

Ball Spline



Feature /

The HIWIN Ball Spline is a rolling guide motion component, mainly composed of a nut(s), a screw shaft, and steel balls in retainers. The steel balls traveling between the nut and the screw, rolling in infinite cycles, allow the nut to move linearly along the screw shaft with high precision. The steel ball contact point in the Ball Spline is an angular contact structure, which can withstand both radial and torque load. The integrated nut/bearing design allows the Ball Spline to achieve high payloads with a compact structure.

The Ball Spline has three sets of steel balls loaded in retainers, with face-to-face angular contact with the screw shaft. The optimized retainer design provides guided movement with high speed, acceleration and deceleration and secures the steel balls firmly, even when the nut is removed from the shaft.

- Transmission of torque

The steel balls traveling on the groove with angular contact offer relative movement between the nut and the screw to achieve torque transmission.

- Integral structure

The integration of the nut and support bearings allows the Ball Spline to achieve high precision and a compact design.

- Easy installation

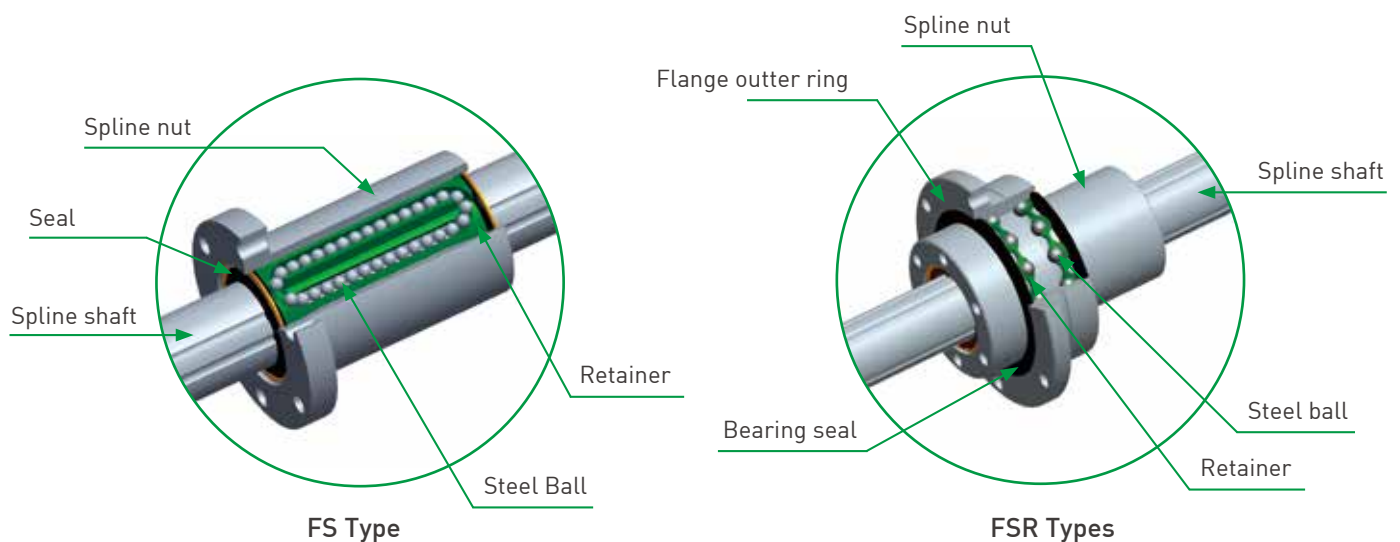
With the optimized retainer design, the nut can easily be removed from the spline shaft and the steel balls will remain secure in the nut.

- Lubricant path

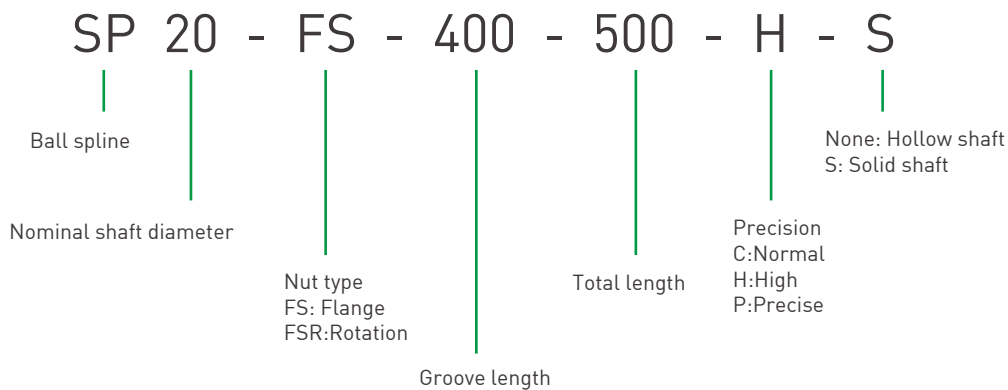
The optimized lubricant path allows grease to be directly guided to the ball track improving lubrication and increasing service life.

FS, FSR Type

Structure /

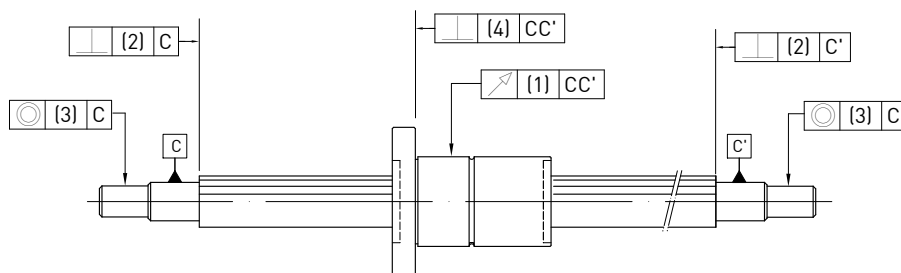


Specification Coding /



Precision /

FS Type



Runout(1)

Unit: μm

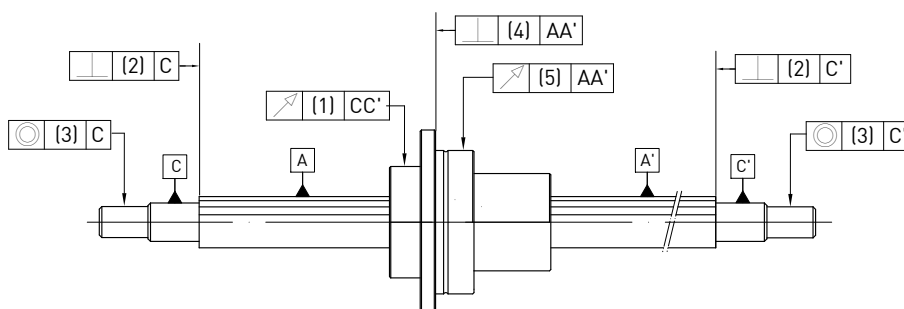
Nominal diameter		16			20			25		
Shaft total length		C	H	P	C	H	P	C	H	P
Above	Below									
-	200	56	34	18	56	34	18	53	32	18
200	315	71	45	25	71	45	25	58	39	21
315	400	83	53	31	83	53	31	70	44	25
400	500	95	62	38	95	62	38	78	50	29
500	580	112			112			88	57	34

Geometric accuracy

Unit: μm

		Verticality (2)			Concentricity (3)			Verticality (4)		
Accuracy		C	H	P	C	H	P	C	H	P
Nominal diameter										
16		27	11	8	46	19	12	39	16	11
20		27	11	8	46	19	12	39	16	11
25		33	13	9	53	22	13	39	16	11

FSR Type



Runout(1)

Unit: μm

Nominal diameter		16			20			25		
Shaft total length		C	H	P	C	H	P	C	H	P
Above	Below									
-	200	56	34	18	56	34	18	53	32	18
200	315	71	45	25	71	45	25	58	39	21
315	400	83	53	31	83	53	31	70	44	25
400	500	95	62	38	95	62	38	78	50	29
500	580	112			112			88	57	34

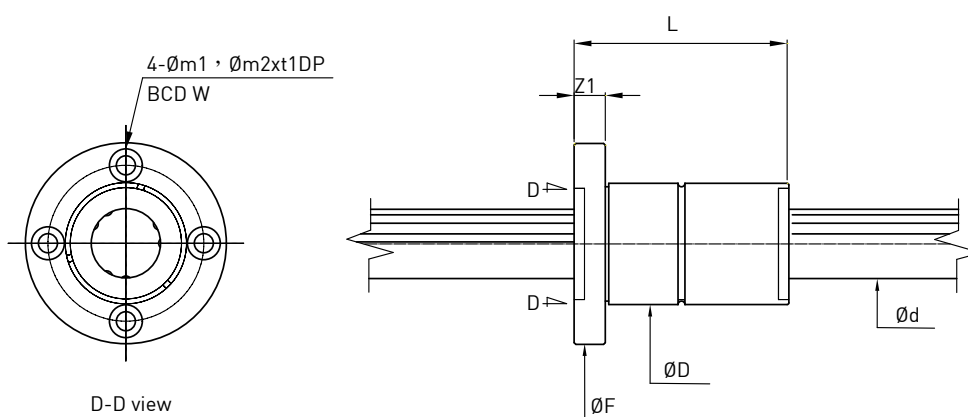
Geometric accuracy

Unit: μm

Nominal diameter	End shaft Verticality (2)			End shaft Concentricity (3)			Nut Verticality (4)			Nut runout (5)		
	C	H	P	C	H	P	C	H	P	C	H	P
16	27	11	8	46	19	12	29	18	13	39	21	16
20	27	11	8	46	19	12	29	18	13	39	21	16
25	33	13	9	53	22	13	32	21	16	42	24	19

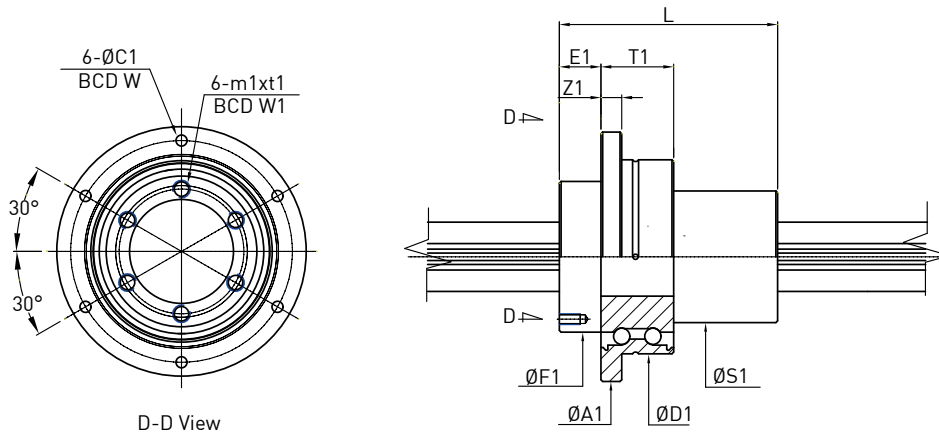
Size table /

FS Type



Unit:mm

Nominal Diameter	FS Type											
	Basic rated load		Basic rated torque		Permissible static moment	Diameter	Flange diameter	Length	Z1	W	m1	m2x1
	C (kN)	C ₀ (kN)	C _T (N-m)	C _{0T} (N-m)	MA (N-m)	D	F	L				
16	7.2	13.5	32.1	34.4	67.6	31	51	50	7	40	4.5	8x4.4
20	10.4	20.0	57.8	63.2	118	35	58	63	9	45	5.5	9.5x5.4
25	15.4	27.5	106.5	108.8	210	42	65	71	9	52	5.5	9.5x5.4

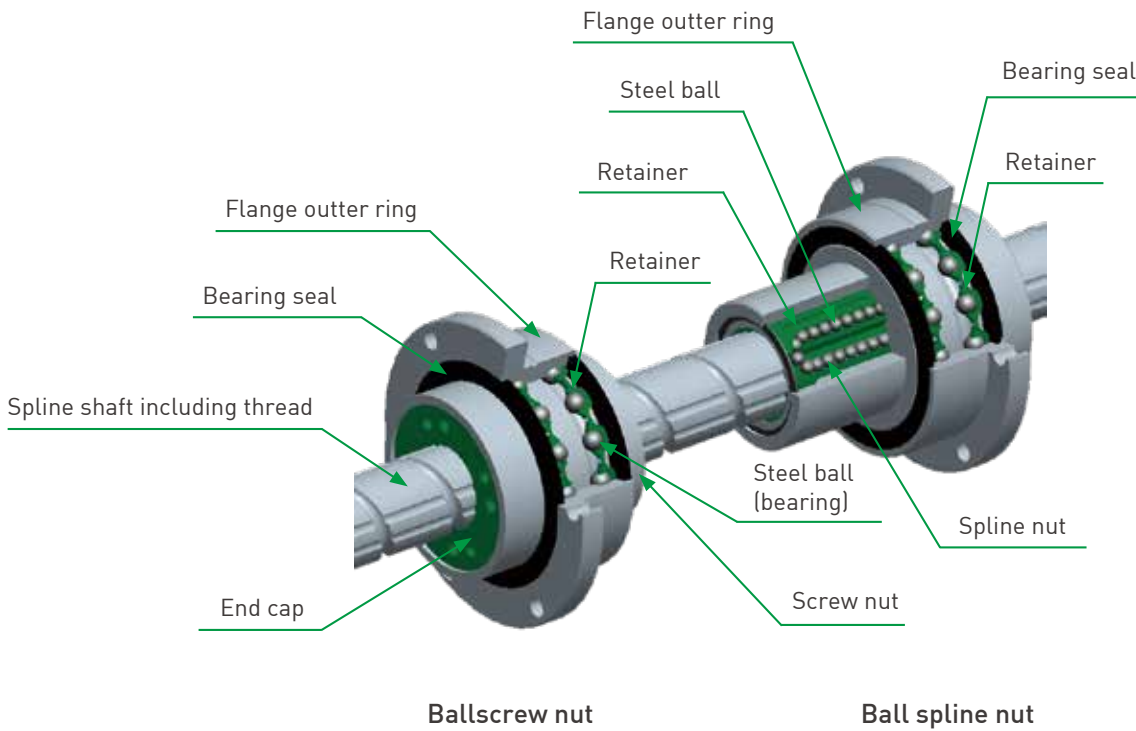


Unit:mm

Nimonal diameter	FSR Type																Support bearing basic rated load		
	Basic rated load		Basic rated torque		Permissible static moment	Diameter	Flange diameter	Total length	F1	S1	T1	E1	Z1	W	W1	m1xt1			C1
	C (kN)	Co (kN)	C _T (N-m)	C _{oT} (N-m)	MA (N-m)	D	A1	L										Ca (kN)	Coa (kN)
16	7.2	13.5	32.1	34.4	67.6	48	64	50	36	31	21	10	6	56	30	M4x6	4.5	9.3	11.5
20	10.4	20.0	57.8	63.2	118	56	72	63	43.5	35	21	12	6	64	36	M5x8	4.5	9.8	13.3
25	15.4	27.5	106.5	108.8	210	66	86	71	52	42	25	13	7	75	44	M5x8	5.5	13.1	22

FBR Type

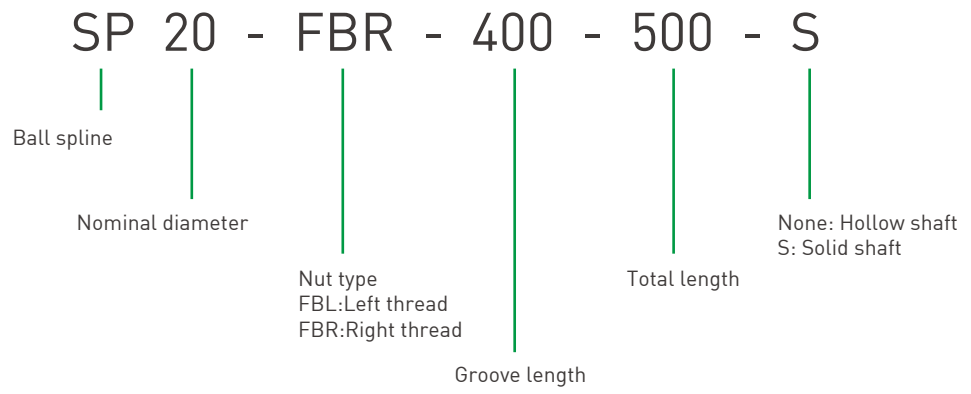
Structure /



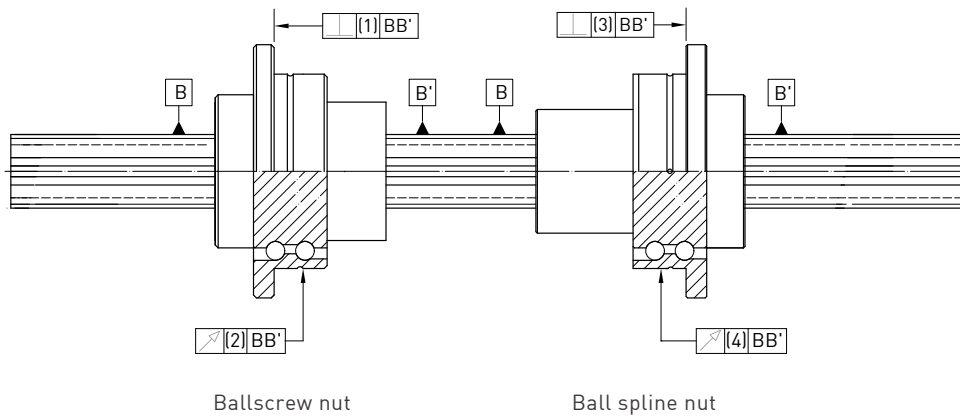
Ballscrew nut

Ball spline nut

Specification Coding /



Geometric accuracy /

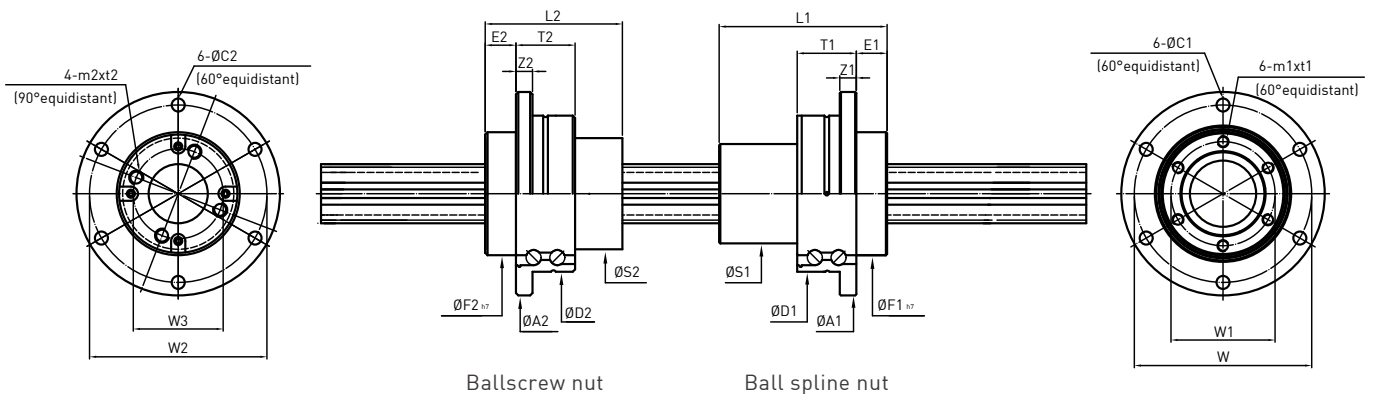


Unit: μm

Nominal diameter	Ballscrew nut		Ball spline nut	
	Verticality (1)	Runout (2)	Verticality (3)	Runout (4)
16	16	20	18	21
20	16	20	18	21
25	18	24	21	21

Size table /

FBR Type

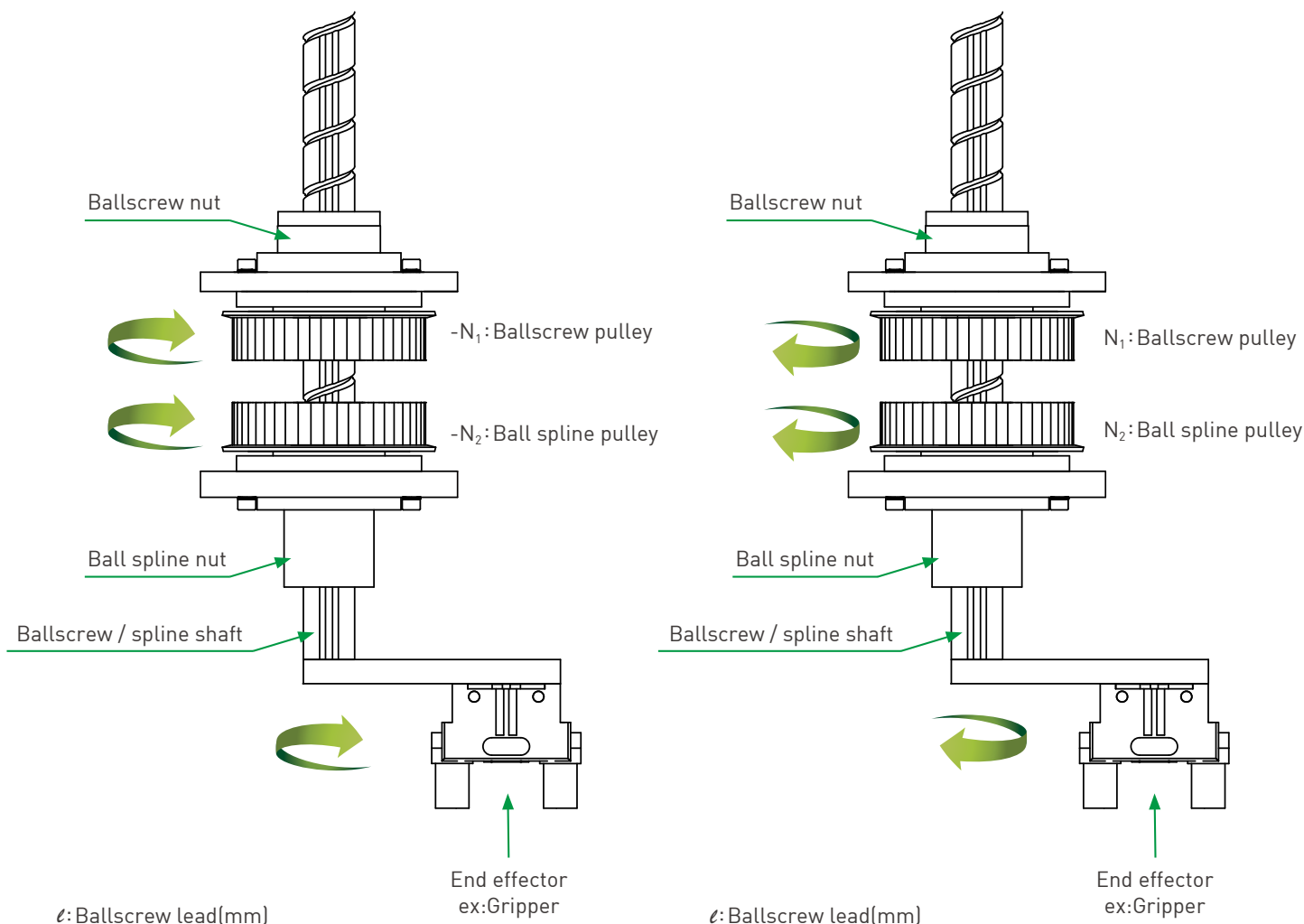


Unit:mm

Model no	Specification			Ball screw nut														Support bearing basic rated load	
	Nominal outer diameter	Nominal inner diameter	Lead	Basic rated load		Diameter D2 g6	Flange diameter A2	Total length L2	F2	S2	T2	E2	Z2	W2	W3	m2xt2	C2	Ca(kN)	Coa(kN)
				Ca(kN)	Coa(kN)														
16	16	11	16	5.6	11.1	48	64	40	36	32	21	10	6	56	25	M4x8	4.5	9.3	11.5
20	20	14	20	6.3	14	56	72	48	43.5	39	21	11	6	64	31	M3x7.5	4.5	9.8	13.3
25	25	18	25	9.5	21.8	66	86	58	52	47	25	13	7	75	38	M6x12	5.5	13.1	22

Model no	Ball spline nut														Support bearing basic rated load				
	Basic rated load		Basic rated torque		Permissible static moment	Diameter D1	Flange diameter A1	Total length L1	F1	S1	T1	E1	Z1	W	W1	m1xt1	C1	Ca(kN)	Coa(kN)
	C(kN)	Co(kN)	C _T (N-m)	C _{OT} (N-m)															
16	7.2	13.5	32.1	34.4	67.6	48	64	50	36	31	21	10	6	56	30	M4x6	4.5	9.3	11.5
20	10.4	20.0	57.8	63.2	118	56	72	63	43.5	35	21	12	6	64	36	M5x8	4.5	9.8	13.3
25	15.4	27.5	106.5	108.8	210	66	86	71	52	42	25	13	7	75	44	M5x8	5.5	13.1	22

FBR Type Ball Spline Working Mode /

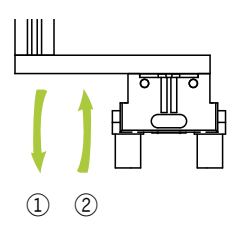
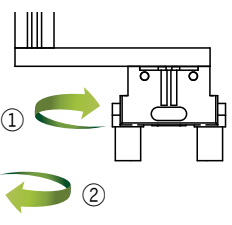
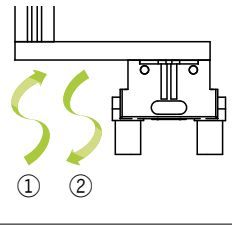


ℓ: Ballscrew lead(mm)

-N₁: Ballscrew pulley rotating speed (counterclockwise)(min⁻¹)
 -N₂: Ball spline pulley rotating speed (counterclockwise)(min⁻¹)

ℓ: Ballscrew lead(mm)

N₁: Ballscrew pulley rotating speed (counterclockwise)(min⁻¹)
 N₂: Ball spline pulley rotating speed (counterclockwise)(min⁻¹)

Work mode	Motion direction	Input		Shaft motion		
		Ballscrew pulley	Ball spline pulley	Vertical(speed)	Rotating direction (speed)	
	1	Vertical→downward	N_1 (Forward)	0	$V=N_1 \times \ell$ ($N_1 \neq 0$)	0
		Rotating direction→0				
	2	Vertical→Upward	$-N_1$ (Reverse)	0	$V=-N_1 \times \ell$ ($N_1 \neq 0$)	0
		Rotating direction→0				
	1	Vertical→0	N_1	N_2 (Forward)	0	N_2 ($N_1 \neq N_2 \neq 0$)
		Rotating direction→Forward				
	2	Vertical→0	$-N_1$	$-N_2$ (Reverse)	0	$-N_2$ ($-N_1 \neq N_2 \neq 0$)
		Rotating direction→Reverse				
	1	Vertical→Upward	0	N_2 ($N_2 \neq 0$)	$V=N_2 \times \ell$	N_2 (Forward)
		Rotating direction→Forward				
	2	Vertical→Downward	0	$-N_2$ ($-N_2 \neq 0$)	$V=-N_2 \times \ell$	$-N_2$ (Reverse)
		Rotating direction→Reverse				

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