

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.

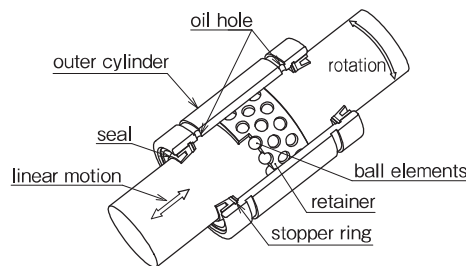
Light Weight and Space Saving

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



TYPE

Table E-1 Type

	Standard Type	Double Retainer Type
SR TYPE	 P,E-6	SR-B TYPE  P,E-8

SPECIFICATION

Refer to Table E-2 for NB Stroke Bush material and operating temperature range.

ALLOWABLE SPEED FOR COMBINED ROTATION AND STROKE MOTION

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

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

Table E-2 Material and Operating Temperature Range

type	outer cylinder	retainer	operating temperature range
SR	steel	aluminum	-20°C~110°C
SR-B			

$$DN \geq dm \cdot n + 10 \cdot \ell s \cdot n_1$$

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

note: $n \leq 5,000$ $\ell s \cdot n_1 \leq 50,000$

RATED LOAD AND RATED LIFE

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

$$L = \left(\frac{f_H \cdot f_T \cdot f_C \cdot C}{f_W \cdot P} \right)^3 \times 10^6$$

L: rated life 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-6 for the coefficients.

●For combined rotation and stroke motion

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

●For stroke motion

$$L_h = \frac{L}{600 \cdot \ell s \cdot n_1 / (\pi \cdot dm)}$$

L_h : life time (hr) ℓs : stroke length (mm)
 n : revolutions per min. (rpm)
 n_1 : number of cycles per minute (cpm)
 dm : ball pitch diameter (mm) $\approx 1.15 \cdot d$

FIT

The fits generally used between the shaft and the housing are listed in Table E-3. 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-4). 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-6) recommended
 Surface Roughness: less than Ra0.4 recommended

Table E-3

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

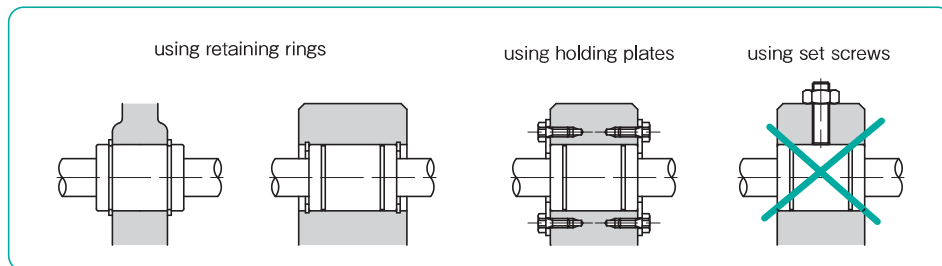
Table E-4 Radial Clearance Negative Limit

part number	limit (μ m)
6	-2
8~10	-3
12~16	-4
20~30	-5
35~50	-6
60~80	-8
100	-10

MOUNTING

Examples of mounting methods of Stroke Bush are shown in Figure E-2. To avoid deformation, do not fix outer cylinder by using set screw.

Figure E-2 Mounting Method



LUBRICATION

Appropriate lubrication is needed to ensure the accuracy of NB Stroke Bush and to maintain bearing life. Anti-rust oil is applied to NB Stroke Bush prior to shipment. The NB selected anti-rust oil has a little to no effect on lubricants, however, please apply lubricant only after cleaning Stroke Bush with kerosene, etc.

Grease Lubricant

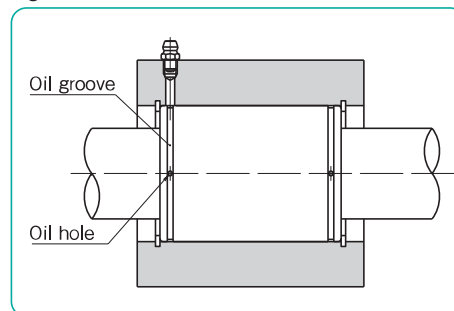
Prior to usage, please apply grease, and re-lubricate periodically according to the operating conditions. (Lithium soap-based grease is recommended.) Relubrication can be done by directly applying grease inside the ball bush or by using oil hole as Figure E-3 shows.

A special low dust generation grease is optional for clean room application. Please refer to page Eng-51.

Oil Lubricant

Prior to usage, please apply oil directly to the shaft surface or by using oil hole as Figure E-3 shows. Turbine oil (ISO standard VG32-68) is recommended.

Figure E-3 Oil hole



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.

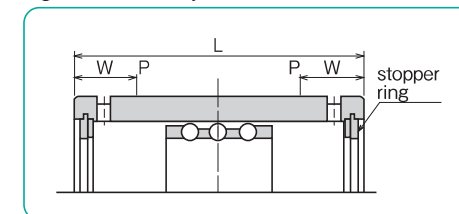
Accuracy

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-4 Outer Cylinder Measurement Points



Operating Temperature Range

The operating temperature is ranging from -20 °C to 110°C. In case of operation at temperature outside this range, please contact NB.

Dust Prevention

Dust and other contaminations affect the bush's lifetime and accuracy if dust or particle enter into inside of bush. Although seals work under a normal environment, in a harsh environment, it is necessary to attach protective covers.

SR TYPE

—Standard Type—

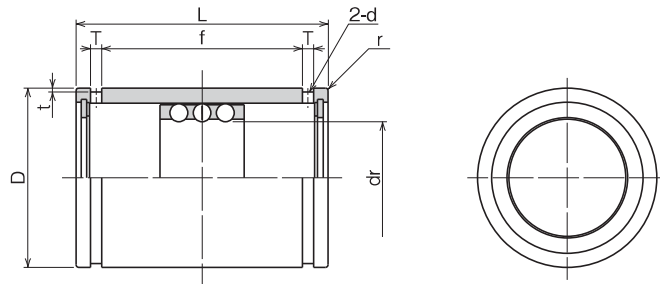


part number structure

example **SR 20**

SR type

inner contact diameter (dr)



part number	maximum stroke mm	number of rows	dr mm	major dimensions								basic load rating				
				tolerance μm	D mm	tolerance μm	L mm	tolerance mm	f mm	T mm	t mm	d mm	r mm	dynamic C N	static Co N	mass g
SR 6	19	3	6	+22	12	0	20		11.3	1.1	0.5	1	0.5	216	147	8.9
SR 8	24	3	8	+13	15	-11	24		17.1	1.5	0.5	1.2	0.5	343	245	15.6
SR 10	30	3	10	+17	19	0	30	0	22.7	1.5	0.5	1.2	0.5	637	461	28.8
SR 12	32	3	12	+27	23	0	32	-0.2	24.5	1.5	0.5	1.2	0.5	1,070	813	42
SR 16	40	3	16	+16	28	-13	37		29.1	1.5	0.7	1.3	0.5	1,180	990	71
SR 20	50	3	20	+33	32	0	45		35.8	2	0.7	1.5	0.5	1,260	1,170	99
SR 25	50	3	25	+20	37	-16	45		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		52	70	0		58.5	2.5	1	2	1.5	3,140	3,530	329
SR 40	108	3	40	+41	60	0	80	-0.3	68.3	2.5	1	2	1.5	4,120	4,800	516
SR 50	138	3	50	+25	72	-19	100		86.4	3	1	2.5	1.5	5,540	6,910	827
SR 60	138	3	60	+49	85	0	100		86.4	3	1	2.5	2	5,980	8,230	1,240
SR 80	132	3	80	+30	110	-22	100	0	86	3	1.5	2.5	2	7,840	12,200	2,050
SR100	132	3	100	+58/+36	130	0/-25	100	-0.4	86	3	1.5	2.5	2	8,430	14,700	2,440

1N≒0.102kgf

SR-UU TYPE

—Standard Type with Seals—



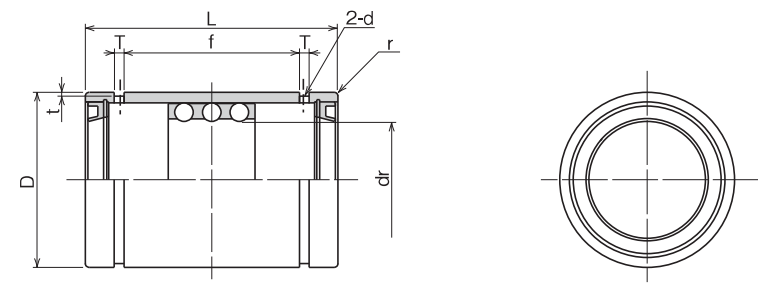
part number structure

example **SR 20 UU**

SR type

inner contact diameter (dr)

seals on both sides



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

1N≒0.102kgf

SR-B TYPE

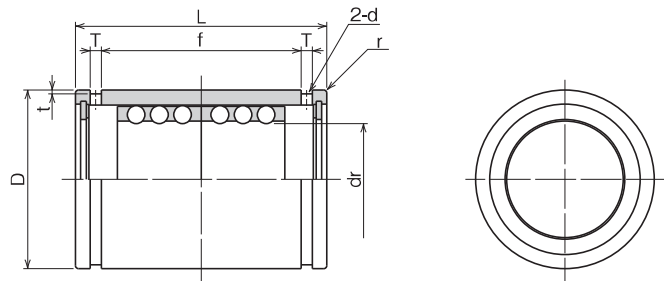
-Double Retainer Type-



part number structure

example **SR 20 B**

SR type
inner contact diameter (dr)
double retainer



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

1N≒0.102kgf

SR-BUU TYPE

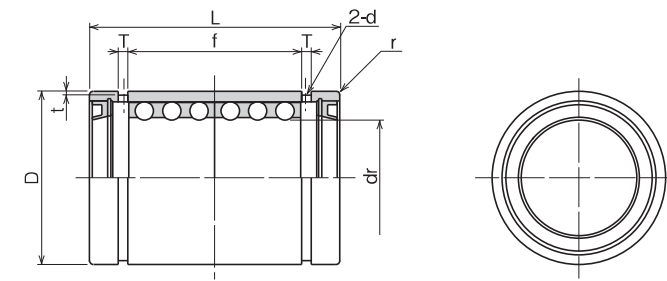
-Double Retainer Type with Seals-



part number structure

example **SR 30 B UU**

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



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

1N≒0.102kgf