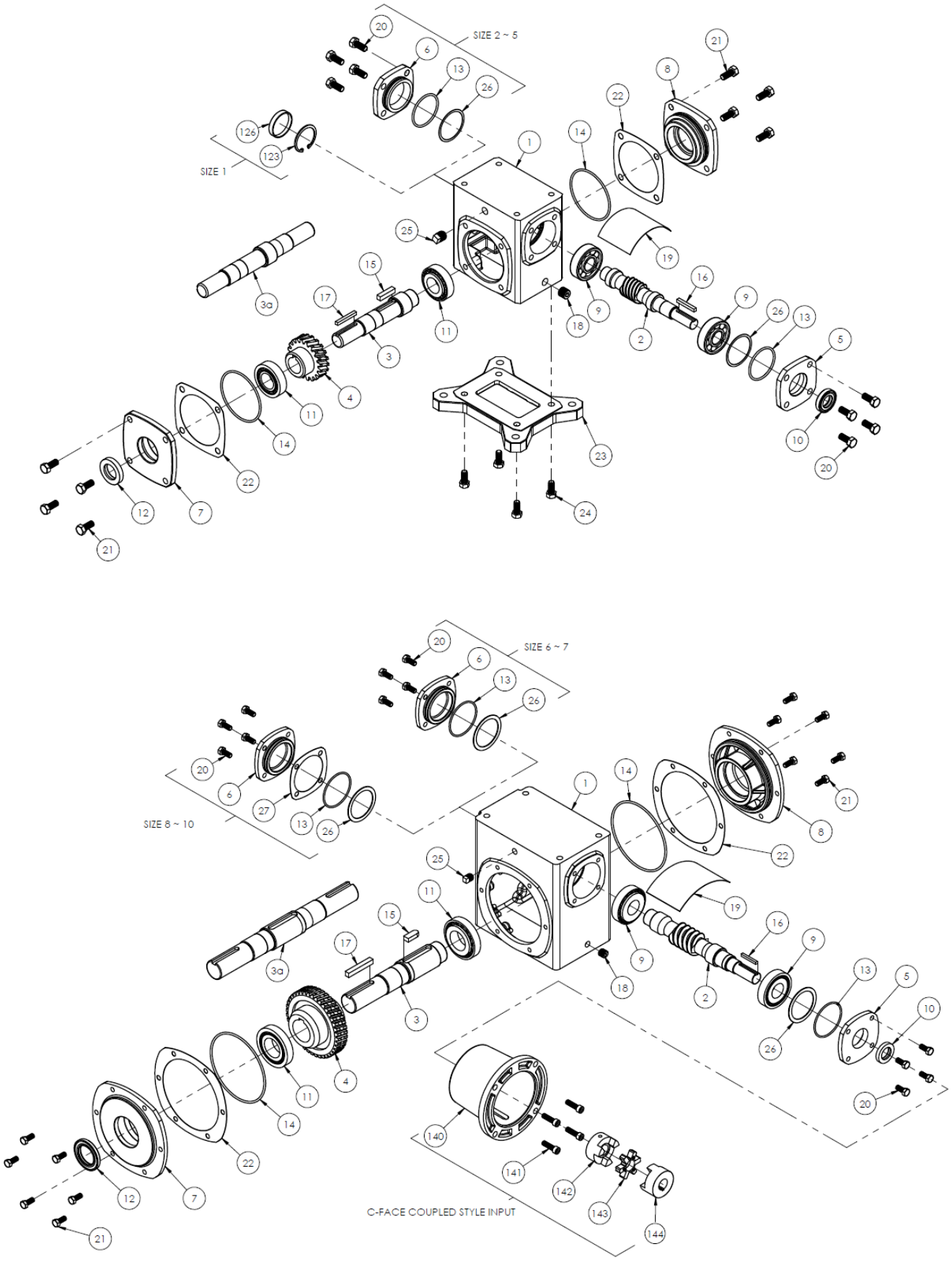
	2DW		3DW		4DW		5DW		6DW		7DW		8DW		9DW		10DW	
Total	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**
Ratio	**1**	**2**	**1**	**3**	**1**	**4**	**1**	**5**	**1**	**6**	**2**	**7**	**2**	**8**	**4**	**9**	**6**	**10**
75:1	5	15	5	15	5	15	5	15	5	15	5	15	5	15	5	15	5	15
100:1	5	20	5	20	5	20	5	20	5	20	5	20	5	20	5	20	5	20
150:1	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15	10	15
200:1	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20	10	20
250:1	10	25	10	25	10	25	10	25	10	25	10	25	10	25	10	25	10	25
300:1	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30	10	30
400:1	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
500:1	25	20	25	20	25	20	25	20	25	20	25	20	25	20	25	20	25	20
600:1	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30	20	30
750:1	25	30	25	30	25	30	25	30	25	30	25	30	25	30	25	30	25	30
900:1	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1000:1	50	20	50	20	50	20	50	20	50	20	50	20	50	20	50	20	50	20
1200:1	40	30	40	30	40	30	40	30	40	30	40	30	40	30	40	30	40	30
1500:1	50	30	50	30	50	30	50	30	50	30	50	30	50	30	50	30	50	30
1800:1	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30	60	30
2400:1	60	40	60	40	60	40	60	40	60	40	60	40	60	40	60	40	60	40
3000:1	60	50	60	50	60	50	60	50	60	50	60	50	60	50	60	50	60	50
3600:1	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60

P = Primary (Input) unit.

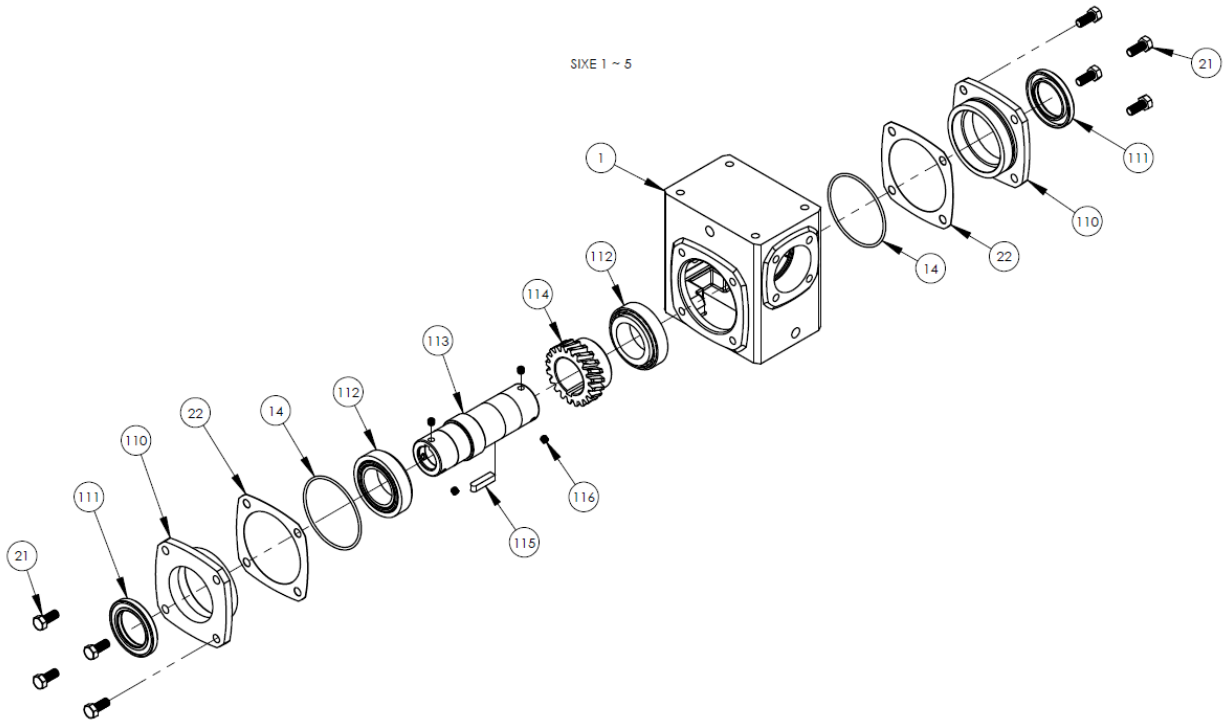
S = Secondary (output) unit

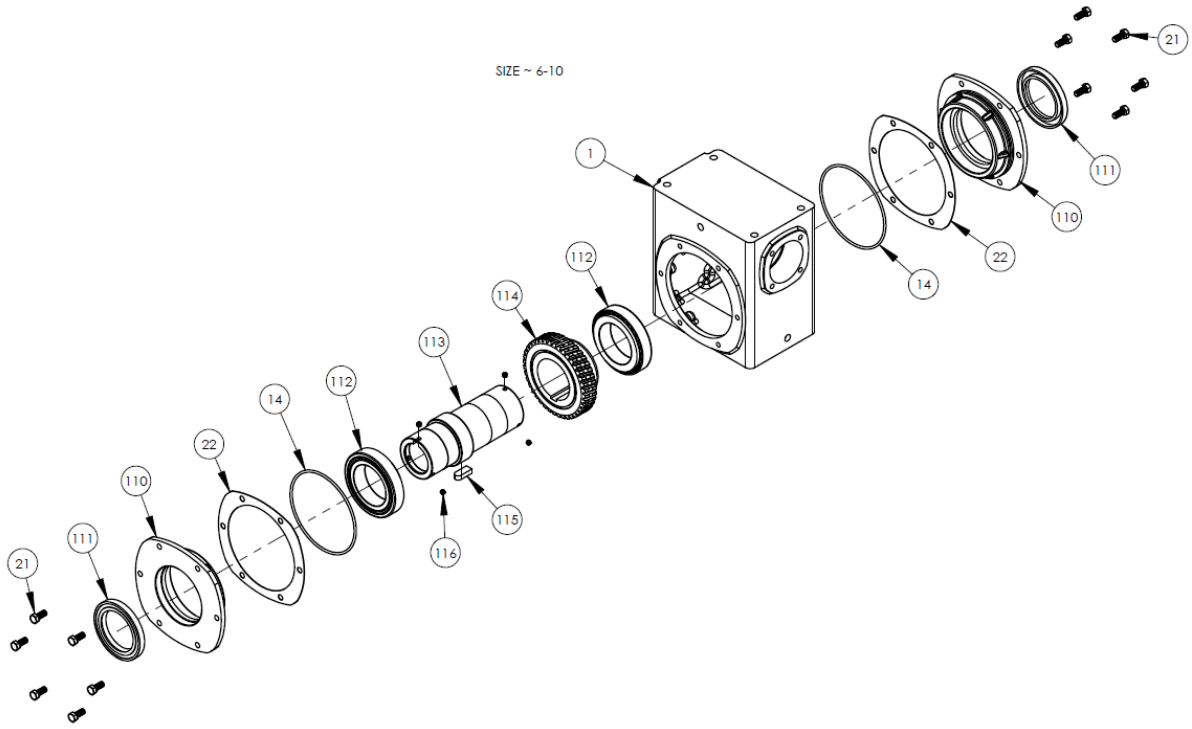
Note: Actual ratio combination supplied by factory may vary from above depending on application and manufacturing requirements. When ordering replacement parts, provide complete serial number and part number.

Basic Single Reduction Unit

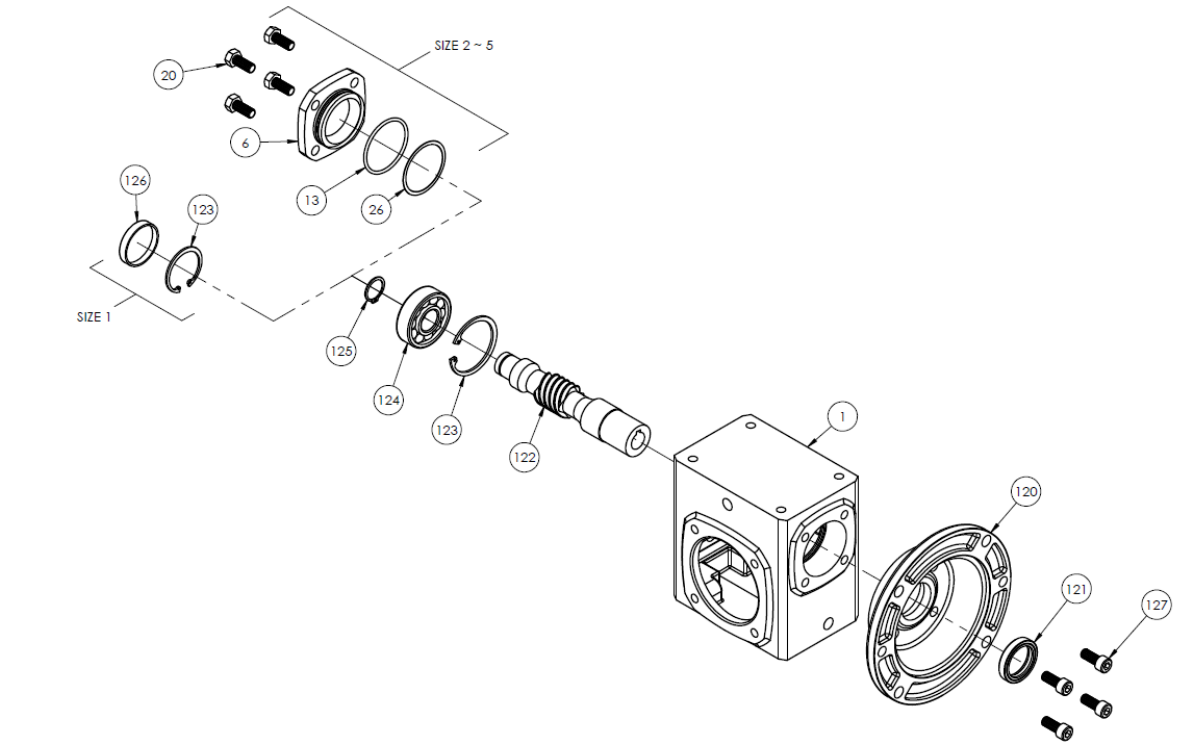


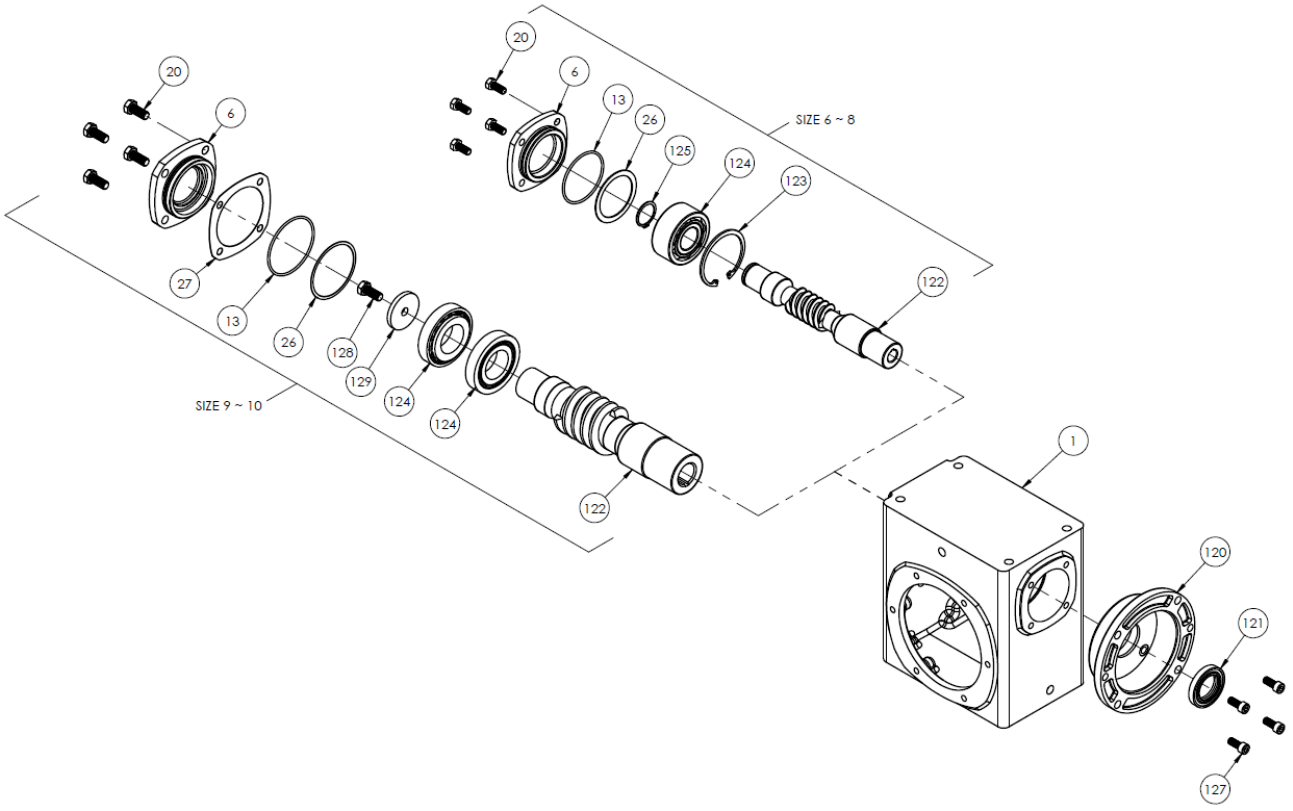
Hollow Output Shaft Unit



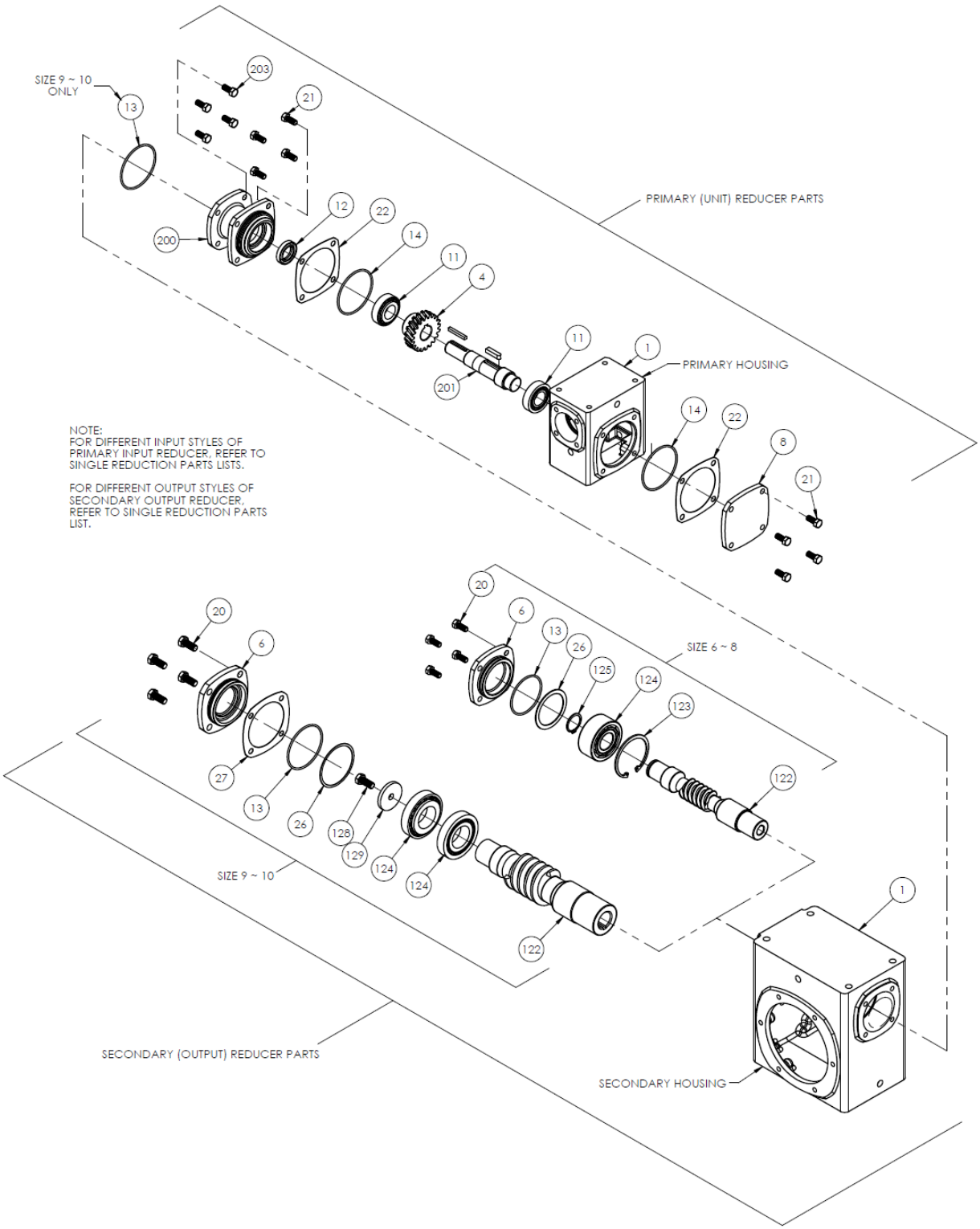


Quill Style Input





Double Reduction Style (Worm/ Worm)



Double Reduction with Helical Primary (Ratio Multiplier)

Helical / Worm Ratio Combinations

	3HW		4HW		5HW		6HW		7HW		8HW		9HW		10HW	
Total	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**	**P**	**S**
Ratio	**2**	**3**	**2**	**4**	**2**	**5**	**2**	**6**	**2**	**7**	**2**	**8**	**3**	**9**	**3**	**10**
10:1	2	5	2	5	2	5	2	5	2	5	2	5	2	5	2	5
20:1	2	10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
25:1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
30:1	2	15	3	10	3	10	3	10	3	10	3	10	3	10	2	15
40:1	4	10	4	10	4	10	4	10	4	10	4	10	4	10	2	20
45:1	3	15	3	15	3	15	3	15	3	15	3	15	3	15	3	15
50:1	5	10	5	10	5	10	5	10	5	10	5	10	5	10	2	25
60:1	4	15	4	15	4	15	3	20	4	15	4	15	4	15	4	15
75:1	5	15	5	15	5	15	5	15	5	15	5	15	5	15	5	15
80:1	4	20	4	20	4	20	4	20	4	20	4	20	4	20	4	20
100:1	4	25	4	25	4	25	4	25	4	25	4	25	4	25	4	25
125:1	5	25	5	25	5	25	5	25	5	25	5	25	5	25	5	25
150:1	5	30	5	30	5	30	5	30	5	30	5	30	5	30	5	30
200:1	5	40	5	40	5	40	5	40	5	40	5	40	5	40	5	40
250:1	5	50	5	50	5	50	5	50	5	50	5	50	5	50	5	50
300:1	5	60	5	60	5	60	5	60	5	60	5	60	5	60	5	60

P = Primary (Input) unit.
S = Secondary (output) unit
Note: Actual ratio combination supplied by factory may vary from above depending on application and manufacturing requirements. When ordering replacement parts, provide complete serial number and part number.

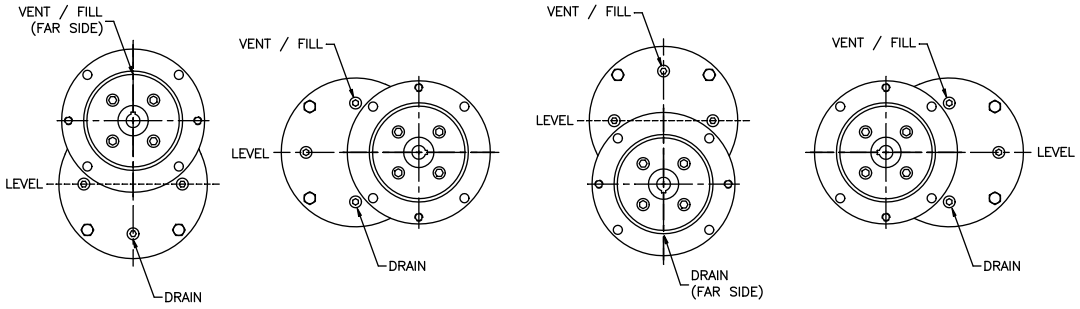
LUBRICATION (HELICAL PRIMARY ONLY)

All standard helical ratio multipliers ordered from the factory are shipped with standard compounded lubricant and is good for ambient temperature ranges of 30° F to 104° F. Double reduction units have separate oil sumps and must be filled and checked independently. Use of synthetics can cause problems if they are not compatible with the seals or conventional lubes they replace. **Prior to startup, verify that the oil is at the level shown on the drawing below.** 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.

VENT PLUG LOCATION

Before putting the unit into operation, substitute the vent plug for the solid plug at the position desired. Arrows indicate the recommended vent plug locations.

CAUTION: On **ALL** quill style input units, cast iron and stainless with the input mounted vertical shaft up or input under will require a double input seal arrangement to prevent leakage or C-face coupled style units should be used. Consult factory



OIL & WEIGHT SPECIFICATIONS

Oil Type (Viscosity)	AGMA	SAE	ISO
	#4	40 Wt.	150

Oil Capacity	Size 1	Size 2	Size 3
	6 fl oz	14 fl oz	14 fl oz

SEAL AND BEARING SIZES

Input Bearing

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
1 (Quill Side)	6005	47	25	12	
1	6200	30	10	9	
2	6204	47	20	14	
3	6204	47	20	14	

ODE Output Bearing

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
1	6002	32	15	9	
2	6205	52	25	15	
3	6205	52	25	15	

DE Output Bearings

Unit Size	Bearing Part Number and Size				
	Series	OD (mm)	ID (mm)	Width (mm)	D&F Equipment P/N
1	6004	42	20	12	
2	6205	52	25	15	
3 (180TC Output)	6206	62	30	16	
3 (210TC Output)	6007	62	35	14	

Input Seal

Unit Size	Bearing Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
1	25	45	7	
2	35	45	7	
3 (140TC Input)	35	50	8	
3 (180TC Input)*	50	60	8	
3 (210TC Input)	50	60	8	

*Units manufactured before July 2012 use a 40X60X8 metric seal (PN 404-0352-8).

Output Seal

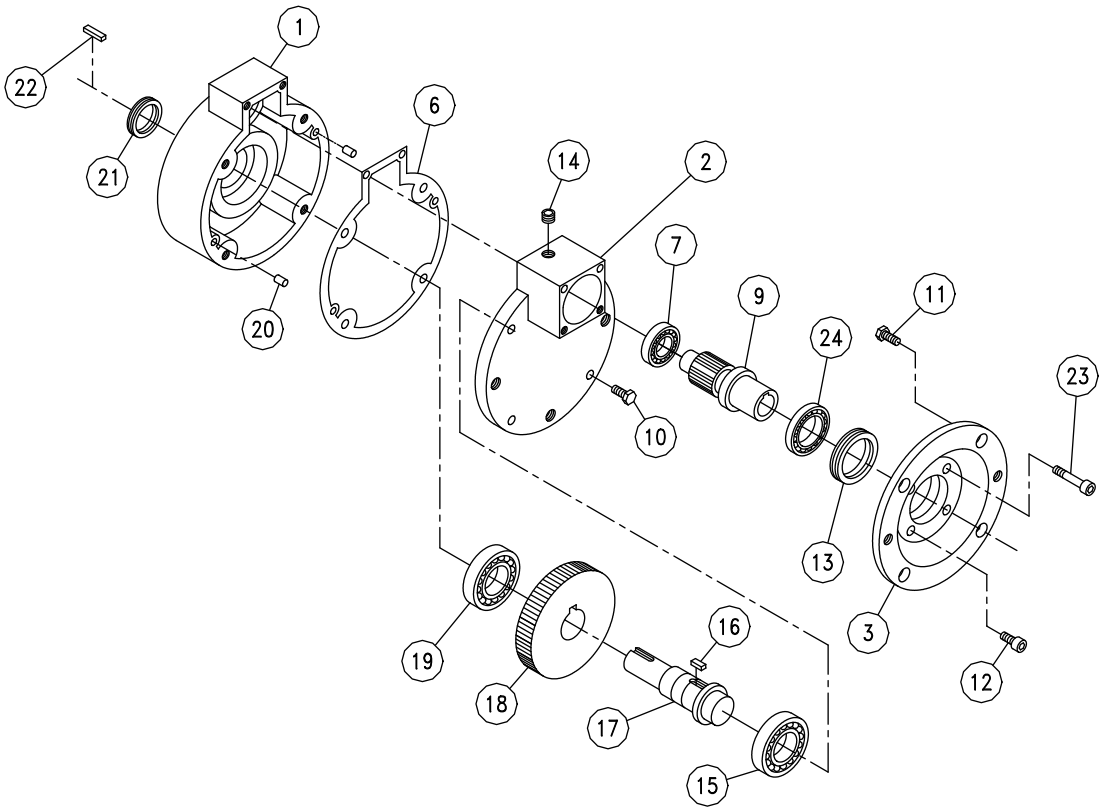
Unit Size	Bearing Part Number and Size			
	Shaft (mm)	Bore (mm)	Width (mm)	D&F Equipment P/N
1	20	35	7	
2	25	40	7	
3 (180TC Output)	30	50	8	
3 (210TC Output)	35	50	8	

Parts List

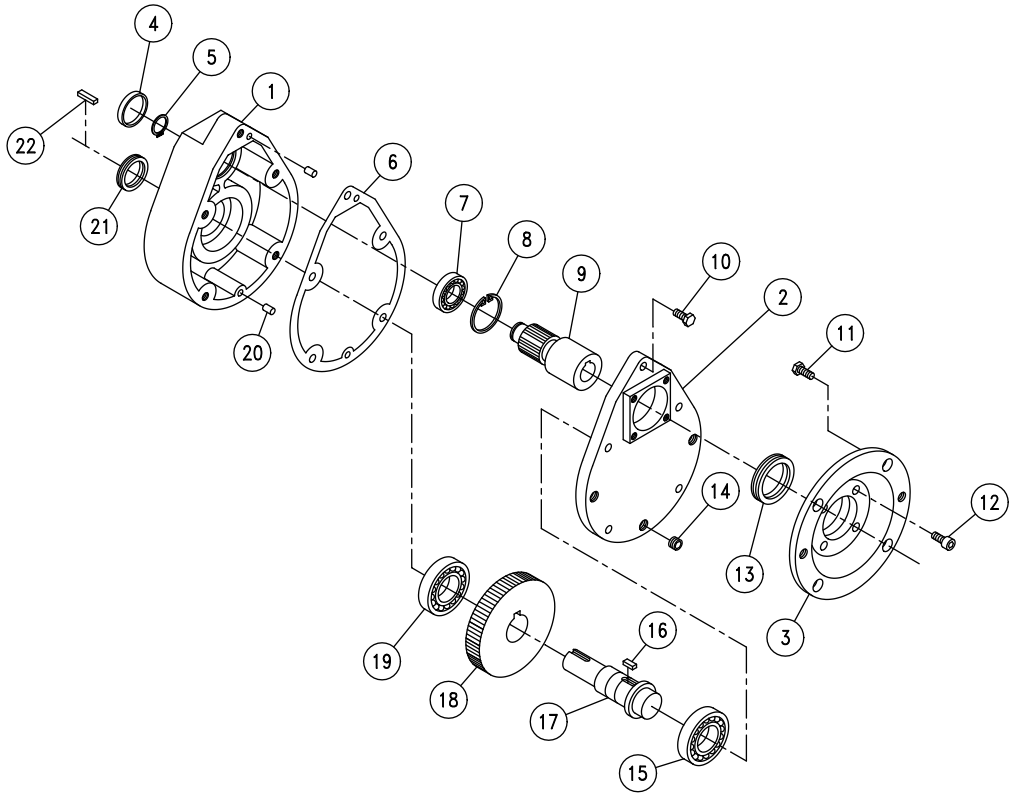
Item No.	Description	Qty	Item No.	Description	Qty
1	Gear Case Housing	1	13	Input Oil Seal	1
2	Gear Case Cover	1	14	NPT Plug	4
3	Quill Style Input Flange	1	15	ODE Output Bearing	1
4	Seal End Plug	1	16	Key	1
5	Retaining Ring (Shaft)	1	17	Output Shaft	1
6	Gasket	1	18	Gear	1
7	Input Bearing	1	19	DE Output Bearing	1
8	Retaining Ring (Housing)	1	20	Dowel Pin	2
9	Quill Input Shaft with Pinion	1	21	Output Oil Seal	1
10	Hex Head Bolt	5	22	Output Key	1
11	Hex Head Bolt (Motor Mounting)	4	23	Long Socket Head Cap Screw	2
12	Socket Head Cap Screw	4	24	Quill Side Input Bearing	1

Notes:
1. Item #23 required on Size 1 and 3 Ratio Multiplier only.
2. Item #24 required on Size 1 Ratio Multiplier only.

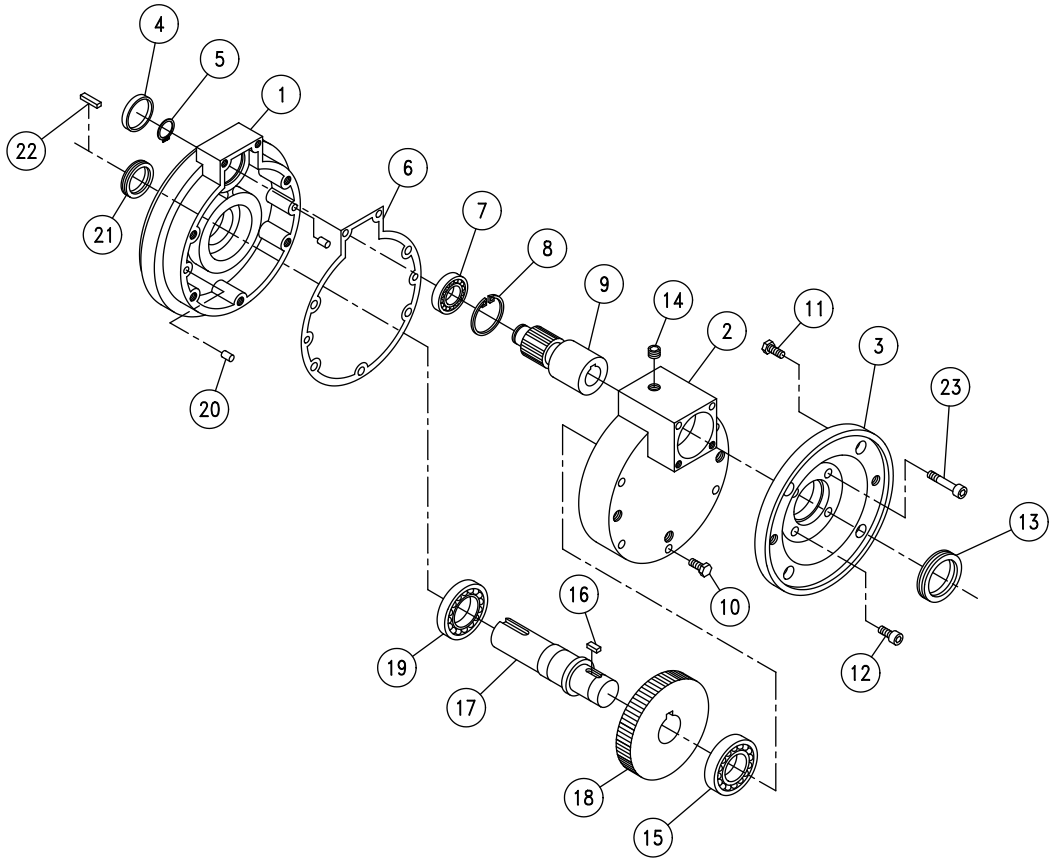
SIZE 1 PARTS



SIZE 2 PARTS



SIZE 3 PARTS



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