THK

THK GLOBAL STANDARD

ISO Standard Compliant Ball Screw

EBB／EPB

Compliant with Mounting Dimensions of ISO 3408-2
Precision grade of ISO 3408-3

Cat. No. 335-3EU

ISO Standard Compliant Ball Screw Models **EBB / EPB**

Model EBB can be a select of screw shaft and nut assembly products or screw shaft and nut as separate components.

Structure and Features

In the ISO standard compliant Ball Screw, balls under a load roll in the raceway cut between the screw shaft and the nut while receiving the axial load, travel along the groove of a deflector embedded inside the nut to the adjacent raceway and then circulate back to the loaded area. Thus, the balls perform infinite rolling motion.

Two types of nuts are available: model EBB of oversized-ball preload type or non-preloaded type, and model EPB of offset preloaded type.

[Compact]

This Ball Screw is compactly built. Because of an internal circulation system using deflectors, the outer diameter of the nut is 70 to 80% of the conventional double nut and the overall nut length is only 60 to 80% of the return pipe nut.

[Compliant with a ISO standard]

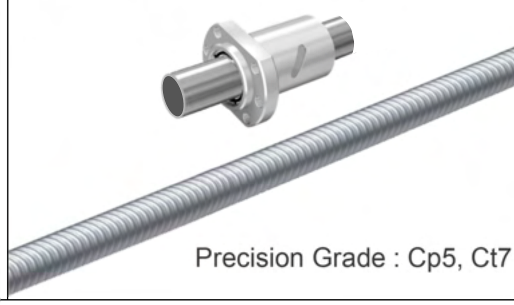
Compliant with Mounting Dimensions of ISO 3408-2 and Precision grade of ISO 3408-3.

EBB／EPB Outline

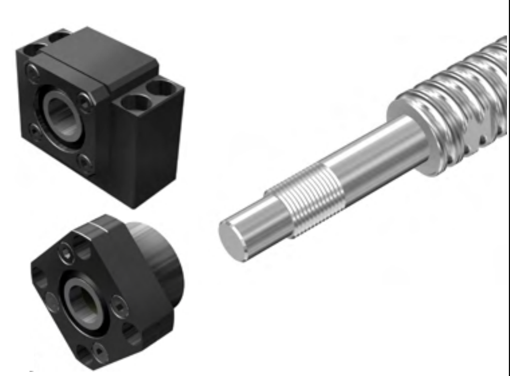
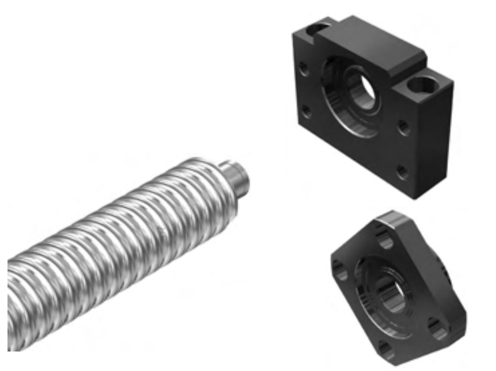
Product lineup

Model EBB	Model EPB
Oversized-ball preload type or non-preloaded type 	Offset Preload Type 

Product form

Complete Assembly	Separate Components
Axial Clearance : G0,G1,G2,G3  Precision Grade : Cp5, Ct7	Axial Clearance : G3  Precision Grade : Cp5, Ct7

Shaft end shape for support unit

Fixed side Shaft End	Support side Shaft End
	

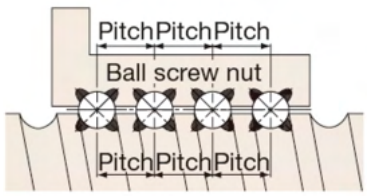
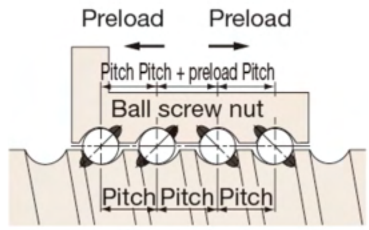
Available Diameter Lead Combination

		Lead (mm)		
		5	10	20
Shaft diameter (mm)	16	● ■	–	–
	20	● ■	–	–
	25	● ■	● ■	–
	32	● ■	● ■	–
	40	● ■	● ■	●
	50	●	● ■	●
	63	–	● ■	●

● : EBB /■ : EPB

Specification

Preload methods

<table>
<tr><th>EBB</th><th>EPB</th></tr>
<tr><td><u>Oversized-ball preload</u>
The nut is filled with balls in a larger diameter to achieve 4-point contact with the raceway.

</td><td><u>Preload by offset-pitch</u>
The pitch is shifted at the central part of the nut to create the required preload.

</td></tr>
</table>

Precision Grade

The precision grades of model EBB / EPB are controlled in accordance with the ISO 3408-3

Model No.	Precision Grades
EBB	Cp5, Ct7
EPB	Cp5

Axial Clearance

Axial clearance of model EBB is as shown in the table below.
Axial clearance of model EPB is only G0 clearance.

Unit : mm

Clearance Symbol	G0	G1	G2	G3
Axial Clearance	0 or less	0 to 0.01	0 to 0.02	0 to 0.05

Available Axial Clearance

Model EBB / EPB precision grades and axial clearance combinations are shown in the table below.

Complete Assembly

Precision Grade	Cp5	Ct7
EBB	G0 G1	G0 G2
EPB	G0	–

Separate Components

Precision Grade	Cp5	Ct7
EBB	G3	

Limitations of Screw Shaft Length

Unit : mm

Precision Class		Cp5	Ct7
Shaft diameter (mm)	16	1500	2000
	20	2000	2500
	25	2000	4000
	32	2000	4000
	40	2000	4000
	50	2000	4000
	63	2000	4000

Model number coding

Model number coding for Complete Assembly

Model number	Lubricator QZ	Seal symbol	Clearance symbol	Shaft length	Accuracy Symbol	Shaft end symbol	
EBB3205-6	QZ ※1 ※5	RR WW ※2 ※5	G0 G1 G2 G3	+650L	Cp5 R Ct7 R	- J1 - J2 - J3 - H1 - H2 - H3 ※3	K ※4

Example)

EBB3205-6QZRRG0+650LCp5R-J1K

Note) The ball screw nut flange faces the fixed side unless otherwise specified.
If desiring the flange to face the supported side, add symbol G in the end of the Ball Screw model number when placing an order.

(Example) EPB2505-5RRGO+420LCp5R-J2KG

Model number coding for Separate Components

Ball screw nut

Nut Model number	Seal symbol
EBB3205-6	RR ※2

Example)

EBB3205-6RR

Ball screw shaft

Shaft Model number	Shaft length	Accuracy Symbol	Shaft end symbol	
TS3205 ※6	+650L	Cp5 R Ct7 R	- J1 - J2 - J3 - H1 - H2 - H3 ※3	K ※4

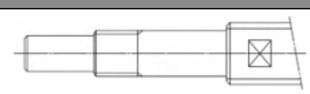
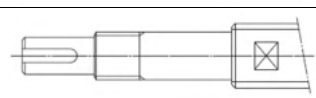
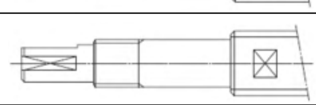
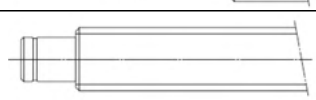
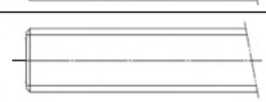
Example)

TS3205+650LCt7R-H1

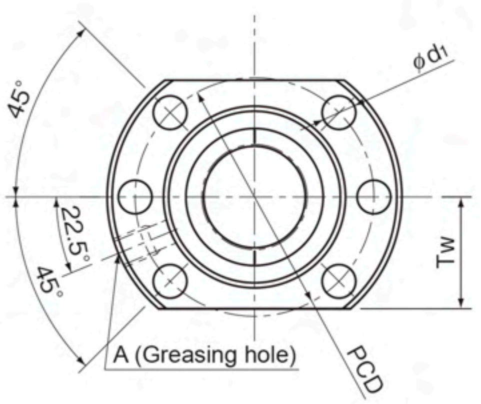
※1 No symbol : Without Lubricator QZ
※2 No symbol : Without Labyrinth Seal RR (Wiper ring WW)
※3 No symbol : Without Shaft end machining
※4 No symbol : Without Shaft end machinng
※5 Lubricator QZ and Wiper ring WW are options that apply to Complete Assembly.
※6 Symbol “TS“ is screw shaft model number.

Shape of the Shaft Ends

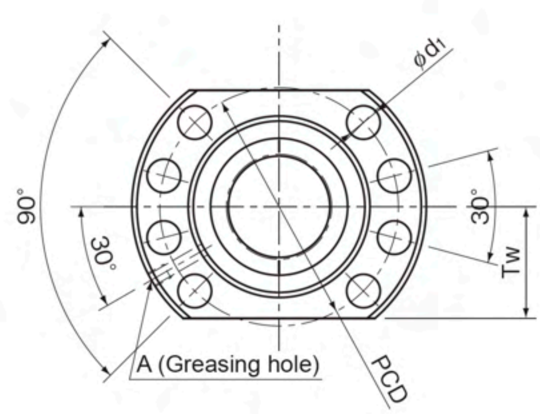
Type of Recommended Shape of the Shaft Ends

Mounting method	Symbol	Shaft End Shape	Support Unit
Fixed	H1		FK
	J1		BK
	H2		FK
	J2		BK
	H3		FK
	J3		BK
Supported	K		FF BF
Free	No Symbole		–

Dimensions



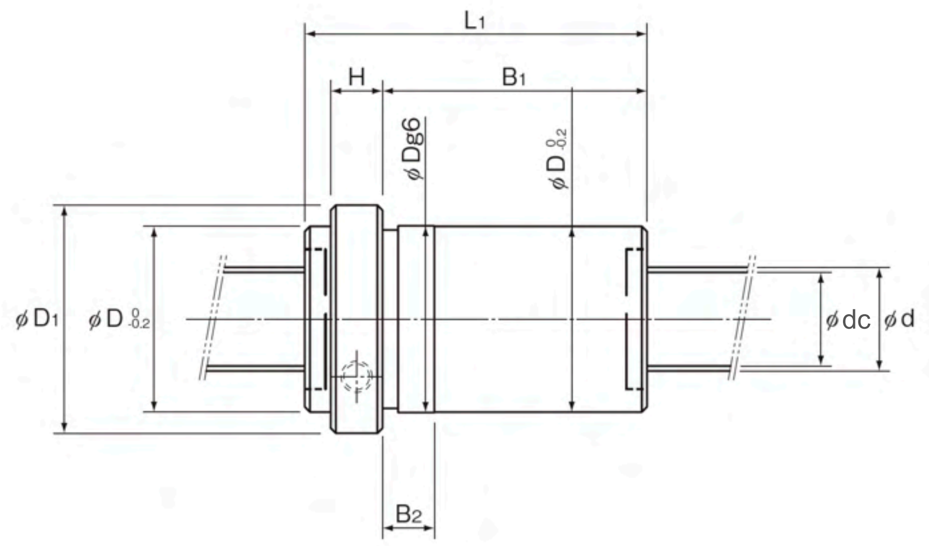
Hole type 1
(Model EBB1605 to 3210)



Hole type 2
(Model EBB4005 to 6320)

Model No.	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of load Circuits Rows × turns	Basic load rating Ca kN	Basic load rating C_0a kN	Rigidity K N/μm
EBB 1605-4	16	5	16.75	13.1	4×1	11.9	17.4	210
EBB 2005-3	20	5	20.5	17.1	3×1	10.6	17.3	200
EBB 2505-3	25	5	25.5	22.1	3×1	12.1	22.6	250
EBB 2510-3	25	10	26.0	21.6	3×1	15.9	27	250
EBB 2510-4	25	10	26.0	21.6	4×1	20.9	37.6	330
EBB 3205-3	32	5	32.75	29.2	3×1	13.9	30.2	300
EBB 3205-4	32	5	32.75	29.2	4×1	17.8	40.3	400
EBB 3205-6	32	5	32.75	29.2	6×1	25.1	60.4	600
EBB 3210-3	32	10	33.75	26.4	3×1	32.1	52.2	300
EBB 3210-4	32	10	33.75	26.4	4×1	41.3	69.7	390
EBB 4005-6	40	5	40.75	37.1	6×1	26.6	77.5	716
EBB 4010-3	40	10	41.75	34.4	3×1	37.3	69.3	380
EBB 4010-4	40	10	41.75	34.4	4×1	47.6	92.4	500
EBB 4010-6	40	10	41.75	34.4	6×1	67.5	138.6	750
EBB 4020-3	40	20	41.75	34.7	3×1	36.8	69.3	750
EBB 5005-6	50	5	50.75	47.1	6×1	30.9	99.1	940
EBB 5010-4	50	10	51.75	44.4	4×1	54.3	120.5	610
EBB 5020-3	50	20	52.25	43.6	3×1	55.3	108.8	470
EBB 6310-6	63	10	64.75	57.7	6×1	87.9	242.1	1140
EBB 6320-3	63	20	65.7	56.0	3×1	104.4	229.3	1470

Note) Basic Dynamic Load Rating (Ca) of the accuracy Ct7 is 0.9 Ca.



Unit : mm

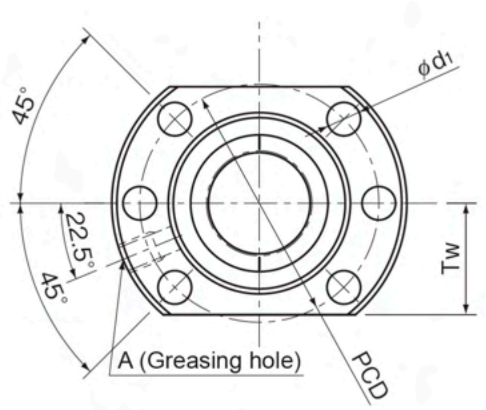
	Nut dimensions										Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	d_1	T_W	Greasing hole A	kg	kg/m
	28	48	55	10	40	12	38	5.5	20	M6×1	0.21	1.25
	36	58	50	10	35	12	47	6.6	22	M6×1	0.31	2.06
	40	62	50	10	35	12	51	6.6	24	M6×1	0.34	3.35
	40	62	80	10	65	18	51	6.6	24	M6×1	0.51	3.45
	40	62	85	10	70	18	51	6.6	24	M6×1	0.53	3.45
	50	80	52	12	35	12	65	9	31	M6×1	0.59	5.67
	50	80	57	12	40	12	65	9	31	M6×1	0.63	5.67
	50	80	67	12	50	12	65	9	31	M6×1	0.71	5.67
	50	80	82	12	65	18	65	9	31	M6×1	0.76	4.98
	50	80	94	12	77	18	65	9	31	M6×1	0.85	4.98
	63	93	70	14	51	12	78	9	35	M8×1	1.13	9.6
	63	93	84	14	65	18	78	9	35	M8×1	1.23	8.22
	63	93	94	14	75	18	78	9	35	M8×1	1.35	8.22
	63	93	114	14	95	18	78	9	35	M8×1	1.59	8.22
	63	93	129	14	105	27	78	9	35	M8×1	1.91	9.03
	75	110	75	16	54	12	93	11	42.5	M8×1	1.55	14.59
	75	110	96	16	75	25	93	11	42.5	M8×1	1.9	13.38
	75	110	134	16	108	27	93	11	42.5	M8×1	2.59	13.8
	90	125	119	18	96	18	108	11	47.5	M8×1	2.87	21.93
	95	135	136	18	108	27	115	13.5	50	M8×1	4.11	21.57

Note) The rigidity values in the table represent spring constants each obtained from the load and the Elastic Deformation finish when providing an axial load 24% of the basic dynamic load rating (Ca).
These values do not include the rigidity of the components related to mounting the nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value.
If the axial load (Fa) is not 0.24 Ca, the rigidity value (K_N) is obtained from the following equation.

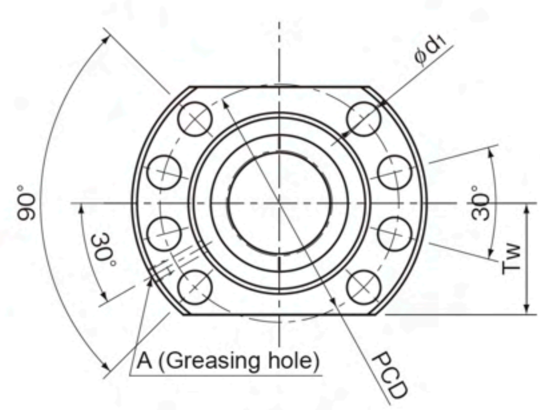
$$K_N = K\left(\frac{Fa}{0.24 \cdot Ca}\right)^{\frac{1}{3}}$$

K: Rigidity value in the dimensional table.

Dimensions



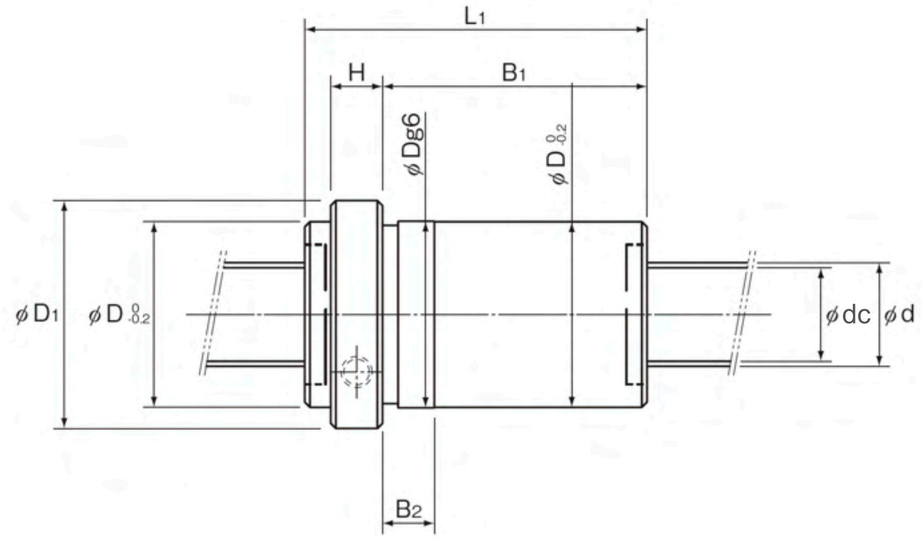
Hole type 1
(Model EPB1605 to 3210)



Hole type 2
(Model EPB4005 to 6310)

Model No.	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of load Circuits Rows × turns	Basic load rating Ca kN	Basic load rating C_0a kN	Rigidity K N/μm
EPB 1605-6	16	5	16.75	13.1	3×1	9.3	13.1	315
EPB 2005-6	20	5	20.5	17.1	3×1	10.6	17.3	396
EPB 2505-6	25	5	25.5	22.1	3×1	12.1	22.6	491
EPB 2510-4	25	10	26.0	21.6	2×1	11.3	18.0	331
EPB 3205-6	32	5	32.75	29.2	3×1	13.9	30.2	616
EPB 3205-8	32	5	32.75	29.2	4×1	17.8	40.3	811
EPB 3210-6	32	10	33.75	26.4	3×1	32.1	52.2	602
EPB 4005-6	40	5	40.75	37.1	3×1	15.4	38.8	751
EPB 4010-6	40	10	41.75	34.4	3×1	37.3	69.3	756
EPB 4010-8	40	10	41.75	34.4	4×1	47.6	92.4	995
EPB 5010-8	50	10	51.75	44.4	4×1	54.3	120.5	1234
EPB 6310-8	63	10	64.75	57.7	4×1	61.9	160.7	1550

Note) Basic Dynamic Load Rating (Ca) of the accuracy Ct7 is 0.9 Ca.



Unit : mm

	Nut dimensions										Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	d_1	T_W	Greasing hole A	kg	kg/m
	28	48	65	10	50	12	38	5.5	20	M6×1	0.25	1.25
	36	58	66	10	51	12	47	6.6	22	M6×1	0.42	2.06
	40	62	66	10	51	12	51	6.6	24	M6×1	0.45	3.35
	40	62	85	10	70	18	51	6.6	24	M6×1	0.56	3.45
	50	80	67	12	50	12	65	9	31	M6×1	0.77	5.67
	50	80	78	12	61	12	65	9	31	M6×1	0.86	5.67
	50	80	112	12	95	18	65	9	31	M6×1	1.03	4.98
	63	93	70	14	51	12	78	9	35	M8×1	1.23	9.06
	63	93	114	14	95	18	78	9	35	M8×1	1.70	8.22
	63	93	138	14	119	18	78	9	35	M8×1	1.99	8.22
	75	110	140	16	119	18	93	11	42.5	M8×1	2.77	13.38
	90	125	142	18	119	18	108	11	47.5	M8×1	3.74	21.93

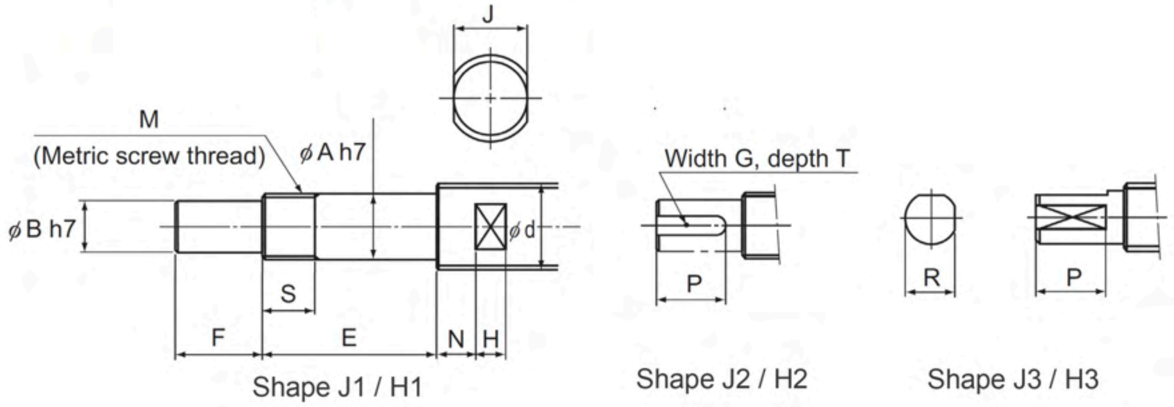
Note) The rigidity values in the table represent spring constants each obtained from the load and the elastic deformation when providing a preload 8% of the basic dynamic load rating (Ca) and applying an axial load three times greater than the preload. These values do not include the rigidity of the components related to mounting the nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value.
If the applied preload (Fa_0) is not 0.08 Ca, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K\left(\frac{Fa_0}{0.08 \cdot Ca}\right)^{\frac{1}{3}}$$

K: Rigidity value in the dimensional table.

Fixed side Shaft Ends

Type of Recommended Shape of the Shaft Ends



Shape J (J1, J2 and J3) (For Support Unit Model BK)

Unit : mm

Ball Screw Model No.	d	A	B	E	F	Metric screw thread	Width across flat	Shape J2					Shape J3		Support Unit Model No.
						M	S	J	N	H	G N9	$T^{+0.1}_{0}$	P	R	P	
EBB/EPB1605	16	12	10	39	15	M12×1	14	13	6	8	3	1.8	12	9.5	12	BK12
EBB/EPB2005	20	15	12	40	20	M15×1	12	16	8	9	4	2.5	16	11.3	16	BK15
EBB/EPB25_ _	25	17	15	53	23	M17×1	17	18	7	10	5	3	21	14.3	21	BK17
EBB/EPB32_ _	32	20	17	53	25	M20×1	15	21	8	11	5	3	21	16	21	BK20
EBB/EPB40_ _	40	30	25	72	38	M30×1.5	25	32	10	15	8	4	32	23.5	32	BK30
EBB/EPB50_ _	50	40	35	98	50	M40×1.5	35	41	14	19	10	5	45	33	45	BK40

Shape H (H1, H2 and H3) (For Support Unit Model FK)

Unit : mm

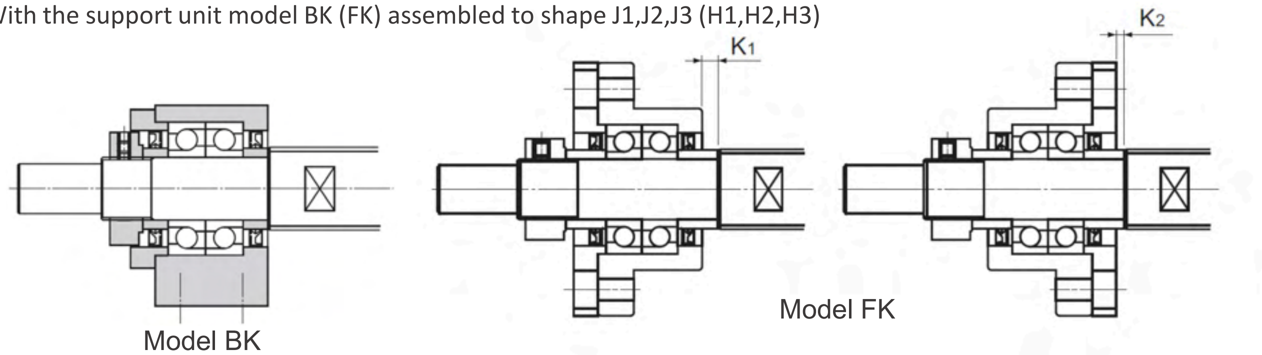
Ball Screw Model No.	d	A	B	E	F	Metric screw thread		Width across flat			Shape H2			Shape H3		Support Unit position		Support Unit Model No.
						M	S	J	N	H	G N9	$T^{+0.1}_{0}$	P	R	P	K_1	K_2	
EBB/EPB1605	16	12	10	36	15	M12×1	11	13	6	8	3	1.8	12	9.5	12	0.5	-0.5	FK12
EBB/EPB2005	20	15	12	49	20	M15×1	13	16	6	9	4	2.5	16	11.3	16	4	2	FK15
EBB/EPB25_ _	25	15	12	49	20	M15×1	13	18	7	10	4	2.5	16	11.3	16	4	2	FK15
EBB/EPB32_ _	32	20	17	64	25	M20×1	17	27	9	13	5	3	21	16	21	1	-3	FK20
EBB/EPB40_ _	40	30	25	72	38	M30×1.5	25	32	10	15	8	4	32	23.5	32	-3	-9	FK30

Note) Support Units are designed to have dimensions so that combinations of models FK and FF or models BK and BF are used on the same shaft.
If desiring the shaft end to be machined at THK, add the shape symbol in the end of the Ball Screw model number.
(Example) TS2505+500L-J2K (Shape J2 on the fixed side; shape K on the supported side)
For the perpendicularity of the end face of the bearing, refer to JIS B 1192-1997.

Note) The ball screw nut flange faces the fixed side unless otherwise specified.
If desiring the flange to face the supported side, add symbol G in the end of the Ball Screw model number when placing an order.

(Example) EBB2510-4RRG0+650LCp5R-J1KG

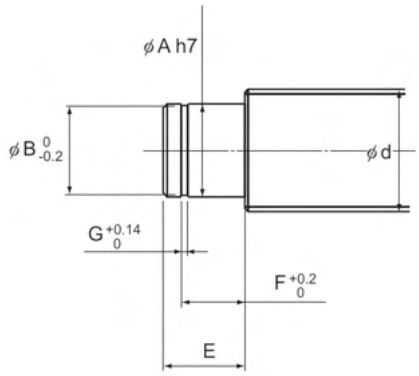
With the support unit model BK (FK) assembled to shape J1,J2,J3 (H1,H2,H3)



Support side Shaft Ends

Type of Recommended Shape of the Shaft Ends
Shape K (For Support Unit Model BF, FF)

Shape K



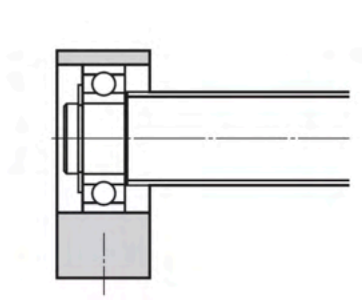
Unit: mm

Ball Screw Model No.	d	A	E	B	F	G	Support Unit Model No.
EBB/EPB1605	16	10	11	9.6	9.15	1.15	BF12/FF12
EBB/EPB2005	20	15	13	14.3	10.15	1.15	BF15/FF15
EBB/EPB25_ _	25	15	13	14.3	10.15	1.15	BF15/FF15
		17	16	16.2	13.15	1.15	* BF17
EBB/EPB32_ _	32	20	16	19	13.35	1.35	** BF20
		20	19	19	15.35	1.35	** FF20
EBB/EPB40_ _	40	30	21	28.6	17.75	1.75	BF30/FF30
EBB/EPB50_ _	50	40	23	38	19.95	1.95	BF40

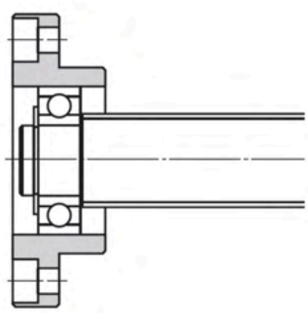
Note) Support Units are designed to have dimensions so that combinations of models FK and FF or models BK and BF are used on the same shaft.
If desiring the shaft end to be machined at THK, add the shape symbol in the end of the Ball Screw model number.
* When model BK17 (shaft end shape: J) is used on the fixed side for a Ball Screw with a shaft outer diameter of 25 mm, the shaft end shape on the supported side is that for model BF17.
** When placing an order, be sure to specify the model number of the Support Unit to be used.

(Example)
TS2505+500L-H2K (Shape H2 on the fixed side; shape K on the supported side)
For the perpendicularity of the end face of the bearing, refer to JIS B 1192-1997.

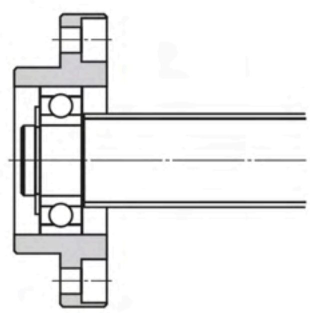
With the support unit model BF / FF assembled to shape K



Model BF



Model FF



Model FF

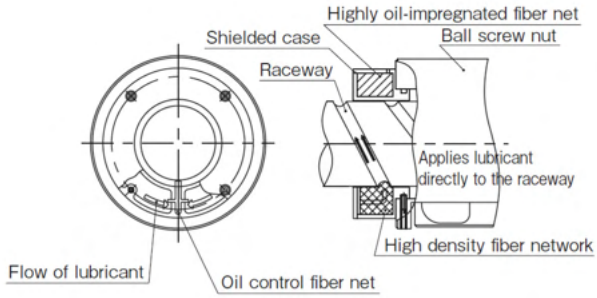
Options

The options that apply to Complete Assembly

For EBB/EPB series, QZ Lubricators and Wiper Rings for Ball Screws are available as options. QZ Lubricators which contains a highly oil impregnated fi ber net are designed for long term maintenance free operation. Contact type seal, Wiper Ring W, excels in foreign material removal.

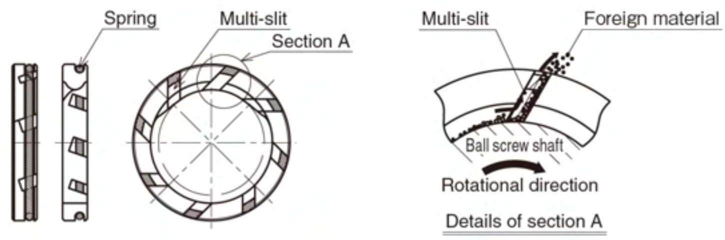
QZ Lubricator

QZ Lubricator is a lubrication system that supplies sufficient lubrication to the raceway of the ball screw shaft.

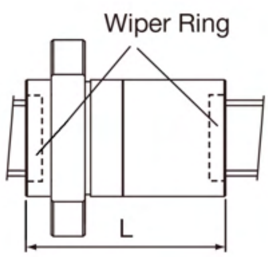


Wiper ring W

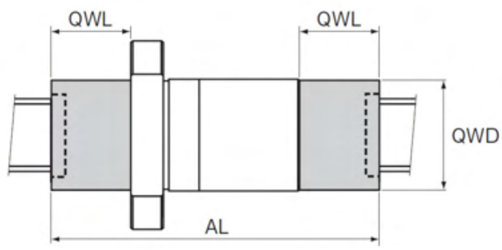
In wiper ring W, a highly wear resistant special resin elastically contacts the circumference and thread groove of the ball screw shaft, and removes foreign material from eight slits, preventing it from entering the ball screw nut.



Dimensions of the Ball Screw Nut Attached with Wiper Ring W and QZ Lubricator



With WW (without QZ)



With QZ and WW

Unit : mm

Model No.	L	QWL	QWD	AL
EBB 1605-4	55	25	27	110
EBB 2005-3	50	26.5	33	98
EBB 2505-3	50	28	39	101
EBB 2510-3	80	32	39	139
EBB 2510-4	85	32	39	144
EBB 3205-3	52	35	45	117
EBB 3205-4	57	35	45	122
EBB 3205-6	67	35	45	132
EBB 3210-3	82	40	49	157
EBB 3210-4	94	40	49	169
EBB 4005-6	70	28.5	61	122
EBB 4010-3	84	44	61	167
EBB 4010-4	94	44	61	177
EBB 4010-6	114	44	61	197
EBB 4020-3	129	47	61	213
EBB 5010-4	96	44	71	165
EBB 5020-3	134	40	71	204
EBB 6310-6	119	39	84	192
EBB 6320-3	136	30.5	94	187

Note) The dimension L indicates the length of the nut with WW.

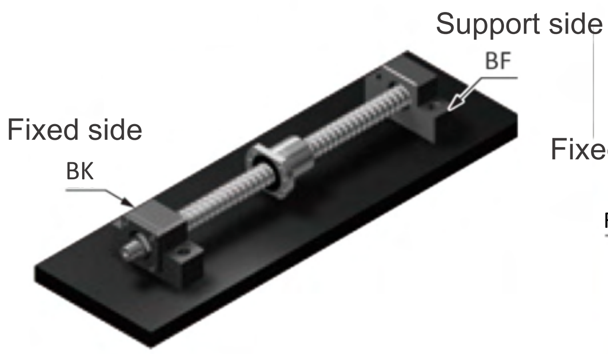
Unit : mm

Model No.	L	QWL	QWD	AL
EPB 1605-6	65	25	27	115
EPB 2005-6	66	26.5	33	114
EPB 2505-6	66	28	39	117
EPB 2510-4	85	32	39	144
EPB 3205-6	67	35	45	132
EPB 3205-8	78	35	45	143
EPB 3210-6	112	40	49	187
EPB 4005-6	70	28.5	61	122
EPB 4010-6	114	44	61	197
EPB 4010-8	138	44	61	221
EPB 5010-8	140	37	71	209
EPB 6310-8	142	39	84	215

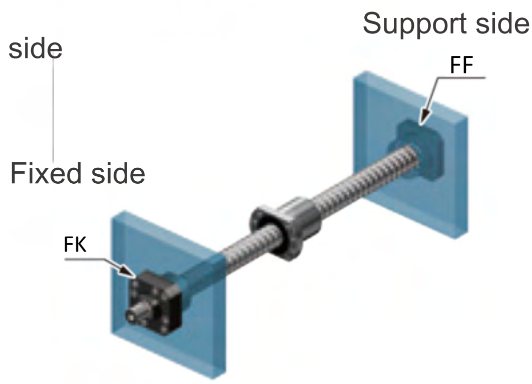
Note) The dimension L indicates the length of the nut with WW.

Support Unit

The support unit is a bearing component that supports the shaft end of the ball screw. To ensure the rigidity balance with the Ball Screw, the support unit uses an angular bearing (contact angle: 30°; DF configuration) with a high rigidity and low torque.
Therefore, a large load can be received in the axial direction, and stable rotation accuracy with high rigidity and high accuracy can be obtained.
The support unit is designed so that BK and BF, FK and FF can be used for one axis.



Base Fixing Type

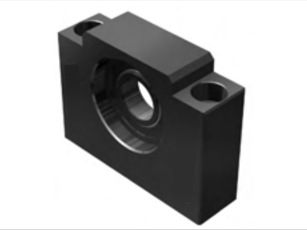
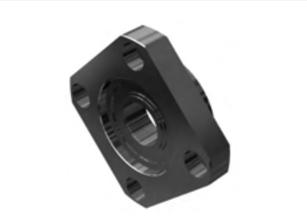


Wall Mounting Type

Fixed side Support Unit Line-up

Model BK	Model FK
	

Support side Support Unit Line-up

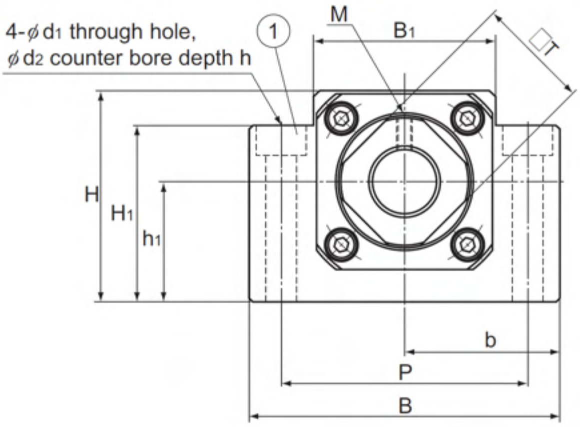
Model BF	Model FF
	

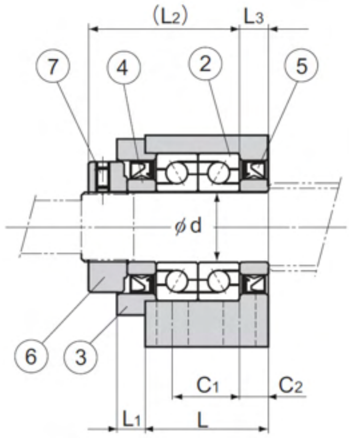
Support Unit Model No.	Bearing	Axial direction		
		Basic dynamic load rating Ca (kN)	Permissible Load (kN)[1)]	Rigidity (N/μm)
BK12/FK12	7001 equivalent (DF P5)	6.66	3.25	88
BK15/FK15	7002 equivalent (DF P5)	7.6	4	100
BK17	7203 equivalent (DF P5)	13.7	5.85	125
BK20	7004 equivalent (DF P5)	12.7	7.55	140
FK20	7204 equivalent (DF P5)	17.9	9.5	170
BK30/FK30	7206 equivalent (DF P5)	28	16.3	195
BK40	7208 equivalent (DF P5)	44.1	27.1	270

Support Unit Model No.	Bearing	Radial direction	
		Basic dynamic load rating C (kN)	Basic static load rating C_0 (kN)
BF12/FF12	6000ZZ	4.55	1.96
BF15/FF15	6002ZZ	5.6	2.84
BF17	6203ZZ	9.6	4.6
BF20	6004ZZ	9.4	5.05
FF20	6204ZZ	12.8	6.65
BF30/FF30	6206ZZ	19.5	11.3
BF40	6208ZZ	29.1	17.8

[1)]Permissible load indicates the static permissible load.

Model BK Square Type Support Unit on the Fixed Side



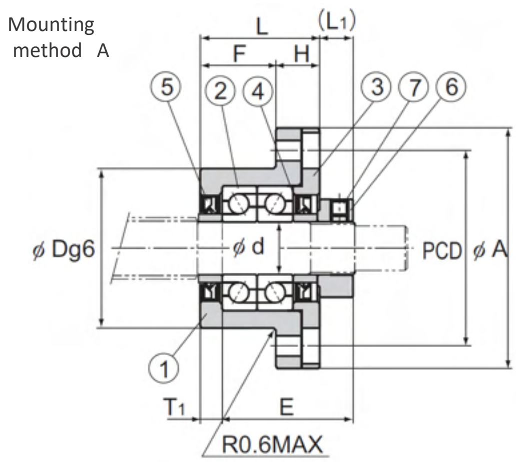


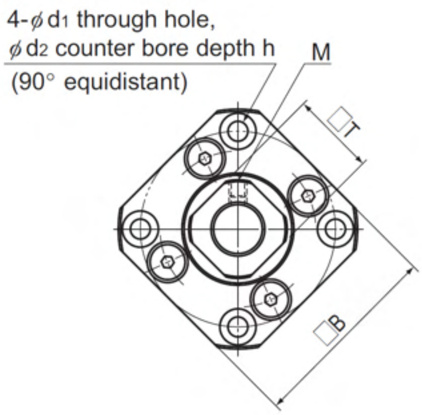
Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1 set
3	Holding lid	1
4	Collar	2
5	Seal	2
6	Lock Nut	1
7	Hexagonal socket-head setscrew (with a set piece)	1

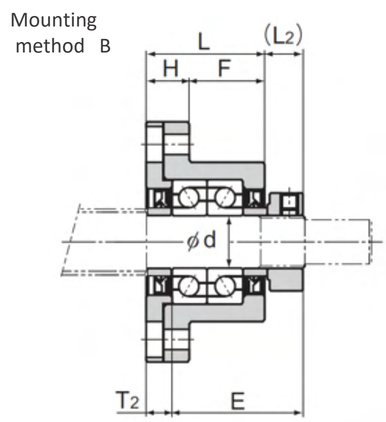
Unit : mm

Support Unit Model No.	d	L	L_1	L_2	L_3	B	H	b ±0.02	h_1 ±0.02	B_1	H_1	P	C_1	C_2	d_1	d_2	h	M	T	Mass (kg)	Ball Screw Model No.
BK12	12	25	5	29	5	60	43	30	22	35	32.5	46	13	6	6.6	10.8	1.5	M3	19	0.41	EBB/EPB1605
BK15	15	27	6	32	6	70	48	35	28	40	38	54	15	6	6.6	11	6.5	M3	22	0.57	EBB/EPB2005
BK17	17	35	9	44	7	86	64	43	39	50	55	68	19	8	9	14	8.5	M4	24	1.27	EBB/EPB25_ _
BK20	20	35	8	43	8	88	60	44	34	52	50	70	19	8	9	14	8.5	M4	30	1.19	EBB/EPB32_ _
BK30	30	45	14	61	9	128	89	64	51	76	78	102	23	11	14	20	13	M6	40	3.32	EBB/EPB40_ _
BK40	40	61	18	76	15	160	110	80	60	100	35	140	33	14	18	26	17.5	M8	50	6.5	EBB/EPB50_ _

Model FK Round Type Support Unit on the Fixed Side



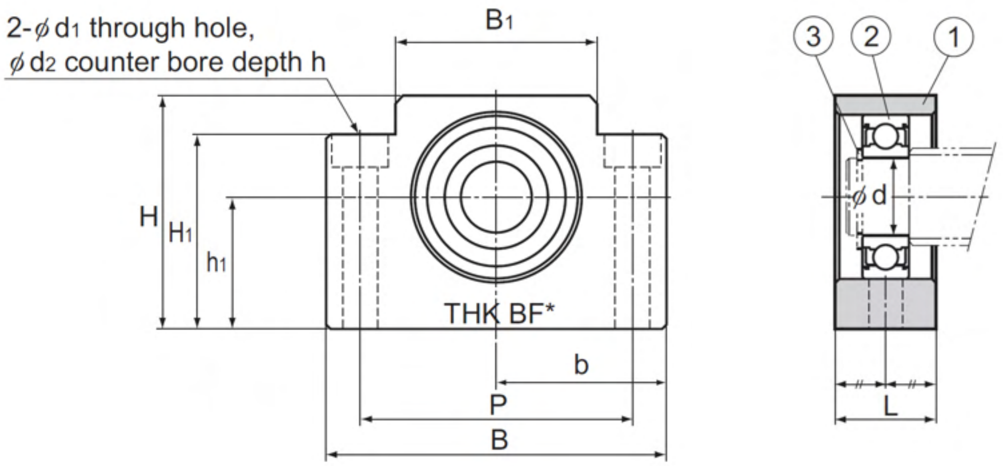




Unit : mm

Support Unit Model No.	d	L	L_1	L_2	L_3	B	H	b ±0.02	h_1 ±0.02	B_1	H_2	E	P	C_1	C_2	d_3	d_1	d_2	h	M	T	Mass (kg)	Ball Screw Model No.
FK12	12	25	5	29	5	60	43	30	22	35	32.5	18	46	13	6	5.5	6.6	10.8	1.5	M3	19	0.41	EBB/EPB1605
FK15	15	27	6	32	6	70	48	35	28	40	38	18	54	15	6	5.5	6.6	11	6.5	M3	22	0.57	EBB/EPB2005 EBB/EPB25_ _
FK20	20	35	9	44	7	86	64	43	39	50	55	28	68	19	8	6.6	9	14	8.5	M4	24	1.27	EBB/EPB32_ _
FK30	30	35	8	43	8	88	60	44	34	52	50	22	70	19	8	6.6	9	14	8.5	M4	30	1.19	EBB/EPB40_ _

Model BF Square Type Support Unit on the Support Side



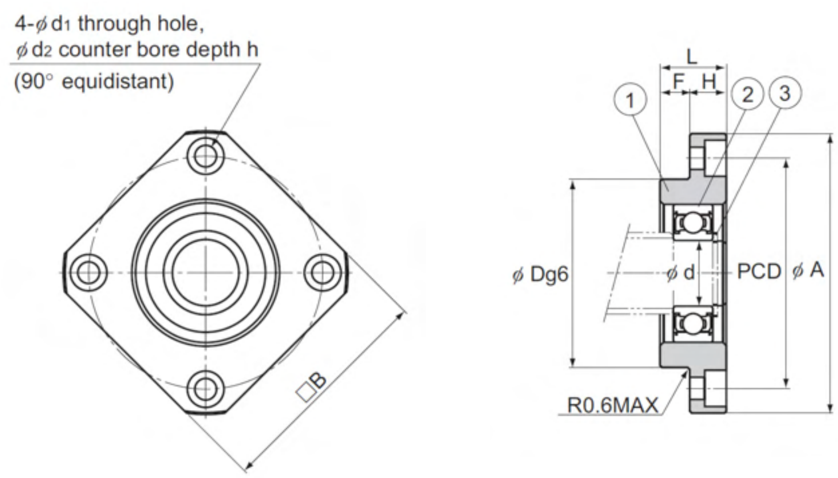
Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1
3	Snap ring	1

Unit : mm

Support Unit Model No.	d	L	B	H	b ±0.02	h_1 ±0.02	B_1	H_1	P	d_1	d_2	h	Bearing used	Snap ring used	Mass (kg)	Ball Screw Model No.
BF12	12	25	60	43	30	22	35	32.5	46	6.6	10.8	1.5	6000ZZ	C10	0.3	EBB/EPB1605
BF15	15	27	70	48	35	28	40	38	54	6.6	11	6.5	6002ZZ	C15	0.38	EBB/EPB2005 EBB/EPB25_ _
BF17	17	35	86	64	43	39	50	55	68	9	14	8.5	6203ZZ	C17	0.74	EBB/EPB25_ _
BF20	20	35	88	60	44	34	52	50	70	9	14	8.5	6004ZZ	C20	0.76	EBB/EPB32_ _
BF30	30	45	128	89	64	51	76	78	102	14	20	13	6206ZZ	C30	1.97	EBB/EPB40_ _
BF40	40	61	160	110	80	60	100	35	140	18	26	17.5	6208ZZ	C40	3.27	EBB/EPB50_ _

Note) The area marked with "*" is imprinted with a numeric character(s) as part of the model number.

Model FF Round Type Support Unit on the Support Side

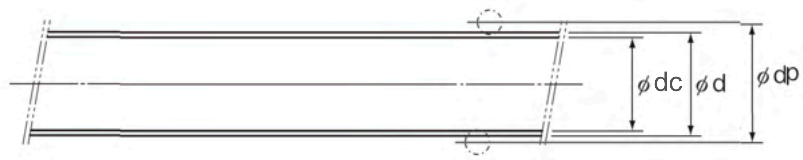


Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1
3	Snap ring	1

Unit : mm

Support Unit Model No.	d	L	H	F	D	A	PCD	B	d_1	d_2	h	Bearing used	Snap ring used	Mass (kg)	Ball Screw Model No.
FF12	10	15	7	8	$34^{-0.009}_{-0.025}$	52	42	42	4.5	8	4	6000ZZ	C10	0.11	EBB/EPB1605
FF15	15	17	9	8	$40^{-0.009}_{-0.025}$	63	50	52	5.5	9.5	5.5	6002ZZ	C15	0.2	EBB/EPB2005 EBB/EPB25_ _
FF20	20	20	11	9	$57^{-0.01}_{-0.029}$	85	70	68	6.6	11	6.5	6204ZZ	C20	0.27	EBB/EPB32_ _
FF30	30	27	18	9	$75^{-0.01}_{-0.029}$	117	95	93	11	17.5	11	6206ZZ	C30	1.07	EBB/EPB40_ _

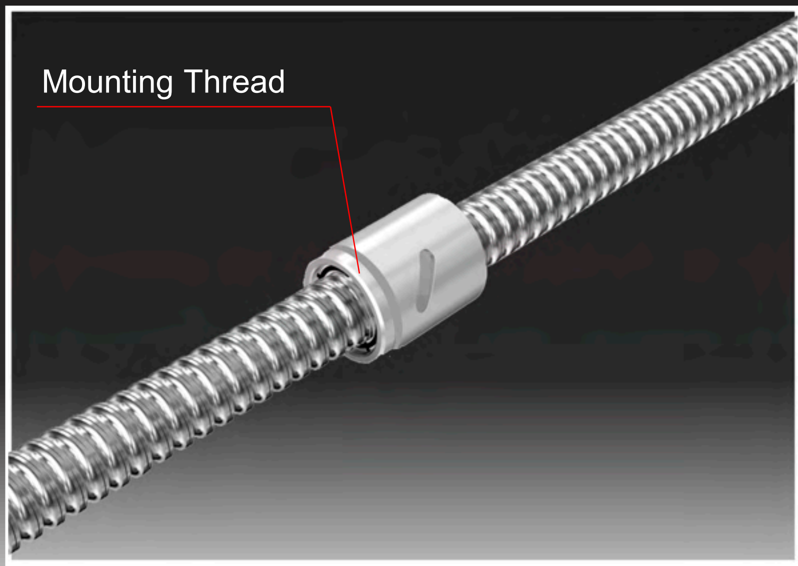
Dimensions



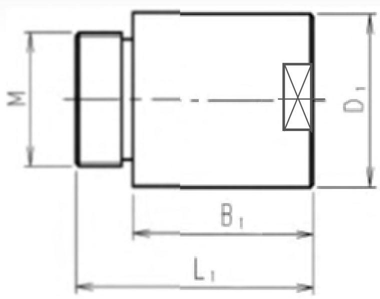
Unit: mm

Model No.	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	Limitations of Screw Shaft Length		Shaft mass kg/m
					Cp5	Ct7	
TS 1605	16	5	16.75	13.1	1500	2000	1.25
TS 2005	20	5	20.5	17.1	2000	2500	2.06
TS 2505	25	5	25.5	22.1	2000	4000	3.35
TS 2510	25	10	26.0	21.6	2000	4000	3.45
TS 3205	32	5	32.75	29.2	2000	4000	5.67
TS 3210	32	10	33.75	26.4	2000	4000	4.98
TS 4005	40	5	40.75	37.1	2000	4000	9.6
TS 4010	40	10	41.75	34.4	2000	4000	8.22
TS 4020	40	20	41.75	34.7	2000	4000	9.03
TS 5005	50	5	50.75	47.1	2000	4000	14.59
TS 5010	50	10	51.75	44.4	2000	4000	13.38
TS 5020	50	20	52.25	43.6	2000	4000	13.8
TS 6310	63	10	64.75	57.7	2000	4000	21.93
TS 6320	63	20	65.7	56.0	2000	4000	21.57

Mounting Thread model without flange can also be manufactured



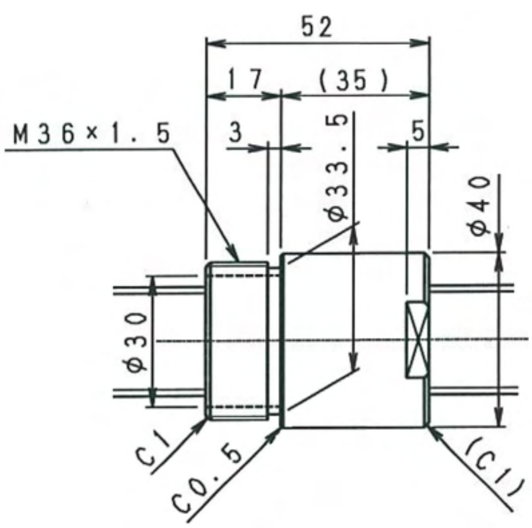
Example



Unit:mm

Model No.	Screw shaft outer diameter d	Lead Ph	Nut dimensions				Basic load rating	
			Outer diameter D_1	Outer length B_1	Overall length L_1	M	Ca kN	C_{0a} kN
EBB 2505-3S[1)	25	5	40	35	52	M36×1.5	12.1	22.6

1)S means special shape symbol



Permissible Rotational Speed of Ball Screw

Permissible Rotational Speed of Ball Screw

The permissible rotational speed of the Ball Screw must be obtained from the dangerous speed of the screw shaft and the DN value.
Of the permissible rotational speed determined by dangerous speed (N_1) and the permissible rotational speed determined by DN value (N_2), the lower rotational speed is regarded as the permissible rotational speed of Ball Screw.

N_1 : Dangerous Speed of the Screw Shaft

When the rotational speed exceeds a certain limit, the Ball Screw may resonate and eventually become unable to operate due to the screw shaft's natural frequency.

Therefore, it is necessary to select a model so that it is used below the resonance point (dangerous speed). Figure on the right page shows the relationship between the screw shaft diameter and a dangerous speed. If determining a dangerous speed by calculation, it can be obtained from the equation below.

$$N_1 = \frac{60 \cdot \lambda_1^2}{2\pi \cdot \ell_b^2} \times \sqrt{\frac{E \times 10^3 \cdot I}{\gamma \cdot A}} \times 0.8 = \lambda_2 \cdot \frac{d_1}{\ell_b^2} \times 10^7$$

N_1 : Permissible rotational speed determined by dangerous speed [min^{-1}]
ℓ_b : Distance between two mounting surfaces [mm]
E : Young's modulus [2.06×10^5 N/mm^2]
I : Minimum geometrical moment of inertia of the shaft [mm^4]

$$I = \frac{\pi}{64} \cdot d_1^4$$ d_1 : screw-shaft thread minor diameter [mm]

γ : Density [specific gravity: 7.85×10^{-6} kg/mm^3]
A : Screw shaft cross-sectional area [mm^2]

$$A = \frac{\pi}{4} \cdot d_1^2$$

λ_1, λ_2 : Factor according to the mounting method

Fixed – free	$\lambda_1 = 1.875$	$\lambda_2 = 3.4$
Supported – supported	$\lambda_1 = 3.142$	$\lambda_2 = 9.7$
Fixed – supported	$\lambda_1 = 3.927$	$\lambda_2 = 15.1$
Fixed – fixed	$\lambda_1 = 4.73$	$\lambda_2 = 21.9$

Note) that in this equation, a safety factor of 0.8 is multiplied to the result.

N_2 : DN Value of the Nut

The permissible rotational speed determined by the DN value obtained using the equations.

$$N_2 = \frac{100000}{dp}$$ For complete assembly

$$N_2 = \frac{70000}{dp}$$ For separate components

N_2 : Permissible rotational speed determined by the DN value [min^{-1}]
dp : Ball center-to-center diameter [mm]
(indicated in the specification tables of the respective model number)

If the working rotational speed exceeds N_2, a high-speed type Ball Screw is available. Contact THK for details.

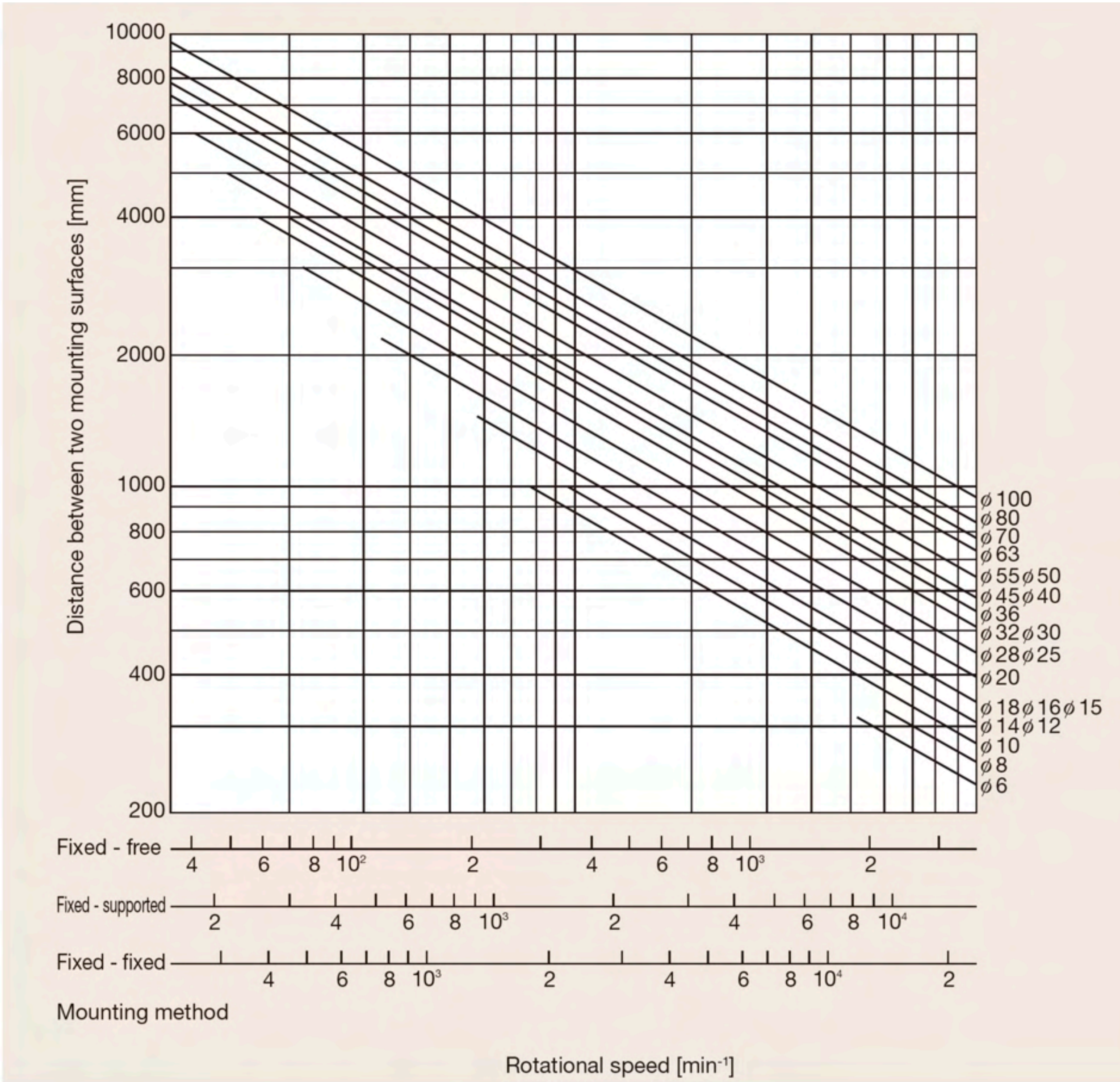


Diagram of Dangerous Speed

Permissible Axial Load

Buckling Load on the Screw Shaft

With the Ball Screw, it is necessary to select a screw shaft so that it will not buckle when the maximum compressive load is applied in the axial direction.
Below figure shows the relationship between the screw shaft diameter and a buckling load.
If determining a buckling load by calculation, it can be obtained from the equation below.

$$P_1 = \frac{\eta_1 \cdot \pi^2 \cdot E \cdot I}{\ell_a{}^2} \times 0.5 = \eta_2 \cdot \frac{d_1{}^4}{\ell_a{}^2} \times 10^4$$

P_1: Bucking load [N]
ℓ_a : Distance between two mounting surfaces [mm]
E: Young's modulus [2.06×10^5 N/mm^2]

I : Minimum geometrical moment of inertia of the shaft [mm^4]

$I = \frac{\pi}{64} \cdot d_1{}^4$ d_1 : screw-shaft thread minor diameter [mm]

λ_1, λ_2 : Factor according to the mounting method

Fixed – free	λ_1 =1.875	λ_2=3.4
Supported – supported	λ_1=3.142	λ_2=9.7
Fixed – supported	λ_1=3.927	λ_2=15.1
Fixed – fixed	λ_1=4.73	λ_2=21.9

Note) That in this equation, a safety factor of 0.5 is multiplied to the result.

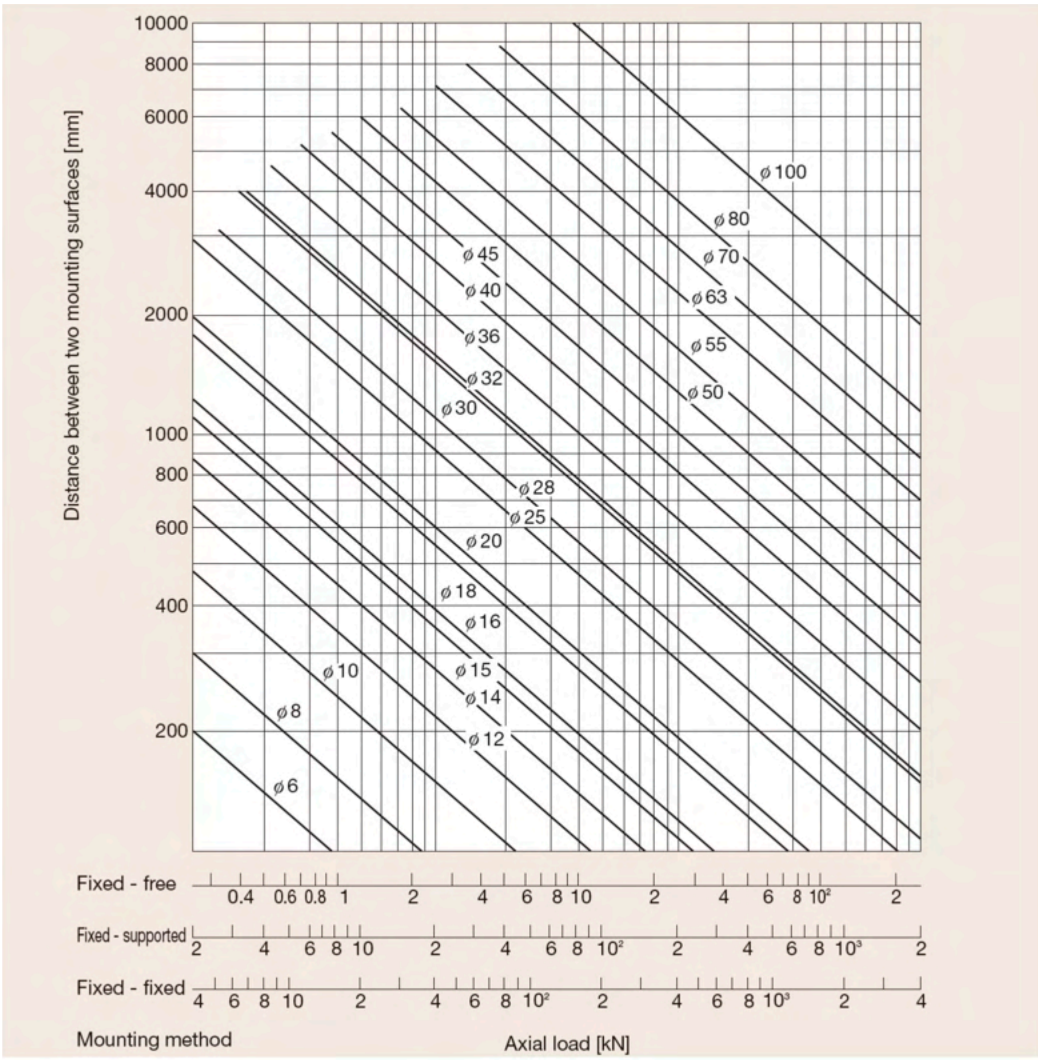


Diagram of Permissible Axial Load

Permissible Tensile Compressive Load on the Screw Shaft

If an axial load is applied to the Ball Screw, it is necessary to take into account not only the buckling load but also the permissible tensile compressive load in relation to the yielding stress on the screw shaft.
The permissible tensile compressive load is obtained from the equation.

$$P_2 = \sigma \frac{\pi}{4} d_1{}^2 = 116 \cdot d_1{}^2$$

P_2: Permissible tensile compressive load [N]
σ : Permissible tensile compressive stress (147 MPa)
d_1 : Screw-shaft thread minor diameter [mm]

Static Safety Factor

Static Safety Factor

Depending on the conditions, it is necessary to include the following static safety factor when calculating the calculated load. When the Ball Screw is stationary or in motion, unexpected external force may be applied through a load caused by an impact or a sudden start or stop.

Basic static load rating C_0a

The basic static load rating (C_0a) is a static load with a constant direction and magnitude whereby the sum of the permanent deformation of the rolling element and that of the raceway on the contact area under the maximum stress is 0.0001 times the rolling element diameter. With the Ball Screw, it is defined as the axial load. (Specific values of each Ball Screw model are indicated in the specification tables for the corresponding model number.)

$$fS = \frac{C_0a}{Famax}$$

fs : Static safety factor
C_0a : Basic static load rating [kN]
Famax : Permissible Axial load [kN]

Static safety factor (fs)

Machine using the Ball screws	Load conditions	fs
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3
Machine tool	Without vibration or impact	1 to 1.5
	With vibration or impact	2.5 to 7

Nominal Rating Life

Calculating the Nominal Rating Life

The nominal rating life of the Ball Screw is calculated from the equation below using the basic dynamic load rating (Ca) and the applied axial load.

Basic dynamic load rating Ca

The basic dynamic load rating (Ca) is used in calculating the nominal rating life when a Ball Screw operates under a load. The basic dynamic load rating (Ca) is a centric, axial load with constant direction and magnitude, where theoretically endure the nominal rating life (L10) of a Group of identical Ball screws and operating under the same conditions to 10^6 revolutions. (Specific basic dynamic load ratings (Ca) are indicated in the specification tables of the corresponding model numbers.)

Life in revolutions

$$L10 = \left(\frac{Ca}{fw \cdot Fa}\right)^3 \times 10^6$$

L_{10} : Life in revolutions [revolutions]
Ca : Basic dynamic load rating [kN]
Fa : Applied axial load [kN]
fw : Load factor

Load factor (fw)

Vibrations / impact	Speed	fw
Faint	Without vibration or impact	1 ~ 1.2
Weak	With vibration or impact	1.2 ~ 1.5
Medium	Without vibration or impact	1.5 ~ 2.0
Strong	With vibration or impact	2.0 ~ 3.5

Life in hours

If the revolutions per minute is determined, the life in hours can be calculated from the equation below using the life in revolutions(L_{10}) .

$$L10h = \frac{L10}{60 \times N} = \frac{L10 \times Ph}{2 \times 60 \times n \times lS}$$

L_{10h} Life in hours [h]
N Revolutions per minute [min^{-1}]
N: Reciprocations per minute [min^{-1}]
Ph Ball Screw lead [mm]
ls Stroke [mm]

Precautions on use

● Handling

(1) Please use at least two people to move any product weighing 20 kg or more, or use a dolly or another conveyance. Doing so may cause injury or damage.
(2) Do not disassemble the parts. This will result in loss of functionality.
(3) Tilting the Ball Screw shaft and the Ball Screw nut may cause them to fall by their own weight.
(4) Take care not to drop or strike the Ball Screw. Failure to do so could cause injury or product damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
(5) When assembling, do not remove the Ball Screw nut from the Ball Screw shaft.
(6) When handling the product, wear protective gloves, safety shoes, etc., as necessary to ensure safety.

● Precautions on Use

(1) Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
(2) If the product is used in an environment where cutting chips, coolant, corrosive solvents, water, etc., may enter the product, use bellows, covers, etc., to prevent them from entering the product.
(3) Do not use the product at temperature of 80℃ or higher. Except for the heat-resistant models, exposure to higher temperatures may cause the resin/rubber parts to deform/be damaged.
(4) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(5) Micro-oscillation makes it difficult for oil film to form on the raceway in contact with the rolling element, and may lead to fretting. Accordingly, use grease offering excellent fretting toughness. It is also recommended that the Ball Screw nut be turned once or so on a regular basis to make sure oil film is formed between the raceway and rolling element.
(6) Do not use undue force when fitting parts (pin, key, etc.) to the product. This may generate pressure marks on the raceway, leading to loss of functionality.
(7) If an offset or skewing occurs with the Ball Screw shaft support and the Ball Screw nut, it may substantially shorten the service life. Pay much attention to components to be mounted and to the mounting accuracy.
(8) If any of the rolling elements falls from the Ball Screw nut, contact THK instead of using the product.
(9) When using this product with a vertical orientation, take preventive measures such as adding a safety mechanism to prevent falls. The own weight of the Ball Screw nut may cause it to fall.
(10) Do not use this product beyond its permissible rotational speed. Doing so may cause accidents or component damage. Be sure to use the product within the specification range designated by THK.
(11) Do not cause the Ball Screw nut to overshoot. The ball may drop, circulating parts may be damaged, raceway in contact with the ball may develop pressure marks, etc., resulting in malfunction. Continuing to use the product in this condition may lead to premature wear or damage to circulating parts.
(12) Use the Ball Screw by providing a LM Guide, Ball Spline or other guide element. Otherwise, the Ball Screw may be damaged.
(13) Insufficient rigidity or accuracy of mounting members causes the bearing load to concentrate on one point and the bearing performance will drop significantly. Accordingly, give sufficient consideration to the rigidity/accuracy of the housing and base and strength of the fixing bolts.

● Lubrication

(1) Thoroughly wipe off anti-rust oil and feed lubricant before using the product.
(2) Do not mix different lubricants. Mixing greases using the same type of thickening agent may still cause adverse interaction between the two greases if they use different additives, etc.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, use the grease appropriate for the specification/environment.
(4) When lubricating the product having no grease nipple or oil hole, apply grease directly on the raceway and stroke the product several times to let the grease spread inside.
(5) The consistency of grease changes according to the temperature. Take note that the torque of the Ball Screw also changes as the consistency of grease changes.
(6) After lubrication, the rotational torque of the Ball Screw may increase due to the agitation resistance of grease. Be sure to perform a break-in to let the grease spread fully, before operating the machine.
(7) Excess grease may scatter immediately after lubrication, so wipe off scattered grease as necessary.
(8) The properties of grease deteriorate and its lubrication performance drops over time, so grease must be checked and added properly according to the use frequency of the machine.
(9) Although the lubrication interval may vary according to operating conditions and the service environment, lubrication should be performed approximately every 100 km in travel distance (three to six months). Set the final lubrication interval/amount based on the actual machine.
(10) Depending on the mounting orientation and access position, lubricant may not spread fully and poor lubrication may occur. Give full consideration to these factors in the design stage.
(11) When using a Ball Screw, it is necessary to provide effective lubrication. Using the product without lubrication may increase wear of the rolling elements or shorten the service life.

● Storage

When storing the Ball Screw, enclose it in a package designated by THK and store it in a room in a horizontal orientation while avoiding high temperature, low temperature and high humidity.
After the product has been in storage for an extended period of time, lubricant inside may have deteriorated, so add new lubricant before use.

● Disposal

Dispose of the product properly as industrial waste.

LIMITED WARRANTY

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ISO Standard Compliant Ball Screw **EBB/EPB**

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THK CO., LTD.

Headquarters 2-12-10 Shibaura, Minato-ku, Tokyo 108-8506 Japan

International Sales Department Phone: +81-3-5730-3860

www.thk.com

Please check our website for more details

tech.thk.com

THK GmbH
- European Headquarters........... Phone: +49-2102-7425-555
- Düsseldorf Office .... Phone: +49-2102-7425-0
- Stuttgart Office......................... Phone: +49-7141-4988-500
- U.K. Office.............................. Phone: +44-1384-471550
- Italy Office .... Phone: +39-02-9901-1801
- Sweden Office .... Phone: +46-8-445-7630
- Austria Ofifce .... Phone: +43-7229-51400
- Spain Office .... Phone: +34-93-652-5740
- Turkey Office .... Phone: +90-216-362-4050
- Prague Office .... Phone: +420-2-41025-100
- Moscow Office .... Phone: +7-495-649-80-47

THK Europe B.V.
- Eindhoven Office .... Phone: +31-40-290-9500

THK France S.A.S.
- Paris Office .... Phone: +33-1-7425-3800

Dealer