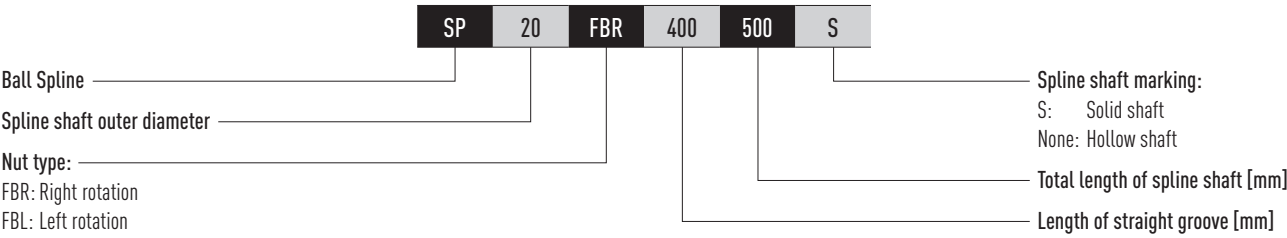


Ball Spline

FBR and FBL types

7. FBR and FBL types

7.1 HIWIN order code for Ball Spline FBR and FBL types



7.2 Selecting accuracy

7.2.1 Accuracy specification

The compound Ball Spline consists of a ball screw nut and a Ball Spline nut, and is made according to the following specifications and inspected in accordance with Fig. 8.1 and Table 8.1.

Ball screw

Axial clearance: 0
Lead accuracy: C4 grade

Ball Spline

Clearance in the direction of rotation: 0 (light preload)
Precision grade: H grade

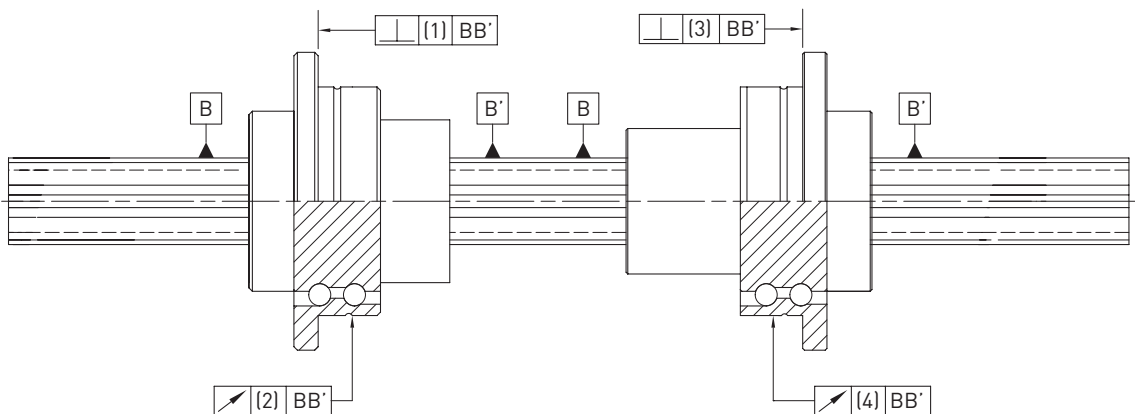


Fig. 7.1 Measurement items of the accuracy of Ball Screw Splines

Table 7.1 Geometric accuracy of Ball Screw Splines				
Nominal shaft diameter	Ball screw 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
32	18	24	21	21

Unit: μm

7.3 Product dimensions and specifications for compound Ball Spline

FBR type

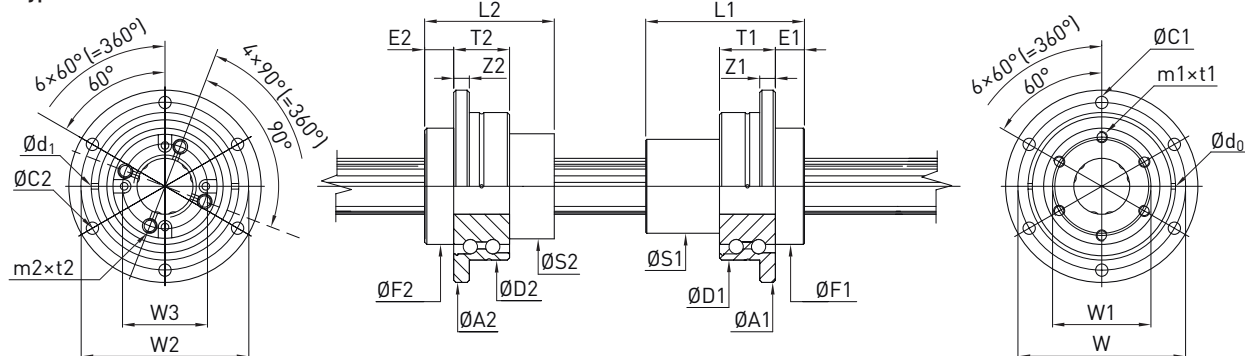


Table 7.2 Product dimensions and specifications of nut type FB Ball Spline: ballscrew nut

Series/ size	Specifications			Ballscrew nut															Outer ring basic rated load	
	Nominal shaft diameter	Nominal inner diameter	Lead	Basic rated load		Outer diameter D2 g6	Flange outer diameter A2	Total length L2	F2 h7	S2	T2	E2	Z2	W2	W3	m2 × t2	C2	Lubrication hole		
				C [kN]	C ₀ [kN]													d ₁	C _a [kN]	C _{0a} [kN]
16	16	11	16	4.7	9.6	48	64	40	36.0	32	21	10	6	56	25	M4 × 8	4.5	1.5	9.3	11.5
20	20	14	20	6.4	14.0	56	72	46	43.5	40	21	11	6	64	31	M5 × 8	4.5	1.5	9.8	13.5
25	25	18	25	9.5	21.9	66	86	58	52.0	47	25	13	7	75	38	M6 × 12	5.5	2.5	13.1	22.0
32	32	23	32	13.0	29.8	78	103	72	63.0	58	25	14	8	89	48	M6 × 10	6.6	2.5	13.7	25.2

All dimensions stated without a unit are in mm

Table 7.3 Product dimensions and specifications of nut type FB Ball Spline: Ball Spline nut

Series/ size	Ball spline nut																	Outer ring basic rated load		
	Basic rated load		Basic rated torsion		Allowable static torque	Outer diameter D1 g6	Flange diameter A1	Total length L1	F1 h7	S1	T1	E1	Z1	W	W1	m1 × t1	C1			Lubrication hole
	C [kN]	C ₀ [kN]	C _τ [Nm]	C _{0τ} [Nm]														MA [Nm]	d ₀	
16	7.2	13.5	32.1	34.4	67.6	48	64	50	36.0	31	21	10	6	56	30	M4 × 6	4.5	1.5	9.3	11.5
20	10.4	20.0	57.8	63.2	118.0	56	72	63	43.5	35	21	12	6	64	36	M5 × 8	4.5	1.5	9.8	13.5
25	15.4	27.5	106.5	108.8	210.0	66	86	71	52.0	42	25	13	7	75	44	M5 × 8	5.5	2.5	13.1	22.0
32	20.5	34.4	181.5	173.1	290.0	78	103	80	63.0	52	25	17	8	89	54	M6 × 10	6.6	2.5	13.7	25.2

All dimensions stated without a unit are in mm

Ball Spline

Options for Ball Spline

8. Options for Ball Spline

8.1 Lubrication

The lubrication varies depending on the conditions of use, but in general, the grease should be replenished at a running distance of 100 km (6 months–1 year). Lubricate the spline shaft by applying grease to the rolling groove or injecting grease into the nut lubrication hole, as shown in [Fig. 9.1](#).

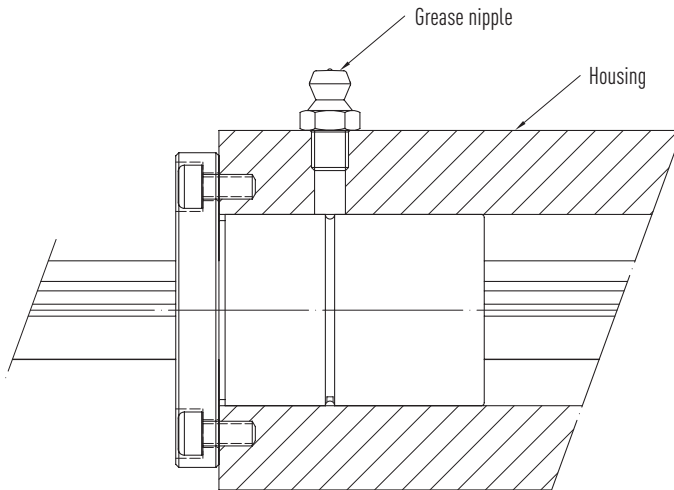


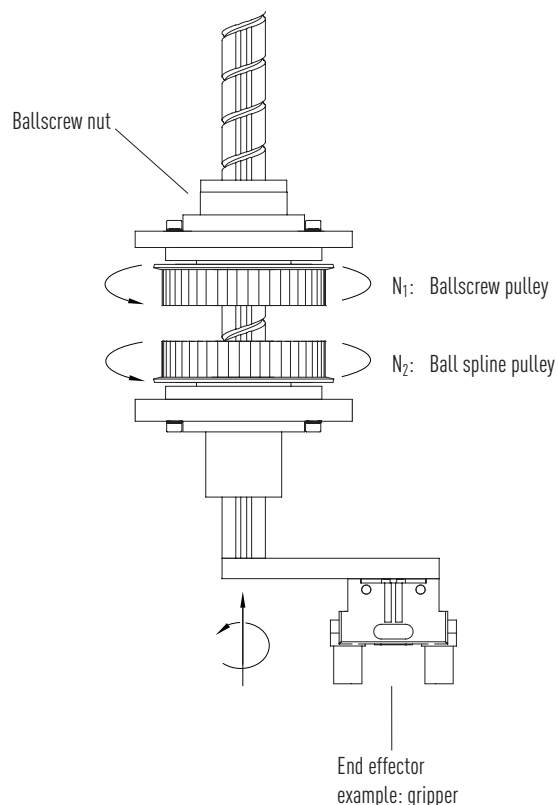
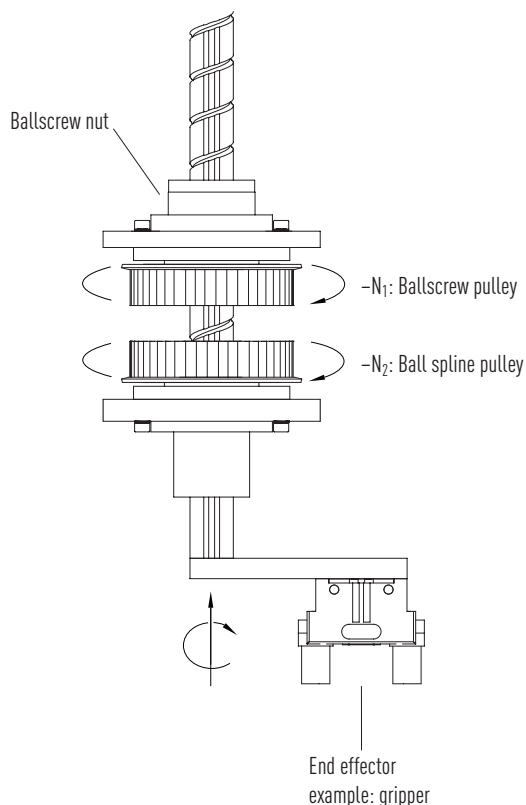
Fig. 8.1 Lubrication method

8.2 Material and surface treatment

Depending on the conditions of use, the Ball Spline may be treated for rust prevention or be manufactured with different material. Please contact HIWIN for the rust prevention treatment and change of material used.

9. Function of FB type Ball Spline

9.1 FB type Ball Spline working mode



l Ballscrew lead [mm]
 $-N_1$ Ballscrew pulley rotating speed (counter-clockwise) [min^{-1}]
 $-N_2$ Ball spline pulley rotating speed (counter-clockwise) [min^{-1}]

l Ballscrew lead [mm]
 N_1 Ballscrew pulley rotating speed (clockwise) [min^{-1}]
 N_2 Ball spline pulley rotating speed (clockwise) [min^{-1}]

Table 9.1 Work modes for FB type Ball Spline

Work mode		Motion direction	Input		Shaft motion	
			Ballscrew pulley	Ball spline pulley	Vertical (speed)	Rotating direction (speed)
	1	Vertical: downward Rotating direction: 0	N_1 ($N_1 \neq 0$) (clockwise)	0	$V = N_1 \times l$	0
	2	Vertical: upward Rotating direction: 0	$-N_1$ ($-N_1 \neq 0$) (counter-clockwise)	0	$V = -N_1 \times l$	0
	1	Vertical: 0 Rotating direction: clockwise	N_1 ($N_1 \neq 0$) (clockwise)	N_2 ($N_2 \neq 0$) (clockwise)	0	N_2 ($N_2 \neq 0$) (clockwise)
	2	Vertical: 0 Rotating direction: counter-clockwise	$-N_1$ ($-N_1 \neq 0$) (counter-clockwise)	$-N_2$ ($-N_2 \neq 0$) (counter-clockwise)	0	$-N_2$ ($-N_2 \neq 0$) (counter-clockwise)
	1	Vertical: downward Rotating direction: clockwise	0	N_2 ($N_2 \neq 0$) (clockwise)	$V = N_2 \times l$	N_2 ($N_2 \neq 0$) (clockwise)
	2	Vertical: upward Rotating direction: counter-clockwise	0	$-N_2$ ($-N_2 \neq 0$) (counter-clockwise)	$V = -N_2 \times l$	$-N_2$ (counter-clockwise)