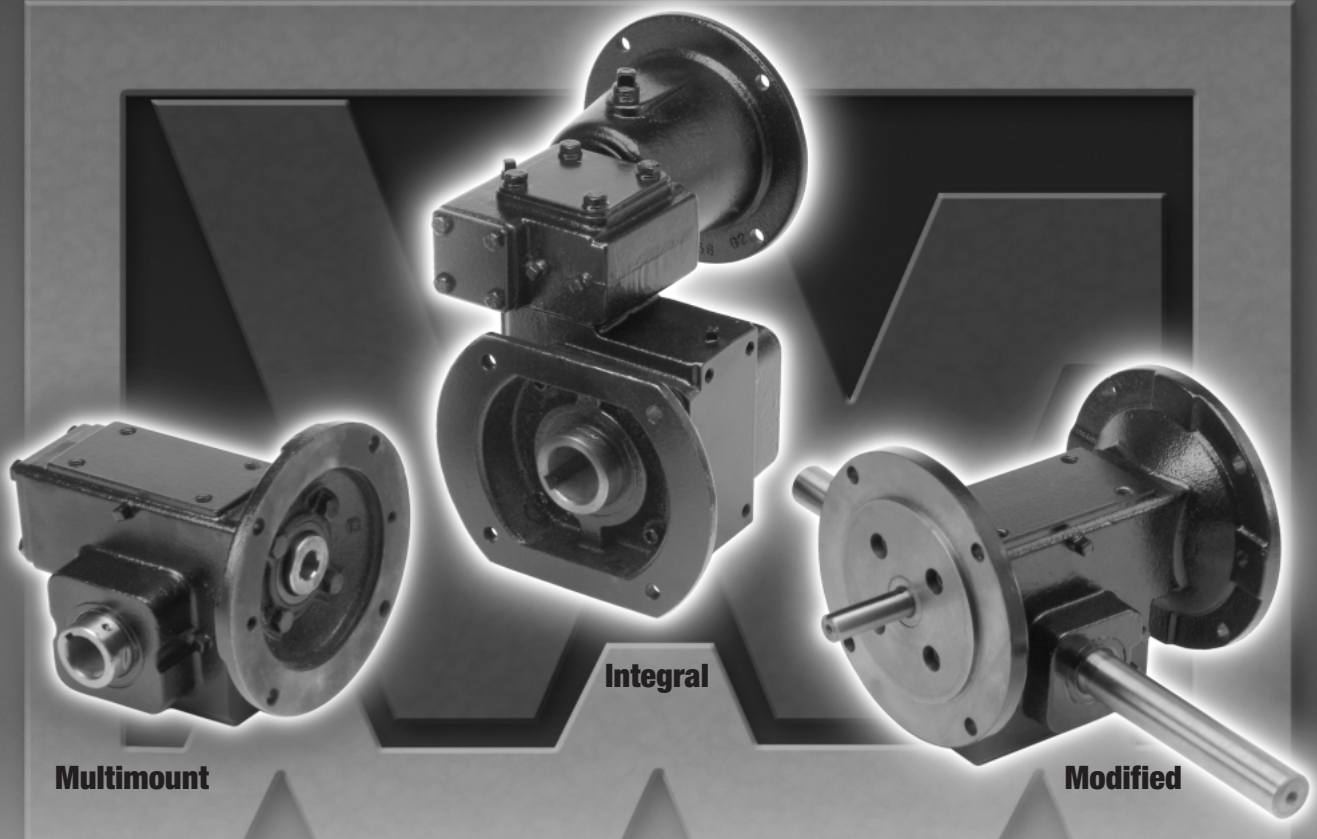


WINSMITH
WMA

SE Encore Speed Reducers

SE Encore Installation, Operation, and Lubrication Instructions

WINSMITH



SE Encore Speed Reducers

I. SELECTION

The selection of the appropriate speed reducer for a given application requires that all factors affecting the operation of the reducer be given careful consideration. Service factors must be applied to catalog ratings depending on the type of prime mover used, the severity of the application, and duration of daily service. Many application and SE Encore worm gear speed reducer selection criteria are discussed in the SE Encore catalog that is available at www.WINSMITH.com. For personal assistance, please speak with a local Winsmith sales representative whose contact information is also available on the website.

II. INSTALLATION

1. Shaft Alignment and Loading

- A. Guard against unusual stresses and overloads by accurately aligning the various drive members (motor, speed reducer, coupling, sprocket, sheave, gear, etc.).
- B. Flexible couplings are recommended if a prime mover shaft is to be directly connected to the input shaft or if the output shaft is directly connected to the driven shaft.
Note: Flexible couplings have a limited capacity for misalignment. Ensure that shaft alignments are within the limits recommended by the coupling manufacturer at installation. Even slight misalignments in a rigid mounting system may bring about binding, large vibration forces, or excessive overhung loading; each in itself promoting premature bearing, shaft, or speed reducer failure. Do not excessively force couplings or other connection devices onto either input or output shafts; the result may be permanent bearing damage. Ensure all shaft keys are captive and secured before operation.
- C. A common base plate supporting the motor and reducer will help preserve the original alignment between the reducer and the motor shaft. If a structural steel base is used, the plate should be at least equal in thickness to the diameter of the base plated fastening bolts. In addition, the structure supporting the base plate must be sufficiently rigid that it prevents excessive flexing during normal operation.
- D. Vibration tends to loosen fasteners even if they are initially tight. After the first week or two of operation, all fasteners within the drive assembly should be retightened. Doweling the motor and speed reducer to the base plate will help maintain alignment.

- E. Excessive thrust or overhung loads on the input or output shafts of a gear reducer may cause premature failures of the bearings and/or shafts. Mount gears, pulleys and sprockets as close to the housing as possible to minimize such loads. Do not exceed catalog loads.

2. Mounting Positions

A. Single Reduction Speed Reducers and Helical Gear Ratio Multipliers

All SE Encore single reduction speed reducers and all helical gear ratio multipliers are filled with lubricant at Winsmith and can be mounted in any of the positions identified in **Figure 3**. Grease fittings (not shown in **Figure 3**) are used to lubricate bearings when the motor speed is below 1160 RPM. Please reference Section III of this document, "Lubrication & Maintenance," for details related to proper lubrication levels.

B. Double Reduction Speed Reducers Worm/Worm and Helical/Worm Double Reduction

The SE Encore double reduction speed reducers are designed to be mounted in any of the "Standard" positions shown in **Figure 4**. These reducers are factory filled with lubricant to a level that is appropriate for these standard mounting positions. Standard models have an oil level that is common to both housings. Grease fittings (not shown in **Figure 4**) are used to lubricate bearings when the motor speed is below 1160 RPM. If an additional mounting position not shown in Figure 4 is required, please speak with a local Winsmith sales representative whose contact information is available on the website, www.WINSMITH.com.

3. Mounting Considerations

The recommended mounting for a hollow shaft reducer incorporates a torque arm. The recommended mounting of a reducer with a flange/bracket mounting on a conveyor head shaft uses a pillow block or flange bearing on the opposite side of the conveyor from the speed reducer as a support bearing. This provides three bearings for alignment purposes. It is difficult to maintain and align a system with a rigidly mounted bearing close to a rigidly mounted speed reducer. It is extremely important to "custom align" and "custom shim" all components prior to tightening mounting bolts when using a rigid mounting approach. This minimizes misalignment that is caused by excessive loads. Select an appropriate key when using a bushing in the output bore of any hollow output shaft speed reducer.

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4. C Face Motor Mounting Procedures

A. C Face/Quill Motor Mounting

1. Check the motor and reducer mounting registers for nicks that could interfere with assembly; remove if necessary.
2. Remove protective plastic from the reducer input shaft. The bore has been coated with an anti-seize compound.
3. Align the motor shaft and key with keyway in bore and slide motor up to input adaptor.
4. Position the motor conduit box as desired.
5. Secure the motor to the reducer using the supplied fasteners. Ensure proper motor seating before tightening the fasteners. If the motor does not readily seat itself, check for axial movement of the motor shaft key as this can cause interference. Staking the keyway adjacent to the motor key will help prevent axial movement of the key during the mounting procedure. Draw down evenly on the fasteners to avoid bending the motor shaft. Tighten the fasteners to the appropriate torque per the size of the fastener.

B. C Face Coupling Motor Mounting

1. Check the motor and reducer mounting registers for nicks that could interfere with assembly. Remove if necessary.
2. When assembling the motor and coupling, the coupling halves should be evenly spaced on each shaft to obtain proper engagement. The following describes a method for doing this:
3. Determine the assembled shaft clearance by measuring the distance from the C Face to the reducer shaft end and subtracting the motor shaft length. Mount and secure the motor shaft side of the coupling such that the spider-end of the coupling is located one half of the clearance distance beyond the motor shaft. Mount the reducer coupling half and coupling spider onto the reducer shaft in its approximate position, but do not secure.
4. Locate the motor conduit box in the desired position and secure the motor to the reducer input adaptor using the fasteners provided. Tighten the fasteners to the appropriate torque per the size of the fastener.
5. Using the access hole in the input adaptor, slide the coupling together and tighten the set screw.

5. Speed Reducer Assembly/ Disassembly Instructions

Contact Winsmith or a local sales representative for a copy of SE Encore Speed Reducers Disassembly and Reassembly Instructions – Engineering Service Bulletin #16.

6. Sealed vs. Vented Speed Reducer Operation

All SE Encore series speed reducers are designed to operate sealed or vented. Deciding whether a speed reducer should operate sealed or vented requires an understanding of the application, the environment, the operation of radial shaft seals, and a review of the fundamentals of thermodynamics that govern the temperature and pressure relationship in the speed reducer.

Any significant increase in pressure in a sealed speed reducer decreases the operational service life of the radial lip seals. A pressure change of only 5 psi may reduce the seal life by as much as one third. There are two important phenomena that cause an increase in the internal pressure of a sealed speed reducer. First, the change of internal pressure during operation is proportional to the change of internal temperature that occurs during normal operation. The relationship follows the combined gas law expressed as

$$P_1 V_1 / T_1 = P_2 V_2 / T_2$$

Secondly, radial lip seals can ingest or “pump” air into a speed reducer regardless of whether it is operating sealed or vented. While the rate of ingestion is highly variable and dependant on running time and speed, under continuous operating conditions the net effect of “pumped” air to the total pressure increase is significant. Venting, or the use of a breather vent, is the only absolute method of eliminating the pressure increase in a speed reducer caused by both pumping and thermal expansion.

In some applications, the duty cycle of the speed reducer is intermittent, the run times short, and the temperature increase modest. While sealing the reducer during operation subsequently increases the pressure in these applications, the increase may be very small and therefore have minimal impact on the seal service life. Additionally, operating a sealed speed reducer may be the best choice in applications where external airborne contamination causes a greater reduction in overall speed reducer service life than the negative impact of the internal pressure increase. The machine builder or the end equipment user should determine whether

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sealing or venting the speed reducer is the best choice for a specific application as this decision has a direct impact on the seal service life. A more detailed discussion of the factors influencing seal wear and seal service life follows.

Internal Temperature and Pressure Increase in a Sealed Speed Reducer

A speed reducer experiences a significant internal temperature increase due to operating loads. The change in temperature of an operating speed reducer (from static ambient temperature to maximum operating temperature) often exceeds 130° Fahrenheit. In a sealed speed reducer, the

increasing temperature results in a corresponding pressure increase as described by the combined gas law:

$$P_1V_1 / T_1 = P_2V_2 / T_2$$

In a closed system (e.g. sealed reducer), any change in temperature from one state of equilibrium to the next state of equilibrium results in a corresponding change in both oil volume and internal pressure. Moreover, the thermal expansion of the lubricant in the reducer can have a considerable effect on the pressure, temperature, and volume relationship. The influence of the lubricant's thermal expansion depends on the percent volume occupied by the lubricant compared to

PRESSURE INCREASE IN A SEALED SPEED REDUCER

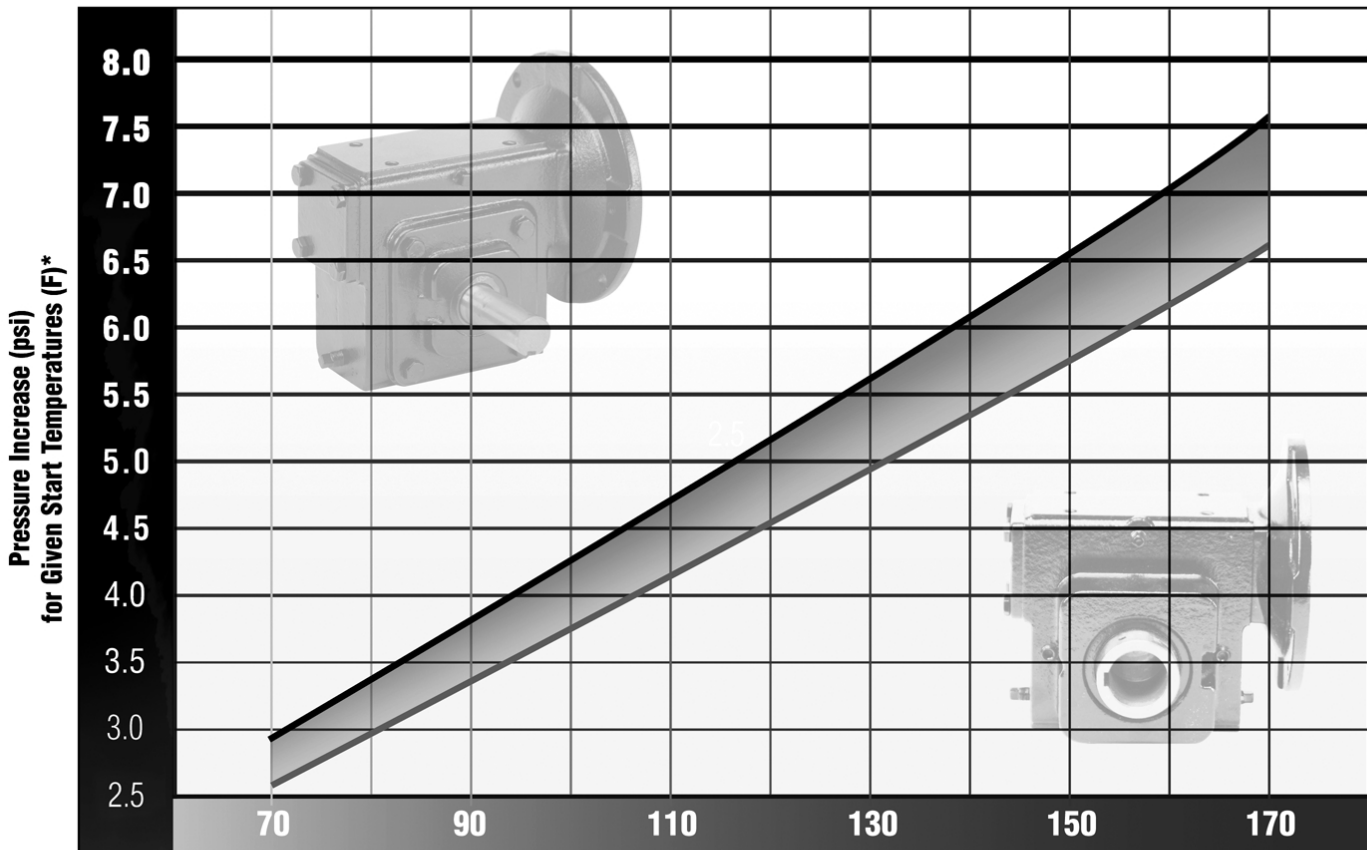


FIGURE 1. Change in Speed Reducer Operating Temperature (F)

- * Assumes 60% lubricant and 40% air fill
- * Assumes reducer starting pressure of 14.7psi at each starting temperature
- * Uses coefficient of thermal expansion for Mobil Glygoyle 460 lubricant

— 10° F Start Temperature
— 100° F Start Temperature

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that of the air. Typically, the volume inside the reducer is about 60% lubricant and 40% air. The thermal expansion of the lubricant alone increases the internal pressure in the reducer by approximately 1.5 psi when the change in temperature is 130 °F.

Figure 1 shows the total impact of the internal temperature and associated pressure increase at different ambient starting temperatures in a sealed speed reducer. Pressure increases greater than 5 psi can result from the combined effect of the lubricant's thermal expansion and the internal temperature change.

Seal "Pumping" Effects on Increased Pressure in an Operating Speed Reducer

Correctly operating radial shaft lip seals are dynamic and require the presence of a microscopically thin film of lubricant directly under the sealing lip. The seal lip imposes shear forces on the film as the shaft rotates beneath it. This creates a seal "pumping action" that circulates the lubricant residing closest to the seal back inside the speed reducer and away from the external environment. The pumping action of the seal prevents the lubricant from seeping out and is necessary for proper operation. Unfortunately, a correctly functioning radial shaft seal also causes an unintended and unavoidable side effect. Tests confirm that microscopic air bubbles and contaminants from the external environment are entrained in the lubricant. The actively pumping seal sweeps them inward with the induced lubricant flow and once inside, they escape into the speed reducer. With continuous operation, the air bubbles accumulate inside the reducer cavity. The seal is acting as an air pump, causing air ingestion that increases the internal pressure of a sealed speed reducer. Winsmith's extensive testing has verified that the increased internal pressure of the speed reducer and the rate of pressurization are dependent on many variables including operating time, linear velocity of the shaft under the seal, temperature, seal material, and seal and shaft manufacturing tolerances.

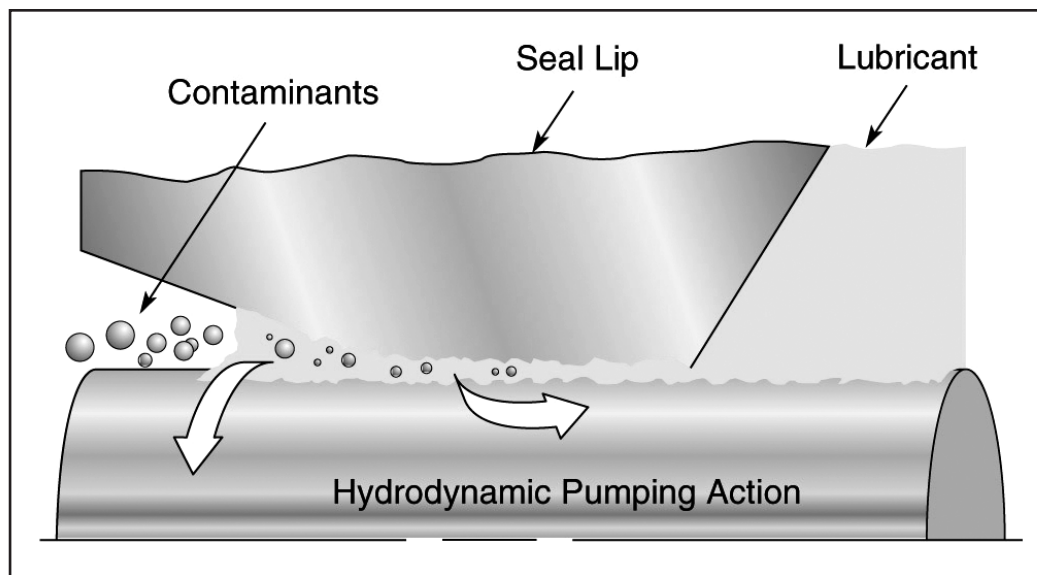


FIGURE 2. Ingestion of Air and Contaminant by a Radial Seal

Courtesy of Parker Hannifin Corporation

In summary, a significantly large percentage of sealed speed reducers develop an internal pressure of 5 psi or more when operated on a continuous duty cycle. This phenomenon can occur even when there is no change in temperature because the radial lip seals ingest air into the reducer (see **Figure 2**). Conversely, testing indicates that when a reducer operates in an intermittent manner (e.g. 5 minutes of run time every 30 minutes of dwell); the internal pressure build-up is very small.

The Effects of Temperature and Pressure on Seal Operating Life

The specific failure mechanisms of seals vary depending on the seal material. However, the normal "wear out" failure mode of an NBR rubber (Acrylonitrile-butadiene or "nitrile") dynamic radial shaft seal is related to time and temperature and often termed "embrittlement." Over time under some relative elevation of temperature, nitrile seals lose elasticity, develop micro cracks that cause an abraded sealing surface that can no longer properly contain the speed reducer lubricant. The embrittlement rate of NBR materials begins to accelerate at lip operating temperatures between 180°F and 200°F.

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The impact of increasing temperature and pressure in a sealed speed reducer on the service life of an NBR seal has been assessed by numerous seal manufacturers. While the results of these tests vary depending on variables such as the actual seal lip temperature, they indicate that a change in pressure as small as 5 psi can reduce the expected seal service life by one third. This is because a positive internal pressure differential in a speed reducer causes the shaft lip seals to exert a higher radial force on the shaft. Under dynamic conditions, this force increases the lip seal contact area on the shaft, increasing the friction, and thereby creating a correspondingly higher temperature between the shaft and the lip seal. This increase is directly proportional to the amount of radial force on the seal and to the speed of the shaft at the seal interface and causes a decrease in the seal life.

All SE Encore speed reducers with a quill input adaptor use special HNBR (hydrogenated nitrile butadiene rubber) or fluoroelastomer (aka Viton®) materials on all input shafts because these materials are tolerant of higher lip operating temperatures. The typical failure mode of HNBR material is blistering at the seal surface.

Performance Issues with Bladders and Expansion Chambers

Various speed reducer design approaches aimed at eliminating the internal pressure increase have incorporated internal collapsible diaphragms or bladders. Eliminating the pressure increase requires that the bladder or diaphragm collapse at very low pressures and have a volume that sufficiently accommodates the expansion of the air and the lubricant. In a reducer with a two inch center distance, the internal volume is between 30 in³ and 40 in³. Assuming the volume is 60% lubricant and 40% air and applying the previously discussed combined gas law over a temperature change of 130°F (70°F start, 200°F final), the size of an internal diaphragm or bladder required to prevent a pressure increase must be between 3.9 in³ and 5.2 in³. In most typical speed reducers, there is insufficient internal space for such a large bladder. Moreover, while some internal expansion chambers are effective in limiting or reducing internal pressure rise due to temperature changes, none are completely effective in avoiding the pressure build up related to seal air pumping action associated with continuous duty cycle applications.

Applications Determine When Sealing a Speed Reducer is Preferred to Venting

As covered in the preceding discussion, sealing a reducer can increase the internal pressure which results in decreased seal service life. This is especially prevalent when operating under continuous duty conditions. However, there are certain applications where the speed reducer duty cycle is highly intermittent, and run times are short with light average duty loads. Testing and field experience indicate that small internal pressure increases (1 – 2 psi) have a minimal effect on the seal service life.

Another application dependent situation where sealed reducer operation is preferred occurs when the external air environment is extremely contaminated with material that, if drawn into the reducer through a vent, can rapidly reduce seal, bearing, or worm gear life. In these applications, the increased pressure resulting from operating a sealed reducer can still have a significantly negative effect on seal life and, in these cases, require more frequent seal replacement. However, the reducer life may be lengthened by operating sealed rather than operating with an open vent in these types of harsh environments. Further, the machine builder or equipment operator might determine that the convenience of operating a sealed speed reducer outweighs the negative result of reduced seal service life.

The Winsmith two (2) year warranty on defects in parts and workmanship remains unaffected whether an SE Encore worm gear speed reducer operates with or without a vent since the vent/sealed decision only affects the service life of the speed reducer wear components.

In conclusion, there are three fundamental factors that govern the speed reducer seal/vent decision. First, as the temperature increases in a sealed reducer, so will the pressure. Second, the radial shaft seals are designed to “pump” lubricant back into the speed reducer. This pumping action also causes an ingestion of air that increases the internal pressure. Any increase of pressure causes decreased dynamic radial seal life. Venting is the most cost effective method of eliminating the pressure. Finally, when extreme environmental conditions cause component or seal wear in excess of that caused by an increased internal pressure, sealing a speed reducer is the best likely alternative. However, under these conditions, seal wear is apt to take place at higher than predicted rates.

SE Encore Speed Reducers

SE Encore Venting Solution is a Standard Feature

The SE Encore worm gear speed reducer series can satisfactorily operate sealed or vented. Each reducer is supplied with an optional "open-closed vent" that can be installed by the equipment builder or the equipment user. This exclusive Winsmith vent is made from black DuPont™ Zytel® Nylon with UV protection. The vent's design incorporates a labyrinth with a dust/splash cap that minimizes contaminate and water incursion from the external environment created by general, harsh, and outdoor applications. The reducer housing offers multiple locations for vent installation depending on the final reducer mounting position on the equipment. Turning the top cap to the closed position ensures that no oil drains while the equipment is in transit to the operating location. Turning the top cap counter clockwise, by hand, opens the vent prior to running the speed reducer. A special screw driver slot molded into the cap allows easy actuation when access is limited. The vent should be installed in the highest pipe plug location available based on the actual mounting orientation of the speed reducer on the operating equipment. Additionally, a bright yellow plastic tag is provided with the vent that reads:

"IMPORTANT - VENT REQUIRES ACTIVATION


THIS REDUCER HAS BEEN SHIPPED TO YOU WITH THE VENT IN THE CLOSED POSITION – IT IS IMPORTANT TO OPEN THE VENT BY MAKING A ONE QUARTER TURN COUNTER CLOCKWISE"

III. LUBRICATION & MAINTENANCE

NOTE: SE Encore worm gear speed reducers are factory filled with Mobil Glygoyle 460 (PAG) lubricant. The use of other lubricants may result in substantially lower torque capacity and is not recommended by Winsmith. If other lubricants are used, a thorough flushing procedure is required.

NOTE: Helical Gear Ratio Multipliers are factory filled with Mobilgear 600 XP 220 lubricant. The use of other lubricants may result in substantially lower torque capacity and is not recommended by Winsmith. If other lubricants are used, a thorough flushing procedure is required.

1. Factory Filling and Universal Mounting

		WINSMITH		DATE
		WWW.WINSMITH.COM		07/08
SIZE	MODEL	RATIO	ASSY	FRAME
E17	MDNS	30	LR	56C
BORE	INPUT HP	OUTPUT TORQUE	CO # 111999	
	0.66	596	MOBIL LUBRICANTS	
		RATINGS FOR 1750 rpm @ 100°F GLYGOYLE 460		
PART # E17MDNS21000EK				
	Size	Model	11 th Position	
			0 = Standard	
			X = Non-Standard	

NOTE: All SE Encore MDNS and MDSS standard models are filled with lubricant by Winsmith. The lubricant level in these reducers may be slightly above the appropriate level plug in some orientations. This small amount of additional lubrication is normal and acceptable.

All SE Encore MDNS and MDSS non-standard models are filled with lubricant by Winsmith to a level dictated by the specified orientation. These fill levels are shown in **Figure 3**.

The 11th character in the part number on the reducer name plate designates a standard or non-standard reducer. A "0" in the 11th position indicates "Standard" and an "X" in the 11th position indicates "Non-Standard."

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2. Ambient Temperature

If the ambient temperature during operation is outside of -18 to 130 degrees F, please contact Winsmith.

3. Initial Start-Up

Prior to start-up, the lubricant level should always be checked. The proper lubricant fill level is dependent on the speed reducer orientation during operation. The appropriate fill, drain, and level plug locations for a variety of models and orientations are shown in **Figures 3 & 4**. Grease fittings, not shown in **Figures 3 & 4**, are used to lubricate bearings when the input speed is below 1160 rpm. If an alternate mounting position, not shown in **Figures 3 & 4**, is required, please contact a local sales representative or Winsmith for assistance.

The oil level should be checked, and adjusted if necessary, prior to operation using the oil level plug provided and while the reducer is oriented in its operating position. Only Mobil Glygoyle 460 or compatible lubricant should be used for reducers containing worm gears. The Helical Gear Ratio Multipliers should use Mobilgear 600 XP220 lubricant.

During the initial start-up operation, a break-in period is necessary before the reducer reaches maximum operating efficiency. Winsmith recommends a gradual application of load during the first several hours after start-up. The reducer may run hot during this initial break-in period. This is normal. A few drops of oil may weep from the lip seals during the break-in stage. After a short period of operation, clean off any excess oil around the shaft seals and recheck the oil level; adjust if necessary.

4. Oil Change Instructions

When changing the oil for any reason, use only Mobil Glygoyle 460 or other compatible PAG (Polyalkylene glycol) synthetic lubricants. If another oil type is used (PAO, Mineral Oil, etc.), the housing(s) must be drained and thoroughly flushed with a light flushing oil prior to refilling. Do not mix different lubricants in the reducer. Lubricant incompatibility may result in premature failure. **Note:** When changing oil, carefully inspect used oil to be sure there are no metal shavings, fragments or other signs of excessive wear.

The oil level should be checked after a short period of operation and adjusted if necessary. Each housing of a

double reduction model should be drained and filled independently when changing the oil. Visit our website, www.WINSMITH.com, for a detailed flushing procedure.

In many light duty, relatively clean ambient conditions, the life of Mobil Glygoyle 460 is extended to the point where a reducer can operate for the AGMA and ISO specified "Normal" reducer life of 25,000 hours without ever changing the lubricant.

Note: The "Normal" reducer life of 25,000 hours specified in AGMA 6034-B92 and ISO TR14521 is highly application dependent. In Winsmith's 100 years of experience, we have found that the actual service life of many of our reducers exceeds 25,000 hours by several multiples.

Under severe conditions (rapid temperature changes, moist, dirty, or corrosive environments) it may be necessary to change the oil at intervals of 1-3 months. Periodic examination of oil samples taken from the reducer will help establish the appropriate interval.

The oil change procedure for all SE Encore speed reducers is similar. The appropriate oil fill, drain, and level plugs are identified in **Figures 3 & 4**. Please note that these locations are unique for each operating position shown. After draining the old lubricant, new lubricant should be added to the appropriate level plug shown.

Mounting Position and Lubricant Levels for Single and Double Reduction Models

Optimal lubricant level information for single and double reduction models is shown in **Figures 3 and 4**. Lubricant levels are critical to the proper operation of all speed reducers. If a speed reducer was ordered and supplied for a specific mounting position, it should not be changed without contacting Winsmith. Altering the mounting position from that which was specified may result in inadequate lubrication. Contact Winsmith or a local sales representative with questions regarding proper lubricant selection and level.

5. Long Term Storage or Infrequent Operation

If a speed reducer is to stand idle for an extended period of time, either prior to installation or during use, the housing should be completely filled with oil. This will protect the interior components from corrosion due to internal condensation. Be sure to drain the oil to the proper level prior to placing the reducer into service. Contact Winsmith or a local sales representative with questions on long term storage.

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6. Grease Fittings

Some speed reducer models are equipped with grease fittings to lubricate bearings that are not adequately lubricated by the oil splash. These fittings must be lubricated every 3-6 months depending on the operating conditions. Winsmith uses Mobilith SHC 220 or equivalent (NLGI #2). Caution should be used when greasing because excessive grease may reduce the performance of the lubricant inside the speed reducer.

7. Low Input Speeds (Under 1160 RPM)

When input speeds are less than 1160 RPM, grease fittings will be required to lubricate any bearings not partially covered by the normal oil level. If a low speed operating condition exists and the reducers are without the appropriate grease fittings, please contact Winsmith or a local Sales Representative.

8. Oil Temperature

Speed reducers in normal operation can generate housing temperatures of up to 212 degrees F depending on the type of the reducer and the severity of the application (loading, duration of service, ambient temperatures). Excessive oil temperatures may be the result of one or more of the following factors:

A. Overloads

Overloads may be due to the original model being too small for the application. Overloads can also occur if the speed reducer is properly sized for the application and higher than anticipated loads are experienced. Always check the reducer rating when increasing driven loads or when increasing the horsepower rating of the motor or other prime mover.

B. Overfilling or Underfilling

If a speed reducer is overfilled with oil, the energy used in churning the excessive oil can result in overheating. If overfilling occurs, shut down the drive, remove the oil level plug, and allow oil to drain from the level hole until it stops. Reinstall the level plug and restart the drive. If the speed reducer is under filled, the resultant friction can cause overheating and possible damage. If this occurs, the reducer should be disassembled and inspected for excessive wear. Replace damaged

components, reassemble the reducer, and fill with lubricant to the appropriate level fill hole.

C. Inadequate Cooling

In order to dissipate internally generated heat, the speed reducer must be installed in such a way that air can circulate freely. Tightly confined areas, (inside cabinets, etc.) should be avoided. If this is not possible, use a separate blower to provide forced air cooling. If possible, the use of a fan-cooled motor is recommended to increase airflow.

9. Oil Seals and Wear Components

Various normal wear components such as oil, seals, bearings and gears may need more frequent replacement in severe applications.

Gear reducer shaft lip seals are all subject to wear. Experience indicates that their useful life is extremely variable, and based primarily on the operating temperature. Other operating factors that influence seal life are high input shaft speeds and environmental factors such as air-borne abrasive particulates. Inspecting the gear reducer regularly and replacing the shaft seals at the first sign that they are beyond their useful life is the only method of ensuring no lubricant leakage. This might be as frequently as 2 years or less in some applications; in others it can be as long as 10 years or more.

Winsmith uses high quality oil seals and precision ground shafts. However, it is possible that damage during shipment or installation can cause oil seal leakage. When replacing a shaft oil seal, the following suggestions will help ensure leak free operation and long seal life:

- A.** When installing a new seal, cover the keyway and any other shaft surface discontinuities with smooth tape to protect the seal lip from being damaged.
- B.** Use a sealant between the OD of the seal and the ID of the bore into which the seal is being installed. The seal bore should also be free of any burrs, nicks, or scratches.
- C.** Be sure that the seal is perpendicular in the seal bore. The outer face of the seal should be flush with the outer surface of the reducer.

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SE Encore Speed Reducers

PRODUCT FAMILY	STANDARD MOUNTING	ADDITIONAL MOUNTING POSITIONS			
		INVERTED	INPUT SHAFT HORIZONTAL		INPUT SHAFT VERTICAL
XDNS XDTS XDUS XDHS					
XDBS					
XDJS					
XDVS					
XDLS					
XDSS XSTS XSUS XSHS					
XSBS					
XSJS					
XSFS					
MDDS					
MHDS					

FIGURE 3

1. Fill, vent, level and drain locations are the same for quill and coupled models.
2. Double reduction size E35 and E43 models are supplied with grease fittings on the input shaft to ensure bearing lubrication for all mounting positions.
3. When input speeds are less than 1160 rpm, to ensure proper lubrication, contact your local Winsmith sales representative.

FIGURE 3
CHART KEY

- (F) REFILL PLUG
- (V) VENT PLUG
- (L) LEVEL PLUG
- (D) DRAIN PLUG

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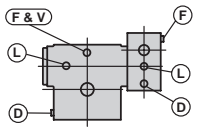
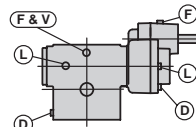
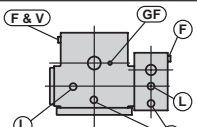
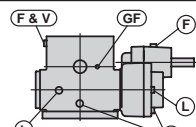
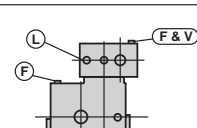
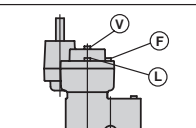
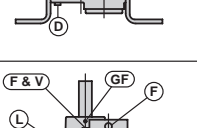
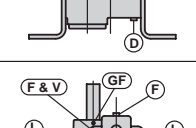
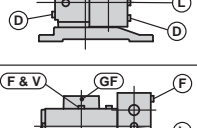
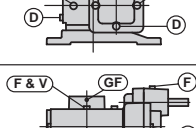
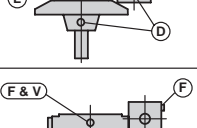
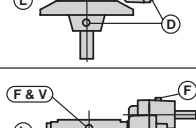
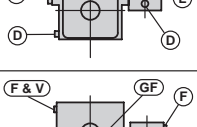
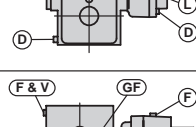
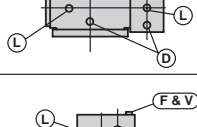
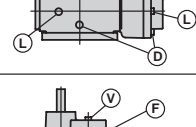
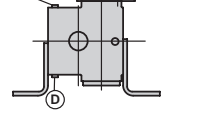
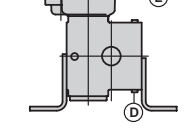
DOUBLE REDUCTION WORM/WORM STANDARD MOUNTING		DOUBLE REDUCTION HELICAL/WORM STANDARD MOUNTING	
XDND XDTD XDUD XDHD		XDNX XDTX XDUX XDHX	
XDBD		XDBX	
XDJD		XDJX	
XDVD		XDVX	
XDL D		XDLX	
XDSD XSTD XSUD XSHD		XDSX XSTX XSUX XSHX	
XSBD		XS BX	
XSJD		XSJX	
XSFD		XSFX	

FIGURE 4

1. Fill, vent, level and drain locations are the same for quill and coupled models.
2. Double reduction size E35 and E43 models are supplied with grease fittings on the input shaft to ensure bearing lubrication for all mounting positions.
3. When input speeds are less than 1160 rpm, to ensure proper lubrication, contact your local Winsmith sales representative.

**FIGURE 4
CHART KEY**

- (F) REFILL PLUG
- (V) VENT PLUG
- (L) LEVEL PLUG
- (D) DRAIN PLUG
- (GF) GREASE FITTING

Warnings And Cautions



WARNING

Warnings

Winsmith products, and associated equipment and machinery, are intended for selection and use by trained and skilled persons capable of determining their suitability for the specific application or use. Proper selection, installation, operation and maintenance, including implementation of adequate safety precautions, are the responsibility of the purchaser or user. The following safety precautions, as well as additional safety precautions that may be required for the specific application or use, are the responsibility of the purchaser or user. **FAILURE TO OBSERVE REQUIRED SAFETY PRECAUTIONS COULD RESULT IN SERIOUS INJURY TO PERSONS OR PROPERTY OR OTHER LOSS.**

Lock-out/Tag-out

It is **EXTREMELY IMPORTANT** that equipment or machinery does not unexpectedly start. To prevent this possibility, all electrical or other input power sources must be turned off, and properly locked out. Tag out procedures must be followed before working on or near the reducer or any associated equipment. Loads on the input and output shafts should be disconnected prior to working on any reducer. Failure to observe these precautions may result in serious bodily injury and/or property damage.

Grounding

Be sure the reducer and associated equipment are properly grounded and otherwise installed in accordance with all electrical code requirements.

Protective Guarding / Loose Clothing, etc.

Always insure there is proper protective guarding over all rotating or moving parts. Never allow loose clothing, hair, jewelry and the like to be worn in the vicinity of rotating or moving parts or machinery. The purchaser or user is responsible for complying with all applicable safety codes. Failure to do so may result in serious bodily injury and/or damage to property or other loss.

Selection & Installation

This speed reducer and associated equipment must be selected, installed, adjusted and maintained by qualified personnel who are knowledgeable regarding all equipment in the system and the potential hazards involved.

Consult Catalog Ratings

Load, torque and other requirements must not exceed the published ratings in the current catalog and/or on the speed reducer nameplate. The reducer selected must be consistent with all service factors for the application. See Winsmith catalogs and www.WINSMITH.com.

Brake Torque Loads

Whenever a brake or any other stopping force is involved in an application, braking torque loads imposed on the speed reducer must not exceed the allowable load ratings.

Not a Brake

Speed reducers should never be used to provide the function of a fail safe brake or an assured self locking device. Speed reducers must never be used to replace a brake or a critical braking application function.

Excess Overhung Loads

Excessive overhung loads on the input or output shafts of a speed reducer may cause premature fatigue failures of the bearings and/or shafts. Mount gears, pulleys and sprockets as close to the housing as possible to minimize such loads. Do not exceed catalog ratings.

Excess Thrust Loads

Excessive thrust loads on the input or output shafts of a gear reducer may cause premature failure of bearings. Do not exceed catalog ratings.

Alignment

Properly align any input and output power transfer elements connected to the speed reducer. Even slight misalignments in a rigid mounting system may cause binding, large vibration forces or excessive overhung loads, leading to premature bearing, shaft, or speed reducer failure. Use of flexible couplings that allow the reducer and connected transfer elements to self-align during operation will compensate for minor misalignments.

Not a Support Structure

A speed reducer must never be used as an integral component of a machine superstructure or support frame that would subject it to additional loads other than properly rated loads transmitted through the shafts.

Mounting Position

The speed reducer should be mounted in one of the mounting positions shown in the catalog. Different mounting positions should not be used without contacting Winsmith as this may result in improper lubrication.

Overhead Mounting

Mounting of a speed reducer in overhead positions may be hazardous. Use of external support rails or structure is strongly recommended for any overhead mounting.

Lifting Eyebolts

Any lifting supports or eyebolts provided on the speed reducer are supplied with the purpose of vertically lifting only the speed reducer, without any other attachments or motors. Inspect such supports and bolts before each use.

Properly Secure Mounting Bolts

Proper mounting bolts and proper torques must be applied and maintained to insure the speed reducer is securely mounted to the desired machinery. Inspect regularly as machine vibration may loosen fasteners.

Thread Locking Compound

Proper thread locking compound should be appropriately applied to the cleaned threads of all mounting bolts connecting or securing the speed reducer to equipment and any drive, accessories, or brake components attached to the speed reducer. If, at any time after installation a factory supplied assembly or construction bolt is removed, care must be taken to thoroughly clean off the old thread locking compound and a new appropriate thread locking compound must be applied. Failure to properly apply new thread locking compound on all mounting or reducer construction bolts may result in serious injury or death from falling mechanical components.

Reducer Surface Is Hot

Operating speed reducers generate heat. Surface temperatures may become hot enough to cause severe burns. Proper personal protective equipment should be used.

Noise

Operating speed reducers may generate high noise levels. Use appropriate hearing protection and avoid extended exposure to high noise levels.

Lubricants Hot and Under Pressure

The temperature of lubricants inside a speed reducer may be very high. The reducer should be allowed to cool to ambient temperature before removal of any vent, drain, level, or fill plugs, and before removing seals or bearing covers. Speed reducers without a pressure vent may also be under great internal pressure. Slowly loosen the lubricant fill plug above the lubricant level to vent any internal pressure before further disassembling.

Lubricant Contact

Contact with lubricants can present safety concerns. Proper personal protective equipment should be used whenever handling speed reducer lubricants. Consult the lubricant MSDS sheet which is often available on the lubrication manufacturer's website.

FDA, USDA, and NSF Applications

Factory supplied lubricants may not be suitable or safe for applications involving food, drugs and similar products. This includes applications subject to FDA, USDA, NSF or other regulatory jurisdiction. Consult the lubricant supplier or Winsmith for acceptable lubricants.

Inspection and Lubrication

Ensure proper operation by regularly inspecting the speed reducer and following all maintenance, operation and lubrication guidelines.



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