STROKE BUSH

The NB stroke bush is a linear and rotational motion mechanism utilizing the rotational motion of ball elements between an outer cylinder and a shaft. It is compact and can withstand high loading.

The retainer is made of a light metal alloy with high wear resistance. Smooth motion is achieved under high-speed and high-acceleration conditions.

Although the linear motion is limited to a specific stroke length, the combined rotation and stroke motion is achieved with very little frictional resistance. The NB stroke bush can be conveniently used in a variety of applications.

STRUCTURE AND ADVANTAGES

The retainer in the NB stroke bush positions the ball elements in a zigzag arrangement. The inner surface of the outer cylinder is finished by precision grinding, resulting in smooth motion of the ball elements. Each of the ball elements is held in a separate hole and smooth motion is achieved for both rotational motion and linear motion. The retainer moves half the length of the linear motion, therefore, the stroke length is limited to approximately twice the length the retainer can travel within the outer cylinder.

● High Precision

High-carbon chromium bearing steel is used for the outer cylinder. It is heat treated and ground to achieve high rigidity and accuracy.

● Ease of Mounting and Replacement

The highly accurate fabrication of the NB stroke bush results in uniform dimensions, facilitating parts replacement and housing fabrication.

● Light Weight and Space Saving

The use of an aluminum alloy for the retainer and the thin-wall outer cylinder makes the NB stroke bush light weight and compact.

● Lubrication

One lubrication hole is provided on each oil groove of the outer cylinder, making it easy to lubricate the SR stroke bush.

Figure E-1 Structure of SR Stroke Bush

outer cylinder
seal
ball elements
retainer
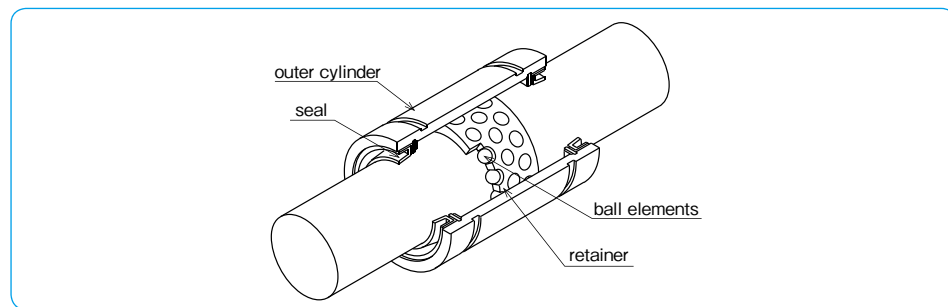
ACCURACY

The accuracies of the SR stroke bush are stated in the dimension tables. Since the outer cylinder deforms due to tension from the retaining ring, the dimension of the outer cylinder is an average value at points P, where calculated using the following equation:

$$W = 4 + \frac{L}{8}$$

W: the distance from the end of the outer cylinder to measurement point P
L: the length of the outer cylinder

Figure E-2 Outer Cylinder Measurement Points
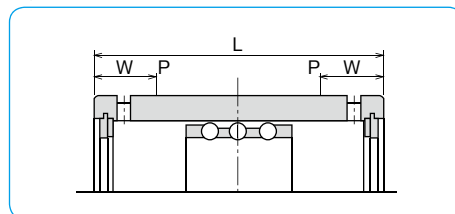
FIT

The fits generally used between the shaft and the housing are listed in Table E-1. The inner contact diameters of the SR stroke bush are listed in the dimension tables. The shaft diameter tolerance should be selected to achieve the desired amount of radial clearance (see Table E-2). Please pay attention that high-speed linear motion can cause the retainer to slip due to inertial force.

In selecting a shaft, please take note of:
Hardness: 58HRC or more (refer to hardness coefficient on page Eng-5) recommended
Surface Roughness: less than Ra0.4 recommended

Table E-1

normal operating condition		vertical use or highly accurate case	
shaft	housing	shaft	housing
k5,m5	H6,H7	n5,p6	J6,J7

Table E-2 Radial Clearance Negative Limit

part number	limit (μm)
6	− 2
8〜10	− 3
12〜16	− 4
20〜30	− 5
35〜50	− 6
60〜80	− 8
100	−10

RATED LOAD AND RATED LIFE

The relationship between the rated load and life of the stroke bush is expressed as follows:

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P} \right)^3$$

L: rated life (10^6 rotations) f_H: hardness coefficient
f_T: temperature coefficient f_C: contact coefficient
f_W: applied load coefficient
C: basic dynamic load rating (N)
P: applied load (N)
※Refer to page Eng-5 for the coefficients.

● For combined rotation and stroke motion

$$L_h = \frac{10^6 \cdot L}{60\sqrt{(dm \cdot n)^2 + (10 \cdot S \cdot n_1)^2}/dm}$$

● For stroke motion

$$L_h = \frac{10^6 \cdot L}{600 \cdot S \cdot n_1 / (\pi \cdot dm)}$$

L_h: life time (hr)   S: stroke length (mm)
n: revolutions per min. (rpm)
n_1: number of cycles per minute (cpm)
dm: ball pitch diameter (mm) ≒ 1.15 dr

ALLOWABLE SPEED FOR COMBINED ROTATION AND STROKE MOTION

The allowable speed for combined rotation and stroke motion is obtained from the following equation:

$$DN \geqq dm \cdot n + 10 \cdot S \cdot n_1$$

The value of DN is given as follows depending on the lubrication method.

for oil lubrication	DN=600,000
for grease lubrication	DN=300,000

note……n≦5,000 S・n_1≦50,000

USE AND HANDLING PRECAUTIONS

Maximum Stroke

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

Retainer Slippage

The retainer can slip under high-speed motion, vertical application, unbalanced-loading, and vibrating conditions. It is suggested that the stroke to be set as a 80% of the maximum stroke in the dimension table. It is also recommended that the bush be cycled to perform the maximum stroke several times, so that the retainer returns to its central position.

SLIDE ROTARY BUSH RK TYPE

NB's RK type slide rotary bush is a highly accurate and high load capacity bearing providing smooth continuous linear and rotational motions. Its structure imposes no constraints on linear and rotational motions. It is much more compact than a standard slide bush with separate rotational bearing.

STRUCTURE AND ADVANTAGES

The RK type slide rotary bush uses a retainer similar to that used in the SR type stroke bush. This retainer gives a smooth motion in a high rotational application.

SM type slide bush is incorporated, providing the stable and smooth linear motion.

Relatively large ball elements are used for high load capacity.

1. A smooth unlimited linear and rotational motion is obtained.
2. There is no need to machine separate housing.
3. High accuracy is ensured for extended period of usage.
4. Its high compatibility eliminates replacement problems.
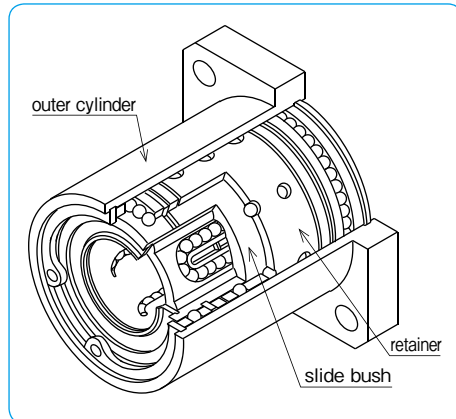5. High rigidity enables it to withstand an unbalanced load and large load.

※For best performance, please select tolerance of h5 for the shaft.

Calculation of Life:

$$L=\left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P}\right)^3 \times 50$$

L: rated life (km) f_H: hardness coefficient
f_T: temperature coefficient f_C: contact coefficient
f_W: applied load coefficient
C: basic dynamic load rating (N) P: applied load (N)
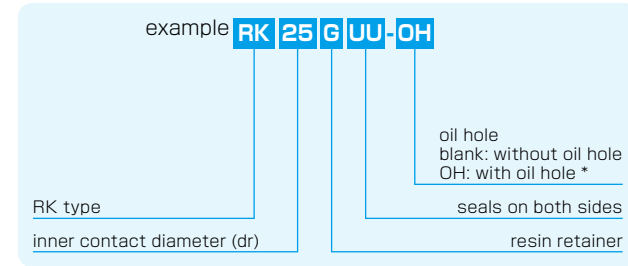※Refer to page Eng-5 for the coefficients.
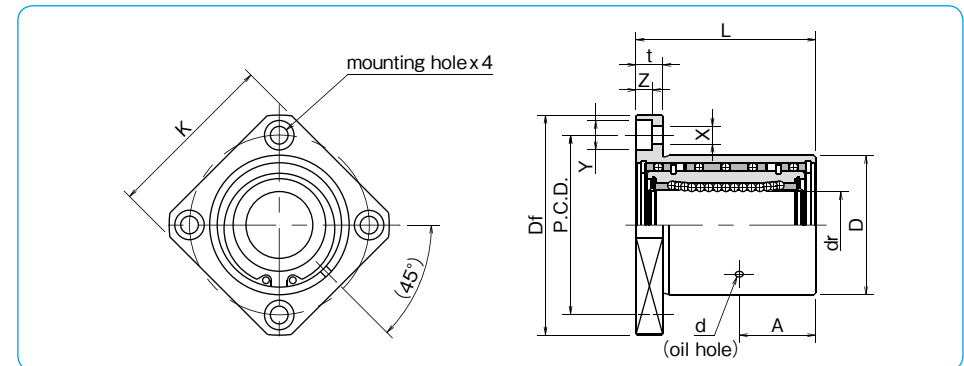
Figure E-6 Structure of RK Slide Rotary Bush

outer cylinder

retainer

slide bush

RK TYPE

part number structure

example RK 25 G UU-OH

oil hole
blank: without oil hole
OH: with oil hole *

RK type

seals on both sides

inner contact diameter (dr)

resin retainer

＊Oil hole is for rotary-portion lubrication.

mounting hole x 4

(45°)

d
(oil hole)

part number	dr		D		L	A	d	flange					X×Y×Z	basic load rating		allowable revolutions per minute	mass
		tolerance		tolerance					Df	K	t	P.C.D.		dynamic C	static Co		
	mm	μm	mm	μm	mm	mm	mm	mm	mm	mm	mm	mm	mm	N	N	rpm	g
RK12GUU	12	0	32	0	36	15	2		54	42	8	43	5.5×9×5.1	510	784	500	180
RK16GUU	16	− 9	40	−25	45	19.5	2		62	50	8	51	5.5×9×5.1	774	1,180	500	280
RK20GUU	20		45		50	±0.3 21.5	3		74	58	10	60	6.6×11×6.1	882	1,370	400	420
RK25GUU	25	0	52	0	67	28.5	3		82	64	10	67	6.6×11×6.1	980	1,570	400	680
RK30GUU	30	−10	60	−30	74	31	3		96	75	13	78	9×14×8.1	1,570	2,740	400	990

1N≒0.102kgf