SLIDE ROTARY SERIES

NB's Slide Rotary Series consists of three different types. The Slide Rotary Bush, which provides both endless rotary and linear motion functions, the Flanged Slide Rotary Bush, and the Slide Rotary Unit which is assembled using various NB standard housings.

The NB Slide Rotary Series has an idealistic structure, incorporating a combination of linear and rotary motion. Linear and rotary motion are merged into a single unit resulting in great space savings compared to the conventional style of Slide Bushings. All three types of the Slide Rotary Series are available in sizes ranging from 6mm to 30mm. All components in the Slide Rotary Series are standardized for versatile installation requirements.

STRUCTURE AND ADVANTAGEOUS FEATURES

NB Slide Rotary Bush is composed of retainer fitted into cylindrical steel outer race and is designed to guide steel balls for smooth circulation in its retainer. The retainer is also designed to rotate freely towards radial direction and offers smooth linear and rotary motions.

Smooth Operation

The inner surface of the outer surface allows smooth operation of linear and rotary motions while maintaining a uniform load distribution.

High Load Acceptability

The use of comparatively large diameter steel balls enhances acceptability of high load capacity.

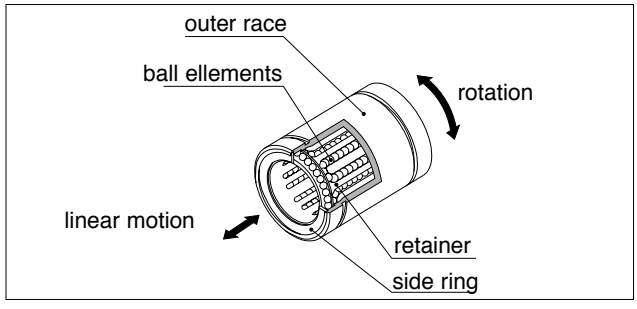
Smooth Rotation

The positioning of the steel balls in a cylindrical formation inside the retainer enables a smooth rotational motion to be achieved independent of the installation direction.

Complete Interchangeability

NB Slide Rotary series is completely interchangeable with SM type Slide Bush, SMK type Flanged Slide Bush and Slide Units such as SMA(W) type, AK(W) type and SMP type.

Figure F-3 Structure of SRE-type NB slide rotary bush



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RATED LIFE AND LOADS

The rated life and loads are defined as follows.

Rated Life

When a group of slide rotary bearings of the same type are used under the same conditions, the rated life is defined as the total number of rotations made without flaking by 90% of the bearings.

Basic Dynamic Rated Load

The basic dynamic rated load is defined as the load with a constant magnitude and direction at which a rated life of 10^6 rotations can be achieved.

Basic Static Rated Load

The basic static rated load is defined as the load with a constant direction that would result in a certain contact stress at the mid-point of the rolling element and tracking surface that are experiencing the maximum stress.

Formula 1 gives the relation between the applied load and the rated life of the slide rotary bush.

$$L=\left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P}\right)^3 \quad \cdots\cdots\cdots\cdots ①$$

L : rated life (10^6 rotations) f_H : hardness coefficient
f_T : temperature coefficient f_C : contact coefficient
f_W : load coefficient C : basic dynamic rated load (N)
P : applied load (N)

Since the slide rotary bush is used in applications with combined linear and rotary motions, the life time is obtained using Formulas ② and ③.

When linear and rotary motions are combined

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

When only linear motion is involved

$$L_h=\frac{10^6 \cdot L}{600 \cdot S \cdot n_1/\pi \cdot dm} \quad \cdots\cdots\cdots\cdots ③$$

L_h : life (hours) S : stroke (mm) n : number of rotations per minute (rpm) n_1 : number of strokes per minute (cpm)
dm : ball pitch diameter (mm) = approx. 1.15 dr (dr is the inner contact diameter of the SRE-type bush)

Calculation Example

The life of an SRE20-type NB slide rotary bush is calculated below based on the following operating conditions.

Conditions

Motions : Linear and rotational, combined
Load, P : 30 N
Stroke, S : 200 mm
Number of rotations per minute (rpm), n=15
Number of strokes per minute (cpm), n_1=10
Shaft surface hardness : greater than 58 HRC
Operating temperature : room temperature
Other : single shaft with single bush

Calculation:

Basic rated load, C=647 N

Based on the above operating conditions, the life is calculated using the following coefficient values.

Hardness coefficient, f_H=1 Temperature coefficient, f_T=1 Contact coefficient, f_C=1 Load coefficient, f_W=1.5

Rated life

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

$$=\left(\frac{1\times1\times1}{1.5} \times \frac{647}{30}\right)^3 = 2{,}972\ (10^6 \text{ rotations})$$

Life (in time)

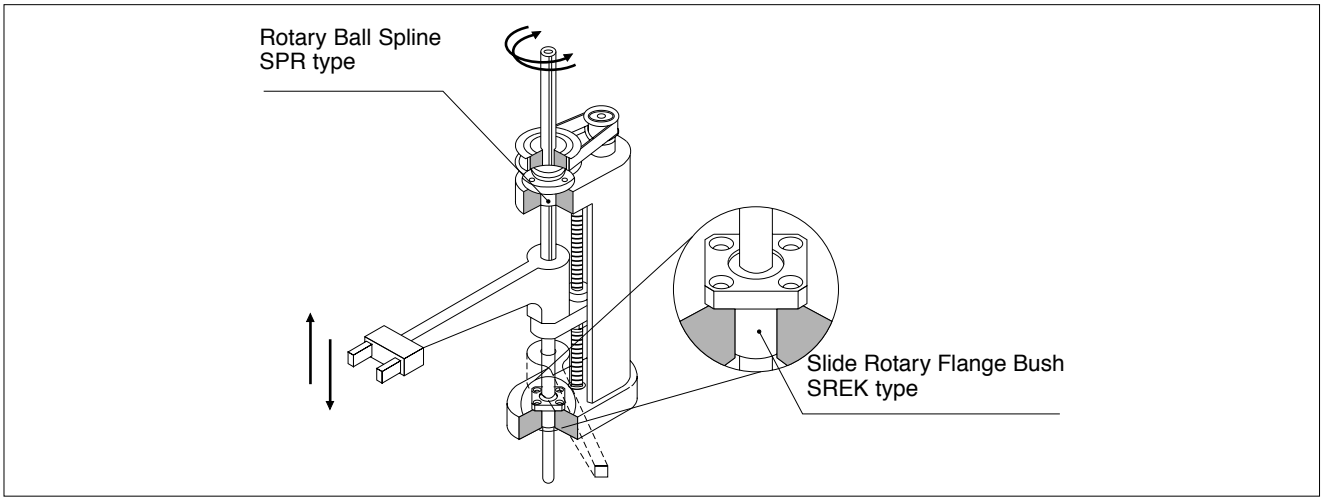
$$L_h=\frac{10^6 \cdot L}{60\sqrt{(dm \cdot n)^2+(10 \cdot S \cdot n_1)^2}/dm}$$

$$L_h=\frac{}{60\sqrt{(1.15\times20\times15)^2+(10\times200\times10)^2}/(1.15\times20)}$$

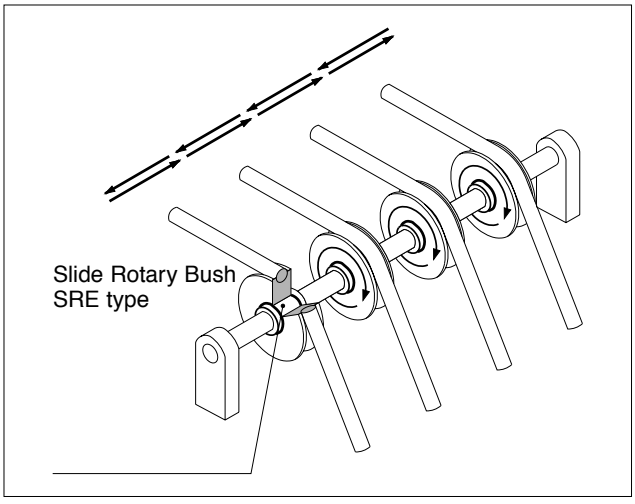
$$= 56{,}900 \text{ (hours)}$$

Application Examples

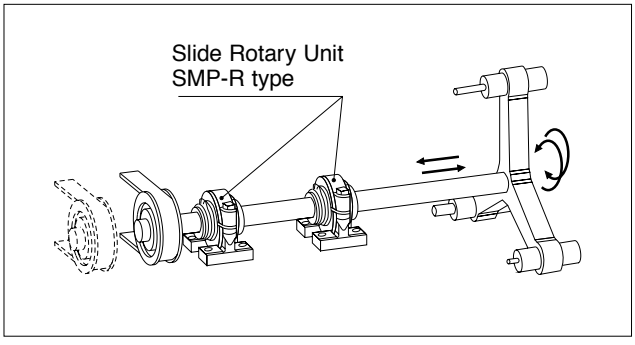
Application Example 1 Vertical Shaft Robot Arm



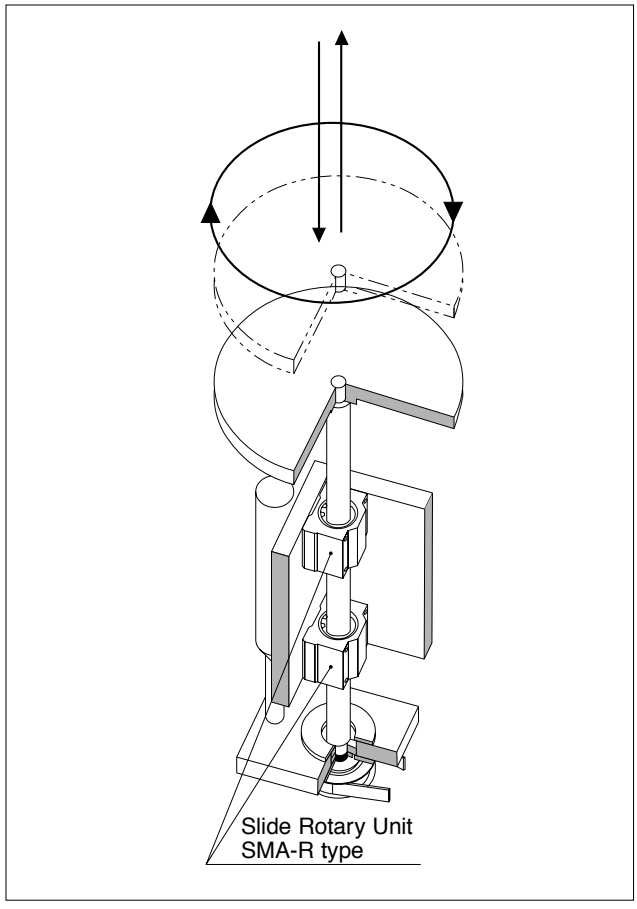
Application Example 2 Multiple Gearing Idler



Application Example 3 Tool Changer



Application Example 4 Turntable



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Precautions Regarding Use

Shaft

Since the balls roll directly over the shaft surface in the SRE-type slide rotary bush, the accuracy and hardness of the shaft are important factors.

Outer Diameter : A tolerance of g6 is recommended for smooth operation.

Hardness : A hardness of greater than 58HRC is recommended for long life. If the hardness is less than 58 HRC, the life is calibrated using the hardness coefficient.

Surface Roughness : A roughness of less than Ra0.4 is recommended.

Housing

An inner diameter tolerance of H7 is recommended.

Lubrication

Lubrication is needed (1) to prevent heat fusing and reduce wear between the rolling elements and between the rolling elements and the tracking surface, (2) to reduce wear of the structural elements, and (3) to prevent oxidation. Lubrication affects both the performance and life of the bush. A lubrication method and a lubrication agent appropriate to the operating conditions should be used. For oil lubrication, turbine oil (V32-68) should be used. For grease lubrication, lithium soap grease no. 2 should be used. The frequency of lubrication depends on the operating conditions.

Dust Control

Dust and other contaminants affect the bush's lifetime and accuracy. Appropriate control methods are thus important.

Operating Temperature Range

The SRE-type bush can be operated at temperatures ranging from −20℃ to 110℃. In a case of operating at a temperature outside this range, please contact NB.

Retainer Material

The standard material of SRE Retainer is "Phosphor Bronze". When requiring other material, please contact NB.

Felt Seal

The use of an FLM felt seal will improve the effectiveness of lubrication and extend the interval between applications of a lubricant.

Figure F-4 Felt seal diagram

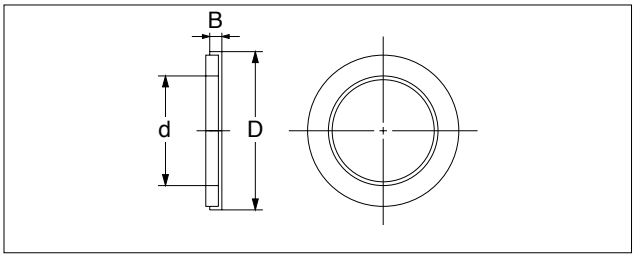


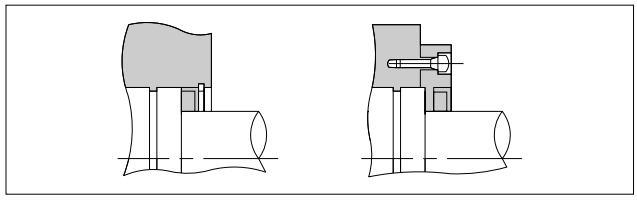
Table F-2 Felt seal dimensions

part number	major dimensions			applicable slide rotary bush
	d	D	B	
FLM 6	6	12	2	SRE 6
FLM 8	8	15	2	SRE 8
FLM10	10	19	3	SRE10
FLM12	12	21	3	SRE12
FLM13	13	23	3	SRE13
FLM16	16	28	4	SRE16
FLM20	20	32	4	SRE20
FLM25	25	40	5	SRE25
FLM30	30	45	5	SRE30

Installation

The felt seal should be installed as shown in Figure F-5. Please note that felt seal is not designed for stopper function.

Figure F-5 Example of Installation



SRE TYPE

part number structure example

SRE 12

SRE type

inner contact diameter

part number	major dimensions							
	inner contact diameter		D		L		B	
	dr	tolerance		tolerance		tolerance		tolerance
	mm	μm	mm	mm	mm	mm	mm	mm
SRE 6	6	+4 −5	12	0 −11	19	0 −0.2	13.5	0 −0.2
SRE 8	8		15		24		17.5	
SRE10	10		19	0 −13	29		22	
SRE12	12	+3 −6	21		30		23	
SRE13	13		23		32		23	
SRE16	16		28		37		26.5	
SRE20	20	+3 −7	32	0 −16	42	0 −0.3	30.5	0 −0.3
SRE25	25		40		59		41	
SRE30	30		45		64		44.5	

*If the inner contact diameter exceeds 30 mm, please contact NB.

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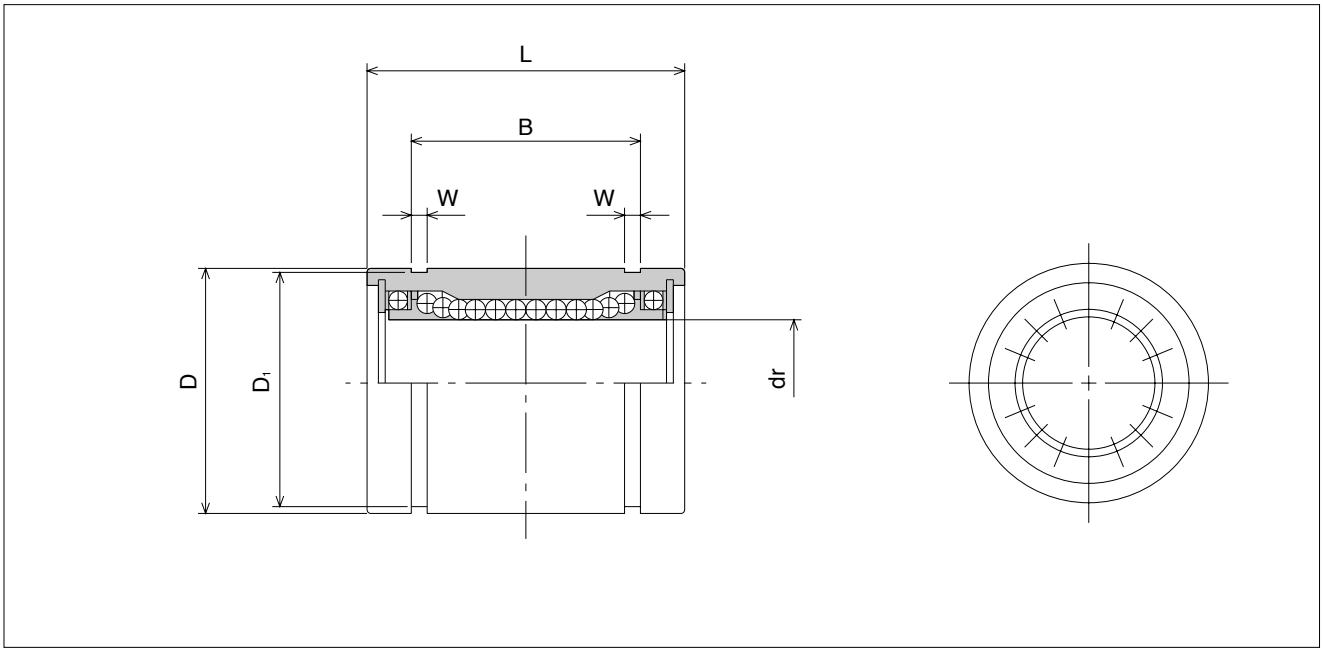

W	D1	basic load rating dynamic C	basic load rating static Co	allowable number of rotations per minute	number of ball circuit	mass	part number
mm	mm	N	N	rpm		g	
1.1	11.5	78	176	300	6	9	**SRE 6**
1.1	14.3	137	314	300	8	15	**SRE 8**
1.3	18	157	372	300	8	20	**SRE10**
1.3	20	274	588	300	8	40	**SRE12**
1.3	22	323	686	300	8	45	**SRE13**
1.6	27	451	882	250	8	65	**SRE16**
1.6	30.5	647	1,180	250	8	110	**SRE20**
1.85	38	882	1,860	250	8	210	**SRE25**
1.85	43	1,180	2,650	200	8	290	**SRE30**

1N≒0.102kgf

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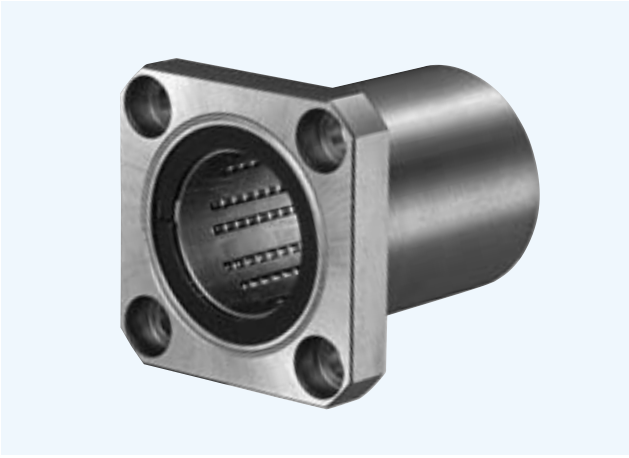
SREK TYPE

– Square Flange type –



part number structure example

SREK **12**

SREK type

inner contact diameter

part number	major dimensions						
	inner contact dimeter		D		L		
	dr	tolerance		tolerance	±0.3	Df	K
	mm	μm	mm	μm	mm	mm	mm
SREK 6	6	+4 −5	12	0 −13	19	28	22
SREK 8	8		15		24	32	25
SREK10	10		19	0 −16	29	40	30
SREK12	12	+3 −6	21		30	42	32
SREK13	13		23		32	43	34
SREK16	16		28		37	48	37
SREK20	20	+3 −7	32	0 −19	42	54	42
SREK25	25		40		59	62	50
SREK30	30		45		64	74	58

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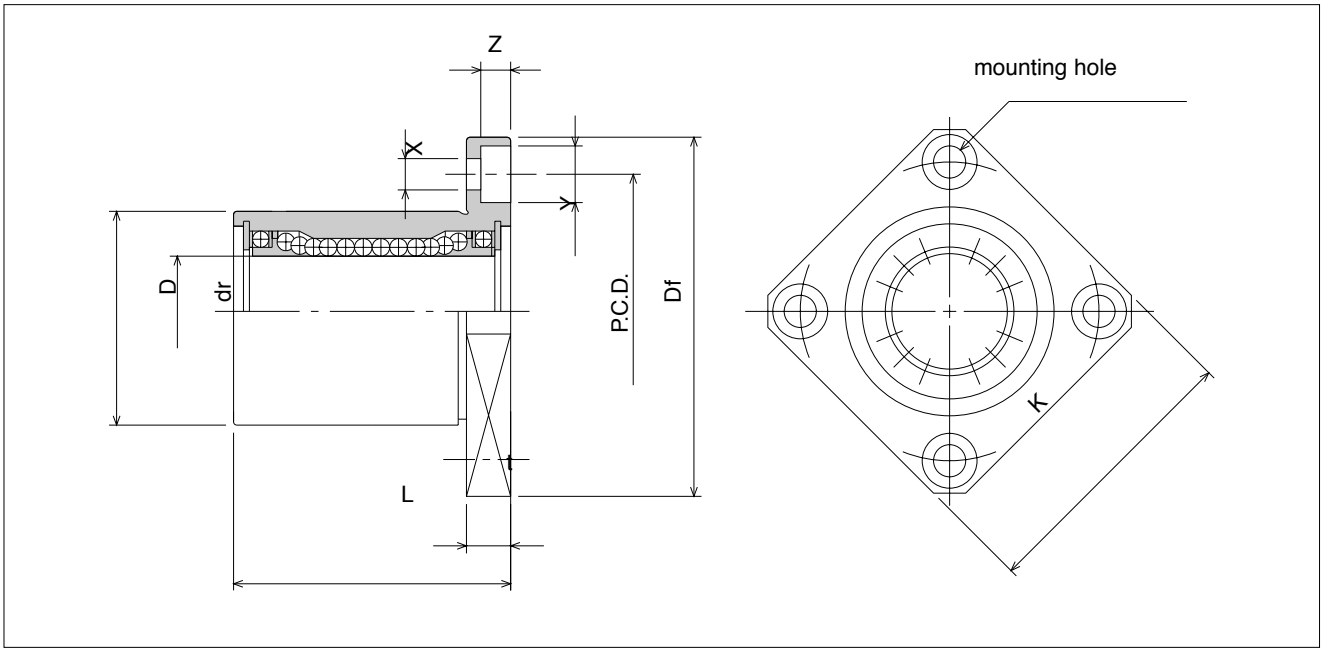

flange			perpendicularity	basic load rating		allowable rotational speed	mass	part number
				dynamic	static			
t	P.C.D	X×Y×Z		C	C_o			
mm	mm	mm	μm	N	N	rpm	g	
5	20	3.5×6×3.1	12	78	176	300	19	**SREK 6**
5	24	3.5×6×3.1		137	314	300	27	**SREK 8**
6	29	4.5×7.5×4.1		157	372	300	36	**SREK10**
6	32	4.5×7.5×4.1		274	588	300	55	**SREK12**
6	33	4.5×7.5×4.1		323	686	300	68	**SREK13**
6	38	4.5×7.5×4.1		451	882	250	93	**SREK16**
8	43	5.5×9×5.1	15	647	1,180	250	155	**SREK20**
8	51	5.5×9×5.1		882	1,860	250	270	**SREK25**
10	60	6.6×11×6.1		1,180	2,650	200	395	**SREK30**

1N≒0.102kgf

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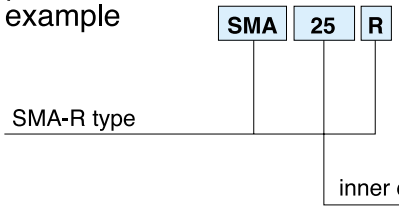
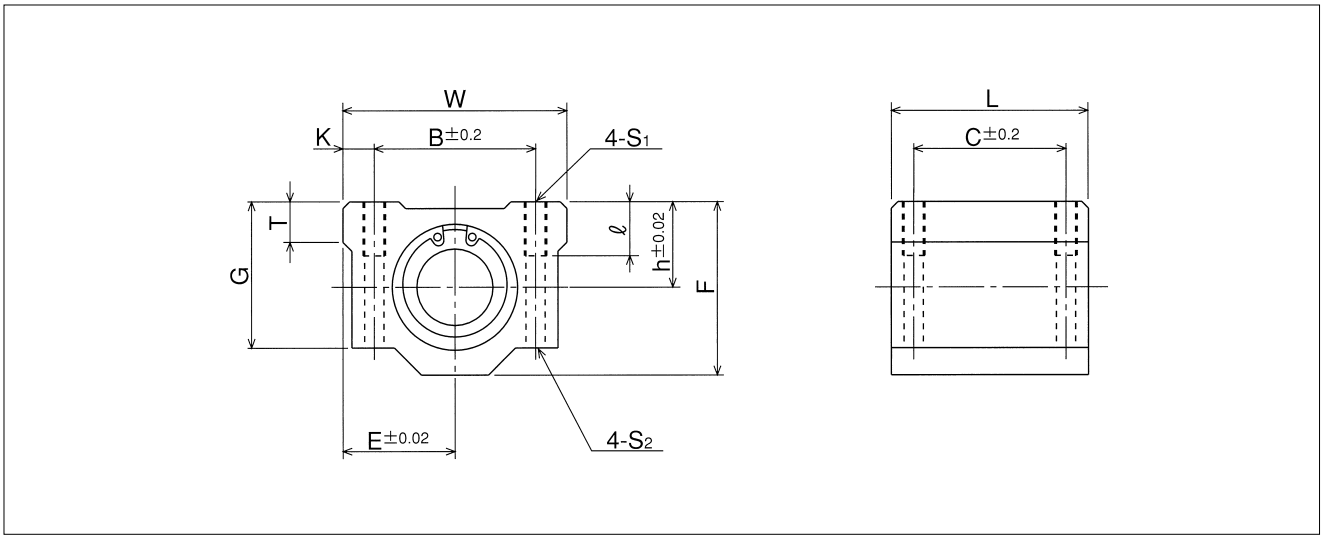
SLIDE ROTARY UNIT
SMA-R TYPE

—Block type—

part number structure example



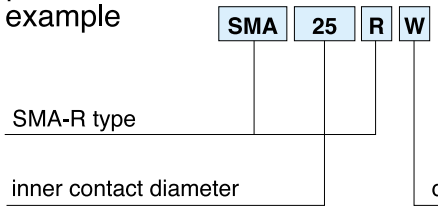


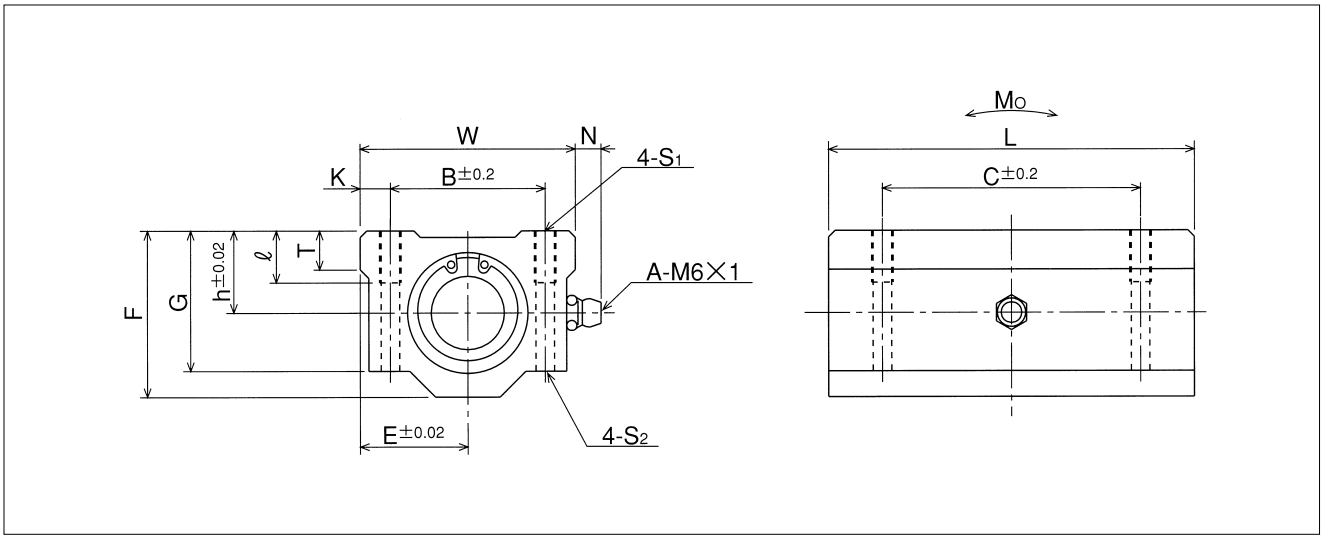
part number	major dimensions															basic load rating		mass
	inner contact diameter		outer dimensions							mounting dimensions						dynamic	static	
		tolerance	h	E	W	L	F	G	T	B	C	K	S_1	ℓ	S_2	C	C_o	
	mm	μm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	mm	N	N	g
SMA 6R	6	+4 −5	9	15	30	25	18	15	6	20	15	5	M4	8	3.4	78	176	35
SMA 8R	8		11	17	34	30	22	18	6	24	18	5	M4	8	3.4	137	314	50
SMA10R	10		13	20	40	35	26	21	8	28	21	6	M5	12	4.3	157	372	76
SMA12R	12	+3 −6	15	21	42	36	28	24	8	30.5	26	5.75	M5	12	4.3	274	588	100
SMA13R	13		15	22	44	39	30	24.5	8	33	26	5.5	M5	12	4.3	323	686	116
SMA16R	16		19	25	50	44	38.5	32.5	9	36	34	7	M5	12	4.3	451	882	189
SMA20R	20	+3 −7	21	27	54	50	41	35	11	40	40	7	M6	12	5.2	647	1,180	265
SMA25R	25		26	38	76	67	51.5	42	12	54	50	11	M8	18	7	882	1,860	570
SMA30R	30		30	39	78	72	59.5	49	15	58	58	10	M8	18	7	1,180	2,650	755

1N≒0.102kgf

SLIDE ROTARY UNIT
SMA-RW TYPE
−Double-Wide Block type−

part number structure example





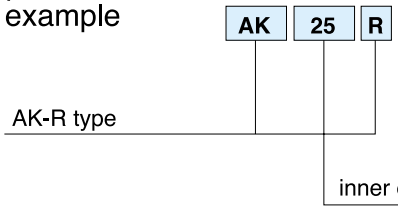
part number	major dimensions																basic load rating		mass
	inner contact diameter		outer dimensions								mounting dimensions						dynamic	static	
		tolerance	h	E	W	L	F	G	T	N	B	C	K	S_1	ℓ	S_2	C	C_o	
	mm	μm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm		mm	mm	N	N	g
SMA 6RW	6	+4 −5	9	15	30	48	18	15	6	7	20	36	5	M4	8	3.4	126	352	64
SMA 8RW	8		11	17	34	58	22	18	6	7	24	42	5	M4	8	3.4	222	628	98
SMA10RW	10		13	20	40	68	26	21	8	7	28	46	6	M5	12	4.3	254	744	148
SMA12RW	12	+3 −6	15	21	42	70	28	24	8	6.5	30.5	50	5.75	M5	12	4.3	444	1,180	201
SMA13RW	13		15	22	44	75	30	24.5	8	6.5	33	50	5.5	M5	12	4.3	523	1,370	232
SMA16RW	16		19	25	50	85	38.5	32.5	9	6	36	60	7	M5	12	4.3	731	1,760	378
SMA20RW	20	+3 −7	21	27	54	96	41	35	11	7	40	70	7	M6	12	5.2	1,050	2,360	590
SMA25RW	25		26	38	76	130	51.5	42	12	4	54	100	11	M8	18	7	1,430	3,720	1,140
SMA30RW	30		30	39	78	140	59.5	49	15	5	58	110	10	M8	18	7	1,910	5,300	1,520

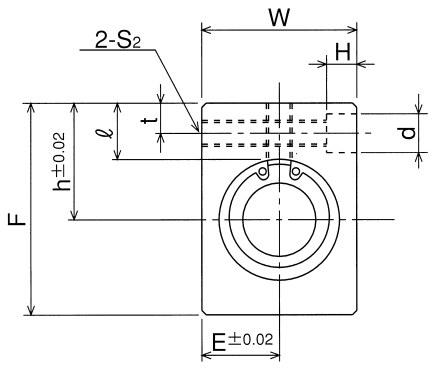
1N≒0.102kgf

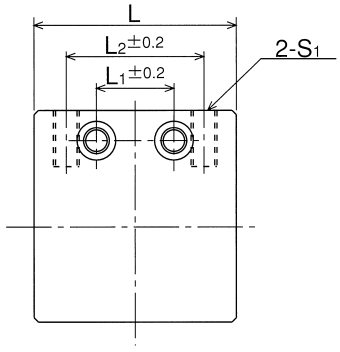
SLIDE ROTARY UNIT
AK-R TYPE

−Compact Block type−

part number structure example





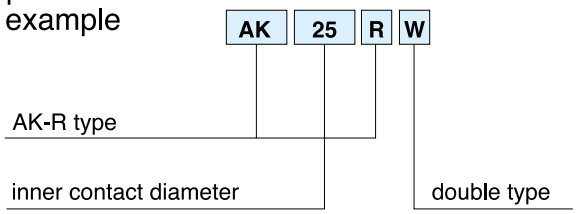


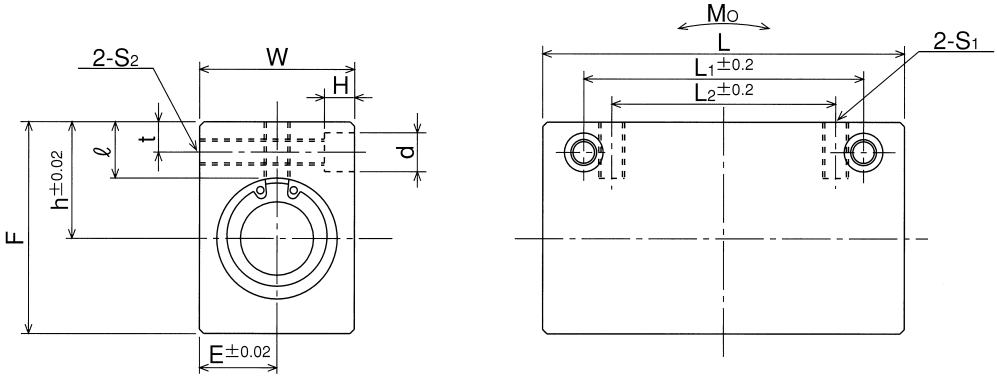
part number	major dimensions															basic load rating		mass
	inner contact diameter		outer dimensions					mounting dimensions								dynamic	static	
		tolerance	h	E	W	L	F	L_2	S_1	ℓ	L_1	t	S_2	d	H	C	C_o	
	mm	μm	mm	mm	mm	mm	mm	mm		mm	mm	mm		mm	mm	N	N	g
AK 6R	6	+4 −5	14	8	16	27	22	18	M 4	8	9	5	M 4	6	5	78	176	22
AK 8R	8		16	10	20	32	26	20	M 5	8.5	10	5	M 4	6	5	137	314	38
AK10R	10		19	13	26	39	32	27	M 6	9.5	15	6	M 5	8	6	157	372	64
AK12R	12	+3 −6	20	14	28	40	34	27	M 6	9.5	15	6	M 5	8	6	274	588	88
AK13R	13		25	15	30	42	43	28	M 6	13.5	16	7	M 6	9	7	323	686	128
AK16R	16		27	18	36	47	49	32	M 6	13	18	7	M 6	9	7	451	882	193
AK20R	20	+3 −7	31	21	42	52	54	36	M 8	15	18	8	M 8	11	8	647	1,180	282
AK25R	25		37	26	52	69	65	42	M10	17	22	9	M10	14	10	882	1,860	544
AK30R	30		40	29	58	74	71	44	M10	17.5	22	9	M10	14	10	1,180	2,650	730

1N≒0.102kgf

SLIDE ROTARY UNIT
AK-RW TYPE
—Double-Wide Compact Block type—

part number structure example





part number	major dimensions															basic load rating		mass
	inner contact diameter		outer dimensions					mounting dimensions								dynamic	static	
		tolerance	h	E	W	L	F	L_2	S_1	ℓ	L_1	t	S_2	d	H	C	C_o	
	mm	μm	mm	mm	mm	mm	mm	mm		mm	mm	mm		mm	mm	N	N	g
AK 6RW	6	+4 −5	14	8	16	46	22	20	M 4	8	30	5	M 4	6	5	126	352	41
AK 8RW	8		16	10	20	56	26	30	M 5	8.5	42	5	M 4	6	5	222	628	71
AK10RW	10		19	13	26	68	32	36	M 6	9.5	50	6	M 5	8	6	254	744	118
AK12RW	12	+3 −6	20	14	28	70	34	36	M 6	9.5	50	6	M 5	8	6	444	1,180	164
AK13RW	13		25	15	30	74	43	42	M 6	13.5	55	7	M 6	9	7	523	1,370	240
AK16RW	16		27	18	36	84	49	52	M 6	13	65	7	M 6	9	7	731	1,760	361
AK20RW	20	+3 −7	31	21	42	94	54	58	M 8	15	70	8	M 8	11	8	1,050	2,360	540
AK25RW	25		37	26	52	128	65	80	M10	17	100	9	M10	14	10	1,430	3,720	1,060
AK30RW	30		40	29	58	138	71	90	M10	17.5	110	9	M10	14	10	1,910	5,300	1,424

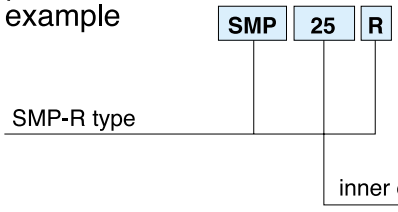
1N≒0.102kgf

SLIDE ROTARY UNIT

SMP-R TYPE

—Pillow Block type—

part number structure example



part number	major dimensions								
	inner contact diameter		outer dimensions						
		tolerance	h	E	W	L	F	G	M
	mm	μm	mm	mm	mm	mm	mm	mm	mm
SMP13R	13	+3 −6	25	25	50	32	46	8	36
SMP16R	16		29	27.5	55	37	53	10	40
SMP20R	20	+3 −7	34	32.5	65	42	62	12	48
SMP25R	25		40	38	76	59	73	12	59
SMP30R	30		45	42.5	85	64	84	15	69

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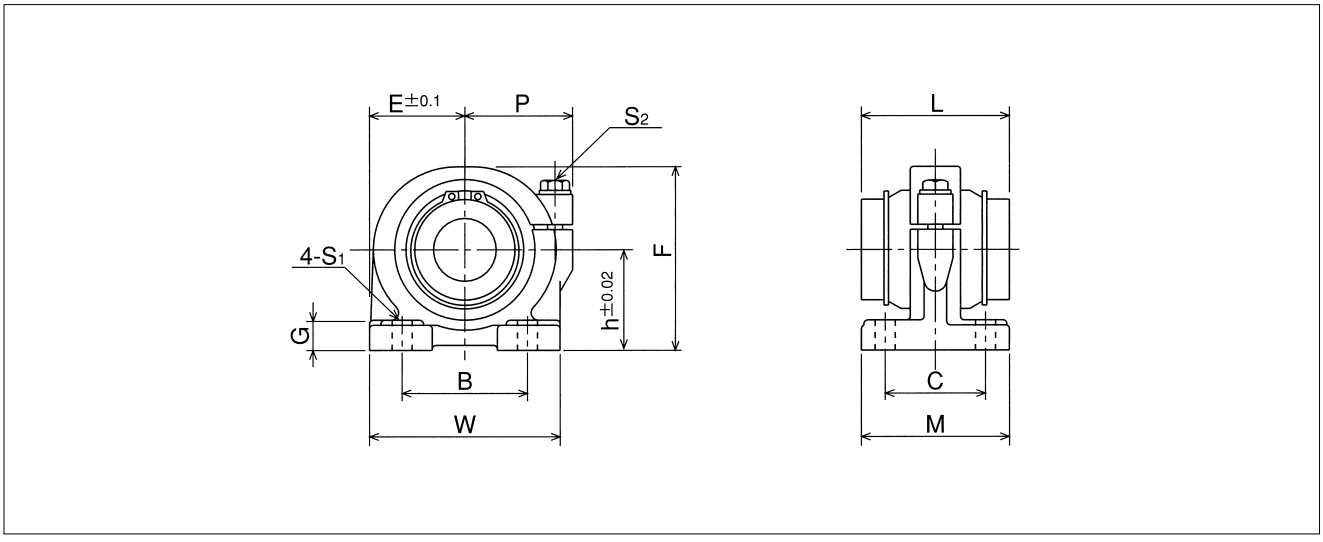

				adjustment bolt size	basic load rating		mass	part number
	mounting dimensions				dynamic	static		
P	B	C	S1 (bolt size)		C	Co		
mm	mm	mm	mm	S2	N	N	g	
30	30	26	7 (M5)	M5	323	686	266	**SMP13R**
32	35	29	7 (M5)	M5	451	882	369	**SMP16R**
37	40	35	8 (M6)	M6	647	1,180	690	**SMP20R**
43	50	40	8 (M6)	M6	882	1,860	970	**SMP25R**
49	58	46	10 (M8)	M8	1,180	2,650	1,420	**SMP30R**

1N≒0.102kgf