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.

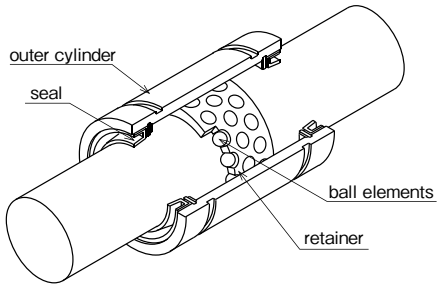
● Light Weight and Space Saving

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



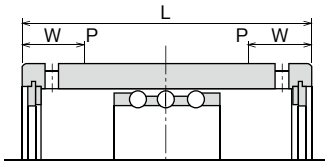
ACCURACY

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……$n \leqq 5{,}000$　$S \cdot n_1 \leqq 50{,}000$

USE AND HANDLING PRECAUTIONS

Maximum Stroke

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

Retainer Slippage

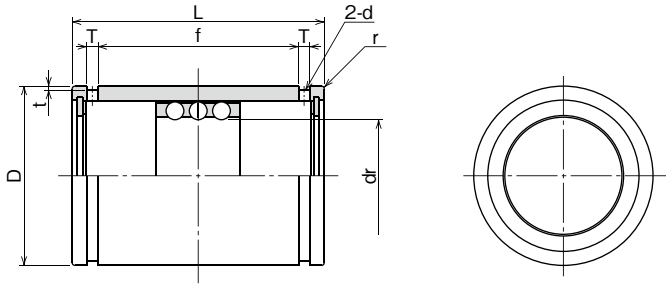
The retainer can slip under high-speed motion, vertical application, unbalanced-loading, and vibrating conditions.
It is suggested that the stroke to be set as a 80% of the maximum stroke in the dimension table. It is also recommended that the bush be cycled to perform the maximum stroke several times,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

SR TYPE

part number structure

example **SR 20**

- SR type
- inner contact diameter (dr)



part number	maximum stroke	number of rows	major dimensions													basic load rating		mass
			dr	tolerance	D	tolerance	L	tolerance	f	T	t	d	r	dynamic C	static Co	
	mm		mm	μm	mm	μm	mm	mm	mm	mm	mm	mm	mm	N	N	g
SR 6	19	3	6	+22 +13	12	0 −11	20	0 −0.2	11.3	1.1	0.5	1	0.5	216	147	8.9
SR 8	24	3	8		15		24		17.1	1.5	0.5	1.2	0.5	343	245	15.6
SR 10	30	3	10		19	0 −13	30		22.7	1.5	0.5	1.2	0.5	637	461	28.8
SR 12	32	3	12	+27	23		32		24.5	1.5	0.5	1.2	0.5	1,070	813	42
SR 16	40	3	16	+16	28		37		29.1	1.5	0.7	1.3	0.5	1,180	990	71
SR 20	50	3	20	+33 +20	32	0 −16	45		35.8	2	0.7	1.5	0.5	1,260	1,170	99
SR 25	50	3	25		37		45	0 −0.3	35.8	2	0.7	1.6	1	1,330	1,330	117
SR 30	82	3	30		45		65		53.5	2.5	1	2	1	2,990	3,140	205
SR 35	92	3	35	+41 +25	52	0 −19	70		58.5	2.5	1	2	1.5	3,140	3,530	329
SR 40	108	3	40		60		80		68.3	2.5	1	2	1.5	4,120	4,800	516
SR 50	138	3	50		72		100		86.4	3	1	2.5	1.5	5,540	6,910	827
SR 60	138	3	60	+49	85	0 −22	100		86.4	3	1	2.5	2	5,980	8,230	1,240
SR 80	132	3	80	+30	110		100	0 −0.4	86	3	1.5	2.5	2	7,840	12,200	2,050
SR100	132	3	100	+58/+36	130	0/−25	100		86	3	1.5	2.5	2	8,430	14,700	2,440

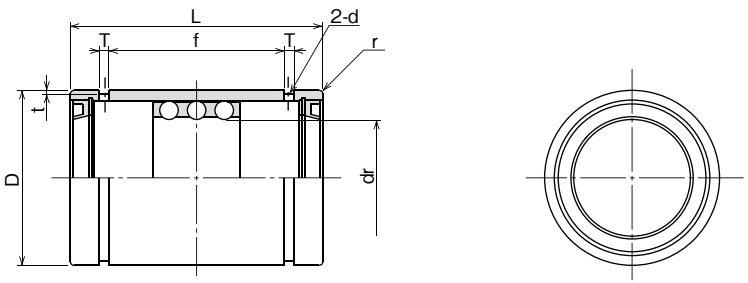
1N≒0.102kgf

SR-UU TYPE

part number structure

example **SR 20 UU**

- SR type
- inner contact diameter (dr)
- seals on both sides



part number	maximum stroke	number of rows	major dimensions													basic load rating		mass
			dr	tolerance	D	tolerance	L	tolerance	f	T	t	d	r	dynamic C	static Co	
	mm		mm	μm	mm	μm	mm	mm	mm	mm	mm	mm	mm	N	N	g
SR 8UU	14	3	8	+22	15	0/−11	24	0 −0.2	12.3	1.5	0.5	1.2	0.5	343	245	15.6
SR 10UU	16	3	10	+13	19	0 −13	30		15.5	1.5	0.5	1.2	0.5	637	461	28.8
SR 12UU	18	3	12	+27	23		32		17.1	1.5	0.5	1.2	0.5	1,070	813	42
SR 16UU	26	3	16	+16	28		37		21.1	1.5	0.7	1.3	0.5	1,180	990	71
SR 20UU	36	3	20	+33 +20	32	0 −16	45		26.8	2	0.7	1.5	0.5	1,260	1,170	99
SR 25UU	36	3	25		37		45	0 −0.3	26.8	2	0.7	1.6	1	1,330	1,330	117
SR 30UU	68	3	30		45		65		45.1	2.5	1	2	1	2,990	3,140	205
SR 35UU	76	3	35	+41 +25	52	0 −19	70		50.1	2.5	1	2	1.5	3,140	3,530	329
SR 40UU	91	3	40		60		80		59.9	2.5	1	2	1.5	4,120	4,800	516
SR 50UU	116	3	50		72		100		77.4	3	1	2.5	1.5	5,540	6,910	827
SR 60UU	117	3	60	+49	85	0 −22	100		77.4	3	1	2.5	2	5,980	8,230	1,240
SR 80UU	110	3	80	+30	110		100	0 −0.4	77	3	1.5	2.5	2	7,840	12,200	2,050
SR100UU	110	3	100	+58/+36	130	0/−25	100		77	3	1.5	2.5	2	8,430	14,700	2,440

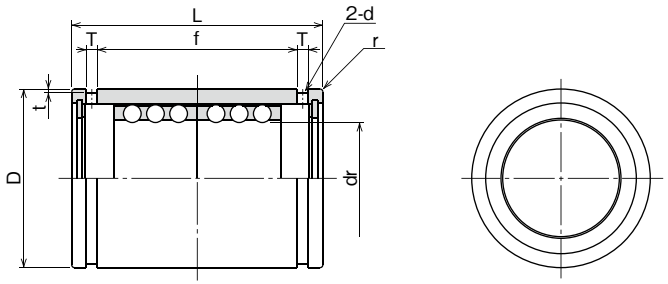
1N≒0.102kgf

SR-B TYPE

part number structure

example **SR 20 B**

- SR type
- inner contact diameter (dr)
- double retainer



part number	maximum stroke	number of rows	major dimensions													basic load rating		mass
			dr	tolerance	D	tolerance	L	tolerance	f	T	t	d	r	dynamic C	static Co	
	mm		mm	μm	mm	μm	mm	mm	mm	mm	mm	mm	mm	N	N	g
SR 8B	8	6	8	+22	15	0/−11	24		17.1	1.5	0.5	1.2	0.5	549	490	16.8
SR 10B	8	6	10	+13	19		30		22.7	1.5	0.5	1.2	0.5	1,030	931	31.2
SR 12B	8	6	12	+27	23	0	32	0	24.5	1.5	0.5	1.2	0.5	1,720	1,630	46
SR 16B	16	6	16	+16	28	−13	37	−0.2	29.1	1.5	0.7	1.3	0.5	1,910	1,980	75
SR 20B	20	6	20		32		45		35.8	2	0.7	1.5	0.5	2,060	2,320	106
SR 25B	20	6	25	+33	37	0	45		35.8	2	0.7	1.6	1	2,170	2,670	125
SR 30B	44	6	30	+20	45	−16	65		53.5	2.5	1	2	1	4,800	6,270	220
SR 35B	54	6	35		52		70	0	58.5	2.5	1	2	1.5	5,050	7,060	346
SR 40B	66	6	40	+41	60	0	80	−0.3	68.3	2.5	1	2	1.5	6,710	9,560	540
SR 50B	88	6	50	+25	72	−19	100		86.4	3	1	2.5	1.5	8,970	13,800	862
SR 60B	88	6	60	+49	85	0	100		86.4	3	1	2.5	2	9,700	16,500	1,290
SR 80B	76	6	80	+30	110	−22	100	0	86	3	1.5	2.5	2	12,700	24,300	2,110
SR100B	76	6	100	+58/+36	130	0/−25	100	−0.4	86	3	1.5	2.5	2	13,700	29,400	2,520

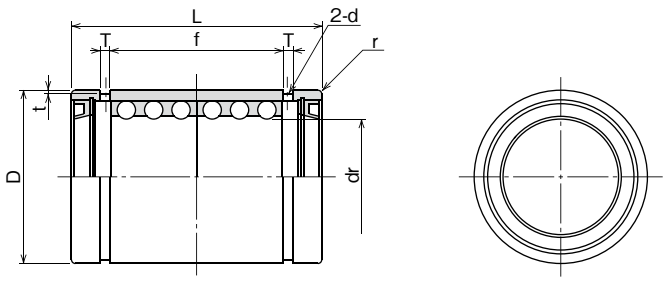
1N≒0.102kgf

SR-BUU TYPE

part number structure

example **SR 30 B UU**

- SR type
- inner contact diameter (dr)
- seals on both sides
- double retainer



part number	maximum stroke	number of rows	major dimensions													basic load rating		mass
			dr	tolerance	D	tolerance	L	tolerance	f	T	t	d	r	dynamic C	static Co	
	mm		mm	μm	mm	μm	mm	mm	mm	mm	mm	mm	mm	N	N	g
SR 30BUU	30	6	30	+33/+20	45	0/−16	65		45.1	2.5	1	2	1	4,800	6,270	220
SR 35BUU	38	6	35		52		70		50.1	2.5	1	2	1.5	5,050	7,060	346
SR 40BUU	49	6	40	+41	60	0	80	0	59.9	2.5	1	2	1.5	6,710	9,560	540
SR 50BUU	66	6	50	+25	72	−19	100	−0.3	77.4	3	1	2.5	1.5	8,970	13,800	862
SR 60BUU	67	6	60	+49	85	0	100		77.4	3	1	2.5	2	9,700	16,500	1,290
SR 80BUU	54	6	80	+30	110	−22	100	0	77	3	1.5	2.5	2	12,700	24,300	2,110
SR100BUU	54	6	100	+58/+36	130	0/−25	100	−0.4	77	3	1.5	2.5	2	13,700	29,400	2,520

1N≒0.102kgf