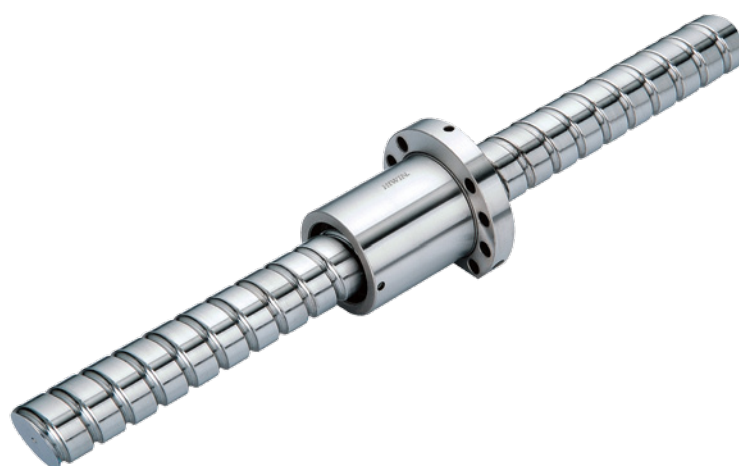




ROLLED Ballscrews

Technical Information



TAIWAN EXCELLENCE
GOLD AWARD 2005

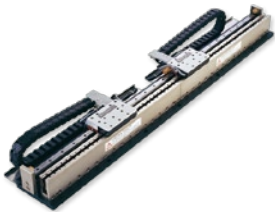
Ballscrew

- For Heavy-Load Drive



TAIWAN EXCELLENCE
2004

Positioning Guideway



TAIWAN EXCELLENCE
GOLD AWARD 2004

Linear Synchronous Motor

- Coreless Type (LMC)
- Iron-core Type (LMS)



TAIWAN EXCELLENCE
2002

Linear Actuator

- LAN for Hospital
- LAM for Industrial
- LAS Compact Size
- LAK Controller



TAIWAN EXCELLENCE
GOLD AWARD 2010, 2003

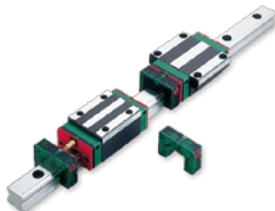
Industrial Robot

- For Semiconductor & Electronic (KK Robot)
- For Automation (KS, KA Robot)



TAIWAN EXCELLENCE
SILVER AWARD 2009

Linear Motor Air Bearing Platform



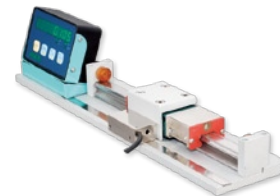
TAIWAN EXCELLENCE
GOLD AWARD 2008



TAIWAN EXCELLENCE
SILVER AWARD 2007, 2002

Linear Guideway

- HG/EG/RG/MG Type
- Self-Lubricating (E2)
- Low Noise (Q1)
- Air Jet (A1)



Positioning Measurement System



TAIWAN EXCELLENCE
GOLD AWARD 2011, 2009, 2008



TAIWAN EXCELLENCE
SILVER AWARD 2006, 2001, 1993

Ballscrews

- Ground/Rolled
- High Speed (High Dm-N Value/Super S Series)
- Heavy Load (Cool type II)
- Self-Lubricating (E2)
- Rotating Nut (R1)



Linear Motor X-Y Robot



TAIWAN EXCELLENCE
SILVER AWARD 2006

TMS Torque Motor Rotary Table



Linear Motor Gantry

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1. HIWIN Rolled Ballscrews

1.1 Rolled Ballscrews Introduction

HIWIN Rolled Ballscrews are made by the rolling process of the screw spindle instead of the grinding process. Rolled ballscrews not only have the benefit of low friction and smooth running for the linear feed system compared with traditional screws, but also can be supplied by quick stock delivery and lower production price.

HIWIN uses the most advanced technology in the ballscrew rolling process. By maintaining the homogeneous manufacturing procedure of selecting materials, rolling, heat treating, machining and assembling.

In general, rolled ballscrews use the same preload method as the precision ground ballscrews, except that there are some differences in the lead error definition and the geometric tolerance. The grade of the rolled ballscrews can be ordered according to the same nut dimension of the precision ground ballscrew. If the ends of the spindle are unmachined, the geometric tolerance does not apply. The production scale of each type of the ballscrews and the accuracy classification are described in the following sections (the unit of length used is in mm).

1.2 Classification of Standard Ballscrews

HIWIN ball nuts are classified into four types by ball circulation method : external recirculation type, internal recirculation type, endcap recirculation type, and Super S. The features of these types are specified below.

1.2.1 Nut Configuration

(1) External recirculation type

The first, called the external recirculation type ballscrew, consists of the screw shaft, the ball nut, the steel balls, the return tubes and the fixing plate. The steel balls are introduced into the space between the screw shaft and the ball nut. The balls are diverted from the ball tracks and carried back by the ball guide return tube form a loop. Since the return tubes are located outside the nut body, this type is called the external recirculation type ball screw Fig. 1.1.

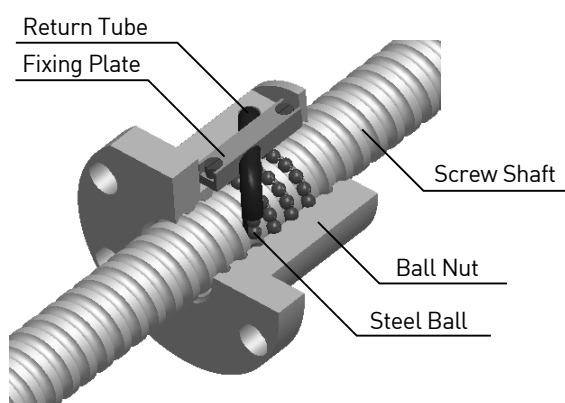


Fig. 1.1 External recirculation type nut with return tubes

(2) Internal recirculation type

The second design, called the internal recirculation type ballscrew, consists of the screw spindle, the ball nut, the steel balls and the ball return caps. The steel balls make only one revolution around the screw spindle. The circuit is closed by a ball return cap in the nut allowing the balls to cross over adjacent ball tracks. Since the ball return caps are located inside the nut body, this is called the internal recirculation type ballscrew Fig. 1.2.

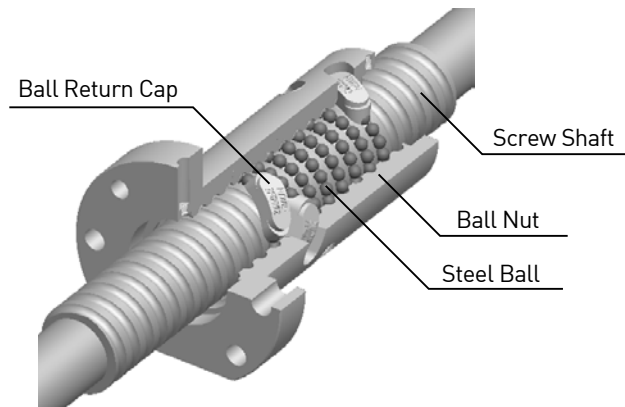


Fig. 1.2 Internal recirculation type nut with return caps

(3) Endcap recirculation type

The third design is called endcap recirculation type ball screw Fig. 1.3. The basic design of this return system is the same as the external recirculation type nut Fig. 1.5 except that the return tube is made inside the nut body as a through hole. The balls in this design traverse the whole circuit of the ball tracks within the nut length. Therefore, a short nut with the same load capacity as the conventional design can be used.

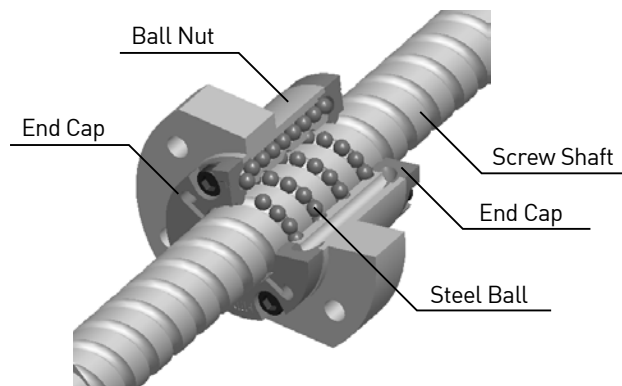


Fig. 1.3 Endcap recirculation type nut with return system

(4) Super S

The forth design is called Super S recirculation type ballscrew which consists of screw shaft, the ball nut, the steel balls and the end deflector (Fig.1.4). The basic design of this return system is the same as the endcap recirculation type. Instead of using endcap, end deflector is used in the recirculation. The balls in this design traverse the whole circuit of the ball tracks by passing through the end deflector within the nut length.

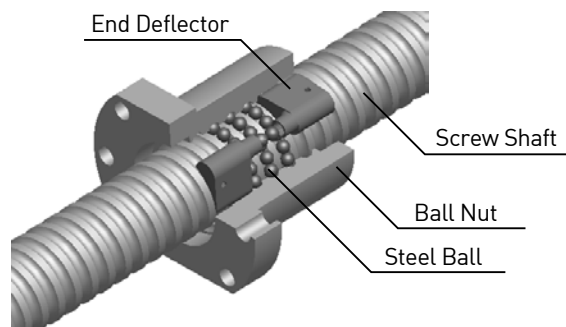


Fig. 1.4 End deflector recirculation type nut with return system

1.2.2 Number of circuits

The HIWIN nomenclature for the number of circuits in the ball nut is described as follows :

For the external type design: For the internal type design: For end cap type design: For Super S Series:

A : 1.5 turns per circuit
B : 2.5 turns per circuit
C : 3.5 turns per circuit
D : 4.5 turns per circuit
E : 5.5 turns per circuit

T : 1.0 turn per circuit

U : 2.8 turns per circuit
S : 1.8 turns per circuit
V : 0.8 turns per circuit

K : 1 turn per circuit

Example :

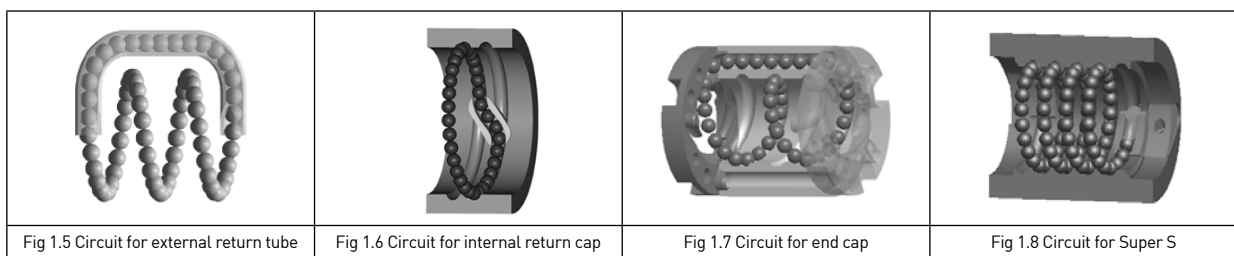
B2 : designates 2 external return tube ball circuits. Each circuit has 2.5 turns.

T3 : designates 3 internal return ball circuits. Each circuit has a maximum of 1 turn.

S4 : designates 4 internal return ball circuits. Each circuit has 1.8 turns.

K5 : designates 5 internal return ball circuits. Each circuit has 1 turn.

Those shapes are shown in Fig. 1.5, Fig. 1.6, Fig. 1.7 and Fig. 1.8



1.3 Precision Rolled Ballscrews

Table 1.1 gives the lead accuracy of the precision rolled ballscrews. The lead accuracy is measured by the accumulated lead error of any portion of 300 mm in length. The maximum axial plays of the precision rolled ballscrews are shown in Table 1.2. These ballscrews can be preloaded as the precision ground ones. The categories of the precision rolled ballscrews are listed in Table 1.3.

Table 1.1 Accuracy grade of precision rolled ballscrew

Unit : 0.001 mm

Accuracy grade	C6	C7	C8	C10
v_{300}	23	50	100	210
ep	$ep = \frac{\text{length measured}}{300} \times v_{300}$			

Accuracy grade v_{300} length measured	C6	C7	C8	C10
0 ~ 100	18	44	84	178
101 ~ 200	20	48	92	194
201 ~ 315	23	50	100	210

Measuring length unit : mm

Table 1.2 Maximum axial play of precision rolled ballscrew

Unit : mm

Ball diameter	≤ 2	2.381 3.175	3.969	4.763	6.350	7.144	7.938	9.525
Axial play	0.06	0.07	0.10	0.12	0.15	0.16	0.17	0.18

Table 1.3 Category of HIWIN precision rolled ballscrew

Unit : mm

Nominal diameter do (mm)	Lead																						Max.screw Length
	1	1.25	2	2.5	3	4	5	5.08	6	8	10	12	16	20	25	30	32	36	40	50	63		
6	●	●																				800	
8	●		●	■	●		●															800	
10			●	■	●	●	●		●		●											1500	
12			●	■	●	■	●	●		●	●	●										1500	
14					●	●	●				●											3000	
15											●			●								3000	
16	●		■	■		●	■	●	●	●	■	●	●				●					3000	
18										●												3000	
20				■		●	■	■	●	●	●			■					●			3000	
22							●				●											3000	
25				●		●	■	■	●	●	■				●							4500	
28							●		●													4500	
32						■	■	■	●	●	■			●			●		●			4500	
36							●		●	●	●	●		●				●				4500	
38											■		●	●					●			4500	
40							■		●	●	■	●	●	●	●				●			5600	
45											●	●		●								5600	
48											●			●								5600	
50							●		●		■	●	●	●		●			●	●		5600	
55									●		●											5600	
63											■	●	●	■					●		●	5600	
80											●		●	●		●						6500	

■ : Right turn and left turn

● : Right turn only. Please contact Hiwin for special request

Note: The maximum length for ballscrew is based on grade C7. For rolled ballscrew, the maximum length varies according to lead accuracy grade.

2. Specification Illustration

HIWIN manufactures ballscrews according to customers' blueprints or specifications. Please read the following information for understanding out ballscrew designing.

- | | |
|---------------------------------|--|
| 1. Nominal diameter. | 6. Accuracy grade (lead deviation, geometrical tolerance). |
| 2. Thread lead. | 7. Working speed. |
| 3. Thread length, total length. | 8. Maximum static load, working load, preload drag torque. |
| 4. End journal configuration. | 9. Nut safety requirements. |
| 5. Nut configuration | 10. Lubrication hole position. |

HIWIN Ballscrew Nomenclature

HIWIN ballscrews can be specified as follows :

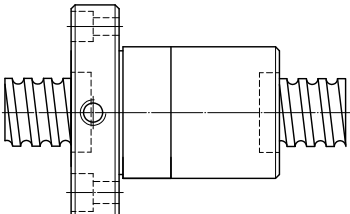
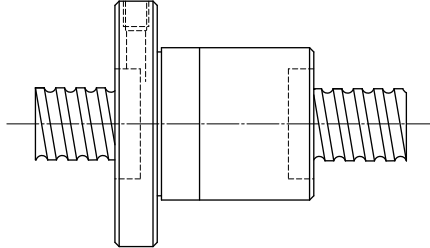
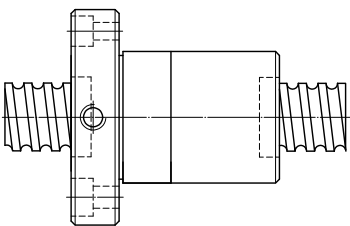
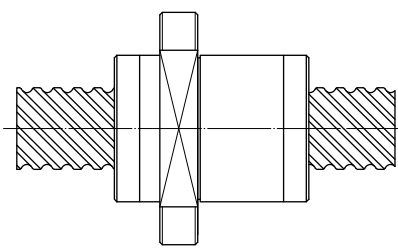
1R40 - 10B2 - PFDWE2 - 800 - 1000 - 0.023 - M

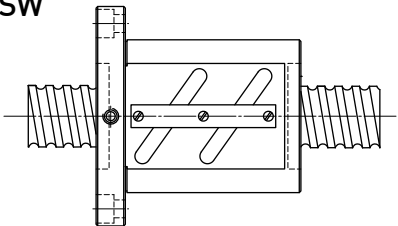
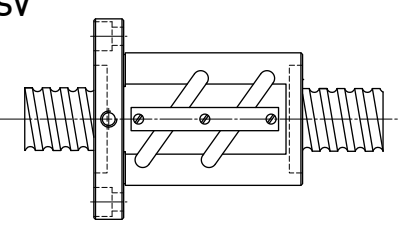
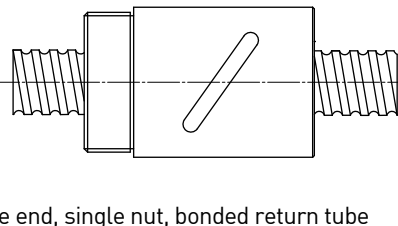
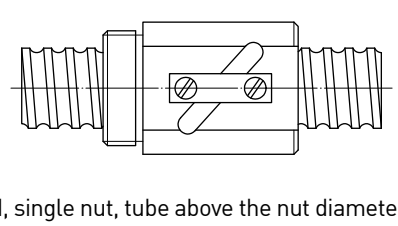
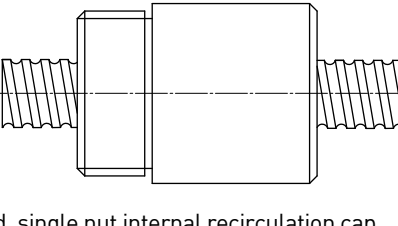
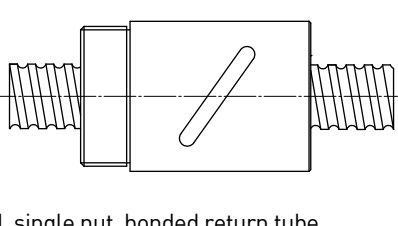
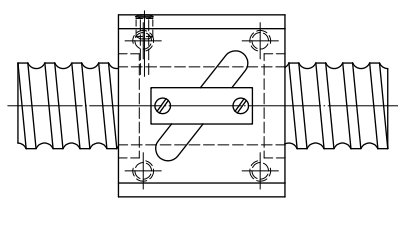


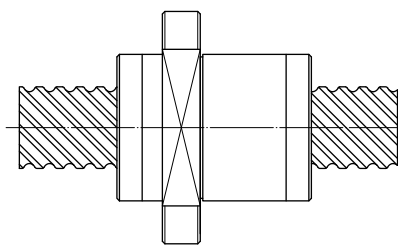
- Note :
1. Different diameters and leads are available upon request.
 2. Right hand thread is standard, left hand thread is available upon request.
 3. Longer lengths are available upon request.
 4. Stainless steel is available upon request, only if the ball size is less than 2.381 mm.
 5. Complete questionnaire on page 24~25 and consult with HIWIN engineers.
 6. If you need to order DIN 69051 type, please mark "DIN".

3.

General Type of Rolled Ballscrews

page	DIN Type		page
8	★ FSI  Flange end, single nut, internal recirculation cap	★ FSC  Flange end, single nut, end deflector	9
page	Stock Type		page
10	★ FSI  Flange end, single nut, internal recirculation cap	FSH  High lead, flange mounted, single nut, end cap	11

page	General Type		page
12	★ FSW  Flange end, single nut, tube within the nut diameter	★ FSV  Flange end, single nut, tube above the nut diameter	13
14	★ FSB  Flange end, single nut, bonded return tube	RSV  Round, single nut, tube above the nut diameter	15
16	RSI  Round, single nut, internal recirculation cap	RSB  Round, single nut, bonded return tube	17
18	SSV  Square, single nut, tube above the nut diameter		

page	High Lead Type	page
19	FSH  High lead, flange mounted, single nut, end cap	19

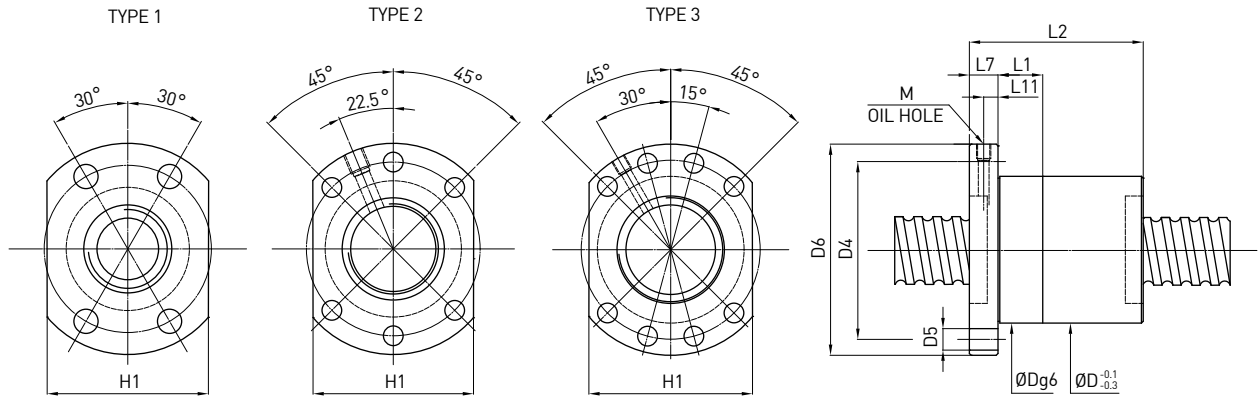
*Different design requires approved drawing, please contact with HIWIN engineers for the other type listed above.

*Single asterisks(★): Self-Lubricating Ballscrew E1 design is available, except the shaft diameter under 16mm or ball diameter under 2.381mm.

3.1 Dimensions for DIN Rolled Ballscrews

F S I TYPE

(DIN 69051 part 5 form B)

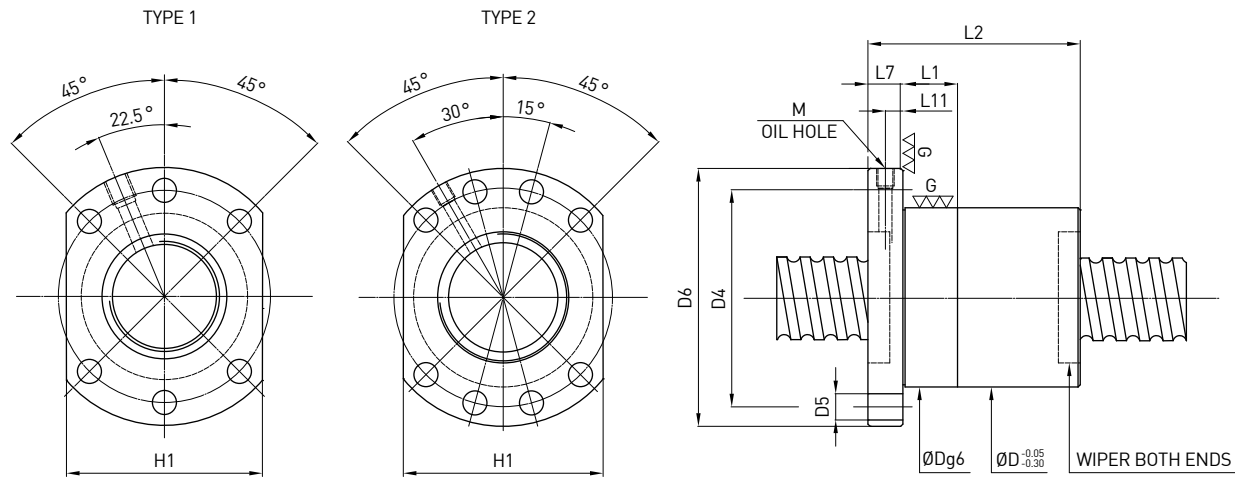


Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut			Flange								
	Nominal Dia.	Lead					L1	L2	D	D4	D5	D6	H1	L7	TYPE	L11	M-Oil Hole	
6-1T3	6	1	0.800	3	110	220	-	15	12	18	3.4	24	16	6	1	-	-	
6-1.25T3	6	1.25	0.800	3	100	210		15	12	18	3.4	24	16	6	1			
8-1T3	8	1	0.800	3	120	270	-	16	16	22	3.4	28	19	6	1	-	-	
8-2T3	8	2	1.500	3	260	440	-	26	16	22	3.4	28	19	6	1	-	-	
8-2.5T3	8	2.5	1.500	3	260	440	-	28	16	22	3.4	28	19	6	1	-	-	
10-2T3	10	2	1.500	3	300	590	-	28	19	28	4.5	36	23	5	1	-	-	
10-2.5T3	10	2.5	2.000	3	430	790	-	32	19	28	4.5	36	23	5	1	-	-	
12-2T3	12	2	1.500	3	340	780	-	28	24	32	4.5	37	24	5	1	-	-	
12-2.5T3	12	2.5	2.000	3	480	990	-	32	24	32	4.5	40	25	5	1	-	-	
16-5T3	16	5	3.175	3	1000	2000	10	40	28	38	5.5	48	40	10	2	5	M6×1P	
20-5T3	20	5	3.175	3	1160	2660	10	44	36	47	6.6	58	44	10	2	5	M6×1P	
20-5T4	20	5	3.175	4	1490	3550	10	52	36	47	6.6	58	44	10	2	5	M6×1P	
25-5T3	20	5	3.175	3	1320	3490	10	44	40	51	6.6	62	48	10	2	5	M6×1P	
25-5T4	25	5	3.175	4	1690	4660	12	52	40	51	6.6	62	48	10	2	5	M6×1P	
25-10T3	25	10	4.763	3	2160	4860	16	65	40	51	6.6	62	48	12	2	5	M6×1P	
32-5T3	32	5	3.175	3	1500	4460	10	46	50	65	9	80	62	10	2	6	M6×1P	
32-5T4	32	5	3.175	4	1920	6210	10	53	50	65	9	80	62	10	2	6	M6×1P	
32-5T6	32	5	3.175	6	2730	9320	10	66	50	65	9	80	62	10	2	6	M6×1P	
32-10T3	32	10	6.350	3	3650	8660	16	74	50	65	9	80	62	16	2	6	M6×1P	
32-10T4	32	10	6.350	4	4680	11550	16	85	50	65	9	80	62	16	2	6	M6×1P	
40-5T4	40	5	3.175	4	2110	7770	10	53	63	78	9	93	70	10	3	7	M8×1P	
40-5T6	40	5	3.175	6	2990	11650	10	66	63	78	9	93	70	10	3	7	M8×1P	
40-10T3	40	10	6.350	3	4030	10680	16	74	63	78	9	93	70	16	3	7	M8×1P	
40-10T4	40	10	6.350	4	5170	14240	16	87	63	78	9	93	70	16	3	7	M8×1P	
40-12T3	40	12	7.144	3	4670	11830	16	79	63	78	9	93	70	16	3	7	M8×1P	
50-5T4	50	5	3.175	4	2330	9990	10	57	75	93	11	110	85	10	3	8	M8×1P	
50-5T6	50	5	3.175	6	3310	14980	10	70	75	93	11	110	85	10	3	8	M8×1P	
50-10T3	50	10	6.350	3	4590	14000	16	78	75	93	11	110	85	16	3	8	M8×1P	
50-10T4	50	10	6.350	4	5880	18660	16	89	75	93	11	110	85	16	3	8	M8×1P	
50-10T6	50	10	6.350	6	8330	28000	16	112	75	93	11	110	85	16	3	8	M8×1P	
50-12T4	50	12	7.938	4	7990	23610	16	103	75	90	11	110	85	16	3	8	M8×1P	
63-10T4	63	10	6.350	4	6560	23990	16	91	90	108	11	125	95	18	3	9	M8×1P	
63-10T6	63	10	6.350	6	9300	35980	16	114	90	108	11	125	95	18	3	9	M8×1P	
63-20T4	63	20	9.525	4	11400	35870	25	150	95	115	13.5	135	100	20	3	10	M8×1P	
80-10T4	80	10	6.350	4	7450	31960	12	91	105	125	13.5	145	110	20	3	10	M8×1P	
80-10T6	80	10	6.350	6	10560	47940	12	114	105	125	13.5	145	110	20	3	10	M8×1P	
80-20T4	80	20	9.525	4	12730	45890	25	160	125	145	13.5	165	130	25	3	12.5	M8×1P	
80-20T6	80	20	9.525	6	18040	68840	25	224	125	145	13.5	165	130	25	3	12.5	M8×1P	

* The calculation for dynamic load and static load is based on DIN69051.

F S C TYPE

(DIN 69051 part 5 form B)

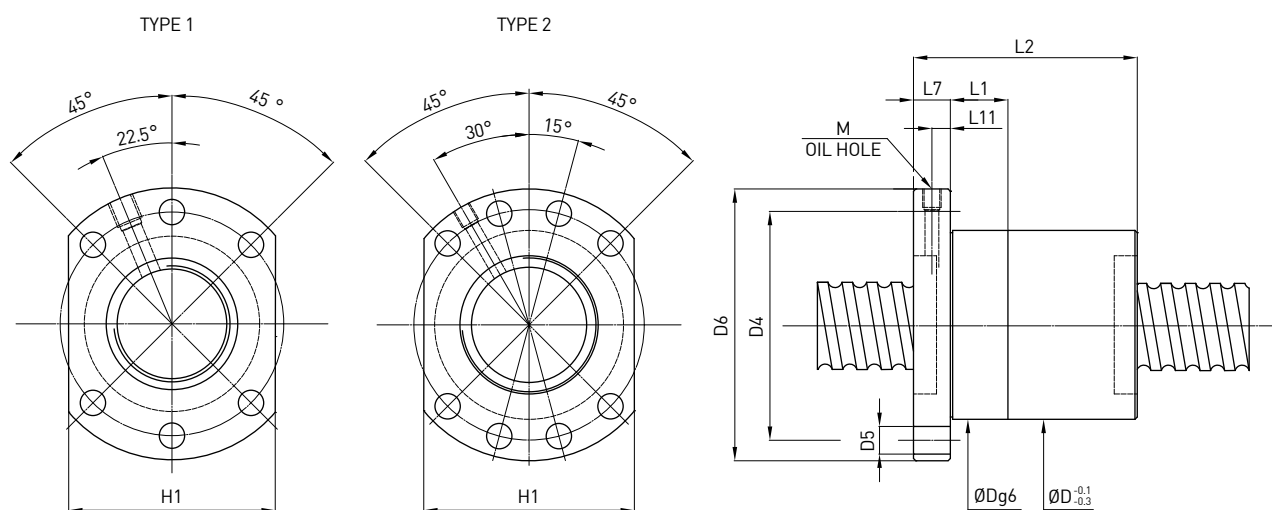


Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut			Flange								
	Nominal Dia.	Lead					L1	L2	D	D4	D5	D6	H1	L7	TYPE	L11	M-Oil Hole	
20-5K4	20	5	3.175	4	1340	3270	10	40	36	47	6.6	58	44	10	1	5	M6×1P	
20-10K3	20	10	3.175	3	990	2260	10	47	36	47	6.6	58	44	10	1	5	M6×1P	
20-20K2	20	20	3.175	2	690	1550	10	57	36	47	6.6	58	44	10	1	5	M6×1P	
25-5K4	25	5	3.175	4	1490	4150	10	43	40	51	6.6	62	48	10	1	5	M6×1P	
25-10K3	25	10	3.175	3	1140	3030	10	50	40	51	6.6	62	48	10	1	5	M6×1P	
25-25K2	25	25	3.175	2	760	1950	10	69	40	51	6.6	62	48	10	1	5	M6×1P	
32-5K4	32	5	3.175	4	1660	5360	10	38	50	59	6.6	80	62	12	1	6	M6×1P	
32-10K5	32	10	3.969	5	2700	8170	10	73	50	65	9	80	62	12	1	6	M6×1P	
32-20K3	32	20	3.969	3	1710	4890	20	87	50	65	9	80	62	12	1	6	M6×1P	
32-32K2	32	32	3.969	2	1150	3170	20	87	50	65	9	80	62	12	1	6	M6×1P	
40-5K5	40	5	3.175	5	2200	8320	20	45	63	78	9	93	70	14	2	7	M8×1P	
40-10K5	40	10	6.350	5	5690	16570	20	83	70	85	9	100	75	14	2	7	M8×1P	
40-20K4	40	20	6.350	4	4600	13010	20	110	70	85	9	100	75	14	2	7	M8×1P	
40-40K2	40	40	6.350	2	2390	6260	20	101	70	85	9	100	75	14	2	7	M8×1P	
50-10K5	50	10	6.350	5	6330	20980	25	80	82	100	11	118	92	16	2	8	M8×1P	
50-20K5	50	20	6.350	5	6280	20860	25	132	82	100	11	118	92	16	2	8	M8×1P	

3.2 Dimensions for Stock Rolled Ballscrews

F S I TYPE

(DIN 69051 part 5 from B) ◀ Stock

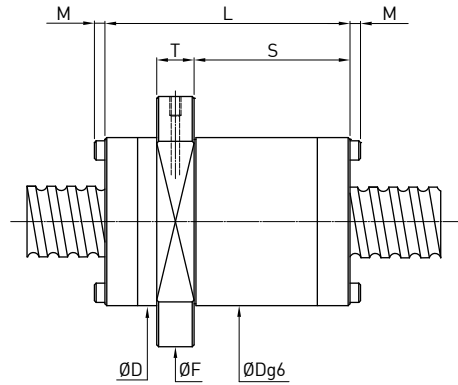
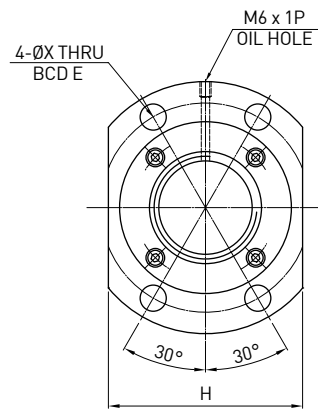


Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Flange								
	Nominal Dia.	Lead					L2	D	D4	D5	D6	H1	L7	TYPE	L1	L11	M-Oil Hole
16-5T3	16	5	3.175	3	1000	2000	40	28	38	5.5	48	40	10	1	10	5	M6x1P
20-5T3	20	5	3.175	3	1160	2660	44	36	47	6.6	58	44	10	1	10	5	M6x1P
20-5T4	20	5	3.175	4	1490	3550	52	36	47	6.6	58	44	10	1	10	5	M6x1P
25-5T3	20	5	3.175	3	1320	3490	44	40	51	6.6	62	48	10	1	10	5	M6x1P
25-5T4	25	5	3.175	4	1690	4660	52	40	51	6.6	62	48	10	1	12	5	M6x1P
25-10T3	25	10	4.763	3	2160	4860	65	40	51	6.6	62	48	12	1	16	5	M6x1P
32-5T3	32	5	3.175	3	1500	4460	46	50	65	9	80	62	10	1	10	6	M6x1P
32-5T4	32	5	3.175	4	1920	6210	53	50	65	9	80	62	10	1	10	6	M6x1P
32-5T6	32	5	3.175	6	2730	9320	66	50	65	9	80	62	10	1	10	6	M6x1P
32-10T3	32	10	6.350	3	3650	8660	74	50	65	9	80	62	16	1	16	6	M6x1P
32-10T4	32	10	6.350	4	4680	11550	85	50	65	9	80	62	16	1	16	6	M6x1P
40-5T4	40	5	3.175	4	2110	7770	53	63	78	9	93	70	10	2	10	7	M8x1P
40-10T3	40	10	6.350	3	4030	10680	74	63	78	9	93	70	16	2	16	7	M8x1P
40-10T4	40	10	6.350	4	5170	14240	87	63	78	9	93	70	16	2	16	7	M8x1P
50-5T4	50	5	3.175	4	2330	9990	57	75	93	11	110	85	10	2	10	8	M8x1P
50-5T6	50	5	3.175	6	3310	14980	70	75	93	11	110	85	10	2	10	8	M8x1P
63-10T6	63	10	6.350	6	9300	35980	114	90	108	11	125	95	18	2	16	9	M8x1P

* The calculation for dynamic load and static load is based on DIN69051.

F S H TYPE

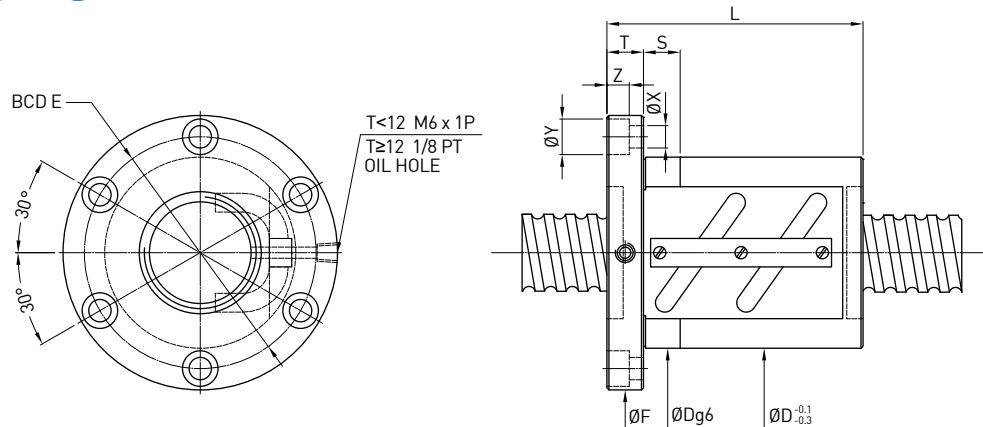
◀ Stock



Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Flange				Bolt	Fit	
	Nominal Dia.	Lead					L	D	F	BCD-E	T	H	X	S	M
16-16S2	16	16	3.175	1.8 × 2	780	1830	48	32	53	42	10	38	4.5	26	0
20-20S2	20	20	3.175	1.8 × 2	870	2290	58	38	62	50	10	46	5.5	32.5	3
25-25S2	25	25	3.969	1.8 × 2	1300	3600	67	47	74	60	12	56	6.6	39.5	3
32-32S2	32	32	4.763	1.8 × 2	1840	5450	85	58	92	74	15	68	9	48	0
40-40S2	40	40	6.350	1.8 × 2	3030	9220	102	72	114	93	17	84	11	60	0

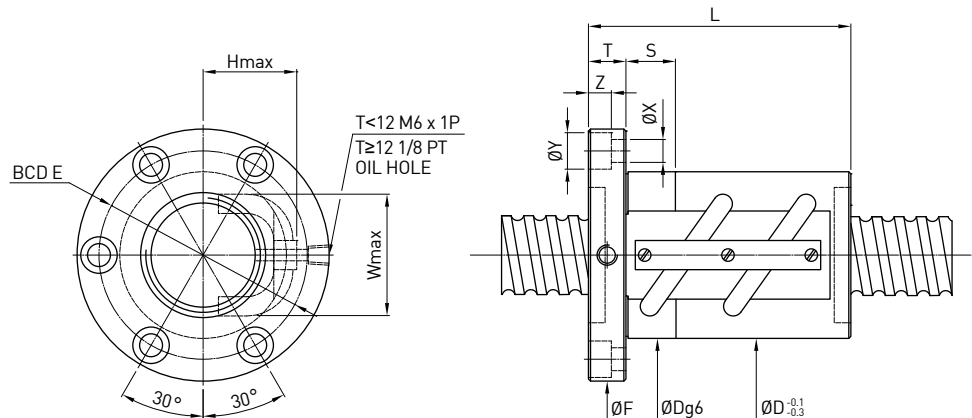
3.3 Dimensions for Rolled Ballscrews

F S W TYPE



Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Flange							Fit
	Nominal Dia.	Lead					L	D	F	BCD-E	T	Bolt				
												X	Y	Z	S	
8-2.5B1	8	2.5	2.000	2.5 × 1	218	317	34	26	47	35	8	5.5	9.5	5.5	8	
10-2.5B1	10	2.5	2.000	2.5 × 1	252	405	34	28	52	38	8	5.5	9.5	5.5	8	
10-4B1	10	4	2.381	2.5 × 1	304	466	41	30	53	41	10	5.5	9.5	5.5	10	
12-4B1	12	4	2.381	2.5 × 1	344	574	41	30	50	40	10	5.5	9.5	5.5	12	
16-4B1	16	4	2.381	2.5 × 1	390	744	39	36	59	48	10	5.5	9.5	5.5	12	
16-5B1	16	5	3.175	2.5 × 1	678	1226	45	40	64	51	12	5.5	9.5	5.5	12	
16-10B1	16	10	3.175	2.5 × 1	667	1194	60	42	66	54	10	5.5	9.5	5.5	12	
20-5B1	20	5	3.175	1.5 × 1	746	1526	45	44	68	55	12	5.5	9.5	5.5	12	
20-5B2	20	5	3.175	2.5 × 2	1353	3052	60	44	68	55	12	5.5	9.5	5.5	12	
20-5C1	20	5	3.175	3.5 × 1	1001	2149	50	44	68	55	12	5.5	9.5	5.5	12	
20-10B1	20	10	4.763	2.5 × 1	1280	2314	54	46	74	59	13	6.6	11	6.5	12	
25-5B2	25	5	3.175	2.5 × 2	1534	3975	60	50	74	62	12	5.5	9.5	5.5	12	
25-10B1	25	10	4.763	2.5 × 1	1459	2983	65	60	86	73	16	6.6	11	6.5	12	
25-10B2	25	10	4.763	2.5 × 2	2652	5966	97	58	85	71	15	6.6	11	6.5	12	
28-5B1	28	5	3.175	2.5 × 1	893	2252	43	54	76	64	12	6.6	11	6.5	12	
28-5B2	28	5	3.175	2.5 × 2	893	2252	43	54	76	64	12	6.6	11	6.5	12	
28-6A2	28	6	3.969	1.5 × 2	1395	3337	55	55	85	65	12	6.6	11	6.5	12	
32-5B2	32	5	3.175	2.5 × 2	1702	5098	60	58	84	71	12	6.6	11	6.5	12	
32-5C1	32	5	3.175	3.5 × 1	1200	3205	50	58	84	71	12	6.6	11	6.5	12	
32-6B2	32	6	3.969	2.5 × 2	2328	6317	63	62	89	75	12	6.6	11	6.5	12	
32-10B1	32	10	6.350	2.5 × 1	2416	5172	98	74	108	90	16	9	14	8.5	15	
32-10B2	32	10	6.350	2.5 × 2	4379	10345	98	74	108	90	16	9	14	8.5	15	
40-5B2	40	5	3.175	2.5 × 2	1859	6354	65	68	102	84	16	9	14	8.5	15	
40-6B2	40	6	3.969	2.5 × 2	2542	7967	72	70	104	86	16	9	14	8.5	15	
40-10B2	40	10	6.350	2.5 × 2	4812	12732	102	84	125	104	18	11	17.5	11	15	
40-12B2	40	12	7.144	2.5 × 2	5675	14433	117	90	130	110	18	11	17.5	11	15	
40-16A2	40	16	6.350	1.5 × 2	3059	7486	118	86	128	106	15	11	17.5	11	15	
40-16B1	40	16	6.350	2.5 × 1	2660	6363	102	86	128	106	15	11	17.5	11	15	
50-6B3	50	6	3.969	2.5 × 3	3954	15048	93	84	118	100	16	9	14	8.5	15	
50-6C2	50	6	3.969	3.5 × 2	3726	14045	80	84	118	100	18	9	14	8.5	15	
50-12B2	50	12	7.938	2.5 × 2	7247	20315	123	100	152	125	22	13	20	13	20	
50-20A2	50	20	6.350	1.5 × 2	3436	9597	114	94	135	114	18	11	17.5	11	15	
63-10B2	63	10	6.35	2.5 × 2	5873	20135	130	110	154	130	22	11	17.5	11	15	
63-10B3	63	10	6.35	2.5 × 3	8324	30202	137	110	152	130	20	11	17.5	11	15	
63-10C2	63	10	6.35	3.5 × 2	7868	28291	128	110	152	130	20	11	17.5	11	15	
63-20B2	63	20	9.525	2.5 × 2	14861	46009	176	124	172	147	22	13	20	13	20	
80-10B3	80	10	6.35	2.5 × 3	9189	38525	137	130	176	152	22	13	20	13	20	
80-10B4	80	10	6.35	2.5 × 4	11768	51366	169	130	178	152	22	13	20	13	20	
80-12B3	80	12	7.144	2.5 × 3	10811	43246	159	136	185	159	22	13	20	13	20	
80-16B3	80	16	9.525	2.5 × 3	21186	80675	204	145	192	166	28	13	20	13	25	
80-20B2	80	20	9.525	2.5 × 2	16483	58851	185	144	210	174	28	18	26	17.5	25	

F S V TYPE



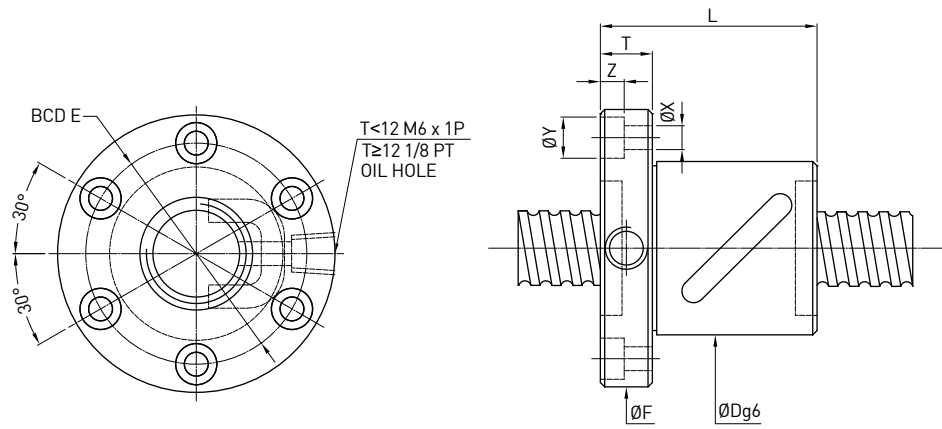
Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Flange						Return Tube		Fit
	Nominal Dia.	Lead					L	D	F	BCD-E	T	Bolt			W	H	
												X	Y	Z			S
8-2.5B1	8	2.5	2.000	2.5 × 1	218	317	34	18	41	29	8	5.5	9.5	5.5	15	15	8
10-2.5B1	10	2.5	2.000	2.5 × 1	252	405	34	20	43	31	8	5.5	9.5	5.5	17	17	8
10-4B1	10	4	2.381	2.5 × 1	304	466	41	23	46	34	10	5.5	9.5	5.5	20	20	10
12-4B1	12	4	2.381	2.5 × 1	344	574	41	25	48	36	10	5.5	9.5	5.5	22	21	12
16-5B1	16	5	3.175	2.5 × 1	390	744	43	31	55	42	10	5.5	9.5	5.5	23	25	12
16-10B1	16	10	3.175	2.5 × 1	667	1194	54	30	53	41	10	5.5	9.5	5.5	23	22	12
20-5B1	20	5	3.175	1.5 × 1	746	1526	46	34	58	46	12	5.5	9.5	5.5	28	25	12
20-5B2	20	5	3.175	2.5 × 2	1353	3052	60	34	58	46	12	5.5	9.5	5.5	28	25	12
20-5C1	20	5	3.175	3.5 × 1	1001	2149	50	35	59	46	12	5.5	9.5	5.5	27	22	12
25-5B2	25	5	3.175	2.5 × 2	1534	3975	60	40	64	52	12	5.5	9.5	5.5	31	25	12
32-5B2	32	5	6.350	2.5 × 2	1702	5098	60	54	80	67	12	6.6	11	6.5	38	29	12
32-10B2	32	10	6.350	2.5 × 2	4379	10345	98	58	92	74	16	9	14	8.5	44	36	15
32-20B1	32	20	6.350	2.5 × 1	2415	5173	100	54	88	70	15	9	14	8.5	43	35	15
40-5B2	40	5	3.175	2.5 × 2	1859	6354	65	58	92	72	16	9	14	8.5	46	34	15
40-10B2	40	10	6.350	2.5 × 2	4812	12732	102	65	106	85	18	11	17.5	11	52	41	15
40-10C2	40	10	6.350	3.5 × 2	6473	17975	120	65	114	90	20	11	17.5	11	53	42	15
50-10C2	50	10	6.350	3.5 × 2	7146	22477	126	80	121	100	18	11	17.5	11	62	46	20
63-10C2	63	10	6.350	3.5 × 2	7869	28290	128	95	137	115	20	11	17.5	11	74	52	20
63-16B2	63	16	9.525	2.5 × 2	13676	43030	153	100	150	123	22	13	20	13	78	62	20
80-10B3	80	10	6.350	2.5 × 3	9189	38525	139	115	163	137	22	14	20	13	90	64	20
80-20B2	80	20	9.525	2.5 × 2	14976	53774	225	125	190	152	28	18	26	17.5	95	75	20
80-20B3	80	20	9.525	2.5 × 3	21224	80661	245	125	190	152	28	18	26	17.5	95	72	20

F

S

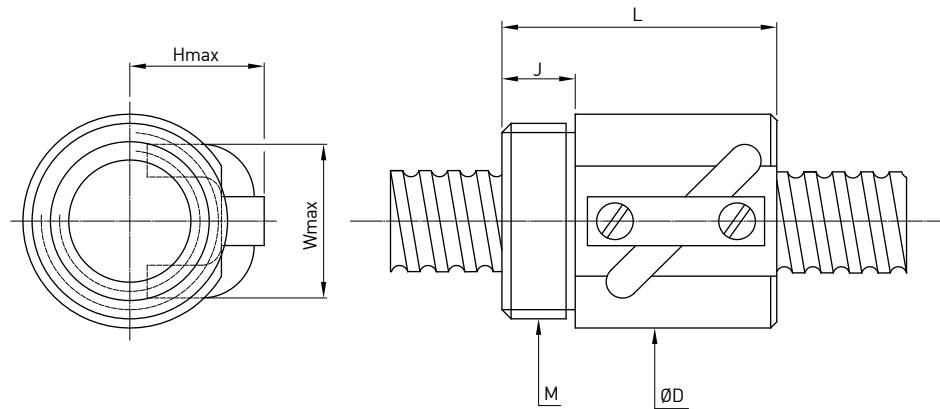
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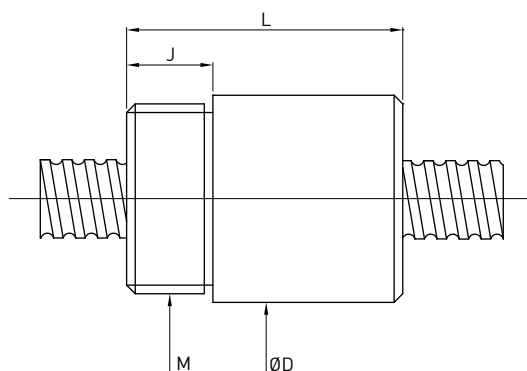


Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Flange					
	Nominal Dia.	Lead					L	D	F	BCD-E	T	Bolt		
												X	Y	Z
8-2.5B1	8	2.5	2.000	2.5×1	218	317	34	22	43	31	8	5.5	9.5	5.5
10-2.5B1	10	2.5	2.000	2.5×1	252	405	34	24	46	34	8	5.5	9.5	5.5
10-4B1	10	4	2.381	2.5×1	304	466	41	26	49	37	10	5.5	9.5	5.5
12-4B1	12	4	2.381	2.5×1	344	574	41	28	51	39	10	5.5	9.5	5.5
12-4C1	12	4	2.381	3.5×1	459	803	44	30	50	40	10	4.5	8	4.5
14-4C1	14	4	2.381	3.5×1	498	943	40	31	50	40	10	4.5	8	4.5
14-5B1	14	5	3.175	2.5×1	636	1095	40	32	50	40	10	4.5	8	4.5
16-5B1	16	5	3.175	2.5×1	679	1226	43	36	60	47	10	5.5	9.5	5.5
16-10B1	16	10	3.175	2.5×1	667	1194	52	36	60	47	12	6.6	11	6.5
20-4C1	20	4	2.381	3.5×1	582	1329	40	40	60	50	10	4.5	8	4.5
20-5B1	20	5	3.175	2.5×1	745	1526	40	40	60	50	10	4.5	8	4.5
20-5C1	20	5	3.175	3.5×1	1001	2149	50	40	64	51	12	5.5	9.5	5.5
20-10B1	20	10	4.763	2.5×1	1280	2314	61	52	82	67	12	6.6	11	6.5
25-5B1	25	5	3.175	2.5×1	845	1987	40	43	67	55	10	5.5	9.5	5.5
25-5B2	25	5	3.175	2.5×2	1534	3975	60	46	70	58	12	5.5	9.5	5.5
25-10B2	25	10	4.763	2.5×2	2652	5966	98	60	96	78	15	5.5	9.5	5.5
32-5B2	32	5	3.175	2.5×2	1702	5098	60	54	80	67	12	6.6	11	6.5
32-10B1	32	10	6.350	2.5×1	2416	5172	68	68	102	84	16	9	14	8.5
32-10B2	32	10	6.350	2.5×2	4379	10345	98	68	102	84	16	9	14	8.5

R S V TYPE

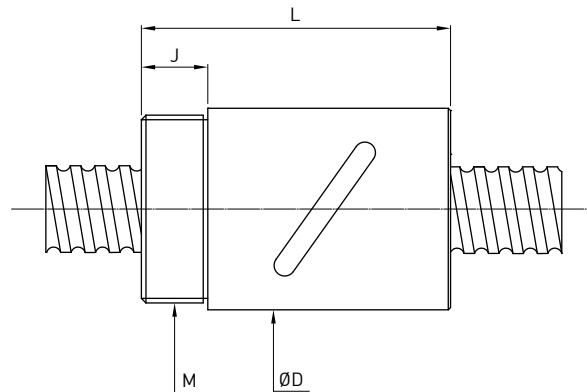


Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Mounting Thread M	Mounting Thread Length J	Return Tube Width W	Return Tube Height H
	Nominal Dia.	Lead					L	D				
8-2.5B1	8	2.5	2.000	2.5×1	218	317	28	18	M18×1P	10	15	15
10-2.5B1	10	2.5	2.000	2.5×1	252	405	30	20	M18×1P	10	17	17
10-4B1	10	4	2.381	2.5×1	305	466	32	23	M22×1P	10	20	20
12-4B1	12	4	2.381	2.5×1	344	574	32	25	M24×1P	10	22	21
16-5B1	16	5	3.175	2.5×1	679	1226	40	31	M28×1.5P	10	23	25
16-5.08B1	16	5.08	3.175	2.5×1	678	1226	45	30	M25×1.5P	13	24	21
16-5.08C1	16	5.08	3.175	3.5×1	1226	1717	45	30	M25×1.5P	13	24	21
20-5C1	20	5	3.175	3.5×1	1001	2149	45	35	M32×1.5P	12	27	22
25-5B2	25	5	3.175	2.5×2	1534	3975	58	40	M38×1.5P	16	31	25
25-10B2	25	10	4.763	2.5×2	2663	6123	94	45	M38×1.5P	16	38	32
32-5B2	32	5	3.175	2.5×2	1702	5098	60	54	M50×2P	18	38	29
32-10B2	32	10	6.350	2.5×2	4379	10345	95	58	M52×2P	18	44	36
40-10B2	40	10	6.350	2.5×2	4812	12732	102	65	M60×2P	25	52	41
50-10C2	50	10	6.350	3.5×2	7146	22477	130	80	M75×2P	30	62	46
63-10C2	63	10	6.350	3.5×2	7869	28290	132	95	M90×2P	40	74	52
63-12C3	63	12	7.938	3.5×3	16828	58535	205	102	M95×3P	35	75	59
80-20B2	80	20	9.525	2.5×2	14976	53774	224	125	M120×2P	50	95	72

R**S****I****TYPE**

Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Mounting Thread	Mounting Thread Length
	Nominal Dia.	Lead					L	D	M	J
8-2.5T2	8	2.5	2.000	2	133	178	23.5	17.5	M15×1P	7.5
8-3T2	8	3	2.000	2	133	178	24	18	M14×1P	8
10-2.5T2	10	2.5	2.000	2	174	263	25	19.5	M17×1P	7.5
10-4T2	10	4	2.381	2	198	282	32	24	M22×1P	10
12-4T3	12	4	2.381	3	337	559	34	25.5	M20×1P	10
12-4T4	12	4	2.381	4	431	746	40	25.5	M20×1P	10
16-5T3	16	5	3.175	3	664	1195	42	36	M30×1.5P	12
20-5T4	20	5	3.175	4	938	1993	52	40	M35×1.5P	12
25-5T4	25	5	3.175	4	1126	2776	60	45	M35×1.5P	15
25-10T3	25	10	4.763	3	1432	2913	70	48	M45×1.5P	15
32-5T5	32	5	3.175	5	1291	3696	60	52	M48×1.5P	15
32-10T3	32	10	6.350	3	2266	4803	80	56	M52×1.5P	15
40-5T5	40	5	3.175	5	1713	5776	68	65	M60×1.5P	18
40-10T4	40	10	6.350	4	3395	8488	88	65	M60×1.5P	18
50-10T4	50	10	6.350	4	3899	11112	100	75	M75×1.5P	20
50-20T3	50	20	9.525	3	6489	14206	114	80	M75×1.5P	20
63-10T6	63	10	6.350	6	6191	21409	120	95	M85×2P	20
63-20T3	63	20	9.525	3	7434	21116	138	95	M85×2P	20

R S B TYPE



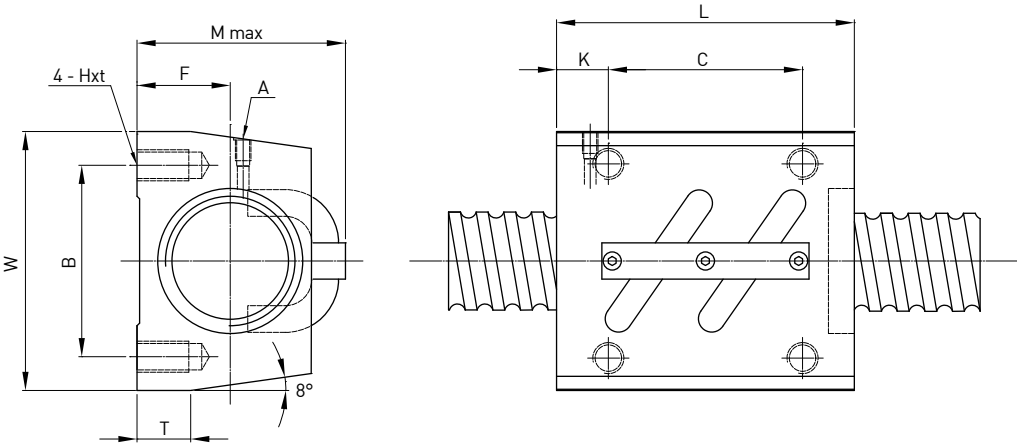
Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Mounting Thread	Mounting Thread Length
	Nominal Dia.	Lead					L	D	M	J
8-2.5B1	8	2.5	2.000	2.5×1	218	317	24	22	M18×1P	7.5
10-2.5B1	10	2.5	2.000	2.5×1	252	405	24	24	M20×1P	7.5
10-4B1	10	4	2.381	2.5×1	305	466	34	26	M22×1P	10
12-4B1	12	4	2.381	2.5×1	344	574	34	25.5	M20×1P	10
12-5B1	12	5	2.000	2.5×1	275	481	38	26	M20×1P	8
16-5B1	16	5	3.175	2.5×1	678	1226	42	36	M30×1.5P	12
16-10B1	16	10	3.175	2.5×1	667	1194	57	36	M30×1.5P	12
20-5B1	20	5	3.175	2.5×1	746	1526	45	38	M35×1.5P	15
20-5C1	20	5	3.175	3.5×1	1001	2149	54	40	M36×1.5P	14
20-10B1	20	10	4.763	2.5×1	1280	2314	60	52	M40×1.5P	15
32-5B2	32	5	3.175	2.5×2	1702	5098	69	54	M50×2P	19
32-10B2	32	10	6.350	2.5×2	4384	10345	105	68	M62×2P	19
40-5B2	40	5	3.175	2.5×2	1859	6354	62	66	M62×2P	19
40-10B2	40	10	6.350	2.5×2	4812	12732	110	76	M70×2P	24
50-5B2	50	5	3.175	2.5×2	2004	7941	70	79	M70×2P	24
50-10C2	50	10	6.350	3.5×2	7145	22477	135	88	M82×2P	29
63-10C2	63	10	6.350	3.5×2	7868	28291	135	104	M95×2P	29

S

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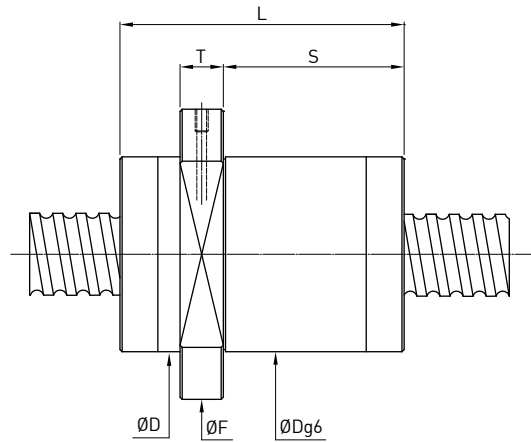
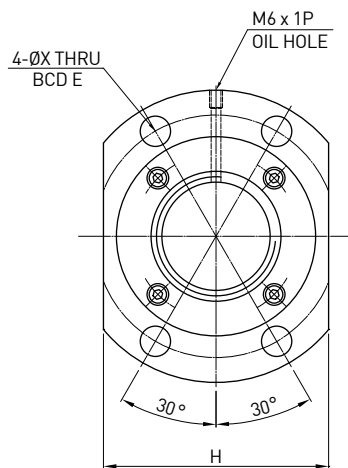
TYPE



Modle	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	W	Hxt	F	L	B	C	K	T	A	M (max)
	Nominal Dia.	Lead														
14-4B1	14	4	2.381	2.5×1	376	682	34	M4×7	13	35	26	22	6	6	M6	30
14-4C1	14	4	2.381	3.5×1	498	943	34	M4×7	13	35	26	22	6	6	M6	30
14-5B1	14	5	3.175	2.5×1	636	1095	34	M4×7	13	35	26	22	6	6	M6	31
16-5B1	16	5	3.175	2.5×1	679	1226	42	M5×8	16	36	32	22	6	21.5	M6	36
20-5B1	20	5	3.175	2.5×1	745	1526	48	M6×10	17	35	35	22	5	9	M6	39
20-10B1	20	10	3.175	2.5×1	1280	2314	48	M6×10	18	58	35	35	10	9	M6	46
25-5B1	25	5	3.175	2.5×1	845	1987	60	M8×12	20	35	40	22	7	9.5	M6	45
25-10B2	25	10	6.350	2.5×2	3816	7968	60	M8×12	23	94	40	60	10	10	M6	54
28-6B1	28	6	3.969	2.5×1	1203	2796	60	M8×12	22	42	40	18	8	10	M6	50
28-6B2	28	6	3.969	2.5×2	2184	5592	60	M8×12	22	67	40	40	8	10	M6	50
32-10B1	32	10	6.350	2.5×1	2413	5172	70	M8×12	26	64	50	45	10	12	M6	62
32-10B2	32	10	6.350	2.5×2	4379	10345	70	M8×12	26	94	50	60	10	12	M6	67
36-10B2	36	10	6.350	2.5×2	4592	11403	86	M10×16	29	96	60	60	11	17	M6	67
45-12B2	45	12	7.144	2.5×2	5963	16110	100	M12×20	36	115	75	75	13	20.5	M6	80

3.4 High Lead Nuts

F S H TYPE



Model	Size		Ball Dia.	Circuits	Dynamic Load 1x10 ⁶ revs C (kgf)	Static Load Co (kgf)	Nut		Flange				Bolt	Fit
	Nominal Dia.	Lead					L	D	F	BCD-E	T	H	X	S
16-32V2	16	32	3.175	0.8 × 2	340	760	34	32	50	41	10	34	4.5	26
16-32V4	16	32	3.175	0.8 × 4	630	1520	34	32	50	41	10	34	4.5	26
20-40V2	20	40	3.175	0.8 × 2	390	980	41	38	58	48	10	40	5.5	27.5
20-40V4	20	40	3.175	0.8 × 4	710	1970	41	38	58	48	10	40	5.5	27.5
25-50V2	25	50	3.175	0.8 × 2	440	1260	50	46	70	58	12	48	6.6	26
32-64S4	32	64	4.763	1.8 × 4	3140	11100	126	58	92	74	12	60	9	48
40-80S2	40	80	6.350	1.8 × 2	2860	9450	170	73	114	93	17	74	11	60
40-80S4	40	80	6.350	1.8 × 2	5200	18910	170	73	114	93	17	74	11	60

4.

Ballscrew Failure Analysis

4.1 Preface

In recent years, more and more ballscrews are installed in various machines to meet the requirements of higher accuracy and better performance. Ballscrews are becoming one of the most widely used power transmission components. In CNC machines, ballscrews help improve their positioning accuracy and elongate their service life. Ballscrews are also increasingly used to replace ACME screws in manually operated machines.

A ballscrew is normally preloaded to minimize the backlash of machine movement. Even a high precision ballscrew will not provide good accuracy and long service life if it is not installed properly.

This article discusses primary ballscrew problems and their precautions. Some measuring procedures are also discussed to help users locate the cause of an abnormal backlash.

4.2 The Cause and Precautions of Ballscrew Problems

Three major categories of ballscrew problems and their precautions are discussed as follows.

4.2.1 Too much play

(1) No preload or insufficient preload :

The ball nut will rotate and move downward by its own weight when a non-preloaded ballscrew is held vertically with the screw spindle constrained. A significant backlash may exist in a non-preloaded ballscrew unit. Therefore non-preloaded ballscrews are only used in the machinery, where low operation resistance but not positioning accuracy is the major concern.

HIWIN can determine the correct amount of preload based on different applications. We can also preset the amount of preload before shipment. Be sure to clearly specify the operation condition of your application when you order a ballscrew unit.

(2) Too much torsional displacement :

- a. Incorrect heat treatment, hardened layer too thin, non-homogeneous hardness distribution, or material too soft : Standard hardness of steel balls, ball nuts, and screw spindles are HRC 62-66, 58-62, and 58-62, respectively.
- b. Incorrect design-L/D ratio too high, etc : The lower the L/D (length/diameter) ratio, the more rigid the spindle is. L/D ratio should be limited to under 60. There will be a significant deflection (torsional displacement) if the L/D ratio is too high. The ballscrew installation shown in Fig 4.1 is supported at one end only. This kind of "non-rigid" design should be avoided if possible.

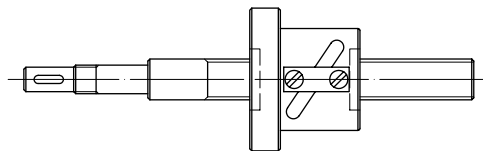


Fig. 4.1 The installation of ballscrews.

(3) Inappropriate bearing selection :

Angular ball bearings should be used in ballscrew installation. A ball bearing with high pressure angle specially designed for ballscrew installation is even a better choice. A regular deep groove ball bearing will generate a significant amount of axial play when axially loaded. It should not be used in this application.

(4) Inappropriate bearing installation :

- a. If the bearing is not attached to the screw spindle properly, it would cause axial play under load. This problem may be caused by the bearing journal of the screw spindle being too long or the non-threaded part of the screw spindle being too short.

- b. The perpendicularity between the bearing seating face and the thread axis of the bearing locknut on the ballscrew, or the parallelism between the opposite faces of the locknut is out of tolerance causing the bearing to tilt. The thread for bearing lock nut and the seating face of a bearing in the ballscrew journal should be machined in one setting to ensure the perpendicularity. It is even better if they can be ground.
- c. Two lock nuts and a spring washer should be used in the bearing installation to prevent them from getting loose in operation.

(5) The ball nut housing or the bearing housing is not rigid enough :

The ball-nut-mounted housing or the bearing-mounted housing may deflect under components' weight or machining load if it is not rigid enough. The test illustrated in Fig A-4 (d) can be used to check the rigidity of the ball-nutmounted housing. Similar test can be used to check the rigidity of the bearing-mounted housing.

(6) The ball nut housing or the bearing housing is not mounted properly :

- a. Components may become loose due to vibration or lack of locating pin(s). Solid pins instead of spring pins should be used for locating purpose.
- b. Ball-nut-seated screws are not seated firmly because the screws are too long or the thread holes on housing are too short.
- c. Ball-nut-seated screws become loose due to vibration and lack of a spring washer.

(7) Parallelism or flatness of the housing surface is out of tolerance :

In a machine assembly, a shim bar is frequently located between the housing location surface and the machine body for adjustment purpose. The clearance of table movement may vary at different locations if the parallelism or flatness of any matching component is out of tolerance no matter they are ground or scraped.

(8) The motor and the ballscrew spindle are not assembled properly :

- a. There will be a relative rotation between the motor shaft and the ballscrew spindle if the connecting coupling is not installed firmly or the coupling itself is not rigid enough.
- b. Driving gears are not engaged properly or driving mechanism is not rigid. A timing belt should be used to prevent slipping if the ballscrew is to be driven by a belt.
- c. Key is loose in the groove. Any inappropriate match among the hub, key, and key seat may cause these components to generate backlash.

4.2.2 Unsmooth operation

(1) Defects from ballscrew manufacturing :

- a. The track surface of the ballscrew spindle or the ball nut is too rough.
- b. The roundness of the bearing balls, the ball nut or the ballscrew spindle is out of tolerance.
- c. The lead or the pitch circle diameter of the ball nut / the spindle is out of tolerance.
- d. The return tube is not attached to the ball nut appropriately.
- e. Uneven bearing ball size or hardness. The above problems should not be found in the manufacturers of top quality.

(2) Foreign objects enter the ball path :

- a. Packing material is trapped in the ball path. Various materials and anti-rust paper are normally used to pack ballscrew units for shipment. It is possible to have these foreign materials or other objects trapped in the ball path if proper procedures are not done while installing or aligning the ballscrew unit. This may cause the bearing balls to slide instead of rolling or even cause the ball nut to jam up completely.
- b. Machined chips get in the ball track. The chips or dust generated during machining processes may be trapped in the bearing ball track if wiper kits are not used to keep them away from the surface of the ballscrew unit. This may cause unsmooth operation, deteriorate accuracy and reduce service life.

(3) Over-travel :

Over-travel can damage the return tube and cause it to collapse or even break. When this happens, the bearing balls will not circulate smoothly. They may break and damage the groove on the ball nut or the ballscrew spindle under severe circumstances. Over-travel may happen during set-up or as the result of a limit switch failure or a machine collision. To prevent further damage, an over-traveled ballscrew should be checked or repaired by the manufacturer before it goes back to service.

(4) Damaged return tube:

The return tube may collapse and cause the same problems as mentioned above if it is hit heavily during installation.

(5) Misalignment:

Radial load exists if the center line of the ball nut's housing and the screw spindle's bearing support housing are not aligned properly. The ballscrew unit may bend if this misalignment is too big. An abnormal wear may still happen even if the misalignment is not significant enough to cause a noticeable bending. The accuracy of a ballscrew unit will deteriorate rapidly if it is misaligned. The higher the preload is set in the nut, the more demanding the alignment accuracy is required in the ballscrew.

(6) The ball nut is not mounted properly on the nut housing:

Eccentric load exists when the mounted ball nut is tilted or misaligned. If this is the case, the motor current may fluctuate during rotation.

(7) Ballscrew unit is damaged during transportation

4.2.3 Fracture

(1) Broken bearing ball :

Cr-Mo steel is the most commonly used material for bearing balls. It takes about 1,400kg (3,080LB) to 1,600kg (3,520LB) to break a steel ball of 3.175 mm (1/8 in) diameter. The temperature of an under-lubricated or non-lubricated ballscrew raises substantially during operation. This temperature raise could make the bearing balls brittle or break which cause damage to the grooves of the ball nut or the ballscrew spindle consequently. Therefore, lubricant replenishment should be considered during the design process. If an automatic lubricating system is not available, a periodical grease replenishment should be scheduled as part of maintenance program.

(2) Collapsed or broken return tube :

Over-travel of the ball nut or an impact on the return tube could cause the return tube to collapse or break. This may block the path of bearing balls and cause them to slide instead of rolling and break eventually.

(3) Ballscrew spindle end breaks :

- a. Inappropriate design: Sharp corners on the ballscrew spindle should be avoided to reduce local stress concentration. (Fig. 4.2) shows some of the appropriate screw end designs.
- b. Bend of screw spindle journal: The seating surface of the bearing of the ballscrew and the thread axis of the bearing's lock nut are not perpendicular to each other or the opposite sides of the lock nut are not parallel to each other. This will cause the end of screw spindle to bend and eventually break. The amount of deflection at the end of the ballscrew spindle (Fig 4.3) before and after the bearing's lock nut being tightened should not exceed 0.01 mm (0.0004 in).
- c. Radial force or fluctuating stress: Misalignment in the ballscrew installation creates abnormal fluctuating shear stress and causes the ballscrew to fail prematurely.

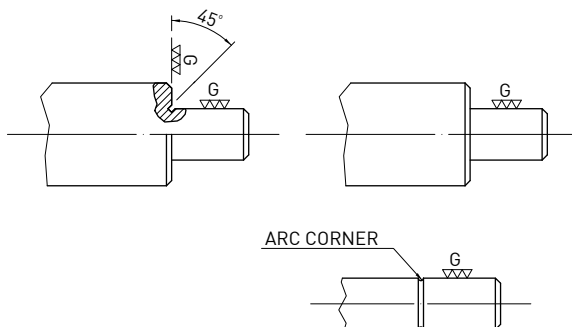


Fig. 4.2 The design of ballscrew spindle end

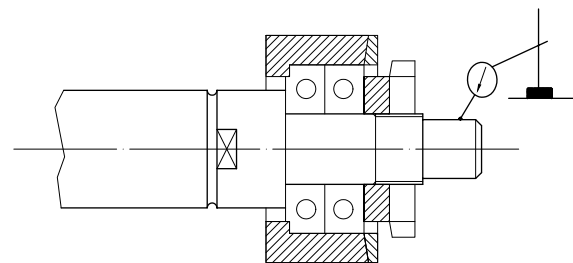


Fig. 4.3 The Deflection of Ballscrew Spindle

4.3 Locating the Cause of an Abnormal Backlash

The following measurement procedures can be performed to locate the cause of an abnormal backlash in the ballscrew installation.

- (1) Glue a gauge ball in the center hole at one end of the screw spindle. Use the flat plate of a dial indicator to check the axial movement of this gauge ball in axial direction while rotating the screw spindle (Fig 4.4(a)).
- (2) Use a dial indicator to check the relative movement between the bearing housing and the bearing seat while rotating the ballscrew (Fig 4.4(b)). Any dial indicator reading other than zero indicates that either the bearing hub is not rigid enough or it is not installed properly.
- (3) Check the relative movement between the machine table and the ball nut housing (Fig 4.4(c)).
- (4) Check the relative movement between the ball nut housing and the ball nut flange (Fig 4.4(d)). Contact the ballscrew manufacturer if an unsatisfactory backlash still exists while all the above checks are ok. The preload or the rigidity of the ballscrew may have to be increased.

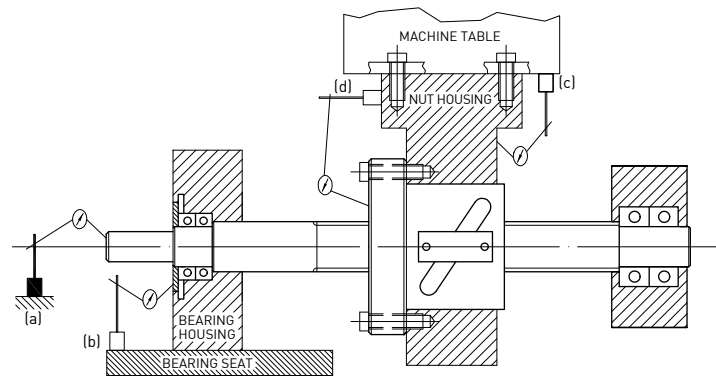


Fig. 4.4 Locating the Cause of an Abnormal Backlash

5.

HIWIN Ballscrew Data Inquiry (A)

Company _____ Date _____
 Address _____
 Telephone _____ Fax. _____
 Machine Type _____ Application _____
 Attached Drawing Yes _____ (Drawing No. _____) No. _____
 Please fill or check following items.

1. Load Condition

(a) Working Axial Load

Max. _____ kgf, at _____ rpm for _____ % of operation time

Normal. _____ kgf, at _____ rpm for _____ % of operation time

Min. _____ kgf, at _____ rpm for _____ % of operation time

(Total of operation time ratio should be 100%)

(b) Max. Axial Static Load _____ kgf

(c) Deviated Load, if any (Please avoid this load condition, if possible)

Radial Load _____ kgf Moment Load _____ kgf-cm

2. Operation Conditions

(a) Stroke _____ mm, Motor power used _____ kw

(b) Life Expectancy _____ x10⁶ revs, _____ km, _____ hr

(c) Rotation Shaft _____ Nut _____

(d) Mounting Method _____ Mounting Span _____ mm

(e) Shock/Vibration: Smooth _____ Normal _____ Vibration _____

3. Main Dimensions

(a) Screw Shaft O.D. _____ mm Turning Direction: R _____ L _____

(b) Lead _____ mm (Pitch _____ mm) No. of Starts _____

(c) Total Length _____ mm Effective Threaded Length _____ mm

(d) Nut Type _____ Seal _____

(e) Support Bearing: Ball _____ Roller _____

4. Lead Accuracy, Axial Clearance, Preload and Stiffness

(a) Target Point of Accumulated Lead Tp: _____ mm

(b) Accuracy Grade _____ (Lead Deviation: _____ mm/300mm)

(c) Axial play _____ mm max.

(d) Preload _____ kgf (or Drag Torque _____ kgf-cm)

(e) Nut Stiffness Kn _____ kgf/μm

5. Other Conditions

(a) Lubrication: Grease _____ Oil _____

(b) Ambient Temperature _____ °C □ °F

(c) Special Conditions _____

6.

HIWIN Ballscrew Request Form (B)

Request for quotation

Customer Name: _____

Date: _____

Address: _____

Phone: _____

Country: _____

Desired Delivery Date: _____

Delivery Point: _____

Type of Ball Screw: (1) _____

Quantity: _____

(2) _____

Quantity: _____

Required Specifications:

(1) ☐ Single Start ☐ Double Start ☐ Triple Start ☐ Four Start

(2) Direction of Turn: ☐ Right ☐ Left

(3) Shaft Diameter: _____

(4) Lead: _____

(5) Circuit: _____

(6) Nut Type: _____

(7) ☐ Internal ☐ External ☐ Endcap

(8) Thread Length: _____

(9) Overall Length: _____

(10) Accuracy Grade: _____

(Lead Deviation: _____ mm/300mm)

(11) Speed: _____ rpm

(12) ☐ Rolled ☐ Ground

* Please refer to HIWIN catalog P.36 for nut information.

Customer Special Requirement

● Please answer the following questions.

Your kind answers would be very helpful in preparing quotation promptly.

(a) In what kind of application is this ballscrew used ?

(b) Is this ballscrew used for the X, Y, or Z axis? Vertically or horizontally ?

(c) How many ballscrews are needed for each machine and what is the annual requirement ?

(d) If this is not a new project, whose ballscrews are you using currently ?



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