LUBRICATION, INSTALLATION, OPERATION, & MAINTENANCE INSTRUCTIONS FOR STAINLESS STEEL CONE DRIVE SPEED REDUCERS

Cone Drive double-enveloping worm gear speed reducers are used throughout industry to provide smooth and quiet speed reduction. When properly selected, applied and maintained, they will provide optimum performance.

IMPORTANT: In any applications of Cone Drive Products where breakage, damage, disconnection, any other malfunction of any drive train component, or excessive wear could result in personal injury or property damage, a failsafe device capable of stopping and holding the load in the event of such an occurrence must be incorporated after the drive train.

THE FOLLOWING INFORMATION IS FOR YOUR PROTECTION. PLEASE READ CAREFULLY.

- Do not attempt to install or operate this reducer until these instructions are read and thoroughly understood. If you have any questions, please contact Cone Drive.
- The horsepower or output torque capacity of this reducer and the service factor (maximum allowable operating cycle) are documented in the product catalog. These values are not to be exceeded as overloading can result in reducer failure. Exceeding the rating and duty cycle will void the warranty. Please contact Cone Drive with any questions regarding rating and service factors.
- 3. Do not alter the reducer without approval from Cone Drive.
- This reducer has moving mechanical components and connected electrical devices, operating under high voltage to achieve its intended purpose. Operation and repair should only be done by qualified personnel.
- 5. Before servicing a speed reducer, the main electrical disconnect must be moved to and locked in the off position. The person performing the work should post on that disconnect a warning to others not to turn on the power.

- It is normal for the reducer to operate at a housing temperature of up to 200°F. To prevent burns, proper guards or shields should be provided by the purchaser or user to prevent personnel from touching the reducer.
- Cone Drive products are furnished without guard covers. It is the responsibility of the purchases or user to provide guards for all exposed shafting, couplings, sprockets, sheaves, belts, chains, clutches, and any other moving parts in accordance with current local, state, and federal requirements.
- 8. Failure to follow the instructions contained in this bulletin may result in unit failure, property damage or personal injury.

INSTALLATION

- The speed reducer must be securely mounted to a rigid foundation or base plate, flat enough to mate with the underside of the reducer housing to prevent creating an unsanitary trap.
- 2. Bolt the reducer to the foundation or mounting base using metric bolts that correspond to the threaded holes in the reducer housing. Be sure to use a bolt in all available threaded mounting holes. Mount the reducer using bolts of minimum SAE Grade A2, Property Class 70, 304 Stainless Steel.
- Couplings, sheaves and sprockets should be mounted on the reducer shafts carefully. Do not pound or hammer them onto the shafts as this will damage bearings and oil seals. Angular and axial alignment of the output shaft to the rotating machine interface is critical to prevent premature output seal leaks.
- 4. Sprockets and sheaves should be mounted as close to the reducer as possible and "V" belts and chains adjusted to the proper tension to keep bearing loading and shaft deflection to a minimum. Too much tension in belts and improper location of sheaves and sprockets will lead to excessive chain pull, bearing
- 1. After the reducer has been properly mounted, aligned and lubricated, it is ready for startup.
- Make sure driven machine is clear of all obstructions and all safety guards and covers are in place, according to appropriate local, state, and federal requirements. If possible, turn motor shaft by hand to confirm drive system is operating freely and in correct direction of rotation.
- All reducers require a few hours of "run-in" under load to achieve optimum efficiency. During this initial run-in the reducer will probably run warmer than normal and draw more current than after the run-in period. Reducers operating at a very low load or speed will take much longer to run-in and even if operated continuously at low load or speed may never achieve the efficiency that they would if operated at or near their catalog rating.

wear and shaft deflection. For specific information on chain pull capacity, shaft stress and bearing life please contact Cone Drive.

- 5. Before starting motor review motor rotation, reducer rotation and required direction of driven machine to ensure that the motor is wired for proper direction of rotation. In many instances a machine must run in one direction and failure to wire the motor properly can result in damage to the driven machine.
- 6. Note: only use the approved lubricants if oil level top-off is necessary, as the factory filled PAG oil is not compatible with other oil types. Stainless steel speed reducers ship factory filled with oil and grease. For lubrication guidelines, see the Approved Lubricants and Lubrication Quantities tables in the maintenance section.
- The speed reducer must be securely mounted to a rigid flat foundation or base plate, either directly to the speed reducer or via the provided mounting feet.
 Note: stainless steel speed reducers are built for universal mounting, ready to mount in any position.

START-UP

- 3. Jog motor to confirm proper rotation.
- Operate reducer with minimum load for approximately 15 minutes (in both directions if applicable) to seat gears, bearings, and oil seals

OPERATION

2. IMPORTANT: Normal reducer operating temperature measured at the oil sump area of the housing should not exceed 200°F. Excessive oil sump temperature is indicative of overloading, misalignment, or improper or marginal lubrication. Continuous operation of the reducer with the oil sump temperature above 200°F will result in premature breakdown of the oil and reduce the useful life of the reducer or result in premature failure

MAINTENANCE

- 1. All reducers and foundation bolts should be checked for tightness after three (3) months of service and annually thereafter.
- 2. If a reducer is to be repaired, contact Cone Drive for detailed instructions, drawings, parts lists, etc. If it is necessary, field service is available.
- 3. If a reducer is to be returned, contact Cone Drive for instructions and a return material authorization (CASE) number.

LUBRICATION

Stainless steel reducers are factory filled with a high-quality food Grade synthetic lubricant. They are "Lubricated for Life" and require no routine maintenance in service. In the event of a major overhaul involving strip-down and reassembly of the gear unit, refer to Table 1 for a list of approved lubricants. Lubricant quantities are given in Table 2.

If switching to the alternative lubricant, care should be taken to thoroughly flush out all the old lubricant before filling with new lubricant. Mixing of different lubricants can result in degraded performance or failure.

The Polyalkylene Glycol based synthetic lubricants listed in Table 1 are suitable for ambient temperatures of -10°F to 200°F (-23°C to 93°C); outside of the listed range, please contact our Application Engineers.

Table 1 Approved Lubricants

SUPPLIER	OIL SUPPLIERS' CORRESPONDING DESIGNATIONS	ISO VISCOSITY GRADE/POUR POINT
Kluber Lubrication	Klubersynth Synthetic UH1 6-460	460 (-22°F, -30°C)
Exxon Mobil Corporation	Synthetic Glygoyle 460	460 (-27°F, -33°C)

Table 2 Lubricant Quantities (applicable for all mounting positions)

SUPPLIER		SIZE									
		F039 F044		44	F050		F060		F076		
Ratio		< 60:1	> 60:1	< 60:1	> 60:1	< 60:1	> 60:1	< 60:1	> 60:1	< 60:1	> 60:1
Oil Capac-	Quarts	0.36	0.44	0.39	0.5	0.5	0.65	0.56	0.7	1.4	1.85
ity	Liters	0.34	0.42	0.37	0.47	0.47	0.62	0.53	0.66	1.32	1.75

LUBRICATION

Cone Drive stainless steel speed reducers are fully corrosion resistant with an electro-polished coating which does not require a rust inhibitor. For extended storage periods of up to one year, rotate the worm and gearshaft every 90 days to keep the seals from sticking to the shaft. For storage periods exceeding one year, purchase a spare set of oil seals to have on hand in case of leaking at start-up.

AMBIENT TEMPERATURE

The oils shown in the Approved Lubricants table are for use in an ambient temperature range of approximately -10°F to 200°F with the low end of the range depending on the pour point of the specific oil used. If the ambient temperature will be below or above this range, please contact Cone Drive for specific recommendations on proper lubricant as well as proper oil seal materials

Lubrication is very important for successful operation of Cone Drive gearsets and speed reducers. Please review these lubrication recommendations and maintenance guidelines, as inadequate lubrication can result in increased power consumption, added maintenance, and gearset failure. Cone Drive recommends only the listed lubricants as the use of other lubricants can result in gearset failure food grade standards.



IF THE INPUT OIL SEALS REQUIRE REPLACEMENT

- Uninstall reducer
- Drain lubricant from reducer
- Remove exterior components (motor, adapter plate, motor bell, etc.)
 O Adapter Plate Removal (all motors)
- Tap each side of adapter plate using a brass hammer. leave planetary connected to adapter plate.
- Detach motor adapter bell
 - Quill removal
- 56c-143/145tc: M62 quill
- · Detach motor adapter bell
- · Use 2/3 jaw gear puller to remove quill
- 182/184tc: M66 quill
- · Use 2/3 jaw gear puller to remove quill
- · Detach motor adapter bell
- · Remove seals
 - Be careful not to scratch housing or shaft, or create fragments that could enter reducer as damage or penetration could result in potential leaks and failure
- · Install replacement seals
 - Press-up seals evenly and carefully to avoid damage to the seal and reducer components
- · Re-press quill onto input shaft (single reduction only)
 - Dead end of shaft must be reacted to avoid damage to reducer components
 - For single-extended shafts the bore plug must be removed to support the shaft, then reinstalled
- Double reduction, re-install adapter plate with planetary
- Flush and refill the reducer with an approved lubricant (see Lubrication Table 1 and 2)
- Reattach motor adapter bell
- Reinstall reducer

IF THE OUTPUT OIL SEALS REQUIRE REPLACEMENT

- Uninstall reducer
- Drain lubricant
- · Remove exterior components (output flange)
- · Remove seals
 - Be careful not to scratch housing or shaft, or create fragments that could enter reducer as damage or penetration could result in potential leaks and failure
- Install replacement seals
 - Press-up seals evenly and carefully to avoid damage to the seal and reducer components
- Flush and refill the reducer with an approved lubricant (See table 1 and 2)
- Reattach exterior components
- Reinstall reducer





Planetary

NEMA, Double Reduction



SHRINK DISC / HOLLOW SHAFT COVER ASSEMBLY

The shrink disc/hollow shaft cover is shipped loose and is to be assembled after the reducer is mounted and the customer's shaft (and shrink disc, if used) is assembled.



REMOVE ONLY TWO CAP BOLTS THAT ARE 180° APART ON THE SIDE OF THE HOUSING WHERE THE COVER WILL BE INSTALLED

ENSURE THE O-RING IS PROPERLY SEATED IN THE GROOVE OF THE SHAFT COVER





MOUNT THE COVER. INSTALL THE LENGTHENED CARRIER BOLTS PROVIDED. TORQUE IN ALTERNATING PATTERN TO: 8 – 9.6 Nm (SIZE 39, 44, 50, 60) 19-23 Nm (SIZE 76)



- The coupling's three-piece design allows the hubs to be installed on each individual shaft, then joined axially.
- Mount the motor's coupling half on the motor shaft. Position to the dimension shown for the appropriate assembly.

	Reducer Size	Kollmorgen	Allen-Bradley	"X" Shaft Protrudes Beyond Coupling Hub (mm)	"Y" Coupling Hub Extends Beyond Shaft (mm)	SetScrew Torque (Nm)
		AKMH3-ALL FACES			5.4	10.5
		AKMH4-(BK, BN, DK, DN)		1.7		10.5
		AKMH4-(AC, AN, CC, CN)			14.1	10.5
		AKMH5-(AC, AN, CC, CN, GC, GN, HC, HN)			2.3	10.5
		AKMH5-(BK, BN, DK, DN)		4.8		10.5
	30 44 50	AKMH6-(AC, AN, CC, CN)			9.3	25.0
	33, 44, 30	AKMH6-(DK, DN)			7.4	25.0
			MPS-A/B 330P, VPH-(A1003F, B1001F, B1003F)		14.1	10.5
$ \longrightarrow \longleftarrow $			VPH-(A0633F, B0632T, B0633M)		15.4	10.5
(2000)			VPH-A/B0753F		12.4	10.5
			MPS-A/B 4540F, VPH-B1304D, VPS-B1304D		2.3	10.5
			VPH - (A1152E, B1152F, A1153C, B1153E)		12.3	10.5
		AKMH3-ALL FACES			5.4	10.5
		AKMH4-(BK, BN, DK, DN)		1.7		10.5
		AKMH4-(AC, AN, CC, CN)			14.1	10.5
		AKMH5-(AC, AN, CC, CN, GC, GN, HC, HN)			2.3	10.5
		AKMH5-(BK, BN, DK, DN)		4.8		10.5
		AKMH6-(AC, AN, CC, CN)			9.3	25.0
	60	AKMH6-(DK, DN)			7.4	25.0
			MPS-A/B 330P, VPH-(A1003F, B1001F, B1003F)		14.1	10.5
			VPH-(A0633F, B0632T, B0633M)		15.4	10.5
V			VPH-A/B0753F		12.4	10.5
			MPS-A/B 4540F, VPH-B1304D, VPS-B1304D		2.3	10.5
			MPS-B560F, VPH-B1653D, VPS-B1653		9.3	10.5
$ \rightarrow \leftarrow $			VPH - (A1152E, B1152F, A1153C, B1153E)		12.3	10.5
(T1000) (T1000)		AKMH4-(BK, BN, DK, DN)		3.6		10.5
		AKMH4-(AC, AN, CC, CN)			8.8	10.5
		AKMH5-(AC, AN, CC, CN, GC, GN, HC, HN)		0.2		25.0
		AKMH5-(BK, BN, DK, DN)		7.3		25.0
		AKMH6-(AC, AN, CC, CN)			8.8	25.0
	76	AKMH6-(DK, DN)			6.9	25.0
			MPS-A/B 330P, VPH-(A1003F, B1001F, B1003F)		8.8	10.5
			VPH-A/B0753F		7.1	10.5
			MPS-A/B 4540F, VPH-B1304D, VPS-B1304D	0.2		25.0
			MPS-B560F, VPH-B1653D, VPS-B1653		6.8	25.0
			VPH - (A1152E, B1152F, A1153C, B1153E)		9.8	25.0

- For some motors (particularly face-mount motors), it will be necessary to remove the motor plate from the motor adapter.
- Fasten the plate to the motor, then mount the motor and plate back to the reducer.



ADD APPROPRIATE SEALANT TO UNDERSIDE OF ADAPTER BOLT HEAD PRIOR TO INSTALLATION



MOUNT THE MOTOR'S COUPLING HALF ON THE MOTOR SHAFT. POSITION TO THE DIMENSION SHOWN FOR THE APPROPRIATE ASSEMBLY.

DOUBLE REDUCTION NEMA MOTOR INSTALLATION

- 1. Remove the nuts but keep the bolts that are between the motor adapter and motor bell
- 2. Insert O-Ring or apply gasket (182/184tc only) to motor adapter face
- 3. Align motor shaft and key with blue bushing and insert the motor
- 4. Tighten bolts





SERVO MOTOR INSTALLATION

IF IT IS NECESSARY TO REPOSITION THE COUPLING HALF MOUNTED TO THE GEARBOX

- 1. Remove the (4) M6 socket cap screws
- 2. Remove the motor adapter
- Loosen and reposition coupling as required on previous page
- 4. Tighten the coupling setscrew.
- 5. Replace the motor adapter; tighten screws

SCREW TORQUES (Nm)					
	Standard Bolt	Stainless Bolt			
M5	9.5-12	5-7			
M6	16-20	8-9.6			
M8	42-48	24-30			
M10		38-46			
1/4-20	10-14				
5/16-18		24-29			
3/8-16	33-54	27-40			





DOUBLE REDUCTION NEMA MOTOR INSTALLATION

End user is responsible for sealing the motor and output flange interfaces. For flanges with O-ring grooves the reducer will be supplied with O-rings that are shipped loose. Install the O-ring in motor adapter groove or output flange groove prior to mounting the motor /reducer. Care should be taken to avoid damaging to the O-ring.

NEMA 182/184tc motor flanges and some servo motor adapters are supplied without O-ring grooves. For these, the end user must use a suitable liquid gasket. The gasket shall be applied as shown below (in red) around the bolt holes and pilot face prior to installing the motor.





SAFETY PRECAUTIONS

IMPORTANT: In any applications of Cone Drive Products where breakage, damage, disconnection, any other malfunction of any drive train component, or excessive wear could result in personal injury or property damage, a fail-safe device capable of stopping and holding the load in the event of such an occurrence must be incorporated after the drive train.

THE FOLLOWING INFORMATION IS FOR YOUR PROTECTION. DO NOT ATTEMPT TO INSTALL OR OPERATE THIS GEARBOX UNTIL ALL OF THESE INSTRUCTIONS ARE READ AND THOROUGHLY UNDERSTOOD.

SELF-LOCKING

It is a common misconception that all worm gears are self-locking or non-overhauling. Actually, worm gear ratios up to 15:1 will overhaul quite freely. Ratios from 20:1 to 40:1 can generally be considered as overhauling with difficulty (particularly from rest). Ratios above 40:1 may or may not overhaul depending on loading, lubrication, and the amount of vibration present. Cone Drive cannot guarantee any worm gear ratio to be self-locking. There have been instances where single reduction ratios as high as 100:1 have overhauled. Therefore, it is not acceptable to rely on a worm gear to prevent movement in a system. Whenever a load must be stopped or held in place, a positive mechanical device must be incorporated into the system to prevent rotation of the gear set.

BACKDRIVING OR OVERHAULING

Applications such as wheel drives that require a brake on the motor or input shaft to decelerate a high inertial load require special attention to brake selection. Whenever possible, these applications should utilize freely overhauling ratios (15:1 or less). If self-locking ratios are used with a brake, the gear set can, under certain conditions, lock-up during decelerations and impose severe shock loading on the gearbox and driven equipment. Each reduction should be limited to 15:1 or less to allow the gearbox to overhaul. Contact Cone Drive for specific information on backdriving efficiency and brake selection.

RATINGS & SERVICE FACTORS

The horsepower or output torque capacity of this gearbox and the service factor (maximum allowable operating cycle) are documented in the product catalog. These values are not to be exceeded as overloading can result in gearbox failure. Exceeding the rating and duty cycle will void the warranty. Please contact Cone Drive with any questions regarding rating and service factors.

ALTERATION

Do not alter the gearbox without approval from Cone Drive.

OPERATION & REPAIR

This gearbox has moving mechanical components and may have connected electrical devices operating under high voltage. Operation and repair should only be done by qualified personnel.

PROTECTIVE GUARDING

Cone Drive products are furnished without guard covers. It is the responsibility of the purchase or user to provide guards for all exposed shafting, couplings, sprockets, sheaves, belts, chains, clutches, and any other moving parts in accordance with current local, state, and federal requirements.

LOCK-OUT/TAG-OUT

Before servicing a gearbox, the main electrical disconnect or other input power sources must be moved to and locked in the off-position. The person performing the work should post on that disconnect a warning to others not to turn on the power. Loads on the input and output shafts should be disconnected prior to working on the gearbox.

GEARBOX SURFACE IS HOT

It is normal for the gearbox to operate at temperatures up to and exceeding 200°F. To prevent burns, proper personal protective equipment, guards, or shields should be provided by the purchaser or user to prevent personnel from touching the gearbox.