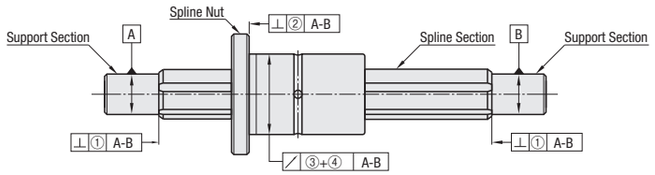
Accuracy



Note: Supporting portion is the part to mount the bearing and support the spline shaft.

■Spline Shaft: Raceway Twist Tolerance (Max.)

Unit: μm

Material	Tolerance
SUJ2	13
SUS440C	33

Spline groove twist is measured at an arbitrary 100mm section of the effective shaft length. If the length to be evaluated is longer or shorter than 100mm, proportionally add or subtract from the standard values in the table.

■Rotational Clearance Unit: μm

No.	Standard Preload SUJ2	Standard Preload SUS440C
6	-2~+1	-1~+4
8		
10	-3~+1	
13		-2~+5
16		
20	-4~+2	
25		-
30		

■Tolerance (Max) of Accuracies against Spline Shaft Supporting Sections Unit: μm

No.	①Spline Section Perpendicularity of End Face of the Shafts	②Flange Mounting Surface Perpendicularity
6	9(22)	11(27)
8		
10		13(33)
13	11(27)	16(39)
16		
20		
25	13	19
30		

Values in ( ) are for SUS440C.

No.	③Max. Runout of Spline Axis Line ~200	201~	316~	401~	501~	631~	801~	1001~
6	46(72)	89	126	163	-	-	-	-
8								
10	36(59)	54(83)	68(103)	82	102	-	-	-
13	34(56)	45(71)	53(83)	62	75	-	-	-
16								
20								
25	32	39	44	50	57	68	83	102
30								

Values in ( ) are for SUS440C.

No.	④Max. Runout of Spline Nut Outer Surface
6	11(27)
8	
10	13(33)
13	
16	16(39)
20	
25	19
30	

Values in ( ) are for SUS440C.

Calculation of Life

Running Life

●Radial Load

$$L=\left(\frac{ft\cdot fh\cdot fp}{fw}\cdot\frac{C}{F}\right)^3\cdot L_0$$

●Torque Load

$$L=\left(\frac{ft\cdot fh}{fw}\cdot\frac{Ct}{T}\right)^3\cdot L_0$$

L: Running Life (km)
ft: Temperature Factor
fh: Hardness Factor
fp: Ratio of Rated Load
fw: Load Factor
L0: Rated Life (50km)
C: Basic Dynamic Load Rating (N)
F: Applied Radial Load (N)
Ct: Basic Dynamic Torque (N · m)
T: Applied Torque (N · m)

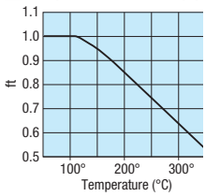
For values and factors, see below.

Life Hours

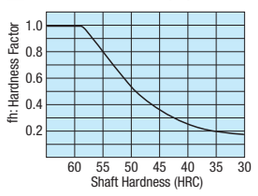
$$Lh=\frac{106\cdot L}{120\cdot St\cdot n}$$

Lh: Running Time (hr)
L: Running Life (km)
St: Stroke Length (mm)
n: Reciprocating Cycles per Minute (cpm)

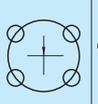
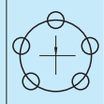
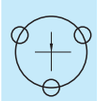
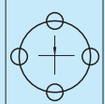
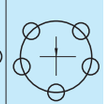
■Temperature Factor (ft)



■Hardness Factor (fh)



■Ratio of Rated Load (fp)

Distributed Load			Direct Download		
No.6, 8	No.10, 13	No.16, 20, 25, 30	No.6, 8	No.10, 13	No.16, 20, 25, 30
					
fp = 1	fp = 1	fp = 1	fp = 1	fp = 0.71	fp = 0.68

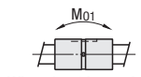
■Load Factor (fw)

Conditions of Use	Load Factor (fw)
Minimal vibrations / shocks (Low speed 15m/min. or less)	1~2
Some vibrations / shocks (Medium speed 60m/min. or less)	2~3
Significant vibrations / shocks (High speed over 60m/min.)	3 or more

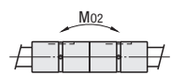
■Load Rating

No.	Basic Rated Torque Dynamic Ct N · m	Basic Rated Torque Static Cot N · m	Basic Load Rating Dynamic C kN	Basic Load Rating Static Co kN	Allowable Static Moment M01 N · m	Allowable Static Moment M02 N · m	Cross Sectional Moment of Inertia mm⁴
6	3.8	7	1.2	2.1	5	36	6.2 x10
8	4.8	8.7	1.2	2.1	5	36	1.97x10²
10	19(11)	34(21)	3.8(2.4)	6.9(4.3)	26(15)	181(102)	5.57x10²
13	28(20)	52(37)	4.6(3.3)	8.3(5.9)	36(22)	251(148)	1.55x10³
16	51	93	6.2	11.1	56	386	3.61x10³
20	85	154	8.5	15.3	83	611	8.74x10³
25	193	348	15.4	27.7	173	1248	2.13x10⁴
30	272	490	18.5	33.3	212	1581	4.373x10⁴

Values in ( ) are for SUS440C.
If the number of nuts is 1, check the M01 column; if the said number is 2, check the M02 column.



When 1 nut is used



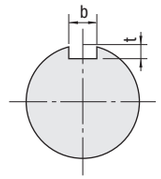
When 2 nuts are used in contacting tandem

Operating Temp.

Plastic components are used in ball spline assemblies. Avoid using in high temperature environments, keep below 80°C.

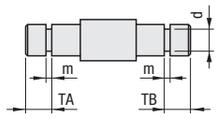
Alteration Overview

■Dimensions of Keyways on the Shaft Ends (P and Q)



P, Q	b	Tolerance (N9)	t	Tolerance
8, 10	3	-0.004 -0.029	1.8	+0.1 0
12	4	0 -0.030	2.5	
13~16	5		3.0	
20	6		3.5	
25	8	0 -0.036	4.0	+0.2 0

■Dimensions of the Retaining Ring Grooves on the Shaft Ends (P and Q)



P, Q	Tolerance	m	Tolerance	d	Tolerance	Applicable Retaining Ring
3	0 -0.010	0.5	+0.05 0	2	+0.06 0	JIS E Type 2
4	0 -0.012	0.7	+0.1 0	3		JIS E Type 3
5				4	+0.075 0	JIS E Type 4
6				5.05		JIS E Type 5
8	0 -0.015	0.9		6.05		JIS E Type 6
10		1.15	+0.14 0	9.6	0 -0.09	JIS C Type 10
12				11.5	0 -0.11	JIS C Type 12
13	0 -0.018			12.4		JIS C Type 13
15				14.3		JIS C Type 15
16				15.2		JIS C Type 16
20	0 -0.021	1.35		19	0 -0.21	JIS C Type 20
25				23.9		JIS C Type 25

Lubrication

Ball splines are shipped greased.
Administer lubrication maintenance with lithium soap based grease (Alvania Grease S2 by Showa Shell Sekiyu K.K), etc. for a mileage of 100km.

Various Grease Application Services

The Lubricant used for Ball Splines can be changed to any of the following Special Greases.
Service is provided to apply grease on nuts and shafts. For performance of each grease, refer to the table below.

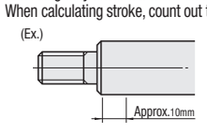
Type	Grease Product Name	Main Features
● L Type	ET–100K (Made by Kyodo Yushi)	High heat resistance and oxidation stability. Also high adhesion and cohesion with limited splash or leakage.
● G Type	LG2 (Made by NSK Ltd.)	Suitable for clean environment due to low particle generation grease. Highly resistant to corrosion.

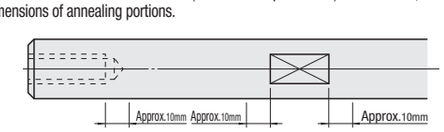
■Precautions for Use
For Particle Generation Amount upon grease application, refer to the "Comparison of Particle Generation (Experimental Values)" section of "Linear Bushings." P.304
If G Type grease, Low Miscible Consistency grease, is applied onto the small dia. portion (No. 6, 8, or 10), resistance may be increased, and thus, sliding motion may be degraded.

Annealing Range

Spline Shafts are already hardened, and must be annealed before machining.
Annealing may lower hardness on the machined area +10mm fore and aft. (See the examples below). Furthermore, the annealing portions are out of the guaranteed range of O.D. Tolerance.
When calculating stroke, count out the dimensions of annealing portions.

(Ex.)





Annealing may lower hardness of the following sections:
· Threaded Ends
· Stepped Parts
· Tapped Ends
· Wrench flats, set screw flats, retaining ring grooves, tap alteration

Ordering Example

Part Number
●BSSS8L-300 (L Type Greased)
●BSSS8G-300 (G Type Greased)

Please add L or G after part number of Regular Type when placing an order.

Add the price in the table below to the unit price of applicable standard product.
<Price Calculation Example> BSSS8G-300 (Standard)
(Standard Type Unit Price) +(Unit Price in the Table Below) = (Total)

■Grease Application Service Charges Table

Part Number (No.)	Unit Price (Add to the price of Standard Type) Nut 1 pc.	Nut 2 pcs.
6≤No.≤13		
16≤No.≤30		

Alterations

Part Number	-	L	-	M	-	(SC, FC···etc.)
BSFS10G	-	350	-	M5	-	SC15

Confirm the details of alterations on each page.