

Stroke Rotary Bushing

ST

IICO Stroke Rotary Bushing is a compact linear motion rolling guide capable of rotation as well as linear motion with low frictional resistance. In the external cylinder, steel balls and a retainer are incorporated. Standard and sealed types are available. In both standard and sealed types, ordinary and heavy duty types are available. This series is used in many applications.

Rotary and linear motion

Steel balls and a retainer are incorporated in an external cylinder having a cylindrical raceway on the inside, so rotary motion can be achieved as well as linear movement.

Low frictional resistance

Very accurate steel balls are incorporated in a precisely ground external cylinder. So low rolling friction with extremely smooth rotary and reciprocating linear motions can be obtained.

Small inertia

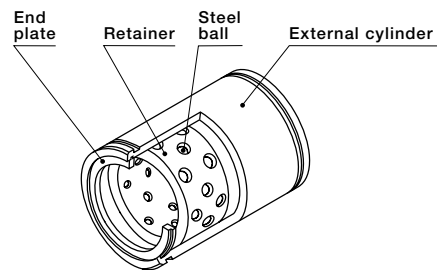
Since the retainer is highly rigid but light, this series is suitable for high speed rotation and reciprocating movement as inertia is small.

Standard type Stroke Rotary Bushing

This type is classified into ordinary and heavy duty types depending on the magnitude of load rating. The heavy duty type has a larger load rating and a higher rigidity than the ordinary type, but the stroke length is shorter compared to the ordinary type.

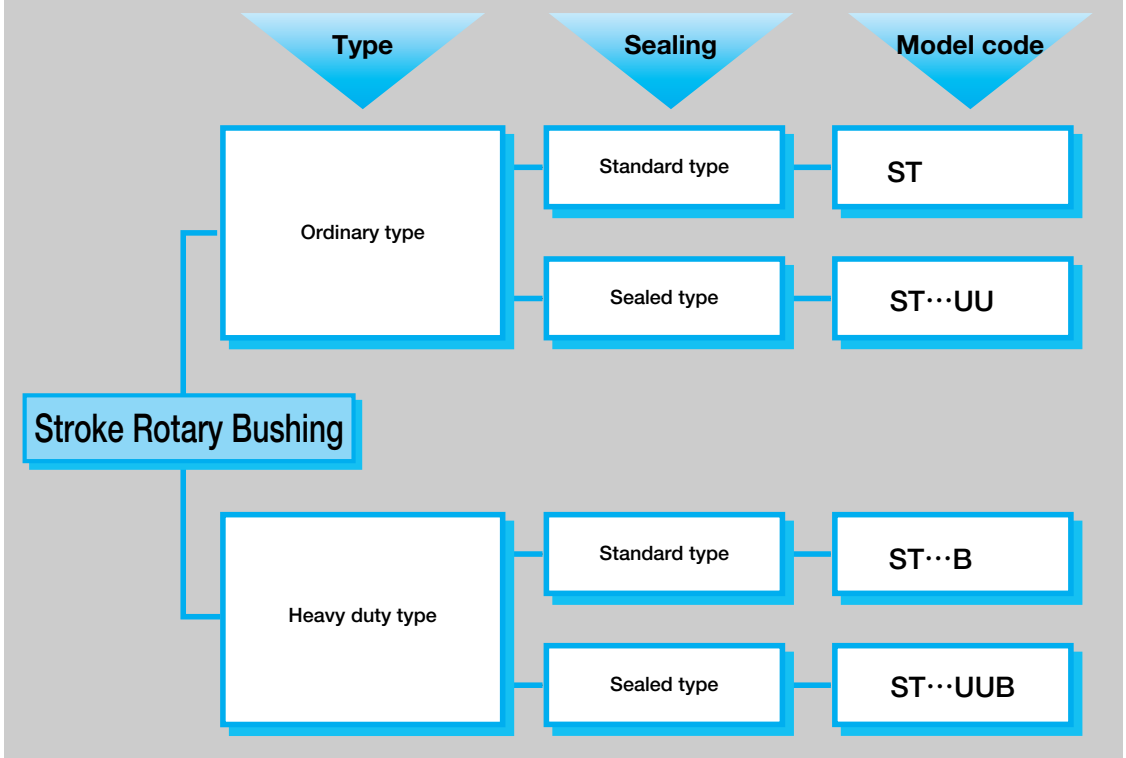
Sealed type Stroke Rotary Bushing

In this type, synthetic resin seals are incorporated in the external cylinder bore at both ends. These seals are used to prevent intrusion of foreign substances. This type is classified into ordinary and heavy duty types. Both types have shorter stroke lengths compared to the standard type.



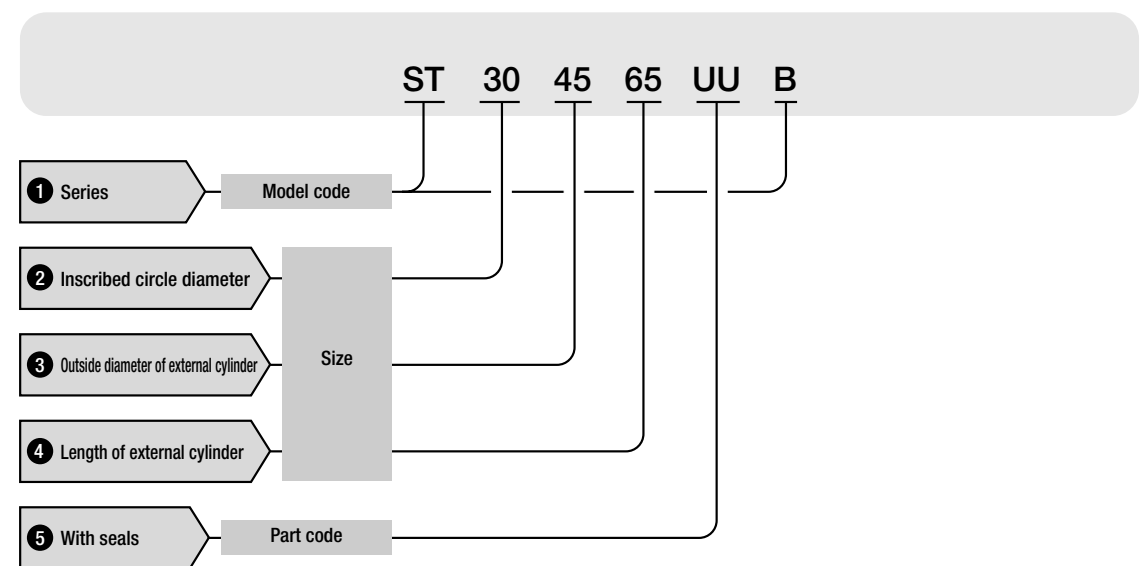
Structure of Stroke Rotary Bushing

Stroke Rotary Bushing series



Identification number and specification

The specification of Stroke Rotary Bushing is indicated by the identification number, consisting of a model code, a size and a part code.



1 Series	Ordinary type : ST Heavy duty type : ST···B	The heavy duty type has larger load ratings and higher rigidity but a shorter stroke length than the ordinary type.
2 Inscribed circle diameter		Indicate the inscribed circle diameter in mm.
3 Outside diameter of external cylinder		Indicate the outside diameter of external cylinder in mm.
4 Length of external cylinder		Indicate the length of external cylinder in mm.
5 With seals	Standard type : No symbol Sealed type : UU	The sealed type incorporates seals for preventing intrusion of foreign substances. The maximum allowable temperature for seals is 120°C.

Load Rating

The load ratings of Stroke Rotary Bushing are defined for radial load. Summarized descriptions of load ratings are given below. For details of load rating definitions and load calculations, see "General description".

● Basic dynamic load rating C

The basic dynamic load rating is defined as the constant radial load both in direction and magnitude under which a group of identical Stroke Rotary Bushings are individually operated and 90% of the units in the group can rotate 1,000,000 revolutions free from material damage due to rolling contact fatigue.

● Basic static load rating C_0

The basic static load rating is defined as the static radial load that gives a prescribed constant contact stress at the center of the contact area between the rolling element and raceway receiving the maximum load.

Accuracy

The accuracy of Stroke Rotary Bushing is shown in Tables 1.1 and 1.2. The outside diameter of external cylinder changes by the tension of the stop ring to be set with the external cylinder. Accordingly, the measurement of the outside diameter should be made at the measuring position obtained from formula (1), and the mean diameter at that position is used.

$$W = 4 + L_1 / 8 \dots \dots \dots (1)$$

where, W : Distance from the end face to measuring position P , mm (See Fig. 1.)

L_1 : Length of external cylinder, mm

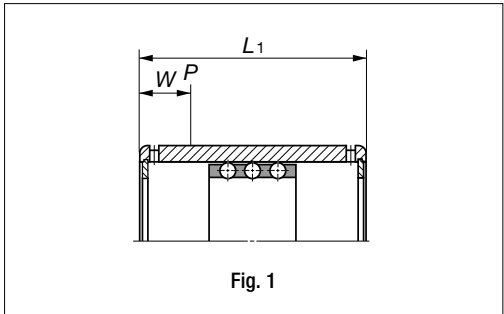


Table 1.1 Tolerance of inscribed circle diameter and outside diameter of external cylinder unit : μm

Inscribed circle diameter F_w or outside diameter D of external cylinder mm		Tolerance of inscribed circle diameter F_w		Tolerance of outside diameter of external cylinder $D_m^{(1)}$	
		high	low	high	low
over	incl.				
4	6	+18	+10	—	—
6	10	+22	+13	0	- 8
10	18	+27	+16	0	- 8
18	30	+33	+20	0	- 9
30	50	+41	+25	0	-11
50	80	+49	+30	0	-13
80	120	+58	+36	0	-15
120	150	—	—	0	-18

Note(1) : D_m is an arithmetic mean value of maximum and minimum outside diameters obtained by two-point measurement method.

Table 1.2 Tolerance of length of external cylinder unit : μm

Inscribed circle diameter F_w mm		Tolerance of length L_1 of external cylinder	
		high	low
over	incl.		
—	20	0	-200
20	60	0	-300
60	100	0	-400

Fit

The fit of Stroke Rotary Bushing with shaft and housing bore is recommended to be as shown in Table 2. Since both rotary and linear motions may be performed at the same time, radial clearance should be held to minimum if shock load is applied or vibration is present during the operation. For use on a vertical axis or when very accurate movement is required, zero clearance or minimal preload is recommended. However, since excessive preload shortens life, radial clearance smaller than the values shown in Table 3 should not be used.

Table 2 Recommended fit tolerance

Operating condition	Tolerance range class	
	Shaft	Housing bore
General application	k5, m5	H6, H7
Vertical axis or high accuracy	n5, p6	J6, J7

Table 3 Minimum radial clearance unit : μm

Inscribed circle diameter F_w mm		Minimum value of radial clearance
over	incl.	
4	6	- 2
6	10	- 3
10	18	- 4
18	30	- 5
30	50	- 6
50	80	- 8
80	100	-10

Allowable Limit of Speed

Stroke Rotary Bushing can operate in both linear and rotary directions at the same time. The allowable limit of speed when linear motion and rotation occur at the same time can be obtained from the following formula. Limiting values in general are shown in Table 4.

$$DN \geq D_{pw} n + 10S n_1 \dots\dots\dots(2)$$

- where, DN : Limit of speed (See Table 4.)
 n : Number of revolutions per minute, rpm
 n_1 : Number of strokes per minute, cpm
 S : Stroke length, mm
 D_{pw} : Pitch circle diameter of balls, mm ($D_{pw} \doteq 1.15 F_w$)
 F_w : Inscribed circle diameter, mm

This formula is applicable only when $n_1 \leq 5000$ and $Sn_1 \leq 50000$.

Table 4 Limit of speed

Lubrication	DN
Oil	600 000
Grease	300 000

Precautions for Use

- ① Actual stroke length should be less than 80% of the maximum stroke length shown in the dimension tables.
- ② Since Stroke Rotary Bushings operate with a shaft as a raceway surface, the shaft should be heat-treated and ground. Recommended surface hardness and roughness of the shaft are shown in Table 5, and also recommended minimum effective hardening depth of the raceway is shown in Table 6.
- ③ This series can be used with oil or grease lubrication. A good quality lithium-soap base grease is recommended for grease lubrication. Lubrication is done through oil holes provided on the external cylinder.

Table 5 Surface hardness and roughness of raceways

Item	Recommended value	Remarks
Surface hardness	58~64HRC	When the raceway hardness is less than the necessary hardness, multiply load ratings by the hardness factor.
Surface roughness	0.2 μmRa or better (0.8 μmRy or better)	When the required accuracy is not severe, a surface roughness of about 0.8 μmRa (3.2 μmRy) is adequate.

Table 6 Minimum effective hardening depth unit : mm

Shaft diameter		Recommended minimum effective hardening depth
over	incl.	
-	28	0.8
28	50	1.0
50	100	1.5

Precautions for Mounting

First, assemble Stroke Rotary Bushing into a housing. Then gradually and gently insert a shaft into a bore. At this time, be careful not to give impact on the steel balls. After Stroke Rotary Bushing is assembled with a shaft and housing, the retainer must be located at the center of the axial direction of the external cylinder. In this process, insert the shaft into the bore, and the retainer will move together with the shaft and then stop at the end of external cylinder. Push in the shaft further for the distance of 1/2 of the maximum stroke length shown in the dimension tables while paying attention not to damage the steel balls and raceways. Pull back the shaft for the distance of 1/2 of the maximum stroke length. The retainer should then be positioned at the center of the axial direction of the external cylinder.

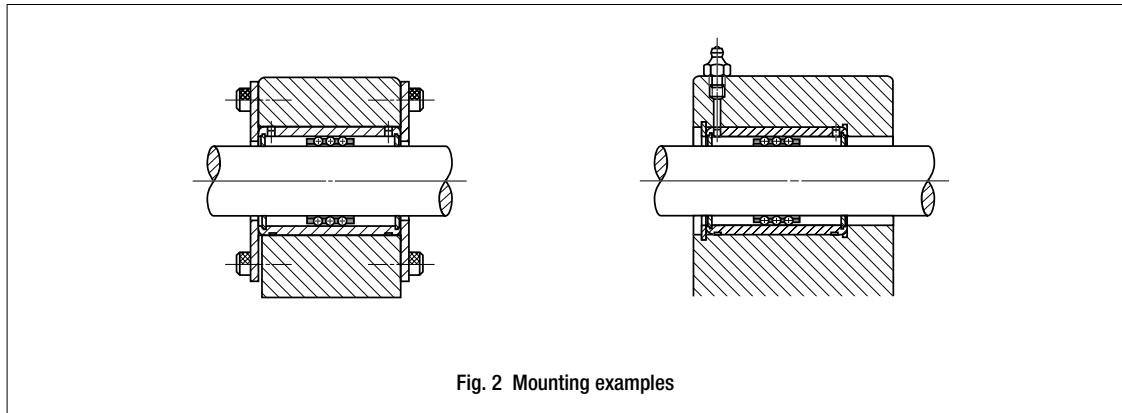
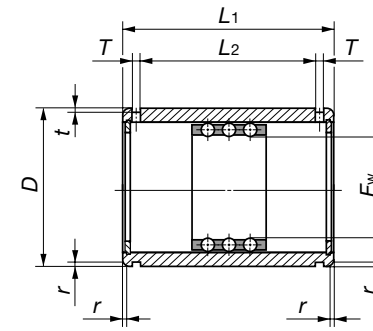


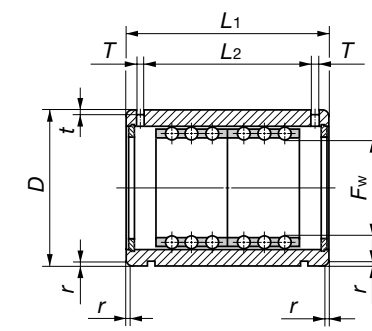
Fig. 2 Mounting examples

IKO Stroke Rotary Bushing

Ordinary type : ST
Heavy duty type : ST...B



ST



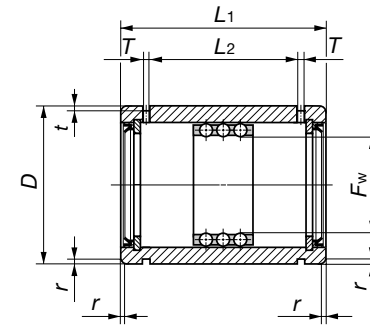
ST...B

Shaft diameter mm	Model number				Nominal dimensions mm			
	Ordinary type	Mass (Ref.) g	Heavy duty type	Mass (Ref.) g	F_w	D	L_1	L_2
4	ST 4814	2.9	—	—	4	8	14	9
5	ST 51016	5.6	—	—	5	10	16	10.6
6	ST 61219	8.9	—	—	6	12	19	13.2
8	ST 81524	15.6	ST 81524B	16.8	8	15	24	17.1
10	ST 101930	28.8	ST 101930B	31.2	10	19	30	22.7
12	ST 122332	42	ST 122332B	46	12	23	32	24.5
16	ST 162837	71	ST 162837B	75	16	28	37	29.1
20	ST 203245	99	ST 203245B	106	20	32	45	35.8
25	ST 253745	117	ST 253745B	125	25	37	45	35.8
30	ST 304565	205	ST 304565B	220	30	45	65	53.5
35	ST 355270	329	ST 355270B	346	35	52	70	58.5
40	ST 406080	516	ST 406080B	540	40	60	80	68.3
45	ST 456580	563	ST 456580B	588	45	65	80	68.3
50	ST 5072100	827	ST 5072100B	862	50	72	100	86.4
55	ST 5580100	1 160	ST 5580100B	1 200	55	80	100	86.4
60	ST 6085100	1 240	ST 6085100B	1 290	60	85	100	86.4
70	ST 7095100	1 400	ST 7095100B	1 450	70	95	100	86.4
80	ST 80110100	2 050	ST 80110100B	2 110	80	110	100	86
90	ST 90120100	2 250	ST 90120100B	2 330	90	120	100	86
100	ST 100130100	2 440	ST 100130100B	2 520	100	130	100	86

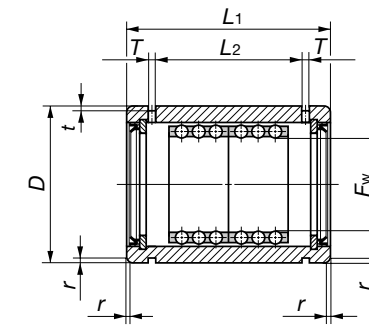
T	t	r	ST			ST...B		
			Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C ₀ N	Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C ₀ N
1.1	0.25	0.3	10	112	59.5	—	—	—
1.1	0.25	0.3	13	121	68.3	—	—	—
1.1	0.25	0.3	15	278	168	—	—	—
1.5	0.5	0.5	24	315	211	8	512	422
1.5	0.5	0.5	30	659	466	8	1 070	932
1.5	0.5	0.5	32	1 110	822	8	1 800	1 640
1.5	0.5	0.5	40	1 230	998	16	1 990	2 000
2	0.5	0.5	54	1 390	1 250	28	2 250	2 500
2	0.5	1	54	1 450	1 430	28	2 360	2 850
2.5	0.5	1	82	3 110	3 160	44	5 060	6 320
2.5	0.7	1.5	92	3 290	3 550	54	5 340	7 100
2.5	0.7	1.5	108	4 340	4 810	66	7 050	9 630
2.5	0.7	1.5	108	4 550	5 330	66	7 390	10 700
3	1	1.5	138	5 790	6 970	88	9 400	13 900
3	1	2	138	6 030	7 630	88	9 800	15 300
3	1	2	138	6 260	8 300	88	10 200	16 600
3	1	2	138	6 510	9 320	88	10 600	18 600
3	1.5	2	132	8 230	12 200	76	13 400	24 400
3	1.5	2	132	8 550	13 500	76	13 900	27 000
3	1.5	2	132	8 820	14 800	76	14 300	29 500

IKO Sealed type Stroke Rotary Bushing

Ordinary type : ST...UU
 Heavy duty type : ST...UUB



ST...UU



ST...UUB

Shaft diameter mm	Model number				Nominal dimensions mm			
	Ordinary type	Mass (Ref.) g	Heavy duty type	Mass (Ref.) g	F_w	D	L_1	L_2
8	ST 81524UU	16.5	—	—	8	15	24	12.3
10	ST 101930UU	30.7	—	—	10	19	30	15.5
12	ST 122332UU	45	—	—	12	23	32	17.1
16	ST 162837UU	74	—	—	16	28	37	21.1
20	ST 203245UU	107	—	—	20	32	45	26.8
25	ST 253745UU	121	—	—	25	37	45	26.8
30	ST 304565UU	215	ST 304565UUB	230	30	45	65	45.1
35	ST 355270UU	342	ST 355270UUB	359	35	52	70	50.1
40	ST 406080UU	529	ST 406080UUB	553	40	60	80	59.9
45	ST 456580UU	577	ST 456580UUB	602	45	65	80	59.9
50	ST 5072100UU	836	ST 5072100UUB	871	50	72	100	77.4
55	ST 5580100UU	1 190	ST 5580100UUB	1 230	55	80	100	77.4
60	ST 6085100UU	1 270	ST 6085100UUB	1 320	60	85	100	77.4
70	ST 7095100UU	1 430	ST 7095100UUB	1 480	70	95	100	77.4
80	ST 80110100UU	2 080	ST 80110100UUB	2 140	80	110	100	77
90	ST 90120100UU	2 290	ST 90120100UUB	2 370	90	120	100	77
100	ST 100130100UU	2 540	ST 100130100UUB	2 620	100	130	100	77

T	t	r	ST...UU			ST...UUB		
			Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C_0 N	Maximum stroke length mm	Basic dynamic load rating C N	Basic static load rating C_0 N
1.5	0.5	0.5	14	315	211	—	—	—
1.5	0.5	0.5	16	659	466	—	—	—
1.5	0.5	0.5	17	1 110	822	—	—	—
1.5	0.5	0.5	24	1 230	998	—	—	—
2	0.5	0.5	32	1 390	1 250	—	—	—
2	0.5	1	32	1 450	1 430	—	—	—
2.5	0.5	1	65	3 110	3 160	27	5 060	6 320
2.5	0.7	1.5	75	3 290	3 550	37	5 340	7 100
2.5	0.7	1.5	91	4 340	4 810	49	7 050	9 630
2.5	0.7	1.5	91	4 550	5 330	49	7 390	10 700
3	1	1.5	120	5 790	6 970	70	9 400	13 900
3	1	2	120	6 030	7 630	70	9 800	15 300
3	1	2	120	6 260	8 300	70	10 200	16 600
3	1	2	120	6 510	9 320	70	10 600	18 600
3	1.5	2	114	8 230	12 200	58	13 400	24 400
3	1.5	2	114	8 550	13 500	58	13 900	27 000
3	1.5	2	114	8 820	14 800	58	14 300	29 500