

# STROKE BALL SPLINE

The NB stroke ball spine SPLFS type is a highly accurate linear motion bearing with a limited stroke, to which both radial load and torque can be applied at the same time. It operates with extremely low dynamic friction.

## STRUCTURE AND ADVANTAGES

The NB stroke ball spline consists of a nut and a shaft both with raceway grooves. The flanged spline nut consists of an outer cylinder, a retainer, side-rings, and ball elements.

Since the retainer in the nut is equipped with ball pockets, the ball elements do not contact each other, which allows for a smooth linear motion. The stroke is limited since the retainer is a non-circulating type. For normal operation, it is recommended to consider 80% of the maximum stroke shown in the dimension table as an actual stroke length.

### Extremely low Dynamic Friction and Low Noise

The rolling elements are separated by the ball pockets so that they do not contact each other. The stroke length is limited, but extremely low dynamic friction and low noise are realized because the rolling elements do not circulate.

### Compact-Size

With the nut about 20% smaller than those of conventional ball splines, it contributes to space saving.

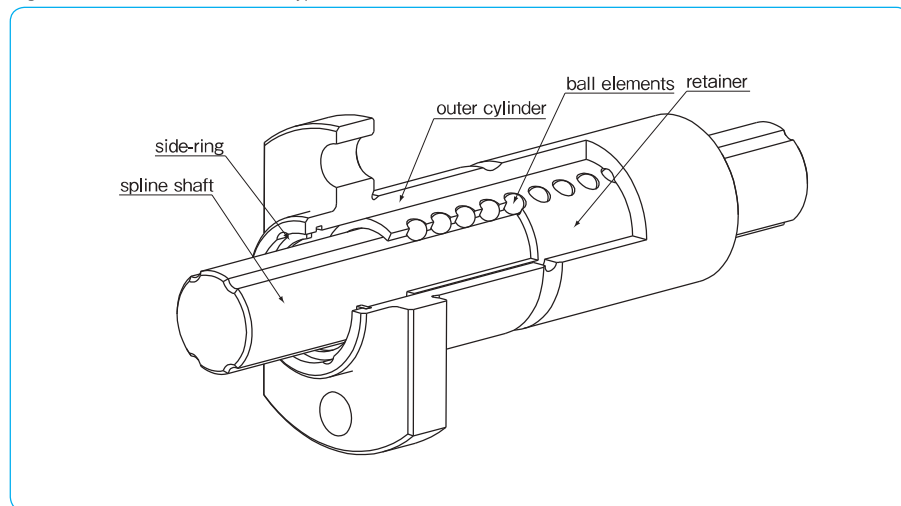
### All Stainless Steel Type

Since all the components are made of stainless steel, this stroke ball spline has an excellent corrosion resistance and heat resistance (operating temperature: -20 to 140°C). It is ideal for clean room or vacuum applications.

### Lubrication

A lubricant groove and two lubrication holes are provided on the outer surface of the nut, which allows for an easy designing of lubricant replenishment.

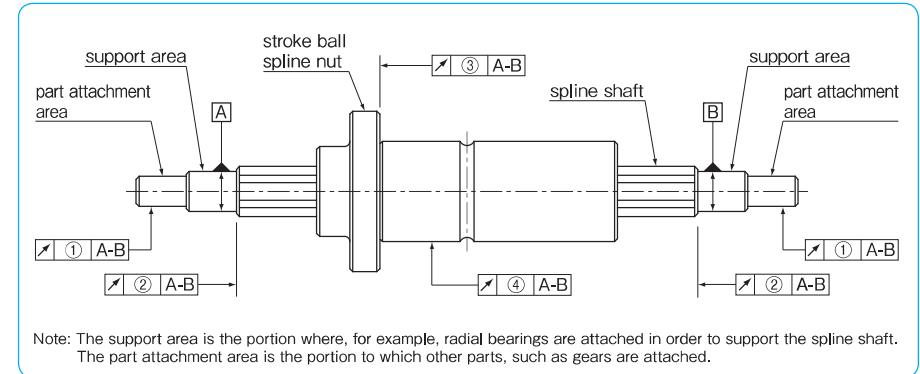
Figure B-41 Structure of SPLFS type



## ACCURACY

The accuracy of the NB stroke ball spline is measured at the points shown in Figure B-42.

Figure B-42 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-31 Tolerance of Spline Shaft Groove Torsion (Max.)

tolerance
13 μm/100mm

Table B-32 Tolerance Relative to Spline Support Area (Max.)

unit: μm

part number	① radial runout of part attachment area	② radial runout of the end of the spline shaft section	③ radial runout of the flange
SPLFS 6	14	9	11
SPLFS 8	14	9	11
SPLFS10	17	9	13
SPLFS13	19	11	13
SPLFS16	19	11	13

Table B-33 ④Radial Runout of Outer Surface of Spline Nut Relative to Spline Support Area (Max.)

unit: μm

spline shaft total length (mm)		size		
greater than	or less	6、8	10	13、16
—	200	46	36	34
200	315	89	54	45
315	400	126*	68	53
400	500	163*	82	62
500	630	—	102	75
630	800	—	—	92
800	1,000	—	—	115
1,000	1,250	—	—	153
1,250	1,500	—	—	256

\* SPLFS6 maximum shaft length: 400 mm

PRELOAD AND CLEARANCE

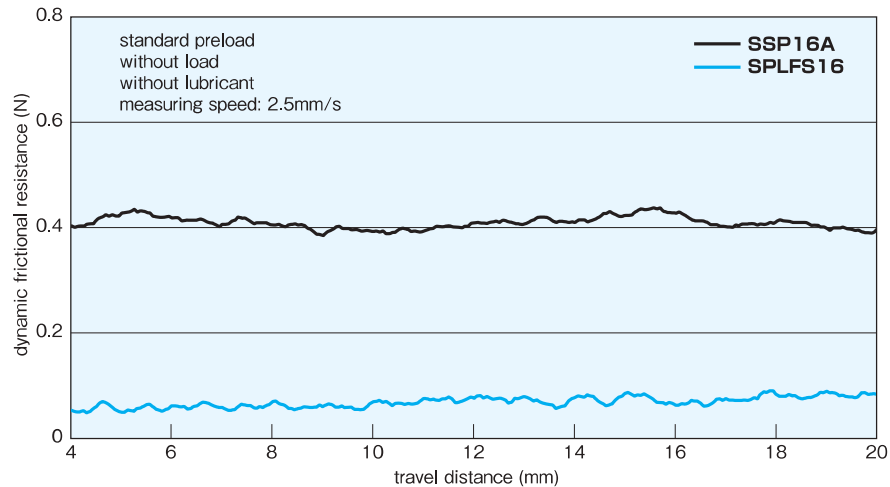
Preload and clearance are expressed in terms of clearance in the rotational direction. For the SPLFS type, only the standard preload is available as shown in Table B-34. Please contact NB if a special preload is required.

Table B-34 Preload and Clearance unit:  $\mu\text{m}$

part number	standard
SPLFS 6	-4~0
SPLFS 8	-4~0
SPLFS10	-4~0
SPLFS13	-4~0
SPLFS16	-4~0

COMPARISON OF DYNAMIC FRICTIONAL RESISTANCE

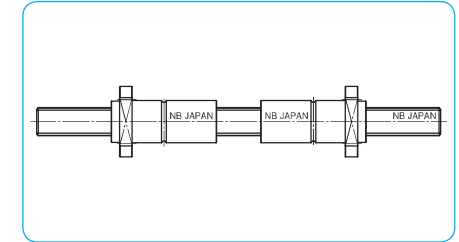
Figure B-43 Comparison of Dynamic Frictional Resistance



NUT ORIENTATION

Unless otherwise specified, the orientation of two nuts NB stroke ball spline is shown in Figure B-44. In other cases please specify the orientation of nut(s) with shaft.

Figure B-44 Nut Orientation and NB mark



USE AND HANDLING PRECAUTIONS

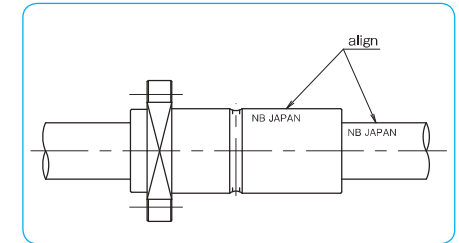
A Set of Spline Nut and Spline Shaft

The ball spline's accuracy and preload is guaranteed when spline nut and shaft are aligned as shown in Figure B-45. Please make sure to align the NB marks when reinserting the shaft.

At this time, both NB marks on the nut and shaft should be aligned in the same direction as when delivered.

When inserting the spline shaft into the 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. In case that the nut is preloaded, please exercise additional care. And also, do not disassemble the spline nut.

Figure B-45



Dust Prevention

Since the stroke ball spline is designed and manufactured for operation with an extremely low dynamic frictional resistance, seals that increase frictional resistance are not equipped as a standard feature. Please contact NB for a special requirement of seals. For use under harsh conditions, the stroke ball spline should be protected using bellows and protective covers.

Maximum Stroke

The maximum stroke in the dimension table is the stroke limit.

Retainer Slippage

If the stroke ball spline is used at a high speed or with a vertical shaft, or under an asymmetric load or oscillation, a retainer slippage may occur. For general operation, it is recommended to consider 80% of the maximum stroke length shown in the dimension table as the stroke length.

To prevent the retainer slippage, it is recommended to conduct a full-stroke movement of the nut whenever necessary in order for the retainer to be relocated to the center.