



D-90 Type SE S-Eliminator™



Information and Operation Instructions



The S-Eliminator™

Very Low Backlash Servo Ready Worm Gear Speed Reducers With Easy Field Adjustment Capability.

The Problem:

1. A motion/position control application has a load inertia that requires a large motor for inertia matching. The cost of the motor and required control and amplifier put the project in jeopardy.
2. A high cycling industrial application causes early failure or reduced system performance because the gearbox has developed too much backlash in the gearing. The cost of replacement and interruption in production is very high.

Both of these problems require a gear product that has very low backlash and is cost effective. Today there are very few products that include backlash below three arc minutes and reasonable costs. The solution today all too often ends up being an over-sized product that is meant to insure application performance. These selections result in less than optimal system performance and more expense than is necessary.

Many problems resulting from excessive backlash could be solved if the backlash could be adjusted out easily. Most of today's products offer a fixed backlash setting that can only be changed through taking the product out of service and replacing parts. This can cause down time and costly repairs.

Solution:

WINSMITH® has developed the very low backlash product, the S-ELIMINATOR, around the flexibility of our D-90® TYPE SE® product. This new S-ELIMINATOR product is shipped with one to two arc minutes of backlash. In addition, the unit backlash can be adjusted in the field very easily to insure the specification desired is maintained over the life of the unit. The product was developed with input flanges that can be easily modified to interface with most servo motor output flanges. This can be done within the normally short unit lead time of the S-ELIMINATOR.

The S-ELIMINATOR can be used to reduce the reflected inertia in a motion/position application at a very competitive price. This will allow a cost reduction in servo motor and related components. The



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performance of a worm gear product in a motion/position application is superior to most gear products on many critical issues.

The S-ELIMINATOR's low backlash reduces the wear on cyclic applications because of the reduced movement of gear components between cycles. This reduction in start-up backlash will have a dramatic impact on speed reducer life. The adjustability of the backlash allows for maintenance of the reducer and increases unit life. Also, it is not necessary to oversize the unit to add protection for the gear system.

Applications:

- Machine tools
- Indexing operations
- Converting equipment
- Robotic positioners
- Tension control
- Rotary tables
- Servo positioning
- Feed to length

Products:

- Available in D-90® TYPE SE® Center Distances 1.33" through 3.50 center distances.

Models:

Non-motorized single reduction units because of the need to have a two bearing system. NEMA C & servo style coupling motor adapters can be used to establish a motorized product.

Ratio:

Range – 4:1-80:1.

Backlash:

Unit shipped with between 1-2 arc minutes of movement. Unit field adjustable to 1-2 arc minutes after wear has developed.

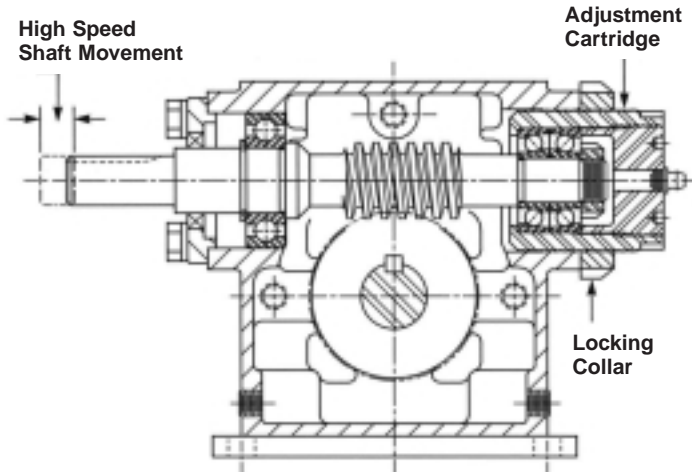


Operation Instructions

Backlash adjustment on the S-ELIMINATOR is made possible by a unique worm design with a variable thread thickness. The worm thread begins with a standard thread thickness at one end which gradually increases over its length. By moving the worm axially, the clearance between the gear tooth space can be taken up by this gradually increasing thread thickness, thereby reducing backlash.

Two angular contact ball or tapered roller bearings are radially and axially clamped to the worm shaft in a threaded cartridge. This cartridge mates with a like thread in the housing. The cartridge is normally located opposite the input shaft (as pictured) but can sometimes be located on the input shaft side as a special. During initial assembly, the worm is axially positioned for the least possible backlash condition and locked in place with a locking collar. A non-hardening sealing compound is applied to the threaded surfaces to prevent oil leakage during storage and operation.

This non-hardening sealant will continue to protect the unit from leakage even after subsequent adjustments. These adjustments are easily accomplished without disassembly or even removal from the installation. First, any coupling attached to the input shaft must be loosened to allow unrestrained axial movement of the worm. Then loosen the locking collar, reposition the worm by rotating the adjustment cartridge clockwise (into the housing) in 1/4 turn increments until the desired backlash is achieved and retighten the collar and coupling on the input shaft.



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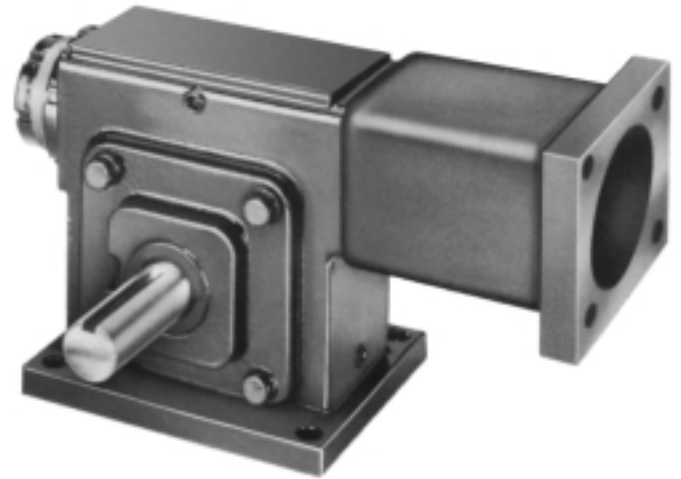
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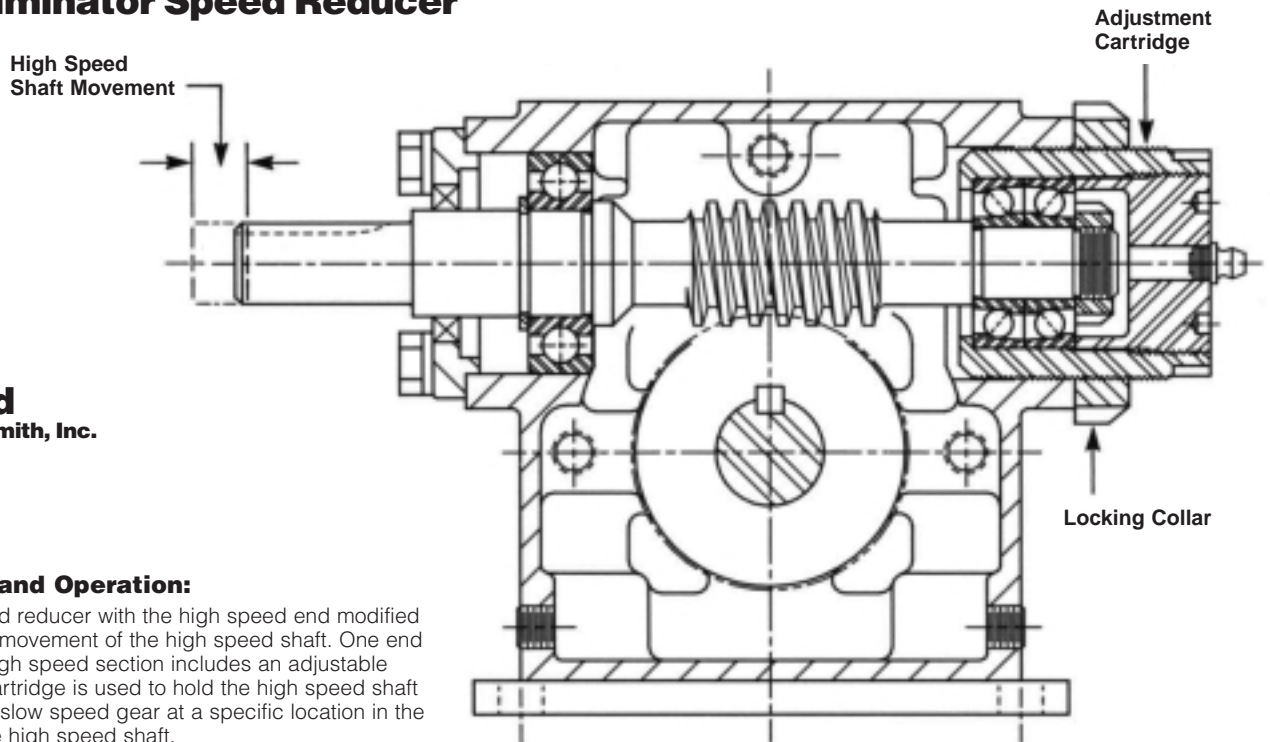
Caution: When repositioning the worm, avoid excessive force on the cartridge which could cause binding of the gear mesh and other internal damage.

The minimum amount of backlash that can be achieved is dependent on run-in time, operating conditions and component tolerance variations. During initial assembly, the worm is moved axially to a point where a slight tightness occurs between the worm and gear when manually rotated. In this position, the effects of tolerance variation (Including runout of the rotating components) will also create a point of maximum backlash as the gear rotates. After some period of operation, the tighter spots will tend to diminish allowing the worm to be readjusted. After sufficient running time and subsequent adjustments, a condition of relatively uniform backlash will be achieved.

The degree of backlash adjustment will depend somewhat on the operating conditions. Intermittent operation or slow input speeds can accommodate an adjustment close to zero. However, units operating continuously at higher input speeds require some clearance between the worm and gear to allow for thermal expansion. If during operation, the housing temperature rises above 200°F while the unit load is still within the catalog thermal unit capacity, the backlash may be too tight.



The S-Eliminator Speed Reducer



Patented
Peerless-Winsmith, Inc.

Description and Operation:

Worm gear speed reducer with the high speed end modified to allow for axial movement of the high speed shaft. One end of the housing high speed section includes an adjustable cartridge. The cartridge is used to hold the high speed shaft in mesh with the slow speed gear at a specific location in the axial plane of the high speed shaft.

The worm position is adjusted by loosening the locking collar and rotating the cartridge to achieve a new gear mesh location. Position is held by re-tightening the locking collar.

Axial Adjustment Movement:

3/8" on smaller units up to 3/4" on larger sizes.

Adjustment Precision:

Continuous movement as determined by setting.



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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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