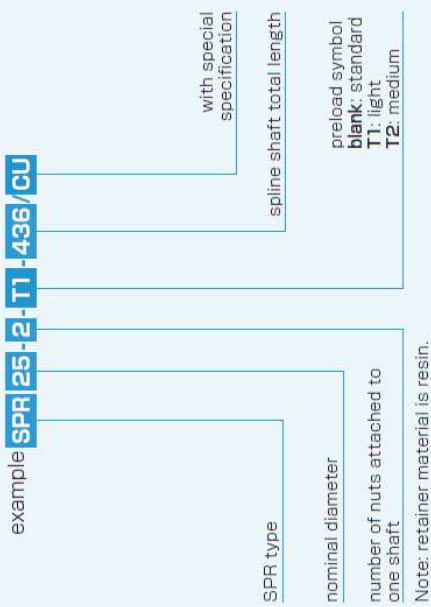


SPR TYPE



part number structure

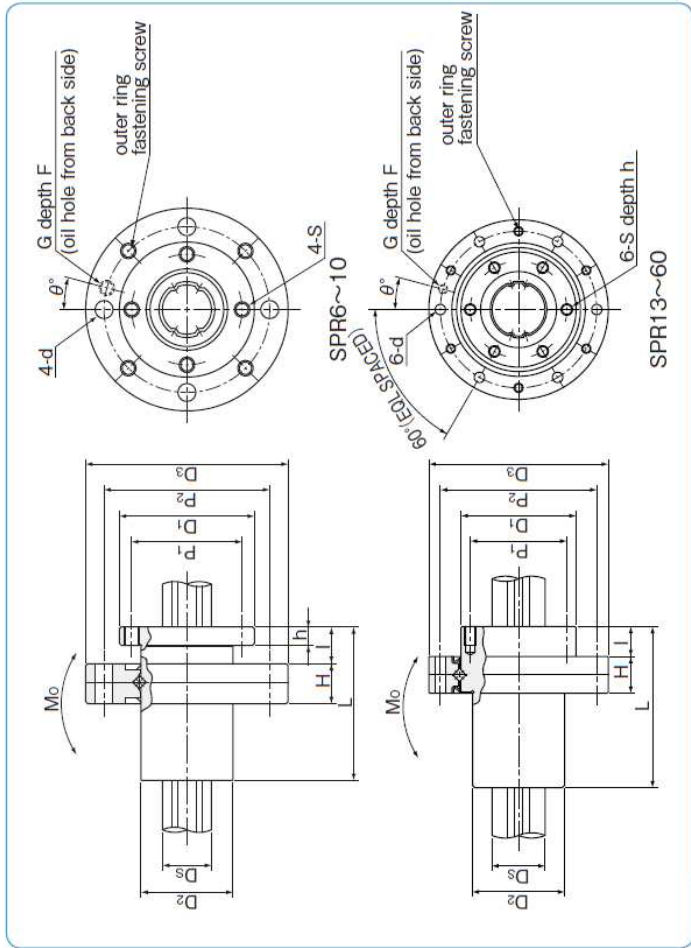
example **SPR25-2-T1-436/CU**



Note: retainer material is resin.

part number	major dimensions				major dimensions of cross roller bearing												
	D <sub>1</sub> mm	D <sub>2</sub> mm	L mm	tolerance μm	P <sub>1</sub> mm	P <sub>2</sub> mm	P.C.D. mm	D <sub>3</sub> mm	tolerance μm	H mm	I mm	S mm	h mm	d mm	G mm	F mm	θ
SPR 6	20	13	25	0	16	M2	2.5	5	6.5	30	0/-21	24	2.4	M3	2.6	20°	
SPR 8	22	0	15	25	18	M2.5	3	6	6.5	33	0	27	2.9	M3	2.6	20°	
SPR10	27	-21	19	33	0	22	M3	4	8	7	40	33	3.4	M3	2.8	20°	
SPR13	29	24	36	-0.2	24	M3	5	8	9	50	-25	42	3.4	M3	3.6	15°	
SPR16	36	0	31	50	30	M4	6	10	11	60	0	50	4.5	M3	4.4	15°	
SPR20A	44	-25	35	63	38	M4	7	12	13	72	-30	62	4.5	M6x0.75	5.2	15°	
SPR25A	55	42	71	80	47	M5	8	13	16	82	0	72	4.5	M6x0.75	6.4	15°	
SPR30A	61	0	47	80	52	M6	10	17	17	100	0	86	6.6	M6x0.75	6.8	15°	
SPR40A	76	-30	64	100	66	M6	10	23	20	120	-35	104	9	M6x0.75	8	15°	
SPR50A	92	0	80	125	80	M8	13	24	22	134	0	118	9	M6x0.75	8.8	15°	
SPR60A	107	-35	90	140	95	M8	13	25	25	155	-40	137	9	M6x0.75	10	15°	
SPR20	40	0	34	60	0/-0.2	34	M4	7	12	13	66	0	56	4.5	M6x0.75	5.2	15°
SPR25	50	-25	40	70	42	M5	8	13	16	78	-30	68	4.5	M6x0.75	6.4	15°	
SPR30	61	0	47	80	52	M6	10	17	17	100	0	86	6.6	M6x0.75	6.8	15°	
SPR40	76	-30	62	100	67	M6	10	23	20	120	-35	104	9	M6x0.75	8	15°	
SPR50	88	0	75	112	80	M8	13	24	22	130	0	114	9	M6x0.75	8.8	15°	
SPR60	102	-35	90	127	90	M8	13	25	25	150	-40	132	9	M6x0.75	10	15°	

Please contact NB for the grease fitting and relubrication method.

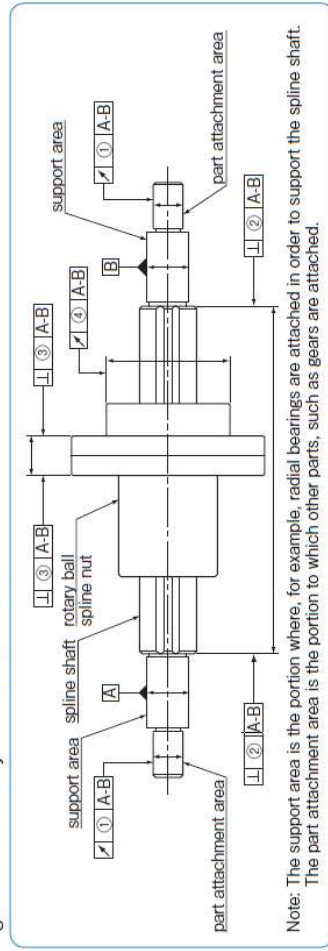


spline shaft Ds tolerance μm	basic torque rating		ball spline		cross roller bearing		allowable		mass		*maximum revolutions	size
	dynamic C <sub>T</sub>	static N · m	dynamic C	static Co	dynamic C <sub>R</sub>	static Co <sub>R</sub>	static Mo	moment N · m	nut	shaft		
6	0/-12	1.5	2.4	1.22	2.28	0.6	0.5	5.1	0.04	0.21	2,940	6
8	0	2.1	3.7	1.45	2.87	1.2	1.10	7.4	0.05	0.38	2,580	8
10	-15	4.4	8.2	2.73	5.07	2.4	2.45	18.0	0.09	0.60	2,060	10
13	0	21	39.2	2.67	4.89	2.9	3.70	13.7	0.17	1.0	1,350	13
16	-18	60	110	6.12	11.2	5.6	6.70	46	0.33	1.5	1,080	16
20	0	105	194	8.9	16.3	6.55	8.79	110	0.57	2.4	890	20A
25	0	189	346	12.8	23.4	9.63	12.7	171	0.81	3.7	700	25A
30	-21	307	439	18.6	23.2	11.8	17.1	181	1.19	5.38	640	30A
40	0	674	934	30.8	37.5	23.0	32.3	358	2.25	9.55	510	40A
50	-25	1,290	2,950	40.3	64.9	27.8	44.0	690	3.57	15.0	430	50A
60	0/-30	1,570	2,620	47.7	79.5	29.0	48.8	881	5.03	21.6	370	60A
18.2	0	83	133	7.84	11.3	5.90	7.35	63	0.45	2.0	980	20
23	0	162	239	12.3	16.1	9.11	11.5	104	0.75	3.1	770	25
28	-21	289	412	18.6	23.2	11.8	17.1	181	1.25	4.8	640	30
37.4	0	637	882	30.8	37.5	23.0	32.3	358	2.30	8.6	510	40
47	-25	1,390	3,180	46.1	74.2	27.2	42.1	696	3.10	13.1	450	50
56.5	0/-30	2,100	4,800	58.0	127	26.5	42.6	1,300	4.70	19	400	60

\* Maximum revolutions for grease lubrication.  
Contact NB for further information in case oil lubrication is required.  
1kN=102kgf 1N·m=0.102kgf·m

ACCURACY OF SPR TYPE

The accuracy of SPR type is measured at the points shown in Figure B-28. Figure B-28 Accuracy Measurement Points



Tolerance of Spline Shaft Groove Torsion (Max.)

The groove torsion is indicated per 100mm, arbitrarily set as the effective length of the spline shaft section.

Table B-18 Tolerance of Spline Shaft Groove Torsion (Max.)

tolerance	13μm/100mm
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Table B-19 Tolerance Relative to Spline Support Area (Max.)

part number	①radial runoff of part attachment area		②perpendicularity of the end of the spline shaft section (when grinding is requested on the drawing)		③perpendicularity of the flange
	14	17	9	14	
SPR 6	14	17	9	14	18
SPR 8	14	17	9	14	18
SPR10	14	17	9	14	18
SPR13	14	17	9	14	18
SPR16	14	17	9	14	18
SPR20A	14	17	9	14	18
SPR25A	14	17	9	14	18
SPR30A	14	17	9	14	18
SPR40A	14	17	9	14	18
SPR50A	14	17	9	14	18
SPR60A	14	17	9	14	18
SPR20	14	17	9	14	18
SPR25	14	17	9	14	18
SPR30	14	17	9	14	18
SPR40	14	17	9	14	18
SPR50	14	17	9	14	18
SPR60	14	17	9	14	18

Table B-20 ④Radial Runout of Outer Surface of Rotary Spline Nut Relative to Spline Support Area (Max.) unit: μm

spline shaft total length (mm) greater than or less	part number											
	SPR 6, 8	SPR 10	SPR 13, 16	SPR 20A, 25A, 30A, 30	SPR 32	SPR 34	SPR 36	SPR 40A, 40, 50A, 50	SPR 44	SPR 46	SPR 50	SPR 60A, 60
200	46	36	34	32	32	32	32	32	32	32	30	30
315	89	54	45	39	36	36	36	36	36	36	34	34
400	126	68	40	44	44	44	44	44	44	44	36	36
500	163*	82	62	50	50	50	50	50	50	50	43	38
630	—	102	75	57	57	57	57	57	57	57	47	41
800	—	—	92	68	68	68	68	68	68	68	54	45
1,000	—	—	115	83	83	83	83	83	83	83	63	51
1,250	—	—	153	102	102	102	102	102	102	102	76	59
1,600	—	—	195*	130	130	130	130	130	130	130	93	70
2,000	—	—	—	171	171	171	171	171	171	171	118	86

\*Please contact NB for spline shafts exceeding 2000mm. \* SPR6 shaft Max. length: 400mm SPR13, SPR16 Max. length: 1500mm

PRELOAD AND CLEARANCE

The amount of clearance and preload for the spline portion and the cross roller portion are expressed in terms of the clearance in the rotational direction and the clearance in the radial direction, respectively. Three levels of preload are available: standard, light (T1), and medium (T2).

Table B-25 Preload and Clearance in Rotational and Radial Direction unit: μm

part number	standard		light (T1)		medium (T2)	
	SPR 6	SPR 8	SPR10	SPR13	SPR16	SPR20A
SPR 6	-2~+1	-6~-2	-3~+1	-8~-3	-4~+2	-12~-4
SPR 8	-3~+1	-8~-3	-4~+2	-12~-4	-6~+3	-18~-6
SPR10	-4~+2	-12~-4	-6~+3	-18~-6	-4~+2	-20~-12
SPR13	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR16	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR20A	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR25A	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR30A	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR40A	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR50A	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR60A	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR20	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR25	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR30	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR40	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR50	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR60	-6~+3	-18~-6	-4~+2	-12~-4	-6~+3	-20~-12
SPR 6	-1~+3	-1~+3	-1~+3	-1~+3	-1~+3	-1~+3
SPR60	-1~+3	-1~+3	-1~+3	-1~+3	-1~+3	-1~+3

Table B-26 Preload and Clearance in Rotational Direction (Linear Motion) unit: μm

part number	standard		light (T1)		medium (T2)	
	SPB16	SPB20	SPB25	SPB16	SPB20	SPB25
SPB16	-3~+1	-8~-3	-4~+2	-12~-4	-3~+1	-8~-3
SPB20	-3~+1	-8~-3	-4~+2	-12~-4	-3~+1	-8~-3
SPB25	-3~+1	-8~-3	-4~+2	-12~-4	-3~+1	-8~-3

The preload is properly adjusted by the spacer for the angular contact bearings.

Table B-27 Preload and Operating Conditions

preload	symbol	operating conditions
standard	blank	minute vibration is applied. a precise motion is required. moment is applied in a given direction.
light	T1	light vibration is applied. light torsional load is applied. cyclic torque is applied.
medium	T2	shock/vibration is applied. over-hang load is applied. torsional load is applied.

HOLLOW SPLINE SHAFT

NB provides hollow shafts. It can be used for cable, air piping and weight reduction. Table B-28 shows a list of recommended inner diameter for hollow spline shaft (SUJ2).

Table B-28 Recommended Inner Diameter for Hollow Spline Shaft

part number	outer diameter diameter Ds		inner diameter d		second moment of inertia I		cross-sectional coefficient Z	
	mm	mm	mm	mm	mm <sup>4</sup>	mm	mm	
SPR 6	6	2	58.3	18.9	58.3	18.9	18.9	
SPR 8	8	3	186	44.9	186	44.9	44.9	
SPR10	10	4	448	85.9	448	85.9	85.9	
SPR13	13	6	1,260	182	1,260	182	182	
SPR16	16	8	2,780	323	2,780	323	323	
SPR20A	20	10	6,860	637	6,860	637	637	
SPR25A	25	15	15,400	1,100	15,400	1,100	1,100	

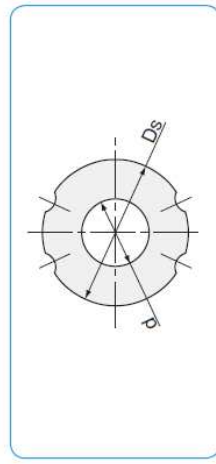
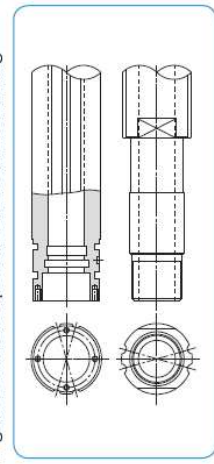


Figure B-30 Examples of Shaft-end Machining



SPECIAL REQUIREMENTS

NB provides customization such as shaft-end machining, spline nut machining, and surface treatment per customer requests. Please contact NB for the inner diameter of SPR20~SPR60.

**MOUNTING**

The flange attachment screws of SPR type have been pre-adjusted for smooth rotary movement and should never be loosened. Shock loading to the flange assembly should be avoided as this can degrade the accuracy of movement and deteriorate the overall performance. The spacer of SPB type is properly adjusted to produce the best preload condition. Shock loading to the spacer should be avoided as this can change the preload condition and deteriorate the accuracy. Please fix the mounting screws diagonally. The recommended torque values for medium-hardness steel screws are listed in Table B-29.

**SPR Type**

When the flange of SPR type is to be used with a faucet joint (as shown in Figure B-31) the housing bore should be machined to a tolerance of H7 and to a minimum depth of 60% of the flange thickness. If only a light load is applied to the SPR in operation, the flange can be used without a pilot end.

**SPB Type**

The housing bore for the SPB type should be machined to a tolerance of H7 and keep the enough depth so that the outer ring is inside the housing. If not, the outer ring may drop off.

**Insertion of Spline Shaft**

When inserting the spline shaft into the rotary ball spline nut, ensure that the ball elements do not drop out. This is done by aligning the raceway grooves of the shaft with the rows of ball elements and the seal -lip of the nut. Then carefully insert the spline shaft through the spline nut.

**LUBRICATION**

Since NB rotary ball spline nuts are equipped with seals at both the spline portion and the rotational portion, the lubricant is retained for an extended period of time. The spline nut is prelubricated with lithium soap based grease prior to shipment for immediate use. Please relubricate with a similar type of grease periodically depending on the operating conditions. Low dust generation grease is available from NB standard grease. (refer to page Eng-39) However, an oil lubricant is recommended for high-speed applications. A grease fitting or machining oil holes is optional (Figure B-33~35), please contact NB for details.

**SPR Type**

A grease fitting for rotational portion and machining oil hole for spline portion are optional.

**SPB Type**

Rotational portion has an oil hole as a standard. For lubrication, it is recommended to mount a grease fit or oil hole to housing. Machining oil hole for spline portion is available. Please contact NB.

Figure B-34 SPR type Oil Hole

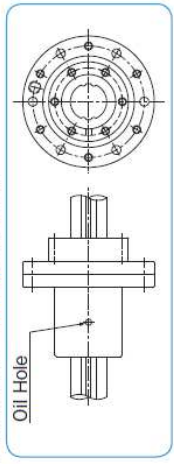


Figure B-33 Example of Installed Grease Fitting

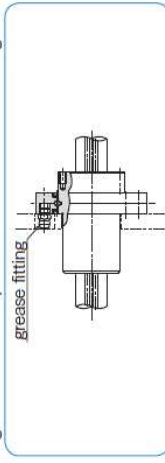
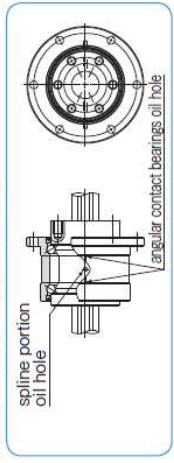


Figure B-35 SPB type Oil Hole



**OPERATING CONDITIONS**

The performance of the rotary ball spline is affected by the operating conditions of the application. The operating conditions should therefore be carefully taken into consideration.

**Operating Temperature**

Resin retainers are used in the rotary ball spline, so the operating temperature should never exceed 80°C.

**Dust Prevention**  
Foreign particles or dust in the rotary ball spline nut affects the motion accuracy and shortens the life time. Standard seals will perform well for dust prevention under normal operating conditions, however, in a harsh environment it is necessary to attach bellows or protective covers.

**APPLICATION EXAMPLES**

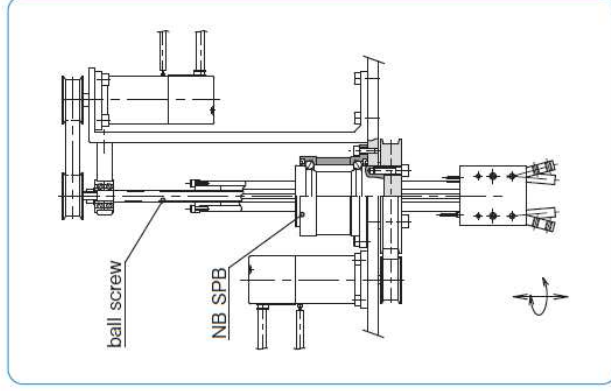


Table B-29 Recommended Torque unit: N·m

mounting screw	M2	M2.5	M3	M4	M5	M6	M8
recommended torque	0.4	0.9	1.4	3.2	6.6	11.2	27.6

(for alloy steel screw)

Figure B-31 SPR type Mounting Method

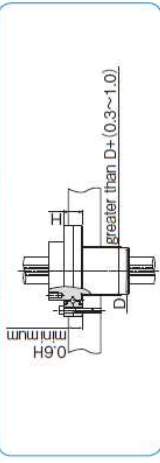


Figure B-32 SPB type Mounting Method

