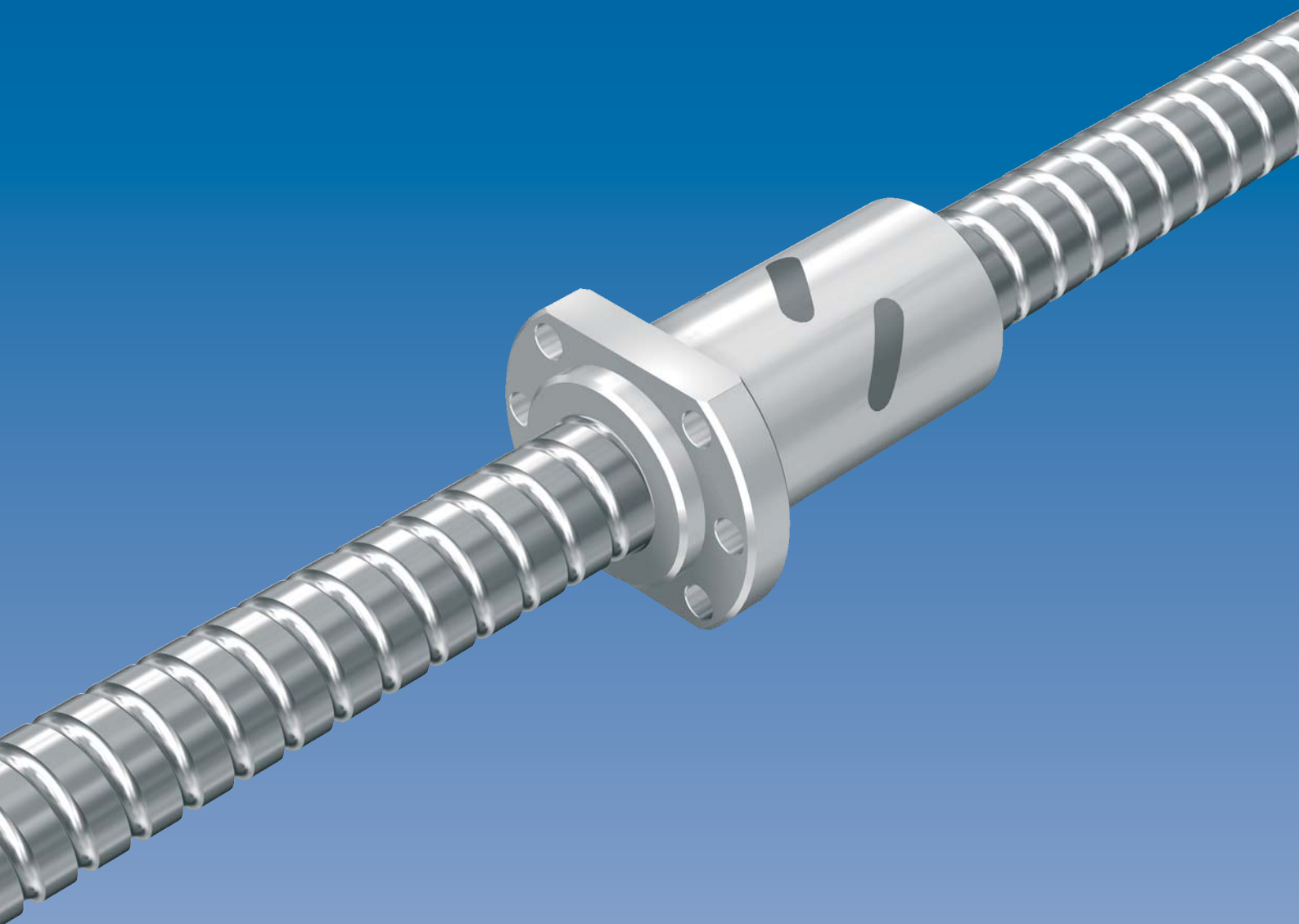


DIN Standard Compliant Ball Screws

- Ball Screws According to
ISO 3408 (DIN 69051)
- Preloaded or without Clearance

EBB/EPB



DIN Standard Compliant Ball Screws

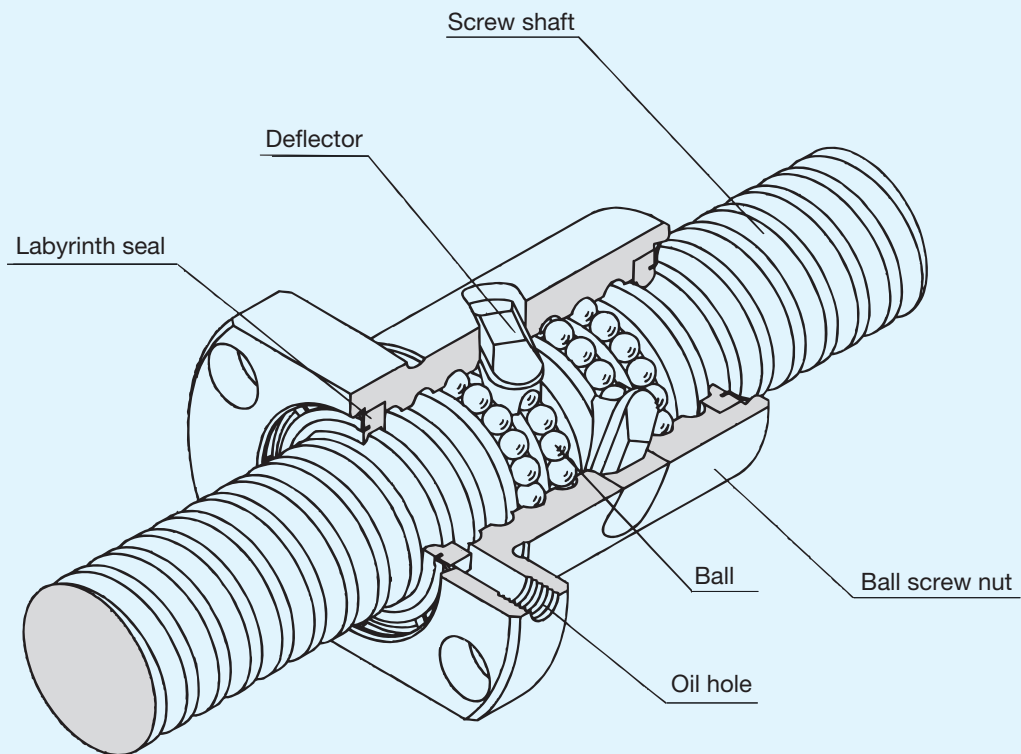


Fig. 1 Structure of a single nut with deflector

• DIN Standard Compliant Ball Screws

Ground ball screws are best suited for applications, where high axial rigidity is required. DIN standard compliant ball screws of the types EBB and EPB are cost-effective alternatives to ground ball screws.

These products match the accuracy grades of the standard ISO 3408 (DIN 69051).

Standard		ISO/DIN
Accuracy grade		Cp5R ¹⁾
Preload	Pitch offset Type EPB	0.05 Ca
	Ball selection Type EBB	Without clearance

¹⁾ The accuracy grade Cp5R of the ball screws are related to ISO 3408 (DIN 69051).

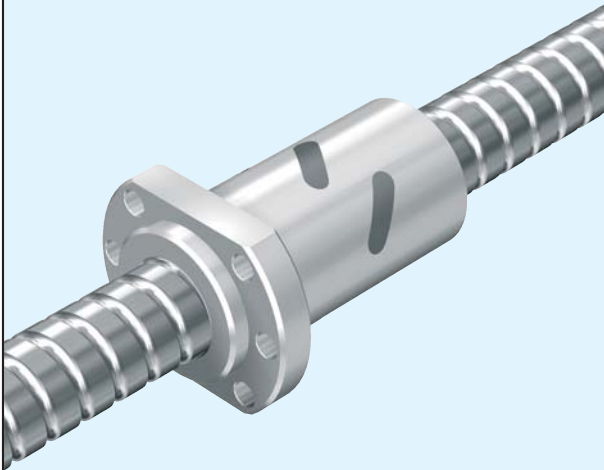
• Support Units and Screw Shafts with Finished Ends Available

DIN standard compliant ball screws of the types EBB and EPB can be delivered with support units and the appropriate shaft ends.

Product Overview

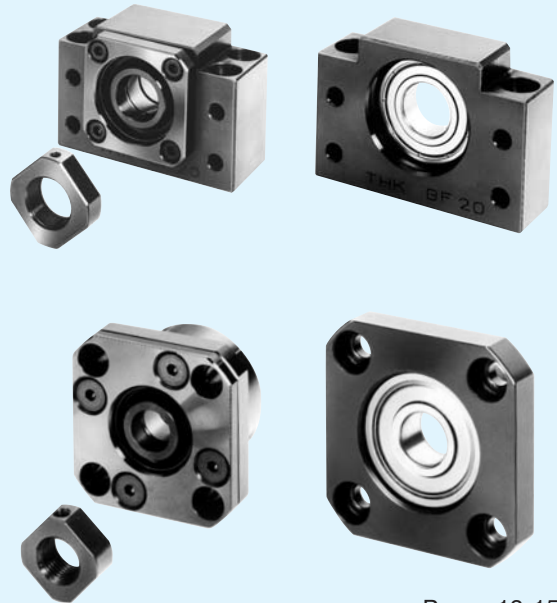
DIN Standard Compliant Ball Screws EPB/EBB (Form B)

Single nut
EBB: GT or G0 (without clearance)
EPB: G0 (without clearance)



Pages 8-11

Support Units BK/BF & FK/FF



Pages 12-15

Screw Shaft Selection

Available Diameter/Lead Combinations

The tables below indicate the standard combinations of the screw shafts and leads.

Table 1 EBB/EPB

Unit: mm

Screw shaft diameter	Lead	
	5	10
16	●	—
20	●	—
25	●	●
32	●	●
40	—	●
50	—	●

Limitations of Screw Shaft Lengths

Table 2 presents the maximum screw shaft lengths by the screw shaft diameter and axial clearance.

Table 2 Limitations of screw shaft lengths Unit: mm

Screw shaft diameter	Max. screw shaft length	
	GT	G0
16	1500	1500
20	2000	2000
25	2000	2000
32	3000	2000
40	3000	2000
50	3000	2000

EBB = GT (0 - 0,005 mm axial clearance)

G0 (without clearance)

EPB = G0 (without clearance)

DN Value

The permissible rotational speed of the ball screw should be determined based on the critical speed and DN value.

The permissible rotational speed determined based on the DN value can be calculated using the following equation.

- DIN standard compliant ball screws EBB/EPB

$$n = \frac{70,000}{d_p}$$

n : permissible rotational speed determined based on the DN value (min^{-1})

d_p : ball center-to-center diameter (presented in the dimension table P. 8 and 10) (mm)

For operating rotational speeds greater than n , high-speed ball screws are available. If you require these models, please contact THK.

Preload and Rigidity

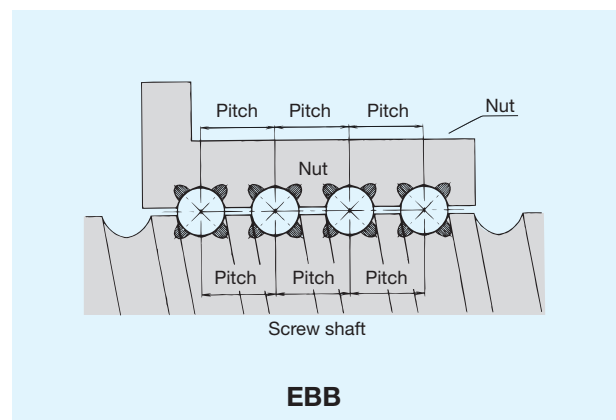
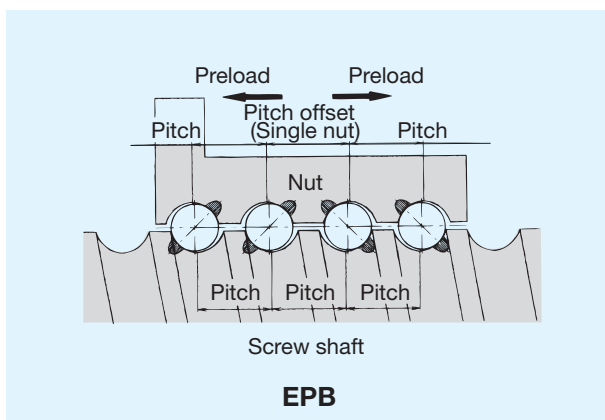
Preload

The preload eliminates the axial clearance of the ball screw and improves the rigidity.

Preload methods

(A) Preload by pitch shift method: The pitch is shifted at the central part of the nut to create the requested preload.

(B) Without clearance by ball selection: The nut is filled with balls in a certain diameter to achieve the 4-point contact of the balls.



Accuracy Grades

Travel Variation and Travel Deviation

The accuracy grades of the DIN standard compliant ball screws are related to ISO 3408 (DIN 69051).

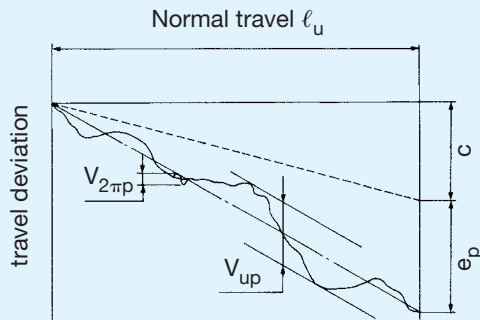


Figure 2 Permissible travel deviation and travel variation in relation to the nominal travel

Definitions according to DIN/ISO Standard:

- e_p : Tolerance on specified travel. The difference between the maximum and minimum values of the permissible actual mean travel.
- V_{up} : Permissible travel variation in relation to the nominal travel l_u .
- $V_{2\pi p}$: Permissible travel variation in relation to one rotation 2π rad.
- V_{300p} : Permissible travel deviation over 300 mm travel.
- c : Travel compensation. The difference between the specified travel and nominal travel within the useful travel.

Table 3 Tolerance on specified travel $\pm e_p$ and permissible travel variation V_{up} in relation to the nominal travel l_u for positioning ball screws.

Unit: μm

Standard		ISO/DIN Cp5R ¹⁾	
Normal travel l_u [mm]		$\pm e_p$	V_{up}
over	to (incl.)		
-	315	23	23
315	400	25	25
400	500	27	26
500	630	32	29
630	800	36	31
800	1000	40	34
1000	1250	47	39
1250	1600	55	44
1600	2000	65	51
2000	2500	78	59
2500	3000	96	69

Table 4 Permissible travel variation in relation to one rotation $V_{2\pi p}$ and permissible travel variation over 300 mm travel V_{300p} for positioning ball screws.

Unit: μm

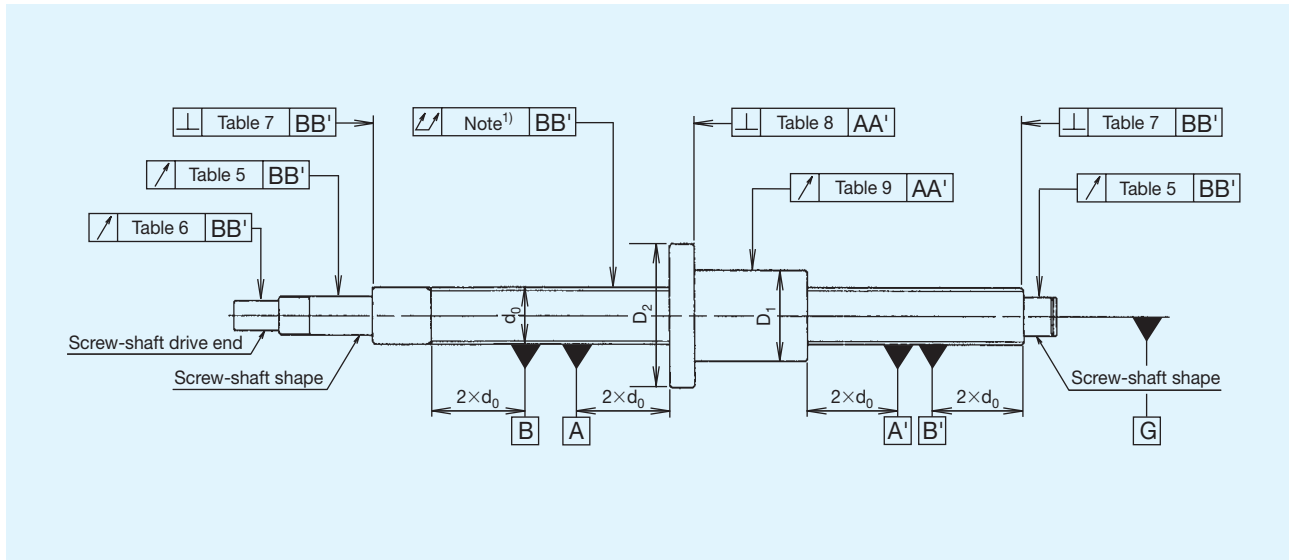
Standard	ISO/DIN Cp5R ¹⁾
V_{300p}	23
$V_{2\pi p}$	8

¹⁾ EBB/EPB: Positioning ball screws of the accuracy grade 5 according to ISO 3408 (DIN 69051)

Accuracy of the Mounting Section

The mounting surface accuracy of the DIN standard compliant ball screws according to DIN/ISO Standard.

For more detailed information and test instructions see ISO 3408 (DIN 69051), part 3.



1) For the overall run-out of the screw shaft axis in the radial direction, refer to ISO 3408 (DIN 69051), part 3. See also tables 10 and 11.

Table 5 Radial run-out of the drive shaft in respect to BB' Unit: μm

Nominal diameter d_0 (mm)		ℓ (mm)	Radial run-out Cp5R
Over	Up to (incl.)		
6	20	80	20
20	50	125	25

Table 6 Radial run-out of the drive shaft in respect to BB' Unit: μm

Nominal diameter d_0 (mm)		ℓ (mm)	Coaxial deviation Cp5R
Over	Up to (incl.)		
6	20	80	8
20	50	125	10

Table 7 Perpendicularity of the bearing journal abutment face in respect to BB' Unit: μm

Nominal diameter d_0 (mm)		Axial run-out Cp5R
Over	Up to (incl.)	
6	63	5

Table 8 Perpendicularity of the flange mounting surface
in respect to AA' Unit: μm

Flange diameter D_2 [mm]		Perpendicularity Cp5R
Over	Up to (incl.)	
16	32	16
32	63	20
63	125	25

Table 9 Radial run-out of the outer diameter of the nut
in respect to AA' Unit: μm

Outer diameter D_1 [mm]		Run-out Cp5R
Over	Up to (incl.)	
16	32	16
32	63	20
63	125	25

Table 10 Measurement of radial run-out of the ball screw shaft outer
diameter for ascertaining straightness related to BB' per
length ℓ_5 Unit: μm

Nominal diameter d_0 [mm]		Reference length ℓ_5 [mm]	Run-out Cp5R
Over	Up to (incl.)		
12	25	160	32
25	50	315	32

Table 11 Maximum radial run-out of the ball screw shaft diameter valid
for $\ell_1 \geq 4\ell_5$ Unit: μm

$\frac{\ell_1}{d_0}$		Run-out (max.) Cp5R
Over	Up to (incl.)	
—	40	64
40	60	96

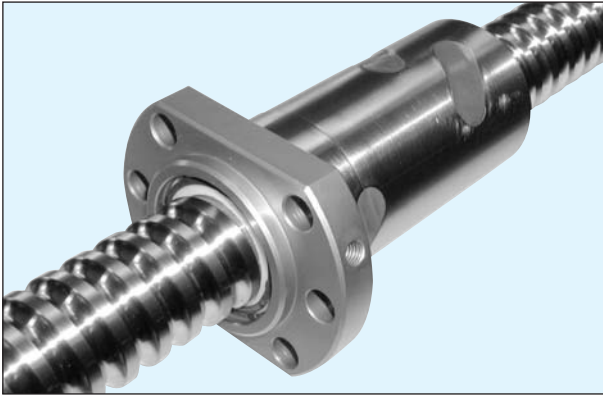
ℓ_1 = Effective screw shaft length [mm]

d_0 = Screw shaft outer diameter [mm]

ℓ_5 = Reference length [mm]

DIN Standard Compliant Ball Screw EBB

- Single nut according to ISO 3408 (DIN 69051) with flange form B
- Without clearance by ball selection

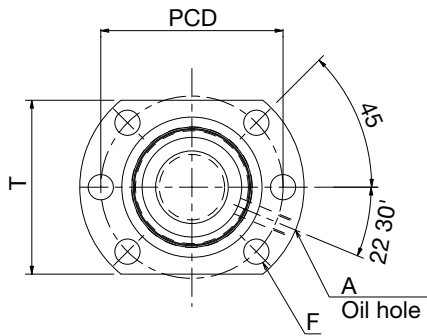


Model No.	Screw shaft diameter d	Lead ℓ	Ball center-to-center diameter d _p	Thread minor diameter d ₃	No. of loaded circuits rows × turns	Basic load rating		Rigidity ¹⁾ K [N/μm]
						C _a [kN]	C _{0a} [kN]	
EBB1605-4	16	5	16.75	13.1	4×1	11.9	17.4	210
EBB2005-3	20	5	20.75	17.1	3×1	10.6	17.3	200
EBB2505-3	25	5	25.75	22.1	3×1	12.1	22.6	250
EBB2510-3	25	10	26	21.6	3×1	15.9	27.0	250
EBB2510-4	25	10	26	21.6	4×1	20.9	37.6	330
EBB3205-3	32	5	32.75	29.2	3×1	13.9	30.2	300
EBB3205-4	32	5	32.75	29.2	4×1	17.8	40.3	400
EBB3205-6	32	5	32.75	29.2	6×1	25.1	60.4	600
EBB3210-3	32	10	33.75	26.4	3×1	32.1	52.2	300
EBB3210-4	32	10	33.75	26.4	4×1	41.3	69.7	390
EBB4010-3	40	10	41.75	34.4	3×1	37.3	69.3	380
EBB4010-4	40	10	41.75	34.4	4×1	47.6	92.4	500
EBB5010-4	50	10	51.75	44.4	4×1	54.3	120.5	610

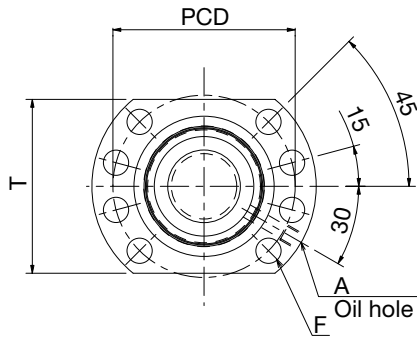
¹⁾ The rigidity values in the table represent spring constants obtained from the load and the elastic displacement when providing an axial load 30% of the basic dynamic load rating (C_a). These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value. If the axial load (F_a) is not 0.3 C_a, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K \cdot \left(\frac{F_a}{0.3 \cdot C_a} \right)^{\frac{1}{3}} \quad K : \text{Rigidity value in the dimensional table.}$$

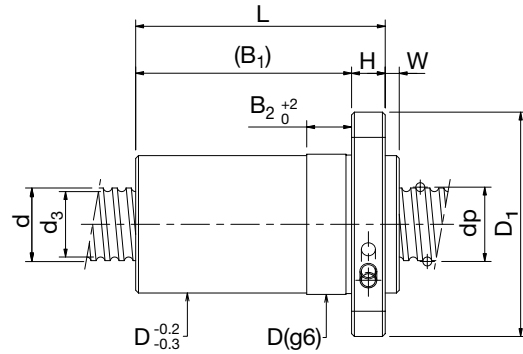
F_a : Axial load



Drilling template 1



Drilling template 2



Unit: mm

Nut dimensions											Oil hole	Screw shaft inertial moment per mm
Outer diameter	Flange diameter	Overall length	H	B ₁	B ₂	W	T	PCD	F	Drilling template		
D	D ₁	L									A	[kg · cm ² /mm]
28	48	50	10	40	10	5	40	38	5.5	1	M6×1	5.05×10 ⁻⁴
36	58	45	10	35	10	5	44	47	6.6	1	M6×1	1.23×10 ⁻³
40	62	45	10	35	10	5	48	51	6.6	1	M6×1	3.01×10 ⁻³
40	62	75	10	65	16	5	48	51	6.6	1	M6×1	3.01×10 ⁻³
40	62	80	10	70	16	5	48	51	6.6	1	M6×1	3.01×10 ⁻³
50	80	47	12	35	10	5	62	65	9	1	M6×1	8.08×10 ⁻³
50	80	52	12	40	10	5	62	65	9	1	M6×1	8.08×10 ⁻³
50	80	62	12	50	10	5	62	65	9	1	M6×1	8.08×10 ⁻³
50	80	77	12	65	16	5	62	65	9	1	M6×1	8.08×10 ⁻³
50	80	89	12	77	16	5	62	65	9	1	M6×1	8.08×10 ⁻³
63	93	79	14	65	16	5	70	78	9	2	M8×1	1.97×10 ⁻²
63	93	89	14	75	16	5	70	78	9	2	M8×1	1.97×10 ⁻²
75	110	91	16	75	16	5	85	93	11	2	M8×1	4.82×10 ⁻²

Model Number Coding

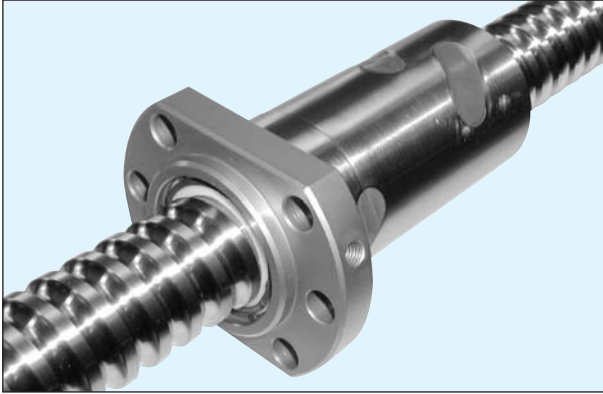
EBB 32 05 – 4 RR GT + 1200L Cp5R

(1) (2) (3) (4) (5) (6) (7) (8)

- (1) Nut
- (2) Screw shaft outer diameter (mm)
- (3) Lead (mm)
- (4) Number of circuits (rows × turns)
- (5) Seals (RR: labyrinth seals attached to both sides)
- (6) Symbol for preload
GT = 0 to 0.005 mm axial clearance
G0 = without clearance
- (7) Screw shaft total length (mm)
- (8) Accuracy

DIN Standard Compliant Ball Screw EPB

- Single nut according to ISO 3408 (DIN 69051) with flange form B
- Preload by pitch offset



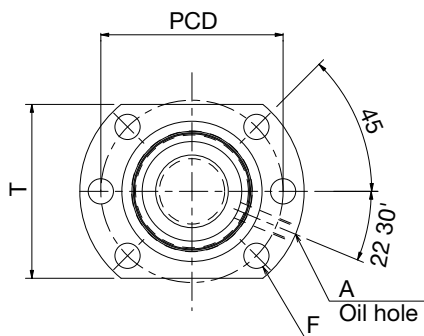
Model No.	Screw shaft diameter D	Lead ℓ	Ball center-to-center diameter D_p	Thread minor diameter D_3	No. of loaded circuits rows $\times$ turns	Basic load rating		Rigidity ¹⁾ K [N/ μ m]
						C_a [kN]	C_{0a} [kN]	
EPB1605-6	16	5	16.75	13.1	3 $\times$ 1	9.3	13.1	320
EPB2005-6	20	5	20.75	17.1	3 $\times$ 1	10.6	17.3	310
EPB2505-6	25	5	25.75	22.1	3 $\times$ 1	12.1	22.6	490
EPB2510-4	25	10	26	21.6	2 $\times$ 1	11.3	18.0	330
EPB3205-6	32	5	32.75	29.2	3 $\times$ 1	13.9	30.2	620
EPB3205-8	32	5	32.75	29.2	4 $\times$ 1	17.8	40.3	810
EPB3210-6	32	10	33.75	26.4	3 $\times$ 1	32.1	52.2	600
EPB4010-6	40	10	41.75	34.4	3 $\times$ 1	15.4	69.3	750
EPB4010-8	40	10	41.75	34.4	4 $\times$ 1	47.6	92.4	1000
EPB5010-8	50	10	51.75	44.4	4 $\times$ 1	54.3	120.5	1230

¹⁾ The rigidity values in this table indicate spring constants obtained from the load and elastic displacement under a preload of 10% of the basic dynamic load rating C_a , and an axial load F_a that is three times that of the preload F_{a0} . As these values do not take into account the rigidity of the parts involved in the nut installation, take 80% of the values given in this table as a general guideline.

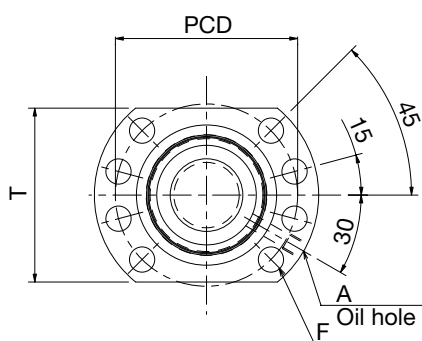
If the preload F_{a0} differs from 0.1 C_a , the rigidity K_N can be calculated using the following equation:

$$K_N = K \cdot \left(\frac{F_{a0}}{0.1 C_a} \right)^{\frac{1}{3}} \cdot 0.8$$

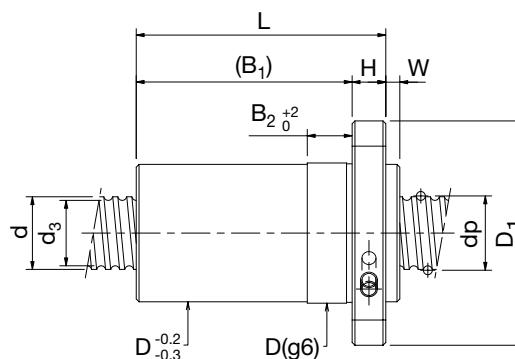
If the ball screw is not preloaded, please consult for the rigidity value.



Drilling template1



Drilling template 2



Unit: mm

Nut dimensions											Oil hole	Screw shaft inertial moment per mm
Outer diameter	Flange diameter	Overall length	H	B ₁	B ₂	W	T	PCD	F	Drilling template		
D	D ₁	L									A	[kg · cm ² /mm]
28	48	60	10	50	10	5	40	38	5.5	1	M6×1	5.05×10 ⁻⁴
36	58	61	10	51	10	5	44	47	6.6	1	M6×1	1.23×10 ⁻³
40	62	61	10	51	10	5	48	51	6.6	1	M6×1	3.01×10 ⁻³
40	62	80	10	70	16	5	48	51	6.6	1	M6×1	3.01×10 ⁻³
50	80	62	12	50	10	5	62	65	9	1	M6×1	8.08×10 ⁻³
50	80	73	12	61	10	5	62	65	9	1	M6×1	8.08×10 ⁻³
50	80	107	12	95	10	5	62	65	9	1	M6×1	8.08×10 ⁻³
63	93	109	14	95	16	5	70	78	9	2	M8×1	1.97×10 ⁻²
63	93	133	14	119	16	5	70	78	9	2	M8×1	1.97×10 ⁻²
75	110	135	16	119	16	5	85	93	11	2	M8×1	4.82×10 ⁻²

Model Number Coding

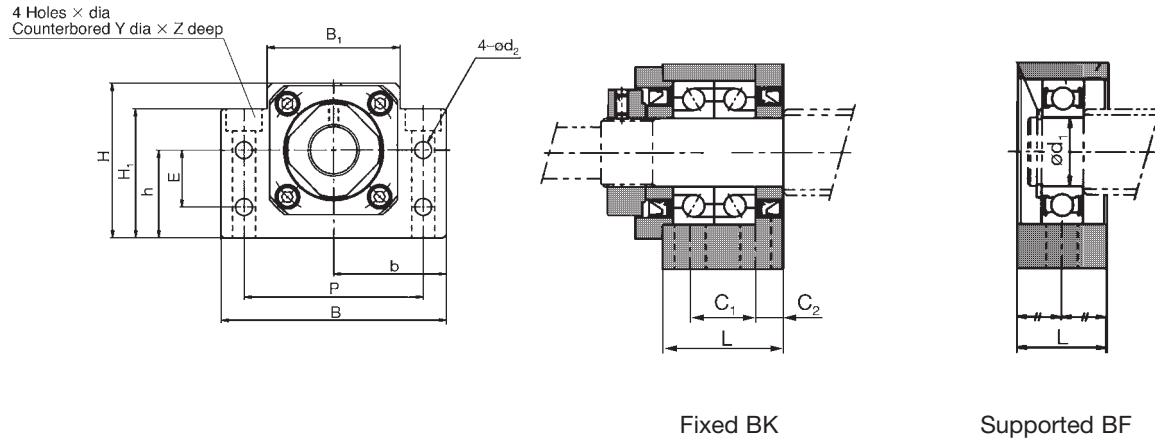
EPB 32 05 – 6 RR G0 + 1200L Cp5R

(1) (2) (3) (4) (5) (6) (7) (8)

- (1) Nut
- (2) Screw shaft outer diameter (mm)
- (3) Lead (mm)
- (4) Number of circuits (rows × turns)
- (5) Seals (RR: labyrinth seals attached to both sides)

- (6) Symbol for preload
G0 = preload
- (7) Screw shaft total length (mm)
- (8) Accuracy

Ball Screw Support Units Type BK/BF (Base Mounting Type)



Unit: mm

Shaft diameter	Body sizes				Datum ±0.02 ±0.02		Fixing holes						Fixed bearing unit (BK)						Supported bearing unit (BF)					
													Axial direction				C ₁ C ₂		Radial direction					
	Dyn. load rat. C _a [kN]	Permissible Load [kN]	Rigidity [N/μm]	d ₁	Dyn. load rating C[kN]	Basic load rating C ₀ [kN]	L																	
d	B	H	B ₁	H ₁	b	h	E	P	d ₂	X	Y	Z	L											
16	60	43	35	32,5	30	25	18	46	5.5	6.6	11	1.5	BK12	25	6.66	3.25	88	13	6	BF12	10	4.55	1.96	20
20	70	48	40	38	35	28	18	54	5.5	6.6	11	6.5	BK15	27	7.6	4	100	15	6	BF15	15	5.6	2.84	20
25	86	64	50	55	43	39	28	68	6.6	9	14	8.5	BK17	35	13.7	5.85	125	19	8	BF17	17	9.6	4.6	23
32	88	60	52	50	44	34	22	70	6.6	9	14	8.5	BK20	35	12.7	7.55	140	19	8	BF20	20	9.4	5.05	26
40	128	89	76	78	64	51	33	102	11	14	20	13	BK30	45	28	16.3	195	23	11	BF30	30	19.5	11.3	32
50	160	110	100	90	80	60	37	130	14	18	26	17.5	BK40	61	44.1	27.1	270	33	14	BF40	40	29.1	17.8	37

Note: For BK units specify J1, J2 or J3 machining. For BF units specify K machining.

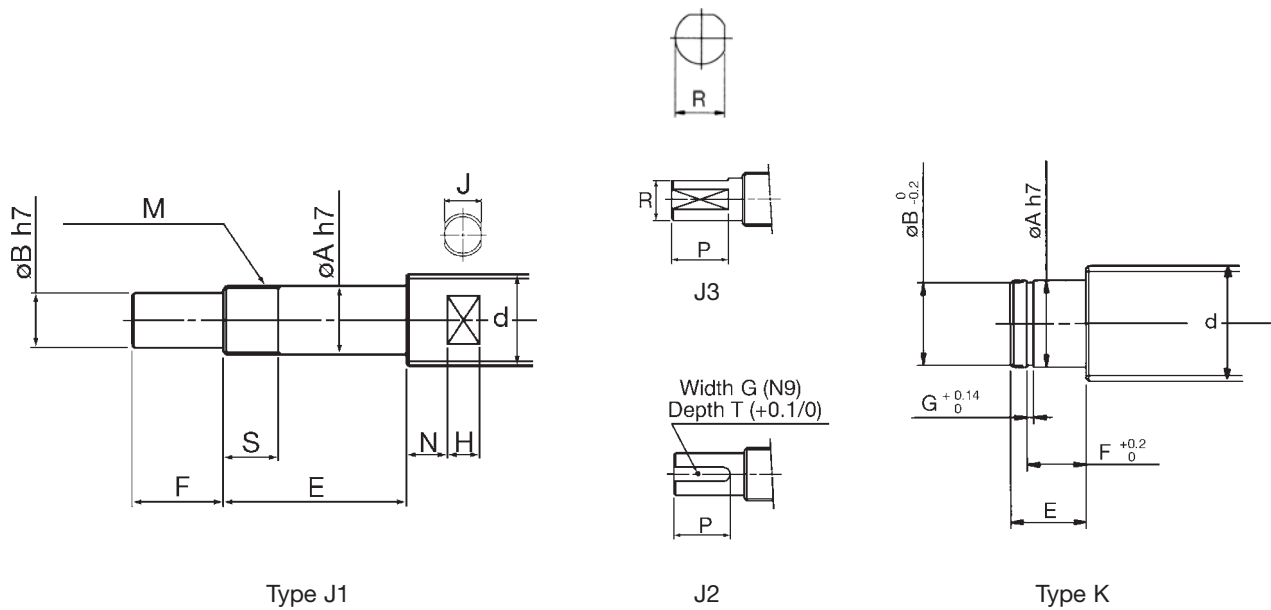
Example: **EBB3205 - 4RRGT + 1200LCp5R - J2K¹⁾**

End machining for supported BF 20

End machining for fixed BK 20

¹⁾ End machining for precision ball screw:
Type J2: Fixed bearing unit for BK20
Type K : Supported bearing unit for BF20

End Machining for BK/BF



Unit: mm

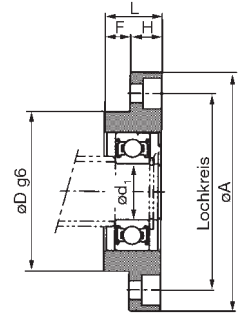
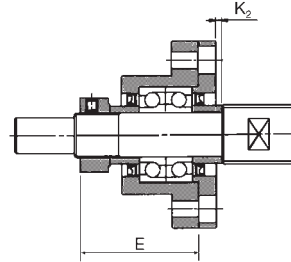
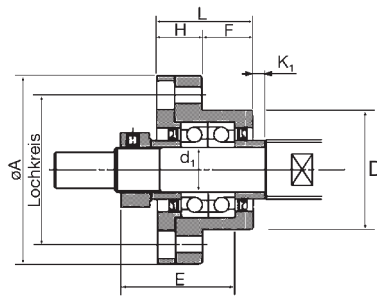
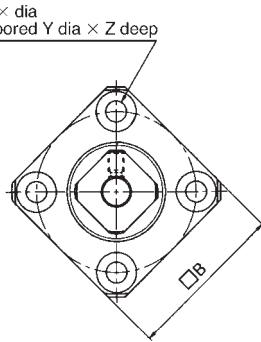
Shaft diameter	Fixed	Type J						Type J1			Type J2			Type J3	
d	BK	A	B	E	F ¹⁾	M	S	J	N	H	G	T	P	R	P
16	BK12	12	10	39	15	M12 × 1	14	13	6	8	3	1.8	12	9.5	12
20	BK15	15	12	40	20	M15 × 1	12	16	6	9	4	2.5	16	11.3	16
25	BK17	17	15	53	23	M17 × 1	17	18	7	10	5	3.0	21	14.3	21
32	BK20	20	17	53	25	M20 × 1	15	27	9	13	5	3.0	21	16	21
40	BK30	30	25	72	38	M30 × 1.5	25	32	10	15	8	4.0	32	23.5	32
50	BK40	40	35	98	50	M40 × 1.5	35	41	14	19	10	5.0	45	33	45

Supported	Type K				
BF	A	E	B	F	G
BF12	10	11	9.6	9.15	1.15
BF15	15	13	14.3	10.15	1.15
BF17	17	16	16.2	13.15	1.15
BF20	20	16	19.0	13.35	1.35
BF30	30	21	28.6	17.75	1.75
BF40	40	23	38.0	19.95	1.95

¹⁾ Drive end length F may be customer specified to suit drive coupling. If not specified the length in the table will be used.

Ball Screw Support Units Type FK/FF (Flange Mounting Type)

4 Holes × dia
Counterbored Y dia × Z deep



Fixed FK

Supported FF

Unit: mm

Shaft diameter	Body sizes & Fixing holes							Fixed bearing unit (FK)										Supported bearing unit (FF)							
																	Axial direction			Radial direction					
	d	Dg6	A	PCD	B	X	Y	Z		d ₁	L	H	F	E	K ₁	K ₂	Dyn. load rat. C _a [kN]	Permissible Load [kN]	Rigidity [N/μm]		d ₁	L	H	F	Dyn. load rat. C _i [kN]
16	36	54	44	44	4.5	8	4	FK12	12	27	10	17	29.5	0.5	-0.5	6.66	3.25	88	FF12	10	15	7	8	4.55	1.96
20/25	40	63	50	52	5.5	9.5	6	FK15	15	32	15	17	36	4.0	2.0	7.6	4	100	FF15	15	17	9	8	5.6	2.84
32	57	85	70	68	6.6	11	10	FK20	20	52	22	30	50	1.0	-3.0	17.9	9.5	170	FF20	20	20	11	9	12.8	6.65
40	75	117	95	93	11	17.5	15	FK30	30	62	30	32	61	3.0	-9.0	28	16.3	195	FF30	30	27	18	9	19.5	11.3

Note: For FK units specify H1, H2 or H3 machining. For FF units specify K machining.

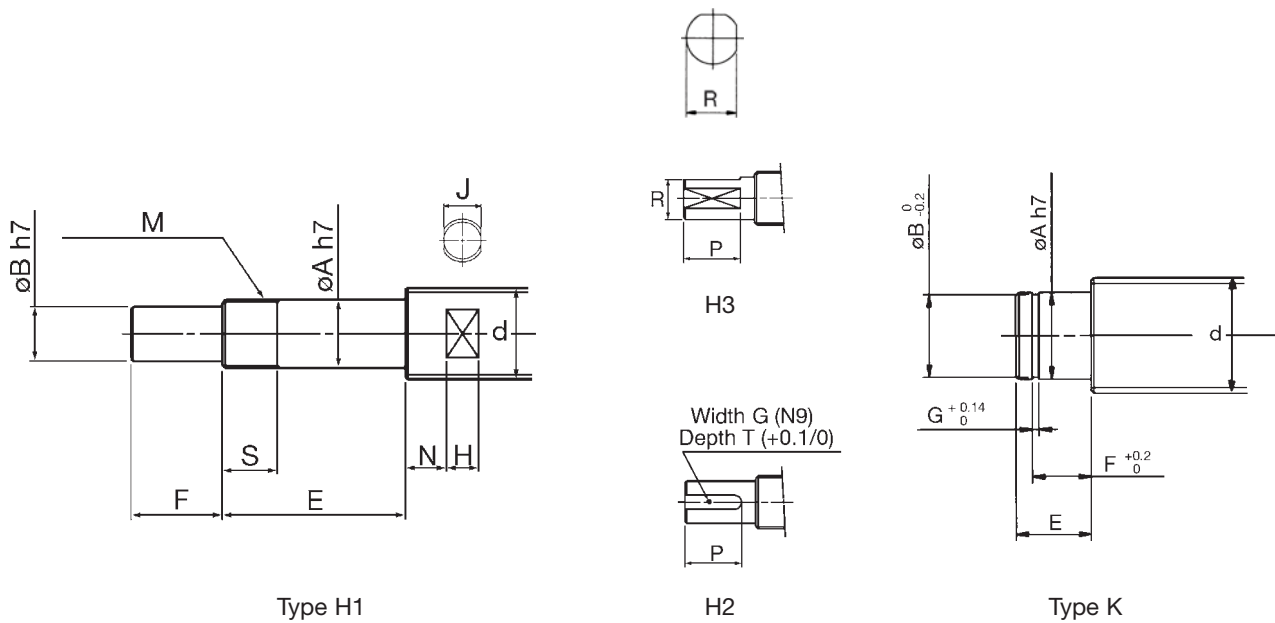
Example: **EBB3205 - 4RRGT + 1200LCp5R - H2K¹⁾**

End machining for supported FF 20

End machining for fixed FK 20

¹⁾ End machining for precision ball screw:
Type H2: Fixed bearing unit for FK20
Type K : Supported bearing unit for FF20

End Machining for FK/FF



Unit: mm

Shaft diameter	Fixed	Type H						Type H1			Type H2			Type H3	
		A	B	E	F ¹⁾	M	S	J	N	H	G	T	P	R	P
16	FK12	12	10	36	15	M12 × 1	11	13	6	8	3	1.8	12	9.5	12
20	FK15	15	12	49	20	M15 × 1	13	16	6	9	4	2.5	16	11.3	16
25	FK15	15	12	49	20	M15 × 1	13	18	7	10	4	2.5	16	11.3	16
32	FK20	20	17	64	25	M20 × 1	17	27	9	13	5	3.0	21	16	21
40	FK30	30	25	72	38	M30 × 1.5	25	32	10	15	8	4.0	32	23.5	32

Supported FF	Type K				
	A	E	B	F	G
FF12	10	11	9.6	9.15	1.15
FF15	15	13	14.3	10.15	1.15
FF15	15	13	14.3	10.15	1.15
FF20	20	19	19.0	15.35	1.35
FF30	30	21	28.6	17.75	1.75

¹⁾ Drive end length F may be customer specified to suit drive coupling. If not specified the length in the table will be used.

DIN Standard Compliant Ball Screws EBB & EPB



Precautions During Use

• Handling

Since the ball screw is a precision component, dropping or subjecting it to strong impacts can result in damage or changes in function. In addition, since the balls will come out if the ball screw nut is disengaged from the screw shaft (ball screw section), please handle with care.

• Assembly

If components are forcibly driven onto the screw shaft or nut, indentations may be formed in the rolling surface. Adequate caution is therefore required so as not to allow excessive force to be applied to the screw shaft and ball screw nut during part assembly.

If the screw shaft support and nut section are off-center or shifted out of position, the service life of the product may be shortened considerably. Adequate caution is therefore required with respect to assembled part accuracy and assembly accuracy.

• Coolant

When this product is used in an environment in which there is the risk of coolant or other similar substance entering the nut section, please consult with THK since product function may be impaired depending on the type of coolant.

• Operating Temperature Range

Since the ball screw uses a special resin, avoid using at temperatures above 80°C.

• Lubrication

Although the ball screw can be used as is since it contains grease (with the exception of special cases), please replenish the grease prior to shipment following trial operation at your firm.

In the case of using in special environments, such as using in locations constantly subjected to the effects of vibrations, or using in a clean room, vacuum or under extremely low or high temperatures, ordinary grease may not be able to be used. In such cases, please inquire to THK.

www.thk.com

Specifications are subject to change without notice

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