

SILVERTHIN™

Engineering Precision with Every Revolution

SLEWING RINGS & PINIONS





ISO Registration Information

Silverthin™ is an ISO 9001 registered manufacturer of Thin Section and Slewing Ring bearings, Silverthin™ Quality Management System is registered to the ISO 9001 standard by BSI, Inc. A copy of our quality registration is available on request and our quality and manufacturing systems are open to audit by our customers.

Our Quality Policy

Our Quality Policy focuses on increasing customer satisfaction through:

- Strategic management of our corporation
- Consistently meeting customer requirements
- Continuous improvement of our processes

The management and employees of Silverthin™ are committed to meeting customer requirements and expectations. We want to assure our customers that we have a Quality Management System capable of providing quality products and services on time.



SILVERTHIN™
BEARING GROUP

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Manufacturing

Silverthin™ Bearing Group specializes in the engineering, manufacturing, sales and marketing of Thin Section and Slewing Ring (also known as Turntable) bearings.

Our flexible manufacturing systems allow us to provide a wide variety of standard and custom bearing configurations across a broad range of sizes.

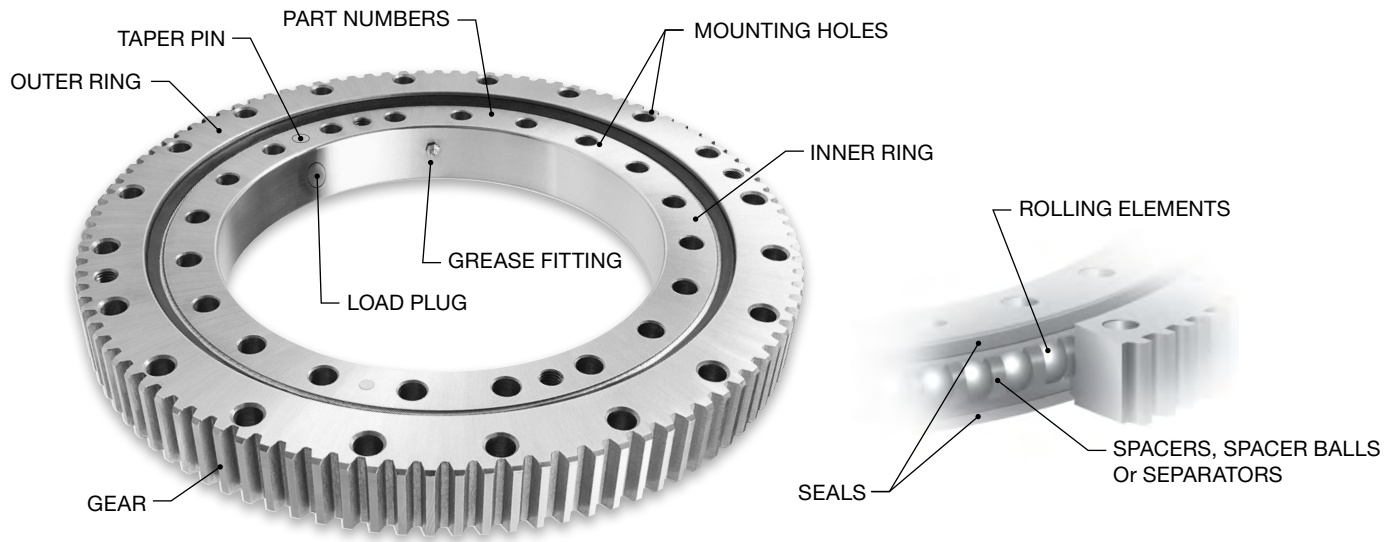
Silverthin™ Bearing Group manufactures large diameter, Thin Section ball bearings for defense, industrial, robotic, semiconductor, medical, energy and distribution markets. Silverthin™ Thin Section bearings are manufactured in the United States in standard and custom configurations, sealed and unsealed, up to 37" in diameter. Components are stocked to meet customer short lead-time and customization requirements.

Silverthin™ Slewing Ring bearings are manufactured in facilities located in Asia to Silverthin specifications with inspection and customer specific modifications performed in Preston, WA. Standard and custom Slewing Ring bearings are engineered and manufactured up to 70 inches in diameter, some from special materials, to serve the needs of our diverse customer base.

The Silverthin™ Advantage:

- Experienced customer service representatives who provide fast, reliable, and friendly customer service.
- Flexible manufacturing and inventory management systems that offer among the industry's best lead times.
- Engineered products including standard, modified standard, and custom designs to meet specific application requirements.
- Complete application, product, and manufacturing engineering support.

Silverthin™ Slewing Ring Bearings - Components (Turntable Bearings)



Inner Ring and Outer Ring

The bearings are comprised of two rings, each of which contains a precision raceway that is induction hardened on the surface to a specified depth. Each ring is made from a medium carbon steel forging. Silverthin™ SK and ST Series bearings have raceways constructed in a four-point contact configuration, with 45° contact angles as standard. Other raceway configurations are available, such as crossed roller and eight-point contact. These other options are often considered in cases where very high loads or special stiffness requirements are needed.

Rolling Elements

Precision rolling elements (specifically hardened chrome alloy steel balls for Silverthin™ SK and ST Series bearings) facilitate relative ring rotation between the inner and outer rings. Rollers as rolling elements are also often used.

Spacers, Spacer Balls & Separators

Spacers, typically made from a plastic material, are commonly used to separate balls to prevent them from rubbing directly against each other. Sometimes spacer balls are utilized instead of spacers. In this case these are balls that are slightly smaller than the load carrying balls, placed between each load carrying ball. Occasionally, application parameters warrant the use of a separator.

Mounting Holes

Mounting holes are generally spaced around the faces of the inner and outer ring along a uniform bolt circle and equal spacing. These holes can be thru holes, tapped holes, blind tapped holes, counter-bored holes, etc. Sometimes bolt circle or spacing requirements need to be customized to meet the demands of a specific application, in which case custom options are available.

In the case of either the standard part numbers listed in this catalog, or other custom versions provided by Silverthin™, the equipment designer, manufacturer, or user is responsible to determine that the mounting design is adequate.

Seals

Seals are provided on each side of the bearing, with their primary functions being grease retention and prevention of

some contamination such as dust and debris from entering the bearing. The seals are typically made from an extruded Buna-N rubber strip, and in smaller sizes are a metallic non-contact shield.

Load Plug

Due to the nature of the race hardening process, there is a gap in the race hardness of each race. In that location for the non-geared ring, or the outer ring for ungeared bearings, a hole is drilled to permit the loading of balls into the final slewing ring assembly. This hole is plugged and secured with a taper pin. *Note that for the ring where a load plug is not present, an 'S' is stamped on the face of that ring at the location of the unhardened gap in the race (also known as the soft spot). **Removal of the load plug voids the warranty.***

Taper Pin

Secures load plug to the inner or outer ring.

Gear

Slewing ring bearings can be supplied as ungeared, or with gears on either the ID of the inner ring or the OD of the outer ring. Gears are typically a standard stub involute spur gear with backlash provisions and AGMA Q8 quality minimum. Details for each bearing can be found in the enclosed dimensional tables, and drawings are available from Silverthin™ Engineering. Custom gear configurations are also available.

Grease Fitting

At least one grease fitting is included in one of the rings. The quantity may increase with the diameter of the bearing. For bearings with gears, the grease fitting(s) are located on either the ID or OD of the ungeared ring. For ungeared bearings, Silverthin™ ST and SK Series slewing rings come equipped to accommodate grease fittings on either the inner or outer ring. Custom quantities, locations and configurations for grease fittings are available.

Part Numbers

Part numbers and serial numbers are etched on one of the faces of the bearing.

Silverthin Slewing Ring Bearings - Technical

Service Factors

To determine if a Silverthin™ Slewing Ring bearing is appropriate for an application, a SERVICE FACTOR is applied. Refer to the table below for a guide to the service factor to apply to your application. The load rating curves shown in this catalog are approximate, and represent an application service factor of 1.00. To determine the required bearing rating, multiply the applicable service factor by the applied loads on the bearing, and compare the resultant loads to the load rating curves.

Class of Service	Typical Considerations	Application Examples	Minimum Service Factor
LIGHT	Well defined loading	Tire mounted light duty construction	1.00
	Loading well below capacity	Light duty Index table	1.00
	Rotation slow, <10% of time and intermittent	Light duty industrial manipulator or robot	1.00
		Light duty hand operated mechanism	1.00
		Light duty medical devices	1.00
		Light duty aerial platforms	1.00
		Welding positioners	1.00
		Rotating signs, displays	1.00
MEDIUM	Well defined loading	Track mounted light duty construction	1.10
	Loading near or below capacity	Scrap yard construction	1.25
	Rotation slow, <30% of time and intermittent	Medium duty industrial manipulator or robot	1.25
		Conveyors	1.10
		Rotary tables	1.25
		Capstans and turnstiles	1.10
		Wastewater treatment	1.10
HEAVY	Loading not well defined	Forestry handling equipment	1.50
	Loading beyond machine capacity can occur	Heavy duty index tables and turntables	1.50
	Shock loading can occur	Excavators	1.50
	Rotation intermittent, up to 100% of time		
SPECIAL	Loading not well defined	Alternative energy (wind, hydro, etc)	TBD
	Continuous rotation	Offshore application	TBD
	High speed rotation	Amusement rides	TBD
	Heavy loads, shock, impact	Steel mill applications	TBD
	High precision, positioning	Precision robotics	TBD

If you require any assistance in determining an applicable service factor, or would like a more detailed load rating curve (recommended if your service factor adjusted applied loads fall close to, or beyond, the load rating curves shown in this catalog), please contact Silverthin™ Engineering for assistance. Please note that the equipment designer is responsible for determining the correct service factor, often validated by testing.



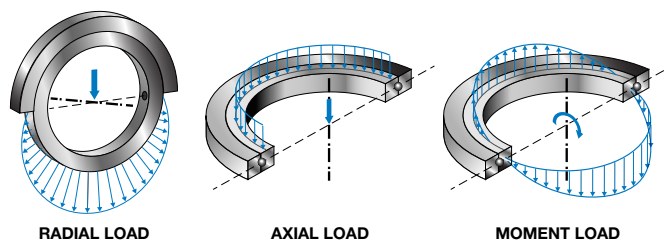
Typical Application

“Typical application” of Silverthin™ Slew Ring Bearings will exhibit the conditions listed below. Special consideration must be given to bearing selection and features whenever the application conditions differ from those considered “typical”. Those typical application conditions are:

- Vertical axis of rotation. Essentially, the bearing mounted “flat”.
- Compressive thrust and moment loads being predominant compared to tension loading.
- Radial load limited to less than 10% of the thrust load.
- For single row bearings, intermittent rotation (not continuous) should not exceed a pitch-line velocity of 500 feet/minute.
- Operating temperature between -40°F to +140°F.
- Mounting surface geometry and installation procedures to assure roundness and flatness of both races. An example approach would be to apply a centered thrust load while tightening the bolts using the alternating star pattern method.
- Periodic checking of mounting bolts to verify proper tension is provided for.
- Periodic lubrication is provided for.

Load Capability

Silverthin™ Slew Ring Bearings are designed to accommodate significant radial, thrust and moment loads as shown below:



This is accomplished in most cases by the unique four point contact raceway geometry, which is similar in concept to Silverthin™ X-Type Thin Section bearings. This allows a single bearing to accommodate all three loading scenarios noted above, either individually or a combination thereof.

Speed

Silverthin™ Slew Ring Bearings are used most commonly where rotation is slow, oscillating, and/or intermittent. For speed limit calculations please contact Silverthin Engineering.

Accuracy

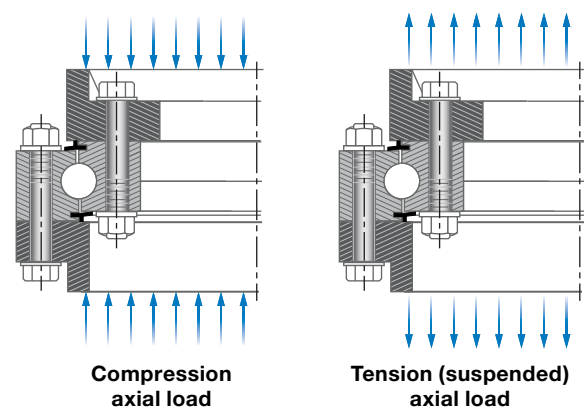
Silverthin™ Slew Ring Bearings are not typically provided with diameter tolerances. Some slewing ring applications require a higher degree of accuracy. For engineering and design support on special applications please contact Silverthin Engineering.

Environment

Silverthin™ Slew Ring Bearings are often used indoors, and outdoors where exposure to moisture and significant contamination is possible. Normal temperature ranges -40°F to +140°F (-40°C to +60°C) are standard. Slew rings designed to operate in harsher environments are available from Silverthin, contact a Silverthin Engineer early in your design process to identify the best bearing system solution for extreme environments.

Mounting – Tension versus Compression

As mentioned earlier, it is best to mount the bearings in “compression” as shown below. This ensures that the load is carried by the balls, which is represented in the load curve provided. Tension mounting has significantly less capacity, as then the bolt strength becomes the primary consideration for capacity.

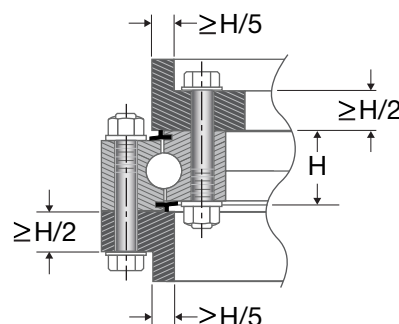


Mounting

Mounting surfaces need to be machined accurately for proper function of the bearing. Where standard bolt patterns cannot be accommodated, contact Silverthin Engineering for alternative options. Consideration must be given to mounting in tension or compression. In tension, BOLT strength becomes the limiting load consideration, the load curve no longer applies, and special considerations must be made. See additional guidelines below.

Minimum Mounting Structure Guidelines

Generally, this rule of thumb will provide adequate structural integrity.



Flatness & Mounting Surface Dish

(Mounting Surface)

Flatness of the bearing mounting surface is critical to optimal performance. Frequently mounting structures are welded or worked in a way to induce stresses into the structure. These stresses must be relieved, following which the bearing mounting surface must be machined flat. Flatness must be considered:

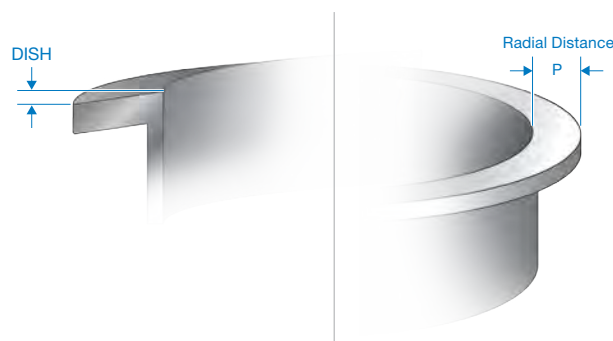
- Circumferential Direction (δ_r):
The amount of out-of-flatness allowable in the circumferential direction for four-point ball bearings is shown in the figure below.
This amount of out-of-flatness must not be exceeded in a span less than 90°, and not more than once in a span not more than 180°.
- Allowable Dish or Perpendicularity Deviation in the Radial direction (δ_p): For four-point contact ball bearing designs, this amount of dish allowable can be approximated using the formula:

$$\delta_p \approx 0.001 * D_w * P$$

Where: P = radial dim of the mounting structure face (in)

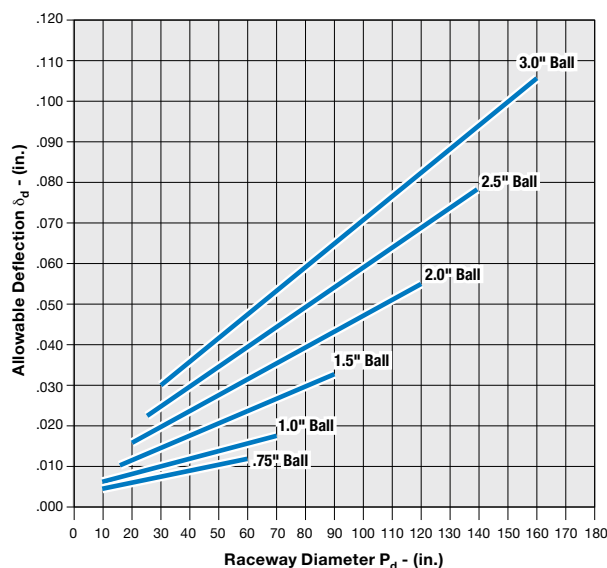
D_w = rolling element diameter (in)

Note that if an application requires greater precision or low rotational torque, it may be necessary to reduce the values of δ_r and δ_p . For roller bearings, the amount of flatness allowable is approximately 2/3 of that for an equivalent sized four-point contact ball bearing.



Allowable Deflection vs Raceway Diameter

Must not occur within 90° nor more than once in 180° of circumferential travel



Lubrication

Grease is the most common lubricant used in slewing ring bearings and gear applications. Regular lubrication through provided grease fittings or grease holes is required for proper operation on standard slewing rings. For special lubrication options, contact Silverthin.™

Friction Moment

(Rotation Torque)

The Friction Moment can be estimated for a slewing ring bearing using the formula noted below. The resulting values assume that the bearing is mounted according to the guidelines outlined in this catalog. This estimate only applies when load is applied to the bearing, and does not reflect starting torque

in an unloaded condition. Also not considered are frictional torque generated by the lubricant, seals and weight of the components. This does however provide a starting point, and with additional experience adjustments can be made in the assembly to accommodate for additional torque.

Where: $M_f = \mu * (4.4M + F_a D_{pw} + 2.2 F_r D_{pw})/2$

M_f = Bearing starting torque under load (ft-lbs)

μ = Coefficient of friction (0.006 typically)

M = Moment load (ft-lbs)

F_a = Axial load (lbs)

F_r = Radial load (lbs)

D_{pw} = Bearing pitch diameter (ft)

Bolts

It is always suggested that bolts be selected with the advice and assistance of a fastening hardware supplier. Bolt quality, pretensioning procedures, and maintenance can vary widely.

The optimal bolting arrangement has a bolt circle in both the inner and outer races with equally spaced fasteners. This results in a more uniform mounting arrangement, yielding the best performance between the bearing and the fasteners. This is not always possible due to mounting structure arrangements, and holes may be shifted accordingly. In these cases testing is recommended to determine actual bolt loads, validate joint configuration and assembly procedure.

As a starting point to determine the approximate load on the heaviest loaded bolt, the following formula can be used. Please note that Silverthin™ makes no warranty, expressed or implied, regarding bolt adequacy. It is strongly recommended that testing be performed to determine the actual load, as this is the only reliable way to be certain.

$$RB = \frac{12 * M * r}{BC * n} \pm \frac{F_a}{n}$$

Where: RB = Total load on heaviest loaded bolt (lbs)

M = Moment load (ft-lbs)

r = Rigidity factor. Use 3 for bearings and support structures of average stiffness.

F_a = Axial load (lbs)

If F_a is in tension, the sign is +

If F_a is in compression, the sign is -

Refer to section "Mounting - Tension versus Compression"

BC = Bolt circle diameter (in)

n = Total number of equally distributed bolts

S_f = Bolt factor of Safety. Minimum recommended value = 3. See formula below.

$$S_f = \frac{\text{Bolt Proof Load Rating}}{RB}$$

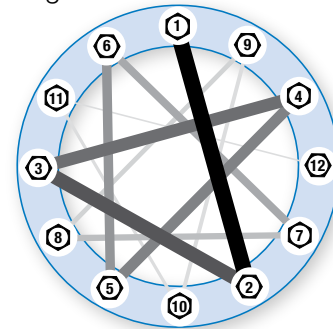
Bolt Diameter (in)	Proof Load (lbs)
1/2	17,000
5/8	27,100
3/4	40,100
7/8	55,400
1	72,700
1 - 1/8	91,600
1 - 1/4	116,300
1 - 1/2	168,600

Other Bolting Recommendations:

1. Use hexagon head high strength bolts with coarse threads according to SAE J429, Grade 8 or ASTM A490/A490M or ISO 898-1, Grade 10.9 tensioned to 70% of their yield strength.
2. Use hexagon head coarse thread nuts where applicable according to SAE J995, Grade 8 or ASTM A563, Grade DH or ISO 898-2, Class 10.
3. For optimal bolt tension, the ratio of the distance from the bottom of the bolt head to the first thread of engagement should be 3.5 or greater. Testing is required for validation.
4. All mounting bolts in a given ring should have equal clamp length.
5. The distance between the head of the bolt and the bolt threads should be at least equal to the bolt body diameter.
6. Thread engagement length of the bolt in the mating steel structure should be at least 1.25 times the bolt diameter.
7. Bench tests are recommended to validate that the bolt tensioning method achieves desired results prior to equipment testing.

Use hardened round flat steel washers in accordance with ASTM F436 under the head of the bolt, and also the nut. Lockwashers, and locking compounds on the thread, are not recommended.

Install the washers, nuts and bolts in the bearing and supporting structure and hand tighten. Do not distort the bearing in order to install bolts. Apply a moderate centered thrust load to the bearing. Tighten the bolts to the equipment designer's specifications. A common approach is to use a star pattern to tighten the bolts, sequences as shown in the diagram below. The pattern is usually done in 3 steps at approximately 30%, 80% and 100% of the final bolt torque or tension level specified by the equipment designer.



Loss of proper tension can lead to premature bolt failure, failure of the bearing and structure, damage to components, and fatality or injury to anyone in the vicinity. *The bolts require frequent inspection for proper tension, which is commonly accomplished by measuring torque of the bolt.*

Securing Bearing to the Mounting Surface

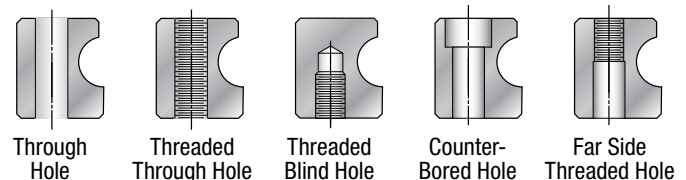
When installing the bearing, it is important to ensure that the bearing is as round as possible. This will optimize load distribution and promote the smoothest operation. The following procedures are recommended as an aid.

Custom Slewing Ring Bearing Options from Silverthin™

Aside from the standard slewing ring options listed in this catalog, Silverthin™ offers a wide range and variety of custom options. These can be either modified versions of standard bearings, or completely custom options, both to accommodate desired solutions. These include but are not limited to:

- Special overall dimensions (bore, OD, widths, offsets).
- Lube holes and grease fittings (additions, subtractions, locations, face mounted, recessed, sizes).
- Special gear geometries, hardness.
- Internal geometry optimization (increased load capacity, increased precision for runouts).

- Internal fit (preload or clearance).
- Special hole patterns and configurations, such as:

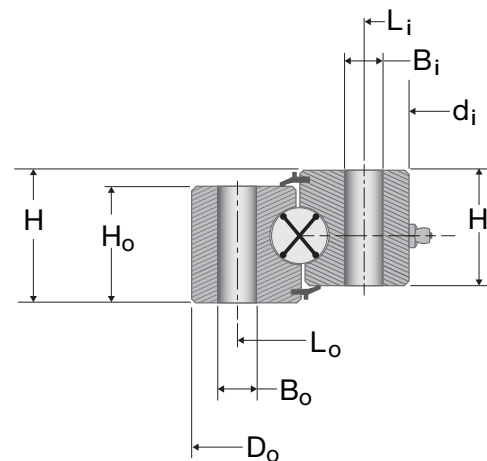
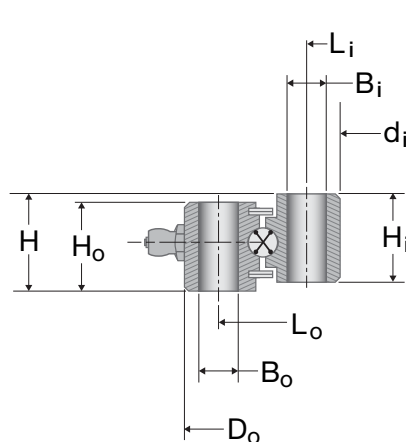
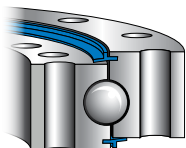


- Accommodate higher speeds or continuous operation (add separator).
- Locating holes, pins or pilots.
- Special sealing configurations.

STO SERIES

NO GEAR SLEWING RING

- Four-point contact ball
- Rectangular cross-section
- Non-gear
- Clearance
- Dimensions up to 72" OD



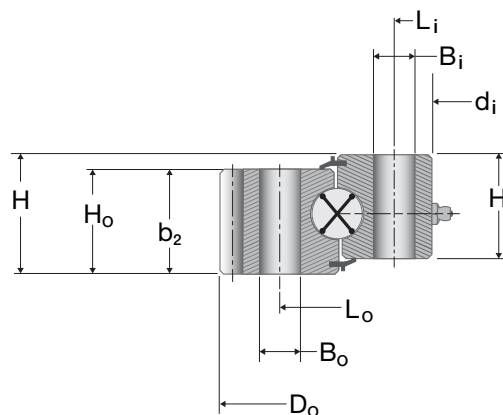
**This diagram for STO-050
and STO-065 only.*

SILVERTHIN P/N	OVERALL DIMENSIONS					MOUNTING HOLES						Moment Rating (ft - lbs)
						Inner Ring			Outer Ring			
	D ₀ (in)	d _i (in)	H (in)	H _i /H ₀ (in)	Appx. Wt. (lbs)	L _i (in)	No. of Holes n _i	B _i (in)	L ₀ (in)	No. of Holes n ₀	B ₀ (in)	
STO-050	4.331	1.968	0.787	0.728	2	2.480	8	0.26	3.818	8	0.26	515
STO-050T	4.331	1.968	0.787	0.728	2	2.480	8	M6	3.818	8	M6	515
STO-065	5.315	2.559	0.866	0.787	4	3.149	8	0.354	4.724	8	0.354	910
STO-065T	5.315	2.559	0.866	0.787	4	3.149	8	M8	4.724	8	M8	910
STO-122	8.898	4.803	1.339	1.142	13	5.512	12	0.354	8.189	12	0.354	5700
STO-122T	8.898	4.803	1.339	1.142	13	5.512	12	M8	8.189	12	M8	5700
STO-143	9.803	5.63	1.339	1.142	15	6.496	12	0.433	8.937	12	0.433	7080
STO-143T	9.803	5.63	1.339	1.142	15	6.496	12	M10	8.937	12	M10	7080
STO-145	11.811	5.709	1.968	1.732	37	6.890	16	0.565	10.630	16	0.565	19050
STO-145T	11.811	5.709	1.968	1.732	37	6.890	16	5/8-11	10.630	16	5/8-11	19050
STO-145X	12.286	5.709	1.968	1.732	41	6.890	16	0.594	10.630	16	0.594	21800
STO-170	12.205	6.693	1.811	1.614	33	7.874	12	0.512	11.024	12	0.512	17080
STO-170T	12.205	6.693	1.811	1.614	33	7.874	12	M12	11.024	12	M12	17080
STO-210	14.37	8.268	1.575	1.496	38	9.449	20	0.562	13.190	16	0.562	24170
STO-210T	14.37	8.268	1.575	1.496	38	9.449	20	5/8-11	13.190	16	5/8-11	24170
STO-210X	14.686	8.268	1.968	1.732	48	11.614	20	0.594	13.190	16	0.594	31330
STO-265	16.535	10.433	1.968	1.732	54	11.614	24	0.562	15.354	18	0.562	41770
STO-265T	16.535	10.433	1.968	1.732	54	11.614	24	5/8-11	15.354	18	5/8-11	41770
STO-265X	17.086	10.433	1.968	1.732	61	11.614	24	0.594	15.354	18	0.594	48670
STO-324T	20.486	12.770	2.062	2.022	105	14.375	20	5/8-11	18.875	20	5/8-11	63390
STO-324X	20.486	12.770	2.375	2.063	105	14.375	20	0.688	18.875	20	0.688	75200

STE SERIES

EXTERNAL GEAR SLEWING RING

- Four-point contact ball
- Rectangular cross-section
- External gear, AGMA 8 quality minimum
- Clearance
- Dimensions up to 72" OD

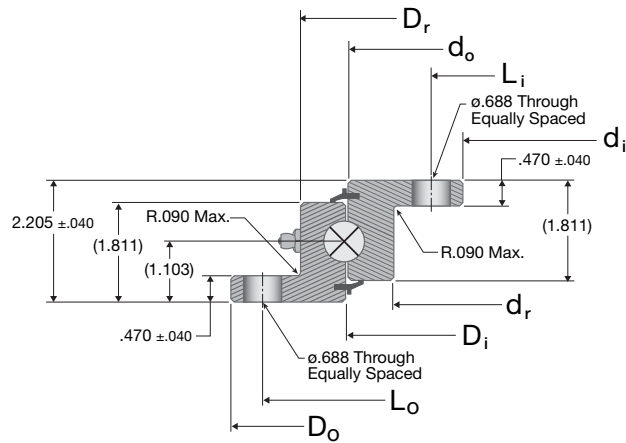


SILVERTHIN P/N	OVERALL DIMENSIONS					GEAR DATA - $\alpha = 20^\circ$					MOUNTING HOLES						Moment Rating (ft - lbs)
	D ₀ (in)	d _i (in)	H (in)	H _i /H ₀ (in)	Appx. Wt. (lbs)	Tooth Form	D ₂ (in)	Gear Dia. Pitch P _d	Max Gear Tooth Load F ₂ (lbs)	No. of teeth Z ₂	Inner Ring			Outer Ring			
											L _i (in)	No. of Holes n _i	B _i (in)	L ₀ (in)	No. of Holes n ₀	B ₀ (in)	
STE-145	12.286	5.709	1.968	1.732	38	FS	12.000	5/7	7140	60	6.890	16	.562	10.630	16	.562	18700
STE-145T	12.286	5.709	1.968	1.732	38	FS	12.000	5/7	7140	60	6.890	16	5/8-11	10.630	16	5/8-11	18700
STE-145X	12.286	5.709	1.968	1.732	38	FS	12.000	5/7	7140	60	6.890	16	.594	10.630	16	.594	21430
STE-210	14.686	8.268	1.575	1.496	38	FS	14.400	5/7	5810	72	9.449	20	.562	13.190	16	.562	23690
STE-210T	14.686	8.268	1.575	1.496	38	FS	14.400	5/7	5810	72	9.449	20	5/8-11	13.190	16	5/8-11	23690
STE-210X	14.686	8.268	1.968	1.732	44	FS	14.400	5/7	7290	72	9.449	20	.594	13.190	16	.594	30720
STE-265	17.086	10.433	1.968	1.732	57	FS	16.800	5/7	7330	84	11.614	24	.562	15.354	18	.562	40940
STE-265T	17.086	10.433	1.968	1.732	57	FS	16.800	5/7	7330	84	11.614	24	5/8-11	15.354	18	5/8-11	40940
STE-265X	17.086	10.433	1.968	1.732	57	FS	16.800	5/7	7330	84	11.614	24	.594	15.354	18	.594	47700
STE-324T	20.486	12.750	2.062	2.022	105	FS	20.200	5/7	8700	101	14.375	20	5/8-11	18.875	20	5/8-11	62130
STE-324X	20.486	12.770	2.375	2.063	105	FS	20.200	5/7	8863	101	14.375	20	.688	18.875	20	.688	73750
STE-415	24.650	16.250	2.375	2.063	132	SD	24.250	4	10420	97	17.750	20	.813	22.250	16	.813	101370
STE-415T	24.650	16.250	2.375	2.063	132	SD	24.250	4	10420	97	17.750	20	3/4-10	22.250	16	3/4-10	101370
STE-470	26.900	18.500	2.375	2.063	147	SD	26.500	4	10460	106	20.000	24	.813	24.500	18	.813	125300
STE-470T	26.900	18.500	2.375	2.063	147	SD	26.500	4	10460	106	20.000	24	3/4-10	24.500	18	3/4-10	125300
STE-540	29.650	21.250	2.375	2.063	163	SD	29.250	4	10520	117	22.750	28	.813	27.250	24	.813	157590
STE-540T	29.650	21.250	2.375	2.063	163	SD	29.250	4	10520	117	22.750	28	3/4-10	27.250	24	3/4-10	157590
STE-590	33.534	23.125	2.875	2.563	283	SD	33.000	3	17290	99	24.875	24	.938	30.625	18	.938	213320
STE-590T	33.534	23.125	2.875	2.563	283	SD	33.000	3	17290	99	24.875	24	7/8-9	30.625	18	7/8-9	213320
STE-705	38.201	27.750	2.875	2.563	325	SD	37.667	3	17390	113	29.500	28	.938	35.250	24	.938	371940
STE-705T	38.201	27.750	2.875	2.563	325	SD	37.667	3	17390	113	29.500	28	7/8-9	35.250	24	7/8-9	371940
STE-730	41.850	28.750	3.250	2.880	491	SD	41.200	2.5	21290	103	31.000	24	1.063	38.000	20	1.063	468100
STE-730T	41.850	28.750	3.250	2.880	491	SD	41.200	2.5	21290	103	31.000	24	1-8	38.000	20	1-8	468100
STE-870	47.444	34.250	4.250	3.875	771	SD	46.800	2.5	31620	117	36.250	28	1.188	43.875	24	1.188	920970
STE-870T	47.444	34.250	4.250	3.875	771	SD	46.800	2.5	31620	117	36.250	28	1 1/8-7	43.875	24	1 1/8-7	920970

SK6 SERIES

NO GEAR SLEWING RING

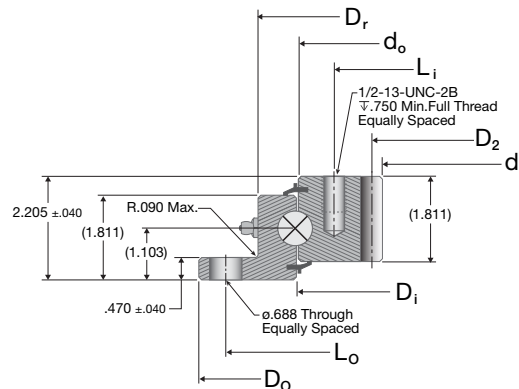
- Four-point contact ball
- Flanged cross-section on non-geared rings
- Non-gear
- Clearance
- Dimensions up to 60" OD



SILVERTHIN P/N	OVERALL DIMENSIONS							GEAR DATA - INV. STUB - $\alpha = 20^\circ$				MOUNTING HOLES				Moment Rating (ft - lbs)
	D ₀ (in)	D _i (in)	D _r (in)	d _i (in)	d _r (in)	d ₀ (in)	Appx. Wt. (lbs)	D ₂ (in)	Gear Dia. Pitch P _d	Max Gear Tooth Load F ₂ (lbs)	No. of teeth Z ₂	Inner Ring		Outer Ring		
												L _i (in)	No. of Holes n _i	L ₀ (in)	No. of Holes n ₀	
SK6-16PZ	20.390	16.220	17.870	11.970	14.490	16.142	58	-	-	-	-	13.130	12	19.250	8	23300
SK6-22PZ	25.510	21.340	22.990	17.090	19.610	21.260	76	-	-	-	-	18.130	15	24.380	12	33630
SK6-25PZ	29.450	25.280	26.930	21.030	23.550	25.200	89	-	-	-	-	22.130	18	28.380	12	50150
SK6-29PZ	33.390	29.212	30.870	24.970	27.490	29.134	104	-	-	-	-	26.130	18	32.250	15	53100
SK6-33PZ	37.320	33.150	34.800	28.90	31.420	33.070	118	-	-	-	-	30.000	18	36.250	18	57400
SK6-37PZ	41.260	37.090	38.740	32.840	35.360	37.010	132	-	-	-	-	34.000	20	40.130	18	65000
SK6-43PZ	47.170	43.000	44.650	38.750	41.270	42.913	153	-	-	-	-	39.880	24	46.000	18	74900

INTERNAL GEAR SLEWING RING

- Four-point contact ball
- Flanged cross-section on non-geared rings
- Internal gear, AGMA 8 quality minimum
- Clearance
- Dimensions up to 60" OD

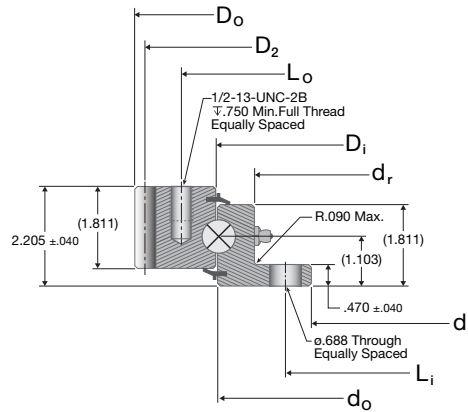


SILVERTHIN P/N	OVERALL DIMENSIONS							GEAR DATA - INV. STUB - $\alpha = 20^\circ$				MOUNTING HOLES				Moment Rating (ft - lbs)
	D ₀ (in)	D _i (in)	D _r (in)	d _i (in)	d _r (in)	d ₀ (in)	Appx. Wt. (lbs)	D ₂ (in)	Gear Dia. Pitch P _d	Max Gear Tooth Load F ₂ (lbs)	No. of teeth Z ₂	Inner Ring		Outer Ring		
												L _i (in)	No. of Holes n _i	L ₀ (in)	No. of Holes n ₀	
SK6-16NZ	20.390	16.339	17.870	12.850	-	16.260	65	13.250	4	6800	53	14.880	12	19.250	8	23300
SK6-22NZ	25.510	21.340	22.990	17.600	-	21.260	90	18.000	4	6530	72	19.630	15	24.380	10	33630
SK6-25NZ	29.450	25.280	26.930	21.600	-	25.200	106	22.000	4	6400	88	23.630	18	28.380	12	50150
SK6-29NZ	33.390	29.213	30.870	25.600	-	29.134	121	26.000	4	6300	104	27.630	18	32.250	15	53100
SK6-33NZ	37.320	33.150	34.800	29.133	-	33.070	148	29.667	3	8520	89	31.500	18	36.250	18	57400
SK6-37NZ	41.260	37.090	38.740	33.133	-	37.007	165	33.667	3	8420	101	35.500	20	40.130	18	65000
SK6-43NZ	47.170	43.071	44.650	39.133	-	42.992	188	39.667	3	8340	119	41.500	24	46.000	18	74900

SK6 SERIES

EXTERNAL GEAR SLEWING RING

- Four-point contact ball
- Flanged cross-section on non-geared rings
- External gear, AGMA 8 quality minimum
- Clearance
- Dimensions up to 60" OD



SILVERTHIN P/N	OVERALL DIMENSIONS							GEAR DATA - INV. STUB - $\alpha = 20^\circ$				MOUNTING HOLES				Moment Rating (ft - lbs)
	D_o (in)	D_i (in)	D_r (in)	d_i (in)	d_r (in)	d_o (in)	Appx. Wt. (lbs)	D_2 (in)	Gear Dia. Pitch P_d	Max Gear Tooth Load F_2 (lbs)	No. of teeth Z_2	Inner Ring L_i (in)	No. of Holes n_i	Outer Ring L_o (in)	No. of Holes n_o	
SK6-16EZ	19.900	16.220	-	11.970	14.490	16.142	72	19.500	4	5560	78	13.130	12	18.000	8	23300
SK6-22EZ	25.150	21.340	-	17.090	19.610	21.260	96	24.750	4	5650	99	18.130	15	23.250	12	33630
SK6-25EZ	29.150	25.280	-	21.030	23.550	25.200	115	28.750	4	5700	115	22.130	18	27.250	15	50150
SK6-29EZ	32.900	29.220	-	24.970	27.490	29.134	128	32.500	4	5740	130	26.130	18	31.000	18	53100
SK6-33EZ	37.200	33.150	-	28.900	31.420	33.070	152	36.667	3	7580	110	30.000	18	35.000	18	57400
SK6-37EZ	41.200	37.090	-	32.840	35.360	37.008	172	40.667	3	7620	122	34.000	20	38.879	18	65000
SK6-43EZ	46.867	42.992	-	38.750	41.270	42.193	189	46.333	3	7680	139	39.880	24	44.750	20	74900

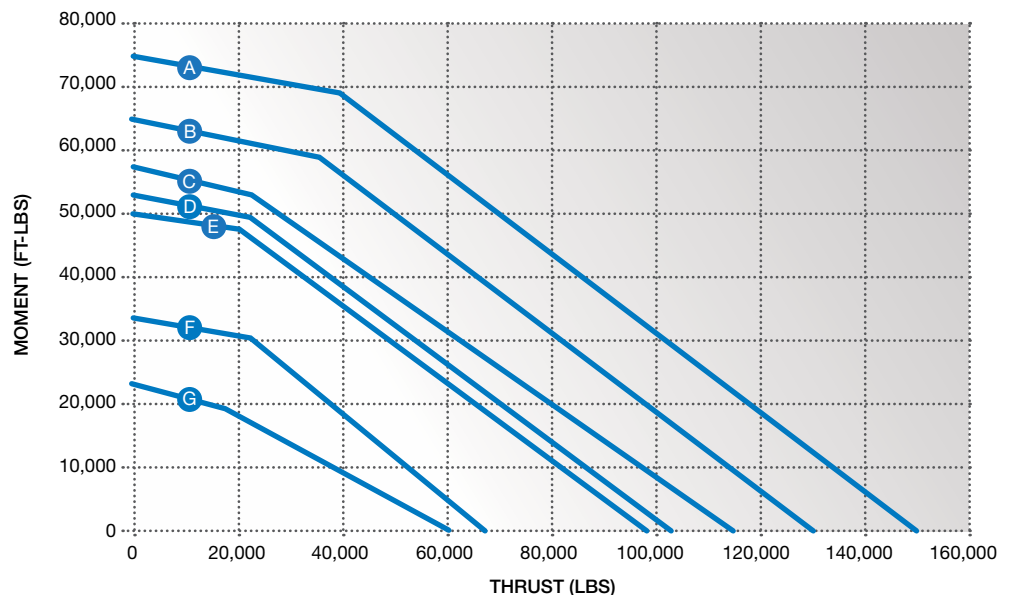
LOAD CURVES

NOTE: The load curves in this section reflect a generic curve for both the STO and STE Series Slewing Ring bearings. The load capacities for the STO Series is actually slightly greater than is shown in the curves in this section. As noted earlier in the

Service Factor section of this catalog, if the actual loading, adjusted with an applicable service factor, falls near or below the appropriate curve, please contact Silverthin™ Engineering for a more precise curve.

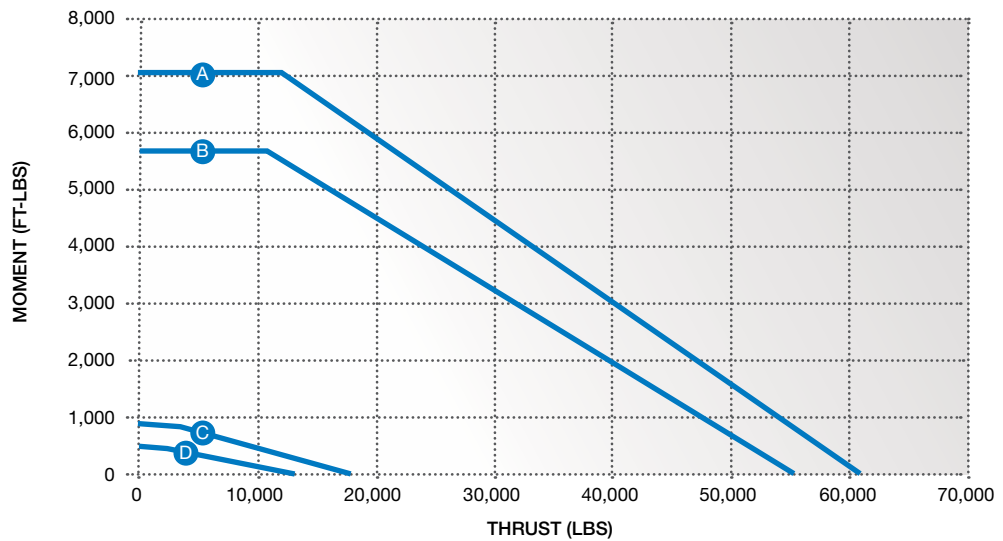
SK6

- A SK6-43
- B SK6-37
- C SK6-33
- D SK6-29
- E SK6-25
- F SK6-22
- G SK6-16

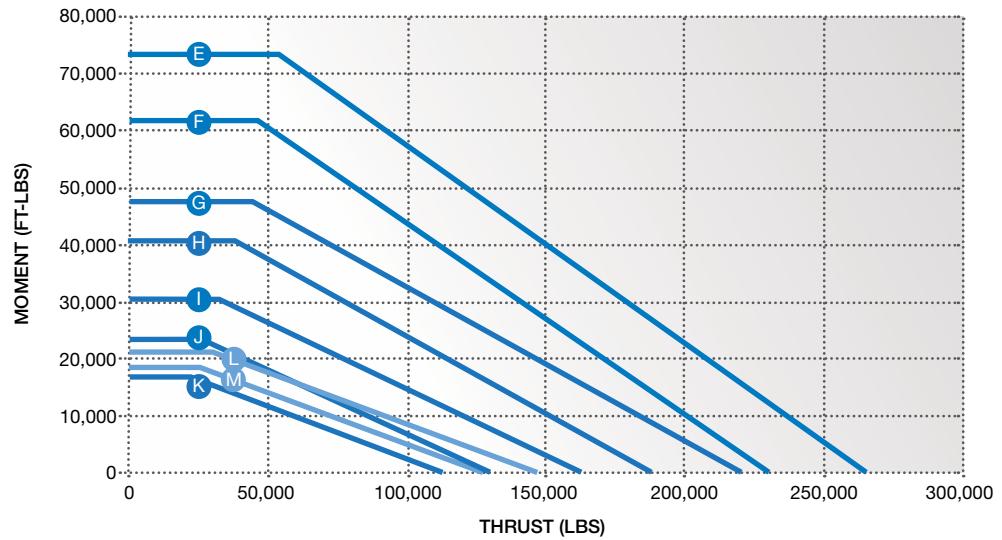


LOAD CURVES (continued)

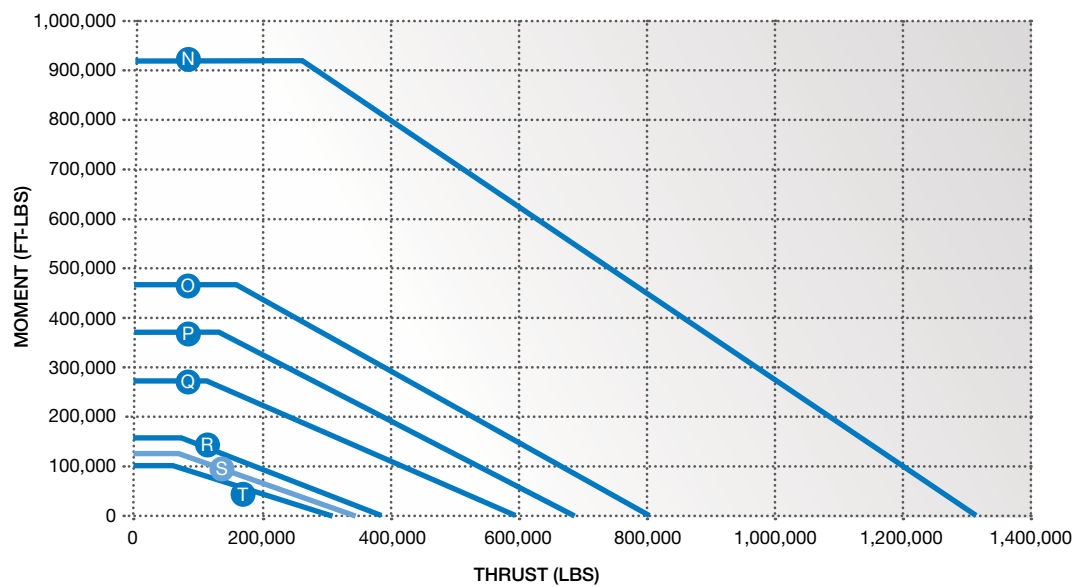
- ST**
- A STO-143
 - B STO-122
 - C STO-065
 - D STO-050



- E STO/STE-324X
- F STO/STE-324T
- G STO/STE-265X
- H STO/STE-265
- I STO/STE-210X
- J STO/STE-210
- K STO/STE-170
- L STO/STE-145X
- M STO/STE-145



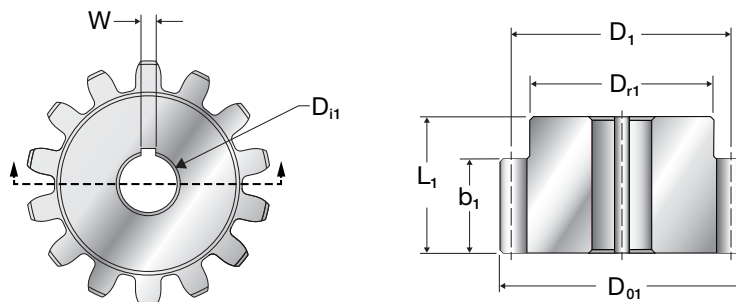
- N STE-870
- O STE-730
- P STE-705
- Q STE-590
- R STE-540
- S STE-470
- T STE-415



Pinions



Silverthin™ is pleased to offer standard, high quality mating pinions from stock for our ST and SK series slewing ring bearings. These pinions are made to AISI 4140 steel and are hardened to have a surface hardness of 55-60 HRC. See below for dimensional data.



Mating Pinions for SK Series Bearings

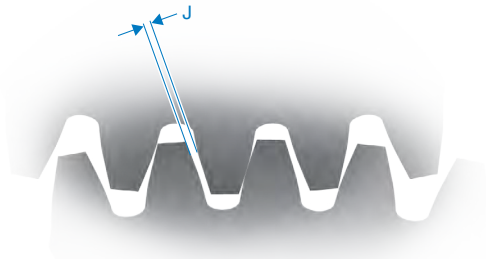
		GEAR DATA (a = 20°)				OUTLINE DIMENSIONS AND WEIGHT						
BEARING P/N	PINION P/N	TOOTH FORM	z1	Pd (in)	b1 (in)	L1 (in)	D1 (in)	Do1 (in)	Dr1 (in)	Di1 (in)	w (in)	G Approx (lbs)
SK6-16 thru	SP1629-14	SD	14	4	2	2.88	3.5	3.9	2.88	1	1/4	6.4
SK6-29	SP1629-17		17	4	2	2.88	4.25	4.65	3.63	1		10
SK6-33 thru	SP3343-14	SD	14	3	2	2.88	4.667	5.2	3.88	1.25	5/16	11.4
SK6-43	SP3343-17		17	3	2	2.88	5.667	6.2	4.88	1.25		18.3
Tolerances				Ref.	+/-0.015	+/-0.015	Ref.	+.000/- .010	Ref.	+0.002/- .000		

Mating Pinions for STE Series Bearings

BEARING P/N	PINION P/N	GEAR DATA (a = 20°)				OUTLINE DIMENSIONS AND WEIGHT						
		TOOTH FORM	z1	Pd (in)	b1 (in)	L1 (in)	D1 (in)	Do1 (in)	Dr1 (in)	Di1 (in)	w (in)	G Approx (lbs)
STE-145 thru	SP145324-14	FS	14	5/7	2.25	2.88	2.8	3.086	2.206	1	1/4	3.9
STE-324	SP145324-17		17	5/7	2.25	2.88	3.4	3.686	2.806	1	1/4	6.6
STE-415 thru	SP415540-14	SD	14	3	2	2.88	3.5	3.9	2.88	1	1/4	6.4
STE-540	SP415540-17		17	3	2	2.88	4.25	4.65	3.63	1		10
STE-590 thru	SP590705-14	SD	14	3	2	2.88	4.667	5.2	3.88	1.25	5/16	11.4
STE-705	SP590705-14		17	3	2	2.88	5.667	6.2	4.88	1.25		18.3
STE-870	SP870-17	SD	17	2.5	4.3	5.825	6.8	7.44	5.51	2.675	5/8	46.2
Tolerances				Ref.	+/-0.015	+/-0.015	Ref.	+.000/- .010	Ref.	+0.002/- .000		

Pinion/Gear Backlash

Backlash, sometimes referred to as play, is the amount of clearance between mating gears. (See Figure Below). For our purposes, the backlash would be between the slewing ring gear and mating pinion. This feature is often controlled by the center distance between the slewing ring and pinion, which can be either fixed or adjustable depending on the demands of the application. See typical backlash ranges table.



Typical Backlash Ranges

Gear Pitch Dia, D2 (in.)	Min Backlash, J (in.)	Maximum Backlash (in.)				
		Diametral Pitch (Pd)				
		1.5	1.75	2	2.5	3, 4, 5
20	0.014	0.029	0.027	0.025	0.023	0.022
30	0.015	0.030	0.028	0.026	0.024	0.023
40	0.016	0.031	0.029	0.027	0.025	0.024
60	0.018	0.033	0.031	0.029	0.027	0.026
80	0.020	0.035	0.033	0.031	0.029	0.028
100	0.022	0.037	0.035	0.033	0.03	0.030
120	0.024	0.039	0.037	0.035	0.033	0.032

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