



II - 193

Stroke Rotary Bushing

Stroke Rotary Bushing

Miniature Stroke Rotary Bushing

Stroke Rotary Cage

ST • STSI • BG

Stroke Rotary Bushing

ST



Points

1 Rotational and linear motions

With the combination of an external cylinder with cylindrical raceway and balls incorporated in the retainer, rotary and linear motion in the axial direction is possible simultaneously with rotational motion.

2 Small rolling frictional resistance

By building a ball with high accuracy into the precisely polished external cylinder, a small rolling frictional resistance and extremely smooth rolling motion together with reciprocal motion have been achieved.

3 Small inertia

The retainer has a high rigidity and light weight so that it has small motion inertia suitable for rolling motion and reciprocal motion in the high-speed operation.

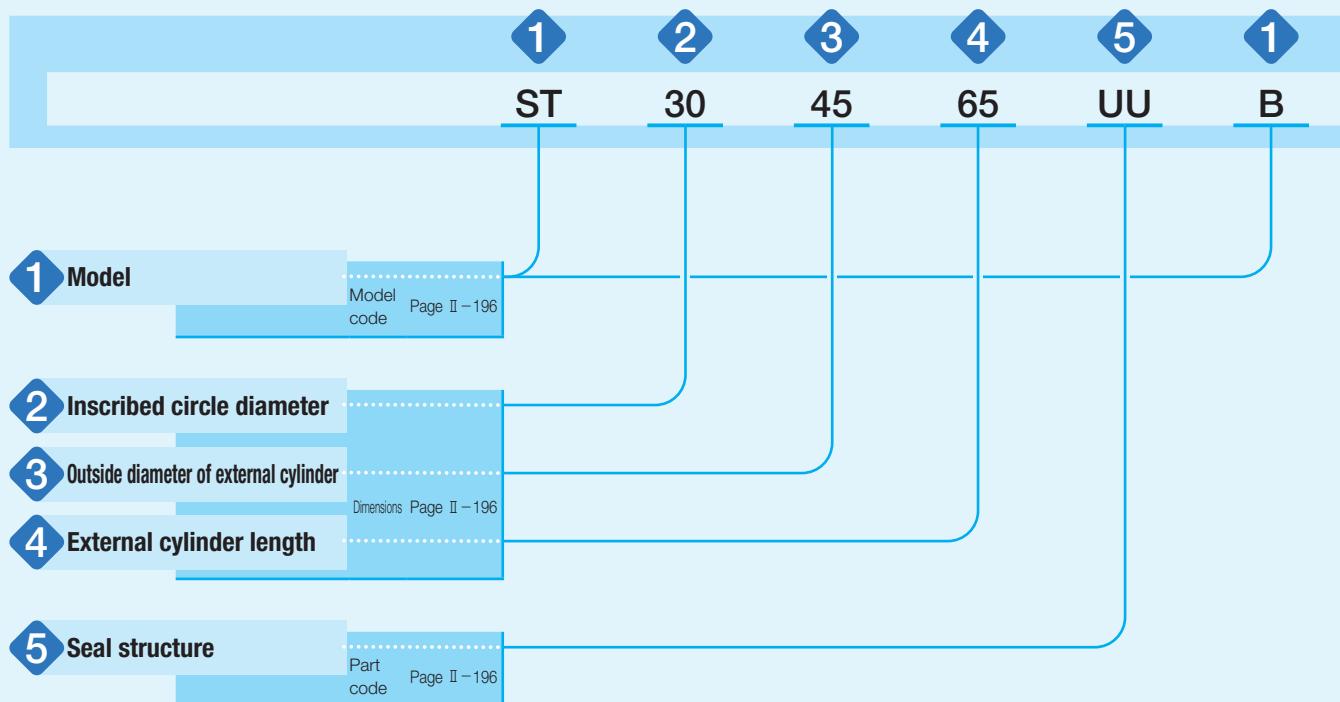
4 Wide variation

Ordinary type and heavy load type with different load rating are provided, and each are available with and without seals. You can select an optimal product for the specifications of your machine and device.

Identification Number and Specification

Example of an identification number

The specification of ST series is indicated by the identification number. Indicate the identification number, consisting of a model code, dimensions and a part code for each specification to apply.



Identification Number and Specification

1 Model	Stroke Rotary Bushing (ST series)	Ordinary type Heavy load type	: ST : ST-B
For applicable models and sizes, see Table 1.			
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 External cylinder length		Indicate the external cylinder length in mm.	
5 Seal structure	Open type With seal	: No symbol : UU	The models with seal type incorporate seals with superior dust protection performance for preventing intrusion of foreign substances.

ST • STSI • BG

Identification Number and Specification

Table 1 Models and sizes of ST series

Shape	Seal structure	Model	Size																		
			4	5	6	8	10	12	16	20	25	30	35	40	45	50	55	60	70	80	90
	Open type	ST	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	With seal	ST-UU	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	Open type	ST-B	—	—	—	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	With seal	ST-UUB	—	—	—	—	—	—	—	—	—	○	○	○	○	○	○	○	○	○	○

Accuracy

Since outside diameter of external cylinder is deformed by stop ring tension, calculate the measurement point from the equation (1) and use the average diameter value at the point.

$$W = 4 + L_1 / 8 \quad \text{---(1)}$$

where, W : Distance from the end to measurement point P , mm (see Fig. 1)

L_1 : External cylinder length, mm

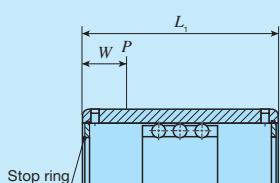


Fig. 1

Table 2 Tolerance of inscribed circle diameter and outside diameter of external cylinder unit: μm

Nominal dimensions of inscribed circle diameter F_w or outside diameter of external cylinder D mm		Tolerance of inscribed circle diameter F_w		Tolerance of outside diameter of external cylinder D_m (1)	
		Over	Incl.	High	Low
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 the maximum diameter and minimum diameter obtained by two-point measurement of the outside diameter of external cylinder.

Table 3 Tolerance of external cylinder length

unit: μm

Nominal dimensions of inscribed circle diameter F_w mm		Dim. L_1 , tolerance of external cylinder length	
Over	Incl.	High	Low
—	20	0	-200
20	60	0	-300
60	100	0	-400

Allowance of Velocity

The ST series is capable of rotation and rotary and linear motion. However, allowance of velocity for these motions performed at the same time is obtained from the equation (2). Typical values are indicated in Table 4.

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

where, DN : Allowance of velocity (see Table 4)

n : Rotational speed, min^{-1}

n_1 : Number of strokes per minute, min^{-1}

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

However, applicable when $n_1 \leq 5000$, $S n_1 \leq 50000$.

Table 4 Allowance of velocity

Lubrication conditions	DN
Oil lubrication	600 000
Grease lubrication	300 000

Lubrication

Grease is not pre-packed in the ST series, so please perform adequate lubrication as needed.

Both of oil lubrication and grease lubrication are available in the ST series. For grease lubrication, use of high-quality lithium-soap base grease is recommended. Oil is fed from

the oil hole on the external cylinder.

Precaution for Use

① Fitting

Recommended fit for the ST series is indicated in Table 5. As the ST series performs rotation and rotary and linear motion at the same time, the radial internal clearance must be smaller when shock load or load accompanied by vibration is applied. Especially when vertical axis application or high accuracy motion is required, it is recommended to set the radial internal clearance at zero or under a slightly-preloaded condition.

Excessive preload will shorten the life, so be careful not to set lower limit value of radial internal clearance below the value stated in Table 6.

Table 5 Recommended fit

Operational conditions	Tolerance class	
	Shaft	Housing hole
Normal operational conditions	k5, m5	H6, H7
For vertical axis or high accuracy	n5, p6	J6, J7

Table 6 Lower limit of radial internal clearance unit: μm

Over	Nominal dimensions of inscribed circle diameter F_w mm		Lower limit of radial internal clearance
	Over	Incl.	
4		6	-2
6		10	-3
10		18	-4
18		30	-5
30		50	-6
50		80	-8
80		100	-10

② Raceway

Since ST series operates with a shaft as a raceway surface, the shaft should be heat-treated and ground. Recommended values for surface hardness and roughness of the shaft are shown in Table 7 and the recommended value for the minimum effective hardening depth is shown in Table 8.

Table 7 Surface hardness and roughness of raceway

Item	Recommended value	Remark
Surface hardness	58~64HRC	When the surface hardness is low, multiply the load rating by hardness factor ⁽¹⁾ .
Surface roughness	0.2 μmRa or lower (0.8 μmRy or lower)	Where accuracy standard is low, around 0.8 μmRa (3.2 μmRy) is also allowed.

Note ⁽¹⁾ For hardness factor, refer to Fig. 3 in page III-5.

Table 8 Minimum effective hardening depth of shaft

unit: mm

Shaft diameter	Recommended value for minimum effective hardening depth
Over	Incl.
—	28
28	50
50	100

③ Stroke length

For stroke length used, 80% of the maximum stroke length stated in the dimension table is recommended.

④ Operating temperature

The maximum operating temperature is 120°C and temperature up to 100°C is allowed for continuous operation. When the temperature exceeds 100°C, contact IKO.

⑤ Assembly operation of external cylinder and shaft

When inserting a shaft, be careful not to shock the ball. After assembling, correct the position of the retainer to be in the center of the external cylinder. After assembling the external cylinder to the housing, insert the shaft softly. Move the retainer as well as the shaft until they contact one side of the surface and stop. Then push the shaft not to damage balls or raceway to the position a half of the maximum stroke length and return it by the same length (a half of the maximum stroke) so that the retainer is positioned regularly at the center of the external cylinder.

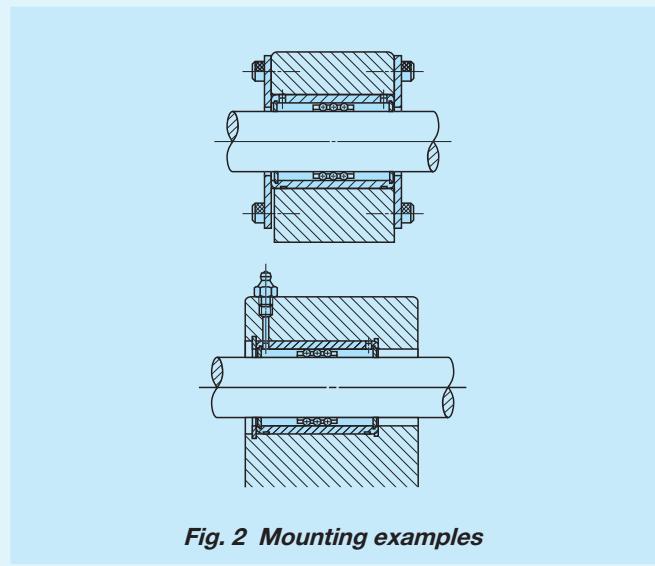
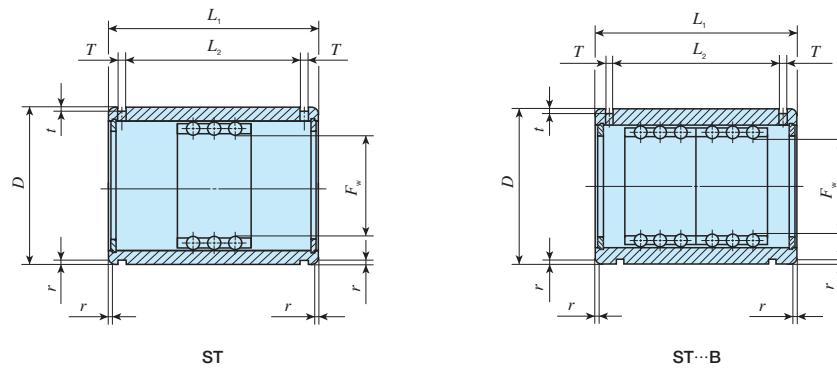


Fig. 2 Mounting examples

IKO Stroke Rotary Bushing Open Type

	Ordinary type						Heavy load type							
Shape	ST						ST-B							
Size	4	5	6	8	10	12	16	—	—	—	8	10	12	16
	20	25	30	35	40	45	50	20	25	30	35	40	45	50
	55	60	70	80	90	100		55	60	70	80	90	100	

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



	<i>T</i>	<i>t</i>	<i>r</i>	Maximum	ST	Basic static	Maximum	ST-B	Basic dynamic	Basic static
				stroke length	dynamic load rating <i>C</i> N	static load rating <i>C₀</i> N	stroke length	dynamic load rating <i>C</i> N	static load rating <i>C₀</i> 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	—	—

ST • STSI • BG

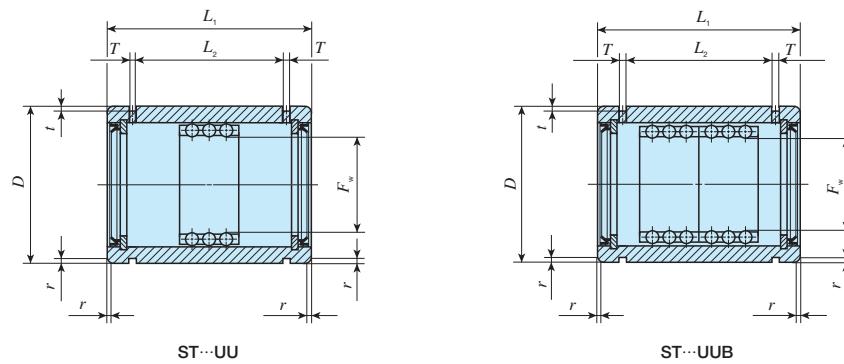
1N=0.102kgf=0.2248lbs.
1mm=0.03937inch

II - 200

IKO Stroke Rotary Bushing With Seal

	Ordinary type						Heavy load type					
Shape	ST···UU						ST···UUB					
Size	8	10	12	16	20	25	—	—	—	—	—	—
	30	35	40	45	50	55	30	35	40	45	50	55
	60	70	80	90	100		60	70	80	90	100	

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



	<i>T</i>	<i>t</i>	<i>r</i>	Maximum stroke length	ST-UU Basic dynamic load rating <i>C</i> N	Basic static load rating <i>C₀</i> N	Maximum stroke length	ST-UUB Basic dynamic load rating <i>C</i> N	Basic static load rating <i>C₀</i> N
				mm			mm		
	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