Product Size and Selection

Alpha
Ball Screw

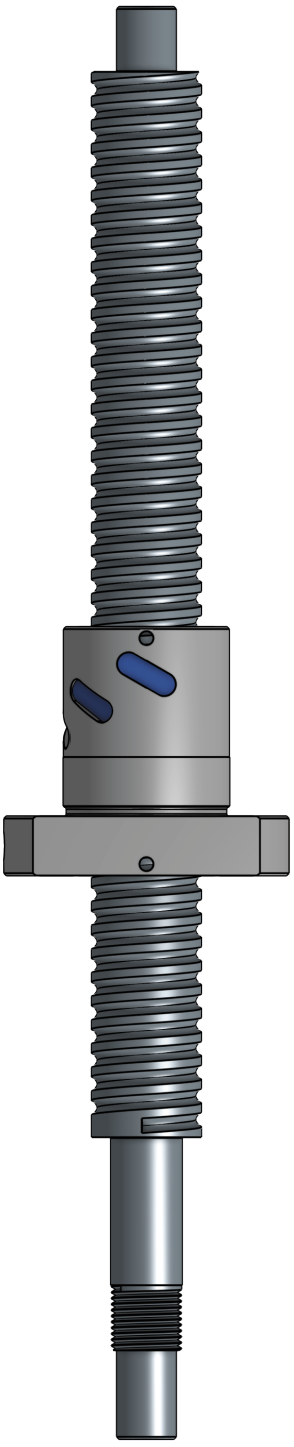
Precision Ground Ball Screws **engineered to last** the most demanding applications.

Driven by Loyalty

Customers have always been the central focus at Alpha; it's why we started in the first place. At Alpha, we care about providing our customers with a total solution, not just a product or service. Our team has over 100 years of combined design, application, and manufacturing engineering experience.

We collaborate with our customers to develop an engineered solution that fits their unique application needs. Our mission is to do the hard work it takes to make our customer's lives easy.

We offer a full range of new precision ground ball screws **engineered to last** the most demanding applications. Let us put our decades of ball screw engineering and manufacturing expertise to work for you.



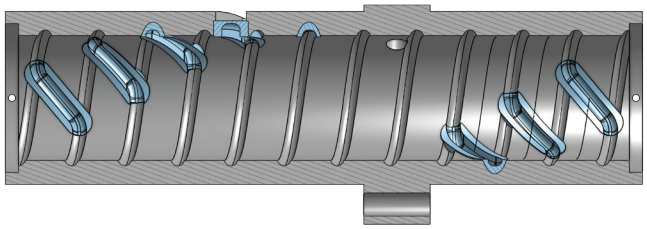
Contents

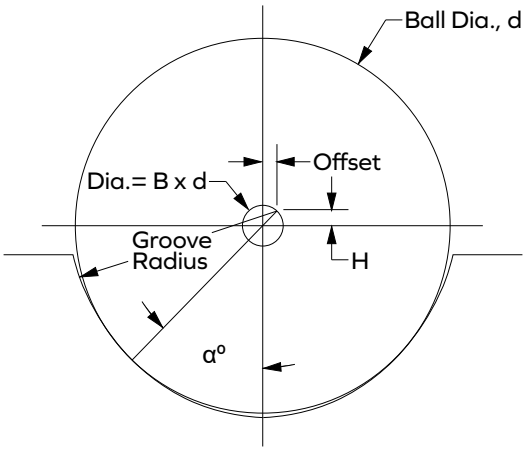
Technology at your Service

Alpha's engineers put our technology to work for you. We are here to collaborate on your application to design the most value add solution for your product.

Hardened Steel Internal Ball Returns

- High speed (150,000 DN)
- Smooth, quiet operation
- Smaller Ball Nut OD than other return designs
- Returns are "captured" and will never dislodge from the Ball Nut



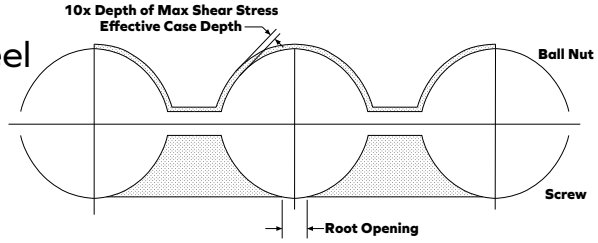


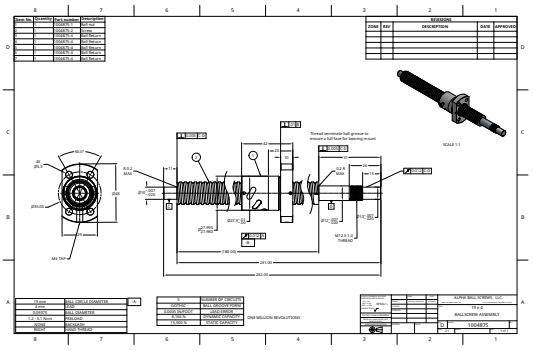
True Gothic Arch Ball Form

- Highest level of stiffness offering improved positional accuracy
- Controlled contact angle and backlash with lower Hertzian contact stresses, providing higher dynamic load capacity

Materials and Heat Treatment

- Ball Screws available in plain carbon or stainless steel
- Ball Nuts carburized to 10x depth of maximum subsurface Hertzian contact stress
- Selectively induction harden screws to control straightness and minimize distortion





Design Engineering Support

- Dynamic and static load capacity analysis
- Detailed Hertzian contact stress analysis
- Life prediction
- Maximum linear or rotational speeds
- Detailed structural and fatigue analysis
- 2D drawings and 3D models

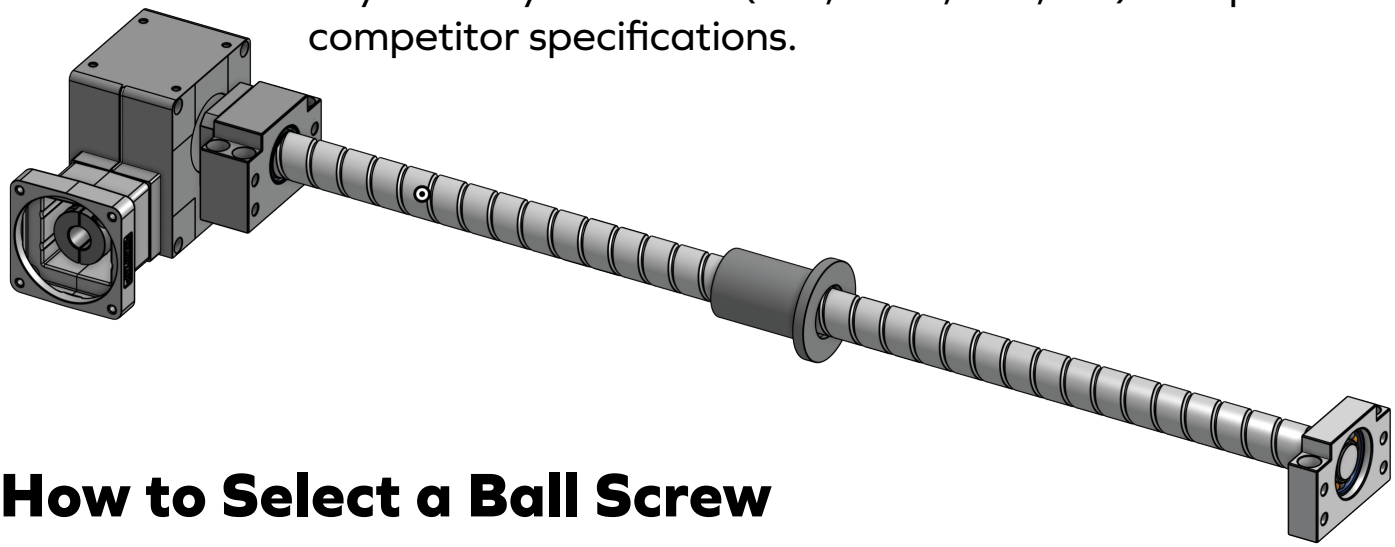
Manufacturing Capability

- Ball Circle Diameters from 0.500 inches to 12.0 inches or 10 mm to 300 mm
- High Helix or Square Lead (50 x 50)
- Lengths up to 40 feet (12 meters)
- Ground thread class to P3 or C1

Specials are our Specialty

At Alpha, we give you the power to customize a ball screw design to fit your unique application needs. Designers can use our engineering data to create a custom solution.

Alternatively, Alpha can produce a ball screw design to any industry-standard (ISO, ANSI, DIN, JIS) or replicate competitor specifications.



How to Select a Ball Screw

The process of sizing a ball screw for an application starts by selecting a size based on dynamic and static load capacity. The following steps detail that process;

1. Size the ball screw diameter, lead, and the active number of circuits based on the dynamic and static capacity required in the application. The capacity calculated for the application, in most cases, will not precisely match the ball screw rated capacity. Choose the nearest value that makes engineering design sense for the application.

2. Calculate the length of the ball nut across the active number of circuits.

3. Choose the type of ball nut mounting and define the length required for the flange and the bolt pattern or thread size.

Alpha Engineering will confirm the ball screw size selected by performing life and other engineering analysis. Please refer to page 11 to configure your part number and contact engineering@alphaballscrew.com.

Step 1 - Select the Basic Size

Using the rating tables (Imperial Ball Screws pages 6-7, Metric Ball Screws pages 8-9), identify the dynamic capacity that closest matches your application need. This dynamic capacity will correspond to a "BCD" and "Number of Circuits" in the table.

For example, if an application requires 35,000 N of dynamic capacity from the metric rating table below, a BCD of 25 mm, Lead of 10 mm (a 25 x 10 ball screw), with a Number of Circuits of 5 and dynamic capacity of 42,666 N is selected. The Screw Root Ø is 18.42 mm and Ball Nut OD is 44 mm.

BCD (mm)	Lead (mm)	Ball Ø (in)	Screw Root Ø (mm)	Ball Nut OD (mm)	Number of Circuits - Operating Load (N) for 1,000,000 Revolutions									Static Load/ Circuit (N)
					1.5	2.5	3	3.5	5	6	7	7.5	10.5	
25	10	0.250	18.42	44	13,749	21,333	27,498	28,492	42,666	54,996	56,984			9,621

It is possible to combine circuits, and their corresponding ratings, to get a shorter ball nut. For the 25 x 10 ball screw, combing 1.5 and 2.5 circuits results in a 4 circuit nut with a dynamic capacity of 13,749 N + 21,333 N = 35,082 N.

Step 2 - Length of the Ball Nut Circuitry

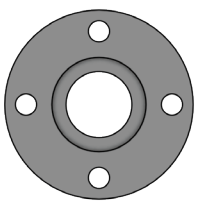
Determine the minimum length of the ball nut (distance across the "Number of Circuits") using the table to the right. From the example above, for the 25 x 10 ball screw with 5 active circuits, the length of the ball nut would be 7.5 x 10 = 75 mm.

**Note: For double start threads, the formula is 3.5 x Lead*

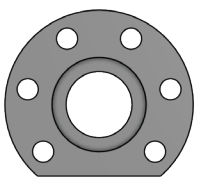
Circuits	Min. Ball Nut Length
1.5	3.5 x Lead
2.5	4.5 x Lead
3	5 x Lead*
3.5	5.5 x Lead
5	7.5 x Lead
6	5 x Lead*
7	9.5 Lead
7.5	10 x Lead
10.5	13.5 x Lead

Step 3 - Ball Nut Mounting Options

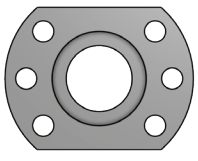
There are four options for ball nut mounting shown below. When requesting a quote or placing an order, this feature is identified in the part number (see page 11 for more information).



Type A



Type B



Type C

Type D

Imperial Series Ball Screws

Imperial Series Ball Screws are available in Ball Circle Diameters (BCD) from 0.500 inches to 12.000 inches. Please contact Alpha Engineering for BCD above 6.000 inches (engineering@alphaballscrew.com).

Imperial Sizes and Leads

Nominal Screw Ø (in)	Nominal Lead (in)												
	0.078	0.100	0.125	0.200	0.250	0.333	0.375	0.400	0.500	0.750	1.000	1.500	2.000
0.500	■	■	■	■	■	■	■	■					
0.625	■	■	■	■	■	■	■	■	■				
0.750		■	■	■	■	■	■	■	■				
0.875			■	■	■	■	■	■	■	■			
1.000			■	■	■	■	■	■	■	■			
1.250				■	■	■	■	■	■	■	■		
1.500				■	■	■	■	■	■	■	■		
1.750					■	■	■	■	■	■	■	■	
2.000					■	■	■	■	■	■	■	■	
2.250					■	■	■	■	■	■	■	■	
2.500						■	■	■	■	■	■	■	■
3.000									■	■	■	■	■
3.500										■	■	■	■
4.000										■	■	■	■
6.000											■	■	■

Imperial Ball Screw Ratings and Dimensions

BCD (in)	Lead (in)	Ball Ø (in)	Screw Root Ø (in)	Ball Nut OD (in)	Number of Circuits - Operating Load (lbs) for 1,000,000 Revolutions									Static Load/ Circuit (lbs)
					1.5	2.5	3	3.5	5	6	7	7.5	10.5	
0.500	0.1000	0.0625	0.435	0.690	225	375	450	525	750					875
	0.1250	0.0625	0.435	0.690	225	375	450	525	750					875
	0.2000	0.125	0.370	0.880	428	713	855	998	1,425					1,110
	0.2500	0.125	0.370	0.880	428	713	855	998	1,425					1,110
	0.5000	0.125	0.370	0.880	428	713	855	998	1,425					1,110
0.625	0.1000	0.0625	0.560	0.815	264	440	528	616	880					1,111
	0.1250	0.0625	0.560	0.815	264	440	528	616	880					1,111
	0.2000	0.09375	0.528	0.910	420	700	840	980	1,400					1,535
	0.2500	0.15625	0.463	1.100	668	1,113	1,335	1,558	2,225					1,650
	0.3333	0.15625	0.463	1.100	668	1,113	1,335	1,558	2,225					1,650
	0.5000	0.15625	0.463	1.100	668	1,113	1,335	1,558	2,225					1,650
0.750	0.1250	0.07813	0.669	0.987	404	673	807	942	1,345	1,614	1,883	2,018	2,825	1,674
	0.2000	0.125	0.620	1.130	687	1,145	1,374	1,603	2,290	2,748	3,206	3,435	4,809	2,414
	0.2500	0.10938	0.637	1.082	599	998	1,197	1,397	1,995					2,200
	0.3333	0.15625	0.588	1.225	816	1,360	1,632	1,904	2,720					2,380
	0.5000	0.1875	0.556	1.319	960	1,603	1,923	2,244	3,205					2,860

Imperial Ball Screw Ratings and Dimensions

BCD (in)	Lead (in)	Ball Ø (in)	Screw Root Ø (in)	Ball Nut OD (in)	Number of Circuits - Operating Load (lbs) for 1,000,000 Revolutions									Static Load/ Circuit (lbs)
					1.5	2.5	3	3.5	5	6	7	7.5	10.5	
0.875	0.1875	0.10938	0.762	1.207	690	1,150	1,380	1,610	2,300					2,679
	0.2000	0.125	0.745	1.255	768	1,280	1,536	1,792	2,560	3,072	3,584			2,850
	0.2500	0.15625	0.713	1.350	1,026	1,710	2,052	2,394	3,420	4,104	4,788	5,130		3,512
	0.5000	0.125	0.745	1.255	677	1,128	1,353	1,579	2,255					2,052
1.000	0.1875	0.10938	0.887	1.332	749	1,248	1,497	1,747	2,495	2,994	3,493	3,743	5,240	3,044
	0.2000	0.125	0.870	1.380	902	1,503	1,803	2,104	3,005	3,606	4,207	4,508	6,311	3,500
	0.2500	0.15625	0.838	1.475	1,178	1,963	2,355	2,748	3,925	4,710	5,495	5,888	8,243	4,228
	0.3333	0.15625	0.838	1.475	1,178	1,963	2,355	2,748	3,925	4,710	5,495			4,228
	0.5000	0.15625	0.838	1.475	1,035	1,725	2,070	2,415	3,450	4,140	4,830			3,044
1.250	0.2000	0.125	1.120	1.630	1,061	1,768	2,121	2,475	3,535	4,242	4,949	5,303	7,424	4,446
	0.2500	0.15625	1.088	1.725	1,409	2,348	2,817	3,287	4,695	5,634	5,573	7,043	9,860	5,469
	0.3333	0.21875	1.023	1.914	2,004	3,340	4,008	4,676	6,680	8,016	9,352			6,911
	0.5000	0.1875	1.056	1.819	2,306	3,843	4,611	5,380	7,685					8,397
	1.0000	0.250	0.991	2.009	2,073	3,455	4,146	4,837	6,910					5,574
1.500	0.2000	0.14063	1.354	1.927	1,407	2,345	2,814	3,288	4,690	5,628	6,566	7,035	9,849	6,031
	0.2500	0.15625	1.338	1.975	1,619	2,698	3,237	3,777	5,395	6,474	7,553	8,093	11,330	6,694
	0.3333	0.250	1.241	2.259	2,753	4,588	5,505	6,423	9,175	11,010	12,845	13,763	19,269	9,655
	0.5000	0.250	1.241	2.259	2,753	4,588	5,505	6,423	9,175	11,010	12,845			9,655
	1.0000	0.34375	1.144	2.544	3,468	5,780	6,936	8,092	11,560	13,872				8,858
1.750	0.2500	0.15625	1.588	2.225	1,818	3,030	3,636	4,242	6,060	7,272	8,484	9,090	12,726	7,923
	0.3333	0.15625	1.588	2.225	1,818	3,030	3,636	4,242	6,060	7,272	8,484	9,090	12,726	7,923
	0.5000	0.3125	1.426	2.699	4,106	6,843	8,211	9,580	13,685	16,422	19,159	20,528	28,739	14,048
	1.0000	0.250	1.491	2.509	2,706	4,510	5,412	6,314	9,020	10,824	12,628	13,530	18,942	8,208
	1.5000	0.250	1.491	2.509	2,706	4,510	5,412	6,314	9,020	10,824	12,628	13,530	18,942	8,208
2.000	0.2500	0.15625	1.838	2.475	2,007	3,345	4,014	4,633	6,690	8,028	9,366	10,035	14,049	9,152
	0.3333	0.250	1.741	2.759	3,606	6,010	7,212	8,414	12,020	14,424	16,828	18,030	25,242	14,000
	0.5000	0.375	1.611	3.139	5,598	9,330	11,196	13,062	18,660	22,392	26,124	27,990	39,189	18,816
	1.0000	0.375	1.611	3.139	5,598	9,330	11,196	13,062						18,816
2.500	0.2500	0.15625	2.338	2.975	2,367	3,945	4,734	5,523	7,890	9,468	11,046	11,835	16,569	11,625
	0.3750	0.28125	2.208	3.354	4,808	8,013	9,615	11,218	16,025	19,230	22,435	24,038	33,653	19,357
	0.5000	0.375	2.111	3.639	6,593	10,988	13,185	15,383	21,975	26,370	30,765	32,963	46,148	24,013
	0.7500	0.375	2.111	3.639	6,593	10,988	13,185	15,383	21,975	26,370	30,765	32,963	46,148	24,013
	1.0000	0.4375	2.046	3.829	8,021	13,368	16,041	18,715	26,735	32,082	37,429			27,645
3.000	0.3333	0.250	2.741	3.759	4,838	8,063	9,675	11,288	16,125	19,350	22,575	24,188	33,863	21,573
	0.5000	0.375	2.611	4.139	8,114	13,523	16,227	18,932	27,045	32,454	37,863	40,568	56,795	31,500
	0.6600	0.500	2.482	4.519	11,010	18,350	22,020	25,690	36,700	44,040	51,380	55,050	77,070	38,619
	0.7500	0.375	2.611	4.139	8,114	13,523	16,227	18,932	27,045	32,454	37,863	40,568	56,795	31,500
	1.0000	0.750	2.222	5.278	17,502	29,170	35,004	40,838	58,340	70,008	81,676	87,510	122,514	52,823
4.000	0.5000	0.375	3.611	5.139	10,010	16,683	20,019	23,356	33,365	40,038	46,711	50,045	70,067	42,892
	0.7500	0.500	3.482	5.519	14,424	24,040	28,848	33,656	48,080	57,696	67,312	72,120	100,968	56,000
	1.0000	0.750	3.222	6.278	22,392	37,320	44,784	52,248	74,640	89,568	104,496	111,960	156,744	75,262
5.000	1.0000	0.625	4.352	6.898	22,538	37,563	45,075	52,598	75,125	90,150	105,175	112,688	157,763	87,500
6.000	1.0000	0.8125	5.157	8.468	35,594	59,323	71,187	83,052	118,645	142,374	166,103	177,968	249,155	134,331
	1.5000	0.8125	5.157	8.468	35,594	59,323	71,187	83,052	118,645	142,374	166,103	177,968	249,155	134,331

Metric Series Ball Screws

Metric Series Ball Screws are available in Ball Circle Diameters (BCD) from 10 mm inches to 300 mm. Please contact Alpha Engineering for BCD above 160 mm (engineering@alphaballscrew.com).

Metric Sizes and Leads

Nominal Screw Ø (mm)	Nominal Lead (mm)													
	2.5	3	4	5	6	8	10	12	16	20	25	32	40	50
10	■	■	■	■										
12	■	■	■	■										
16	■	■	■	■	■									
20			■	■	■	■	■	■	■					
25			■	■	■	■	■	■	■	■				
32			■	■	■	■	■	■	■	■	■			
40				■	■	■	■	■	■	■	■	■		
50				■	■	■	■	■	■	■	■	■	■	
63				■	■	■	■	■	■	■	■	■	■	■
80				■	■	■	■	■	■	■	■	■	■	■
100						■	■	■	■	■	■	■	■	■
125							■	■	■	■	■	■	■	■
160							■	■	■	■	■	■	■	■
200								■	■	■	■	■	■	■

Metric Ball Screw Ratings and Dimensions

BCD (mm)	Lead (mm)	Ball Ø (in)	Screw Root Ø (mm)	Ball Nut OD (mm)	Number of Circuits - Operating Load (N) for 1,000,000 Revolutions									Static Load/ Circuit (N)
					1.5	2.5	3	3.5	5	6	7	7.5	10.5	
10	2.5	0.0625	8.35	15	1,066	1,654	2,132	2,205	3,308					700
	3	0.07813	7.94	16	1,527	2,369	3,054	3,164	4,738					925
	4	0.09375	7.53	17	1,819	2,823	3,638	3,770	5,646					1,015
12	2.5	0.0625	10.35	17	1,164	1,806	2,328	2,414	3,612					866
	3	0.07813	9.94	18	1,687	2,617	3,374	3,495	5,234					1,149
	4	0.09375	9.53	19	2,033	3,154	4,066	4,213	6,308					1,265
	5	0.125	8.71	22	3,118	4,839	6,236	6,462	9,678					1,776
16	2.5	0.0625	14.35	21	1,323	2,053	2,646	2,744	4,106					1,201
	3	0.07813	13.94	22	1,939	3,008	3,878	4,018	6,016					1,603
	4	0.09375	13.53	23	2,367	3,673	4,734	4,906	7,346	9,468	9,812			1,776
	5	0.125	12.71	26	3,742	5,807	7,484	7,755	11,614	14,968	15,510			2,518
	6	0.15625	11.88	28	5,094	7,905	10,188	10,557	15,810	20,376	21,114			3,174
20	4	0.09375	17.53	27	2,628	4,078	5,256	5,447	8,156	10,512	10,894			1,855
	5	0.125	16.71	30	4,220	6,549	8,440	8,746	13,098	16,880	17,492			3,279
	6	0.15625	15.88	32	5,850	9,077	11,700	12,123	18,154	23,400	24,246			4,158
	10	0.250	13.42	39	11,647	18,072	23,294	24,136	36,144	46,588	48,272			7,294

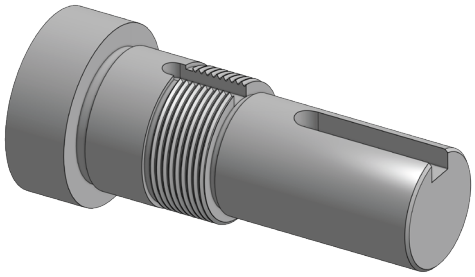
Metric Ball Screw Ratings and Dimensions

BCD (mm)	Lead (mm)	Ball Ø (in)	Screw Root Ø (mm)	Ball Nut OD (mm)	Number of Circuits - Operating Load (N) for 1,000,000 Revolutions									Static Load/ Circuit (N)
					1.5	2.5	3	3.5	5	6	7	7.5	10.5	
25	4	0.09375	22.53	32	2,896	4,493	5,792	6,001	8,986	11,584				2,043
	5	0.125	21.71	35	4,700	7,293	9,400	9,740	14,586	18,800	19,480			4,247
	6	0.15625	20.88	37	6,598	10,238	13,196	13,674	20,476	26,392	27,348			5,415
	10	0.250	18.42	44	13,749	21,333	27,498	28,492	42,666	54,996	56,984			9,621
32	4	0.09375	29.53	39	3,204	4,971	6,408	6,640	9,942					3,885
	5	0.125	28.71	42	5,241	8,132	10,482	10,861	16,264	20,964	21,722			5,620
	6	0.15625	27.88	44	7,428	11,526	14,856	15,934	23,052	29,712	31,868			7,206
	8	0.1875	27.06	46	9,978	15,482	19,956	20,678	30,964	39,912	41,356	46,138		8,967
	10	0.250	25.42	51	16,040	24,889	32,080	33,241	49,778	64,160	66,482	74,170	99,723	12,976
40	5	0.125	36.71	50	5,749	8,920	11,498	11,914	17,840	22,996				7,203
	6	0.15625	35.88	52	8,195	12,715	16,390	16,982	25,430	32,780				9,280
	8	0.1875	35.06	54	11,079	17,190	22,158	22,959	34,380	44,316	45,918			11,595
	10	0.250	33.42	59	18,090	28,069	36,180	37,489	56,138	72,360	74,978	83,648	112,467	16,899
	12	0.3125	31.77	64	25,314	39,277	50,628	52,458	78,554	101,256	104,916	117,049	157,374	21,677
	20	0.375	30.12	69	32,017	49,679	64,034	66,350	99,358	128,068	132,700	148,046	199,050	25,480
50	8	0.1875	45.06	64	12,205	18,938	24,410	25,294	37,876					14,919
	10	0.250	43.42	69	20,145	31,258	40,290	41,747	62,516	80,580	83,494			21,886
	12	0.3125	41.77	74	28,551	44,301	57,102	49,167	88,602	114,204	98,334	122,019	147,501	28,231
	20	0.3750	40.12	79	36,576	56,753	73,152	75,798	113,506	146,304	151,596	169,127	227,394	33,344
	25	0.4375	38.48	84	44,850	69,592	89,700	92,945	139,184	179,400	185,890	207,387	278,835	38,423
	32	0.4375	38.48	84	45,085	69,955	90,170	93,431	139,910	180,340	186,862	208,471	280,293	38,423
63	8	0.1875	58.06	77	13,420	30,822	26,840	27,810	61,644					19,276
	10	0.250	56.42	82	22,314	34,624	44,628	46,243	69,248	89,256	92,486			28,452
	12	0.3125	54.77	87	31,913	49,517	63,826	66,134	99,034	127,652	132,268	147,564		36,897
	20	0.375	53.12	92	41,268	64,033	82,536	85,821	128,066	165,072	171,642	191,122	257,463	43,785
	25	0.4375	51.48	97	51,145	79,359	102,290	105,990	158,718	204,580	211,980	236,494	317,970	50,664
	32	0.4375	51.48	97	51,315	79,623	102,630	106,343	159,246	205,260	212,686	237,281	319,029	50,664
80	10	0.250	73.42	99	24,641	38,235	49,282	51,065	76,470					37,122
	12	0.3125	71.77	104	35,459	55,019	70,918	73,483	110,038	141,836	146,966			48,379
	16	0.3750	70.12	109	46,121	71,563	92,242	95,578	143,126	184,484	191,156	213,262	286,734	57,666
	20	0.4375	68.48	114	57,571	89,330	115,142	119,307	178,660	230,284	238,614	266,208	357,921	66,994
	25	0.5	66.83	119	69,845	108,374	139,690	144,742	216,748	279,380	289,484	322,961	434,226	76,558
	32	0.5	66.83	119	69,990	108,600	139,980	145,043	217,200	279,960	290,086	323,633	435,129	76,558
	40	0.5	66.83	119	70,199	108,923	140,398	145,476	217,846	280,796	290,952	324,598	436,428	76,558
	50	0.5	66.83	119	70,523	109,426	141,046	147,147	218,852	282,092	294,294	327,096	441,441	76,558
100	12	0.3125	91.77	124	38,895	60,351	77,790	80,604	120,702					62,013
	16	0.3750	90.12	129	50,811	78,840	101,622	105,298	157,680	203,244				74,194
	20	0.4375	88.48	134	63,741	98,903	127,482	132,092	197,806	254,964	264,184	294,736	396,276	86,490
	25	0.5	86.83	139	77,747	120,634	155,494	161,117	241,268	310,988	322,234	359,498	483,351	99,149
	50	0.5	86.83	139	78,233	121,389	156,466	162,125	242,778	312,932	324,250	361,747	486,375	99,149
125	25	0.5	111.83	164	85,803	133,135	171,606	177,812	266,270	343,212	355,624	396,750		127,744
	50	0.625	108.54	173	112,355	174,334	224,710	232,837	348,668	449,420	465,674	519,526	698,511	148,138
160	25	0.5	146.83	199	95,056	147,492	190,112	196,987	294,984	380,224	393,974	439,535		168,169
	50	0.625	143.54	208	125,098	194,106	250,196	259,245	388,212	500,392	518,490	578,449	777,735	196,018

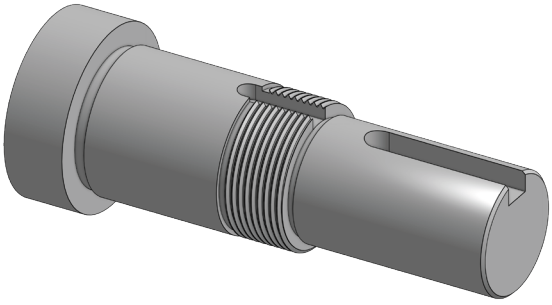
What's your End Game?

The most common end designs we have captured below. If you don't see what you are looking for, let us know and we will create it for you.

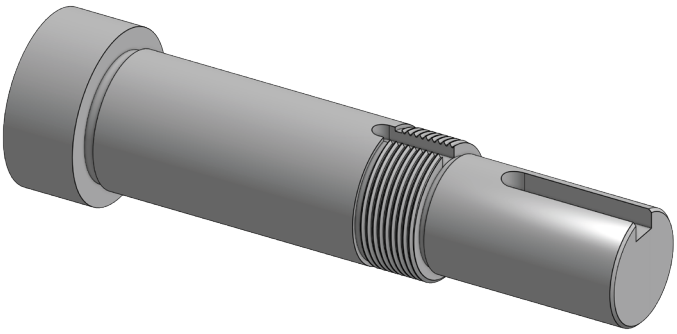
Type 1 Simple Support
Single bearing simple support design.



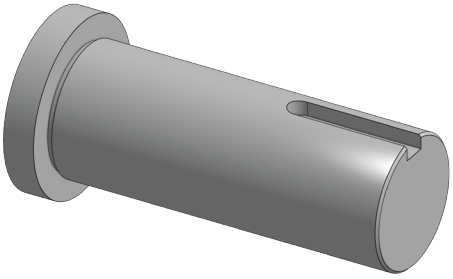
Type 2 Simple Support
Double bearing simple support end design.



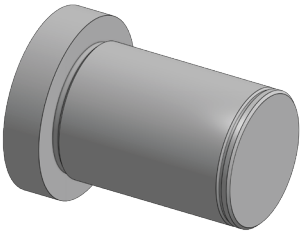
Type 3 Fixed Support
Fixed support end design.



Type 4 Pillow Block
Pillow block bearing end design.

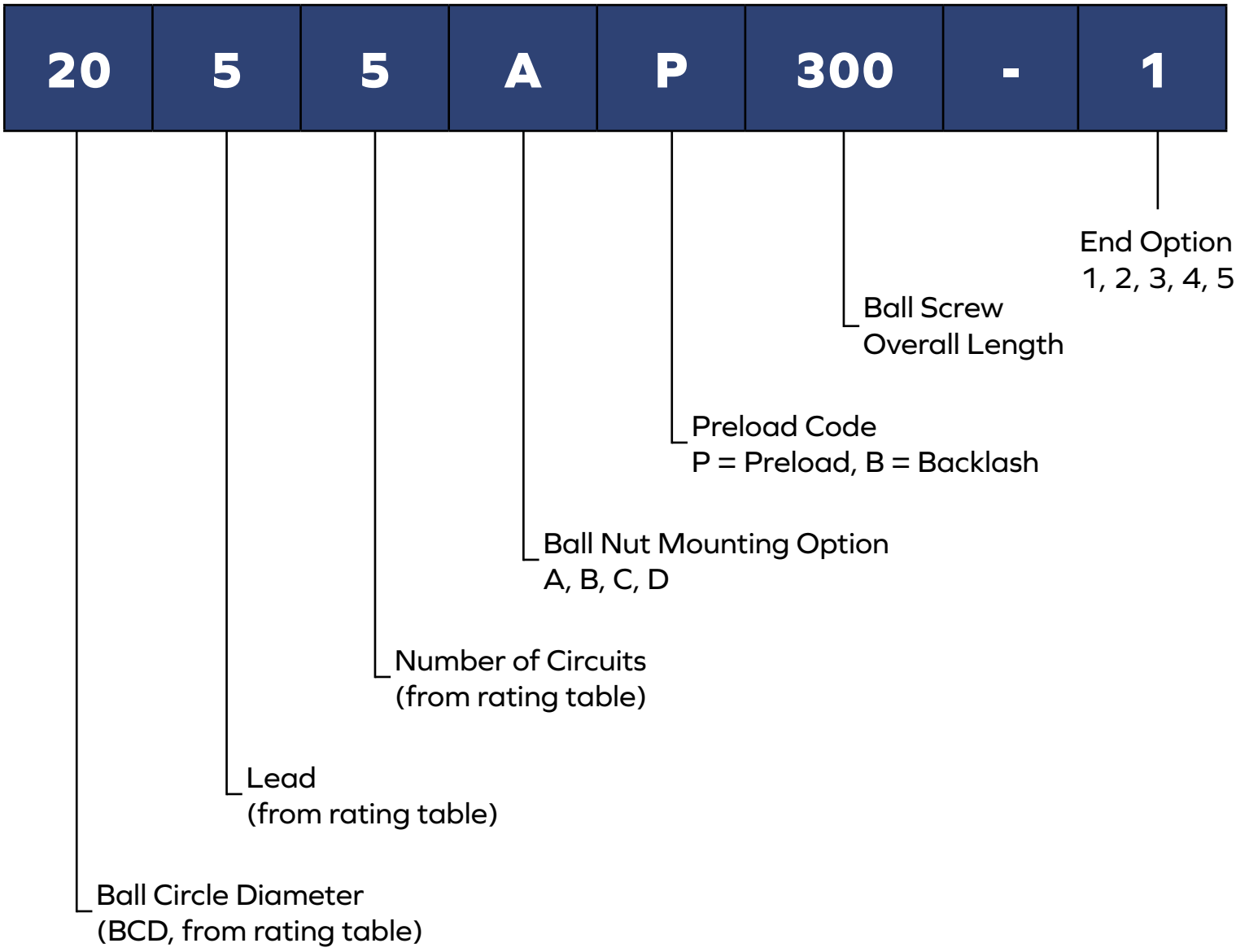


Type 5 Simple Bearing
Simple bearing end design.



How to Order

Configure a part number with the ball screw dimensional data, ball nut mounting type, and end machining option. Provide this part number to Alpha with your application details so that we can complete further engineering analysis, create 2D drawings, 3D models, and provide price and availability (engineering@alphaballscrew.com).



We can customize the ball nut mounting features of bolt circle diameter, bolt hole size, flange thickness, and flange diameter to meet your needs. If you do not have a specification, we will provide a design recommendation.

Alpha
Ball Screw

Engineered to Last

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Freeland, Michigan 48623
alphaballscrew.com