



**Features**

- Low-friction structure
- Simple and efficient lubrication method
- Little play between ring rail and bearing
- Usable on planes at any angle
- Easy mounting and mounting error adjustment
- Ring rail drive equipment location can be set freely
- Large central opening where other components can be stored

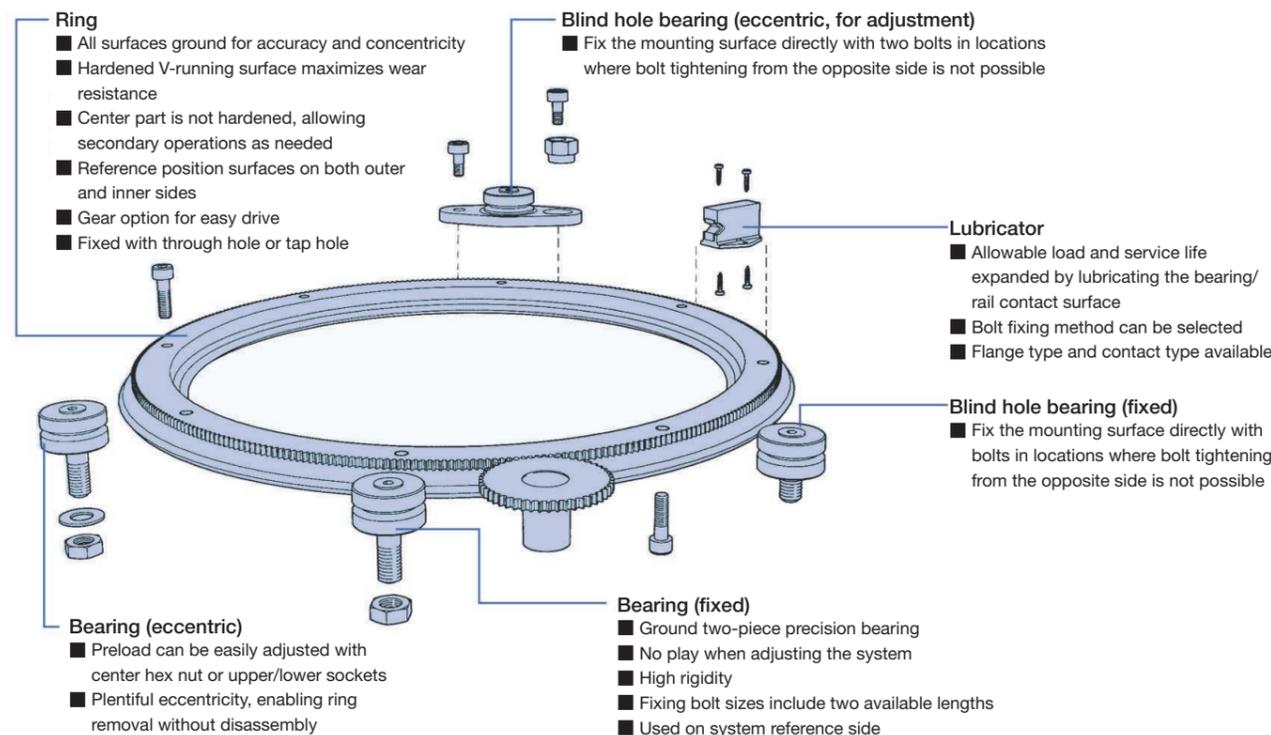


**Ring Rail Gear System**

With its five different ring diameters, the product can be mounted freely and with high accuracy through the use of 12 types of bearings.



**System Configuration**



**Technical Information**

**System in which the ring mounted with bearings revolves**

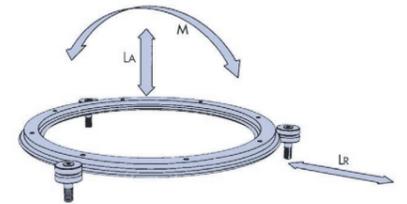
Ring rail gears' allowable load and service life are determined by various factors. These factors include ring size, size and number of bearings used, lubrication, size and direction of load, operation speed (see Note 1), and travel path length (see Note 2). In order to extend the normal life, use at a load below the maximum. The data and formulae in this section can be used to calculate the life. When possible, be sure to use a lubricator (see Page 482) to lubricate the ring rail gears. This lubrication vastly extends the allowable load and system life.

[Note 1] The rated operation speed is 1m/s without lubrication and 5m/s with lubrication; be sure to take inertia load into account as well. Smaller loads may enable faster operation.

[Note 2] For short-stroke operation (stroke length less than 5 times the bearing outer diameter), calculate the life with the stroke set at 5 times the bearing outer diameter.

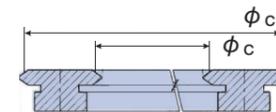
**System allowable load**

In this system, where a complete ring revolves on a number of bearings surrounding it, bearings are set at specific intervals around the ring periphery. When calculating life, the load operating on the system must be divided into direct load elements  $L_A$  and  $L_R$  and moment load elements  $M$ . (See figure at right and Note 1)



Bearing size	Ring part numbers used	No. of bearings at equal intervals	Max. allowable load without lubrication			Max. allowable load with lubrication		
			$L_A(N)$	$L_R(N)$	$M(Nm)$	$L_A(N)$	$L_R(N)$	$M(Nm)$
RSJ/BHJ-18 (Made to Order)	R20-210	3	135	76	$32 \times \phi_c$	375	170	$90 \times \phi_c$
		4	165	90	$39 \times \phi_c$	465	200	$108 \times \phi_c$
		For each 1 pc added	21	13	$4 \times \phi_c$	90	50	$18 \times \phi_c$
RSJ/BHJ-25	R25-159 R25-255 R25-351	3	300	170	$72 \times \phi_c$	960	510	$230 \times \phi_c$
		4	370	200	$87 \times \phi_c$	1190	600	$278 \times \phi_c$
		For each 1 pc added	48	30	$9 \times \phi_c$	230	150	$48 \times \phi_c$
RSJ/BHJ-34	R44-468 R44-612	3	600	340	$140 \times \phi_c$	2400	1200	$570 \times \phi_c$
		4	740	400	$170 \times \phi_c$	2950	1400	$690 \times \phi_c$
		For each 1 pc added	96	60	$19 \times \phi_c$	570	350	$120 \times \phi_c$
RSJ/BHJ-54 (Made to Order)	R76-799 R76-1033	3	1350	765	$320 \times \phi_c$	5400	2740	$1290 \times \phi_c$
		4	1670	900	$390 \times \phi_c$	6650	3200	$1560 \times \phi_c$
		For each 1 pc added	210	130	$44 \times \phi_c$	1290	800	$270 \times \phi_c$

$\phi_c$  is the contact diameter of the ring slide (unit: m), that is the diameter of the circle passing through the central position of the bearing and curved rail contact point.



To calculate the life of this system, input the  $L_A$ ,  $L_R$  and  $M$  values first indicated for the direct load and the maximum allowable load in the table above into the following formula [1] in order to derive the load element  $L_F$ .

$$L_F = \frac{L_A}{L_{A(max)}} + \frac{L_R}{L_{R(max)}} + \frac{M}{M_{(max)}} \quad [1]$$

**System life calculation**

Having calculated  $L_F$ , one of the two formulae below can be used to calculate life (units: km). In these formulae, obtain the reference life for the relevant bearing and lubrication status from the table at right.

When using the system without lubrication, use formula [2].

$$\text{System life (km)} = \frac{B_L}{(0.03+0.97L_F)^2} \quad [2]$$

When using the system with lubrication, use formula [3].

$$\text{System life (km)} = \frac{B_L}{(0.03+0.97L_F)^3} \quad [3]$$

Catalog Number	$\phi_c$ value (m)	
	With bearing on outside	With bearing on inside
<b>M</b> R20-210 (P,Q)	0.2275	0.1925
R25-159 (P,Q)	0.1815	0.1365
R25-255 (P,Q)	0.2775	0.2325
R25-351 (P,Q)	0.3735	0.3285
R44-468 (P,Q)	0.5085	0.4275
R44-612 (P,Q)	0.6525	0.5715
<b>M</b> R76-799 (P,Q)	0.8695	0.7285
<b>M</b> R76-1033 (P,Q)	1.1035	0.9625

**M** : Made to Order

Bearing	Reference life without lubrication ( $B_L$ )	Reference life with lubrication ( $B_L$ )
<b>M</b> RSJ/BHJ-18	50	60
RSJ/BHJ-25	70	40
RSJ/BHJ-34	100	70
<b>M</b> RSJ/BHJ-54	150	150

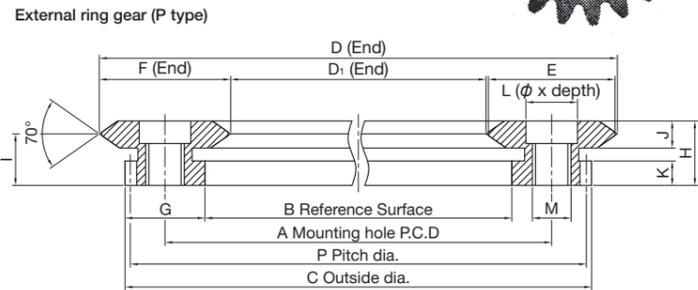
**M** : Made to Order



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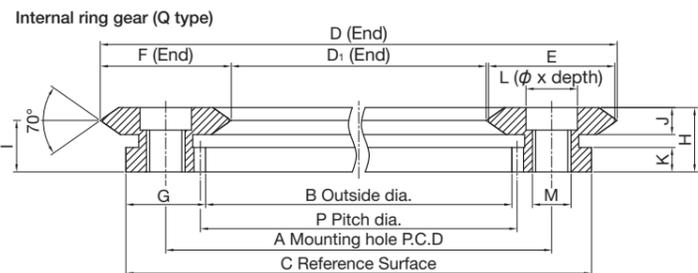
**HIAHN**  
FEINWERKTECHNIK GmbH  
Oberes Dorf 1  
95152 Selbitz

**External Ring Gears**



Type	Catalog Number	±0.2			±0.025						Face width	No. of holes	Counterbore	Socket head screw		
		A	B	C	D	D1	E	F	G	H					I	J
External ring gear	<b>R20-210P</b> (made to order)	210	197.6	222.4	230.37	189.63	20	20.37	12.4	10	8	4.2	3.8	8	8 x 3.5	M6 x 1
	<b>R25-159P</b>	159	143.6	174.4	184.74	133.26	25	25.74	15.4	12.25	10	4.5	5.75	8	9 x 6	M8 x 1.25
	<b>R25-255P</b>	255	239.6	270.4	280.74	229.26	25	25.74	15.4	12.25	10	4.5	5.75	8	9 x 6	M8 x 1.25
	<b>R25-351P</b>	351	335.6	366.4	376.74	325.26	25	25.74	15.4	12.25	10	4.5	5.75	12	9 x 6	M8 x 1.25
	<b>R44-468P</b>	468	442	494	512.74	423.26	44	44.74	26	15.5	12.5	6	7	12	11 x 7	M8 x 1.25
	<b>R44-612P</b>	612	586	638	656.74	567.26	44	44.74	26	15.5	12.5	6	7	16	11 x 7	M8 x 1.25
	<b>R76-799P</b> (made to order)	799	748.5	849.5	875.74	722.26	76	76.74	50.5	24	19.5	9	12	16	20 x 13	M16 x 2
	<b>R76-1033P</b> (made to order)	1033	982.5	1083.5	1109.74	956.26	76	76.74	50.5	24	19.5	9	12	20	20 x 13	M16 x 2

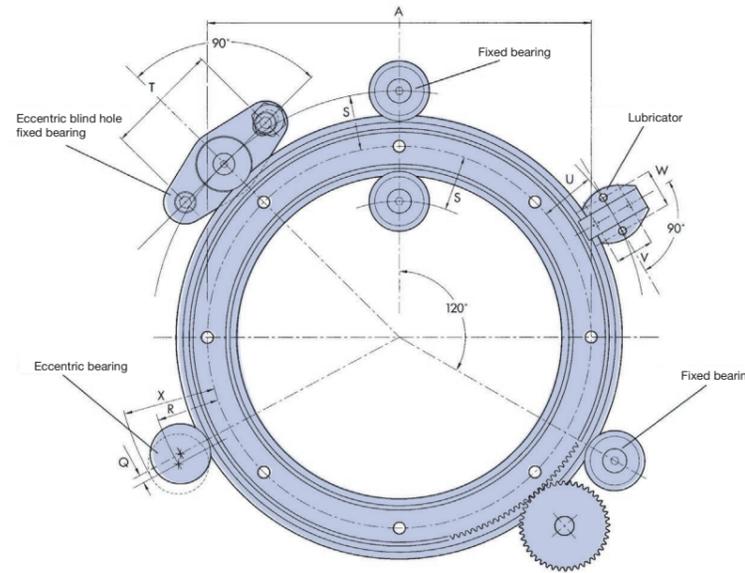
**Internal Ring Gears**



Type	Catalog Number	±0.2			±0.025						Face width	No. of holes	Counterbore	Socket head screw		
		A	B	C	D	D1	E	F	G	H					I	J
Internal Ring Gears	<b>R20-210Q</b> (made to order)	210	197.6	222.4	230.37	189.63	20	20.37	12.4	10	8	4.2	3.8	8	8 x 3.5	M6 x 1
	<b>R25-159Q</b>	159	143.6	174.4	184.74	133.26	25	25.74	15.4	12.25	10	4.5	5.75	8	9 x 6	M8 x 1.25
	<b>R25-255Q</b>	255	239.6	270.4	280.74	229.26	25	25.74	15.4	12.25	10	4.5	5.75	8	9 x 6	M8 x 1.25
	<b>R25-351Q</b>	351	335.6	366.4	376.74	325.26	25	25.74	15.4	12.25	10	4.5	5.75	12	9 x 6	M8 x 1.25
	<b>R44-468Q</b>	468	442	494	512.74	423.26	44	44.74	26	15.5	12.5	6	7	12	11 x 7	M8 x 1.25
	<b>R44-612Q</b>	612	586	638	656.74	567.26	44	44.74	26	15.5	12.5	6	7	16	11 x 7	M8 x 1.25
	<b>R76-799Q</b> (made to order)	799	748.5	849.5	875.74	722.26	76	76.74	50.5	24	19.5	9	12	16	20 x 13	M16 x 2
	<b>R76-1033Q</b> (made to order)	1033	982.5	1083.5	1109.74	956.26	76	76.74	50.5	24	19.5	9	12	20	20 x 13	M16 x 2

**Ring Rail Gears**

Ring rail gears are composed of high-quality steel and hardened V-edges, precision-ground overall, with reference surfaces on both inside and outside for easier positioning. There is a gear drive ring rail with machined gears on either the inner or outer reference surface. The number of gears on the external ring gear is a multiple of 12 for easier pinion selection.



Module	Pressure angle Pa	No. of teeth z	Profile shift coefficient x	Pitch dia. P	Weight (kg)	Drilling position										Catalog Number
						Q	R	S	T ±0.2	U ±0.2	V ±0.2	W ±0.2	X			
0.8	20°	276	0	220.8	0.66	1.8	19	17.2	38	18	13	13	30.6	<b>R20-210P</b> (made to order)		
0.8	20°	216	0	172.8	0.77	1.4	24.5	23.1	50	22.5	16	18	39	<b>R25-159P</b>		
0.8	20°	336	0	268.8	1.20	1.4	24.5	23.1	50	22.5	16	18	39	<b>R25-255P</b>		
0.8	20°	456	0	364.8	1.65	1.4	24.5	23.1	50	22.5	16	18	39	<b>R25-351P</b>		
1	20°	492	0	492	5.10	1.8	37.8	36	60	34.5	22	25	57.3	<b>R44-468P</b>		
1	20°	636	0	636	6.70	1.8	37.8	36	60	34.5	22	25	57.3	<b>R44-612P</b>		
1.5	20°	564	+0.167	846	25	3.2	62.6	59.4	89.5	57	33	38	94	<b>R76-799P</b> (made to order)		
1.5	20°	720	+0.167	1080	32	3.2	62.6	59.4	89.5	57	33	38	94	<b>R76-1033P</b> (made to order)		

**Assembly**

When using ring rail gears, as shown in the figure above, it is recommended to use two fixed bearings 120° apart as reference. Use the eccentric type for the other bearings. In locations where ring position adjustment is required, all eccentric bearings can be used. When using lubrication to improve allowable load/life, one or more lubricators can be mounted at easily used positions. (See Technical Data on Page 483.)

- [Caution on Product Characteristics]
- For each bearing size, two fixing bolt lengths are available.
  - Series including SSY Spur Gears are available as ring rail gear drive pinions.
  - Q, R, and S are accurate logical values. The ring axis is determined by the S dimension positional accuracy. Normally, the Q and R dimensions' positional accuracy is not important. Machine the bearing hole with a reamer so that it meets tolerance for the R dimension.

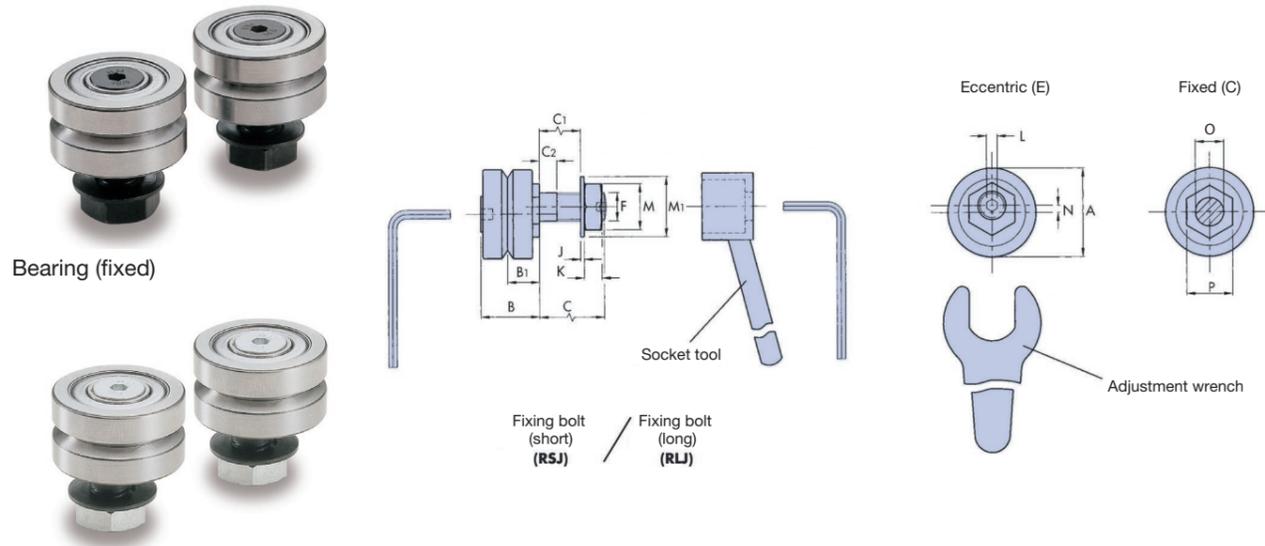
[Precautions for Made to Order Products] ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.

Module	Pressure angle Pa	No. of teeth z	Profile shift coefficient x	Pitch dia. P	Weight (kg)	Drilling position										Catalog Number
						Q	R	S	T ±0.2	U ±0.2	V ±0.2	W ±0.2	X			
0.8	20°	249	0	199.2	0.66	1.8	19	17.2	38	18	13	13	30.6	<b>R20-210Q</b> (made to order)		
0.8	20°	182	-0.25	145.6	0.77	1.4	24.5	23.1	50	22.5	16	18	39	<b>R25-159Q</b>		
0.8	20°	302	-0.25	241.6	1.20	1.4	24.5	23.1	50	22.5	16	18	39	<b>R25-255Q</b>		
0.8	20°	422	-0.25	337.6	1.65	1.4	24.5	23.1	50	22.5	16	18	39	<b>R25-351Q</b>		
1	20°	444	0	444	5.10	1.8	37.8	36	60	34.5	22	25	57.3	<b>R44-468Q</b>		
1	20°	588	0	588	6.70	1.8	37.8	36	60	34.5	22	25	57.3	<b>R44-612Q</b>		
1.5	20°	501	0	751.5	25	3.2	62.6	59.4	89.5	57	33	38	94	<b>R76-799Q</b> (made to order)		
1.5	20°	657	0	985.5	32	3.2	62.6	59.4	89.5	57	33	38	94	<b>R76-1033Q</b> (made to order)		



**■ Bearings (Through Hole Type)**

Through hole type bearings include long and short fixing bolts compatible with almost all applications. They also come in two types: fixed, to be used at the reference position, and eccentric, enabling easy system adjustment.



Bearing (eccentric)

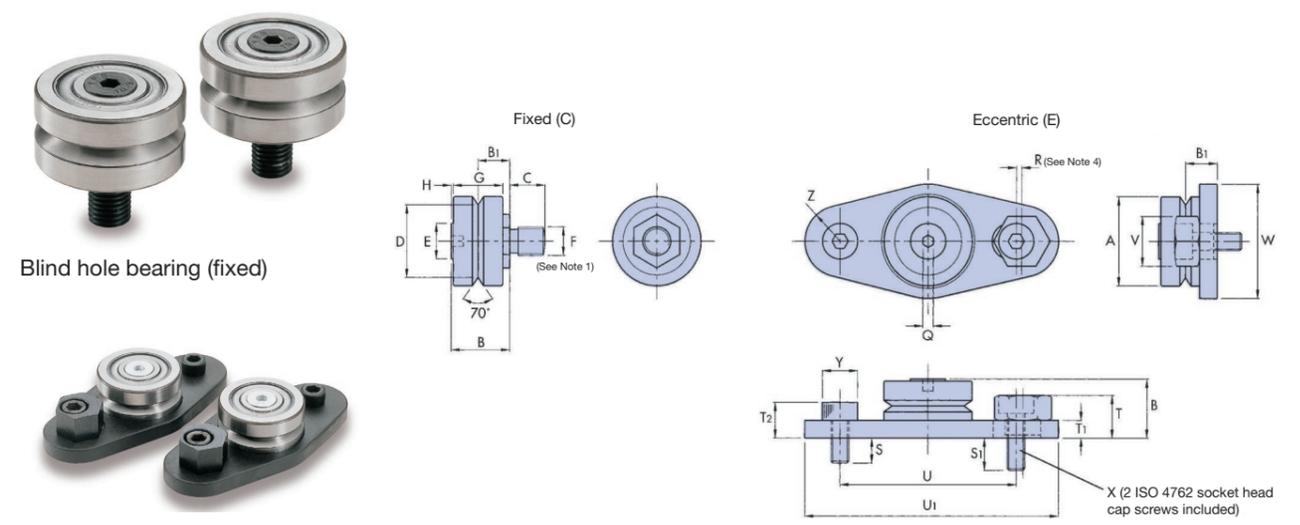
Body (Ring rail gear)	Catalog Number	Type	A	B	$\pm 0.025$ B1	C	C1	C2	$\pm 0.025$ D	E	F	G	H	J	K	L
For R20 (Made to Order)	RSJ-18-C	Through hole fixed (short)	18	12.4	6.75	7.4	3.4	2.4	14.00	7	M6 x 0.75	10	0.6	0.8	3.2	—
	RLJ-18-C	Through hole fixed (long)	18	12.4	6.75	14	10	2.5	14.00	7	M6 x 0.75	10	0.6	0.8	3.2	2.5
	RSJ-18-E	Through hole eccentric (short)	18	12.4	6.75	7.4	3.4	2.4	14.00	7	M6 x 0.75	10	0.6	0.8	3.2	2.5
	RLJ-18-E	Through hole eccentric (long)	18	12.4	6.75	14	10	2.5	14.00	7	M6 x 0.75	10	0.6	0.8	3.2	2.5
	BHJ-18-C	Blind hole fixed	18	12.4	6.75	7.4	—	—	14.00	7	M6 x 0.75	10	0.6	—	—	—
	BHJ-18-E	Blind hole eccentric	18	12.4	6.75	7.4	—	—	14.00	7	M6 x 0.75	10	0.6	—	—	2.5
For R25	RSJ-25-C	Through hole fixed (short)	25	16.6	9	9.8	3.8	2.2	20.27	10	M8 x 1	14	0.5	1	5	—
	RLJ-25-C	Through hole fixed (long)	25	16.6	9	19	13	4.9	20.27	10	M8 x 1	14	0.5	1	5	3
	RSJ-25-E	Through hole eccentric (short)	25	16.6	9	9.8	3.8	2.2	20.27	10	M8 x 1	14	0.5	1	5	3
	RLJ-25-E	Through hole eccentric (long)	25	16.6	9	19	13	4.9	20.27	10	M8 x 1	14	0.5	1	5	3
	BHJ-25-C	Blind hole fixed	25	16.6	9	9.8	—	—	20.27	10	M8 x 1	14	0.5	—	—	—
	BHJ-25-E	Blind hole eccentric	25	16.6	9	9.8	—	—	20.27	10	M8 x 1	14	0.5	—	—	3
For R44	RSJ-34-C	Through hole fixed (short)	34	21.3	11.5	13.8	6.6	5.2	27.13	12	M10 x 1.25	18	0.7	1.25	6	—
	RLJ-34-C	Through hole fixed (long)	34	21.3	11.5	22	14.8	5.9	27.13	12	M10 x 1.25	18	0.7	1.25	6	4
	RSJ-34-E	Through hole eccentric (short)	34	21.3	11.5	13.8	6.6	5.2	27.13	12	M10 x 1.25	18	0.7	1.25	6	4
	RLJ-34-E	Through hole eccentric (long)	34	21.3	11.5	22	14.8	5.9	27.13	12	M10 x 1.25	18	0.7	1.25	6	4
	BHJ-34-C	Blind hole fixed	34	21.3	11.5	13.8	—	—	27.13	12	M10 x 1.25	18	0.7	—	—	—
	BHJ-34-E	Blind hole eccentric	34	21.3	11.5	13.8	—	—	27.13	12	M10 x 1.25	18	0.7	—	—	4
For R76 (Made to Order)	RSJ-54-C	Through hole fixed (short)	54	34.7	19	17.8	8.2	5.7	41.76	25	M14 x 1.5	28	1.6	1.6	8	—
	RLJ-54-C	Through hole fixed (long)	54	34.7	19	30	20.4	7.9	41.76	25	M14 x 1.5	28	1.6	1.6	8	—
	RSJ-54-E	Through hole eccentric (short)	54	34.7	19	17.8	8.2	5.7	41.76	25	M14 x 1.5	28	1.6	1.6	8	6
	RLJ-54-E	Through hole eccentric (long)	54	34.7	19	30	20.4	7.9	41.76	25	M14 x 1.5	28	1.6	1.6	8	6
	BHJ-54-C	Blind hole fixed	54	34.7	19	17.8	—	—	41.76	25	M14 x 1.5	28	1.6	—	—	—
	BHJ-54-E	Blind hole eccentric	54	34.7	19	17.8	—	—	41.76	25	M14 x 1.5	28	1.6	—	—	6

- [Caution on Product Characteristics] ① Screws are metric fine thread. See dimension F above.  
 ② All the RSJ/RLJ type eccentric bearing fixing bolts have hex sockets for adjustment, as in the figure.  
 ③ Nuts and washers are included with the fixed and eccentric types of RSJ/RLJ bearings.  
 ④ The R dimension value is the eccentricity of the adjusting nut, which is the adjustment amount of the adjusting nut in 360° rotation on the bearing center line.  
 ⑤ The bearing sizes are designed for use on specifically sized ring parts (see table above). When required by certain applications, however, it is possible to combine ring parts larger than those designed with arbitrary bearings for use. Also, size 34 bearings can be used along with size 25 ring parts.

[Precautions for Made to Order Products] ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.

**■ Bearings (Blind Hole Type)**

Blind hole type bearings are used when fixing from the back of the bearing is not possible. They also come in two types: fixed, to be used at the reference position, and eccentric, enabling easy system adjustment.



Blind hole bearing (eccentric, for adjustment)

M	M1	N	$\pm 0.03$ O	P	Q	R	S	S1	T	T1	T2	$\pm 0.2$ U	U1	V	W	X	Y	Z	Weight (g)	Catalog Number
10	13	—	6	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19.0	RSJ-18-C
10	13	2.6	6	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20.0	RLJ-18-C
—	—	—	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19.0	RSJ-18-E
—	—	—	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20.0	RLJ-18-E
—	—	—	—	11	2	1.2	8	10.5	10	4	8	38	54	11	24.5	M4 x 0.7	7	7	18.0	BHJ-18-C
—	—	—	—	11	2	1.2	8	10.5	10	4	8	38	54	11	24.5	M4 x 0.7	7	7	45	BHJ-18-E
13	17	—	8	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48.0	RSJ-25-C
13	17	2	8	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	51.0	RLJ-25-C
—	—	—	—	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48.0	RSJ-25-E
—	—	—	—	13	3	1.5	7	9	12	5	10	50	72	14	32	M5 x 0.8	8.5	10	51.0	RLJ-25-E
—	—	—	—	13	3	1.5	7	9	12	5	10	50	72	14	32	M5 x 0.8	8.5	10	43.0	BHJ-25-C
—	—	—	—	13	3	1.5	7	9	12	5	10	50	72	14	32	M5 x 0.8	8.5	10	105	BHJ-25-E
17	21	—	10	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	115	RSJ-34-C
17	21	2.5	10	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	120	RLJ-34-C
—	—	—	—	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	115	RSJ-34-E
—	—	—	—	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	120	RLJ-34-E
—	—	—	—	15	4	2	9.5	8.5	17.5	6.5	12.5	60	90.5	17	42	M6 x 1	10	14	105	BHJ-34-C
—	—	—	—	15	4	2	9.5	8.5	17.5	6.5	12.5	60	90.5	17	42	M6 x 1	10	14	235	BHJ-34-E
22	28	—	14	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	415	RSJ-54-C
22	28	4.5	14	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	425	RLJ-54-C
—	—	—	—	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	415	RSJ-54-E
—	—	—	—	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	425	RLJ-54-E
—	—	—	—	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	390	BHJ-54-C
—	—	—	—	27	8	3.0	14.5	16.4	23.5	10.5	18.5	89.5	133	25	62	M8 x 1.25	13	20	800	BHJ-54-E

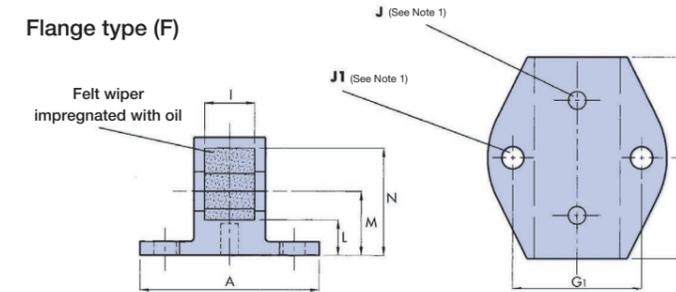
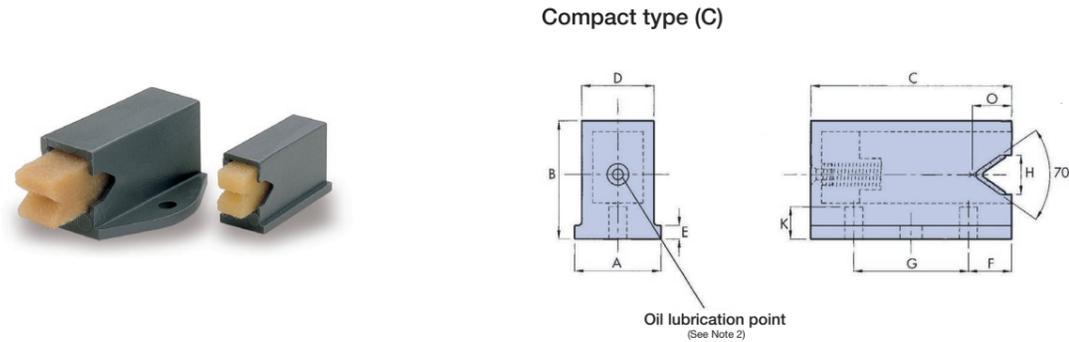
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**Lubricator**

The lubricator is composed of impact-resistant molded polyacetal plastic and a felt wiper impregnated with lubricant and supported with a spring. It is designed to create a constant film of oil on the rail operating surface without excessive friction. The use of lubrication vastly extends the system allowable load and life.



Body (Ring rail gear)	Catalog Number	Type	A	B	C	D	E	F	G	G1	H	I	J	J1 (screw used)
For R20 (Made to Order)	<b>LB-20C</b>	Compact	8	12	22.5	6.5	2	4.75	13	13	7.2	4	φ 2.5 x 10	φ 2.7(M2.5 x 0.45 x 6)
	<b>LB-20F</b>	Flange	19											
For R25	<b>LB-25C</b>	Compact	12	16.5	28	9.9	2	6	16	18	5.5	7	φ 3 x 10	φ 3.2(M3 x 0.5 x 8)
	<b>LB-25F</b>	Flange	25											
For R44	<b>LB-44C</b>	Compact	17	20	38	15	2.4	8	22	25	7	11	φ 3 x 16	φ 4.2(M4 x 0.7 x 10)
	<b>LB-44F</b>	Flange	34											
For R76 (Made to Order)	<b>LB-76C</b>	Compact	25	33.5	57	22.7	4.5	12	33	38	10	18	φ 3.5 x 22	φ 5.2(M5 x 0.8 x 12)
	<b>LB-76F</b>	Flange	50											

K	L	M	N	O	Weight (g)	Catalog Number
2.5	3.5	6.75	10.75	4.5	3	<b>LB-20C</b>
					3	<b>LB-20F</b>
4.5	5	9	15.25	5.5	5	<b>LB-25C</b>
					6	<b>LB-25F</b>
5.5	6.25	11.5	18.25	8	14	<b>LB-44C</b>
					16	<b>LB-44F</b>
9	10	19	31.5	11.5	40	<b>LB-76C</b>
					44	<b>LB-76F</b>

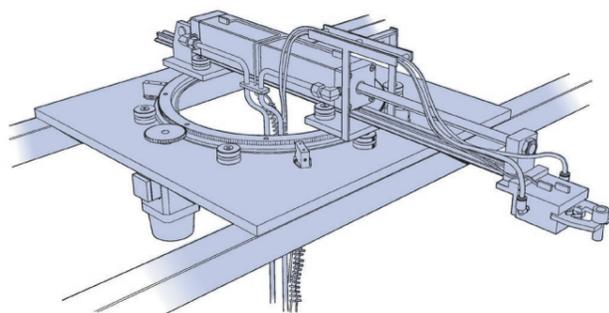
- [Caution on Product Characteristics] ① Each lubricator comes with two self-tapping Plastite 45 cross-recessed pan head screws, generally compliant with ISO 7049, for fixing in hole J. Further, flange type lubricators come with two DIN 84A cross-recessed cheese head screws for fixing in hole J1.
- ② For oil replenishment, use BP Energol GHL68 or 68-viscosity EP mineral oil from the lubrication point.
- [Precautions for Made to Order Products] ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.



**Usage Examples**

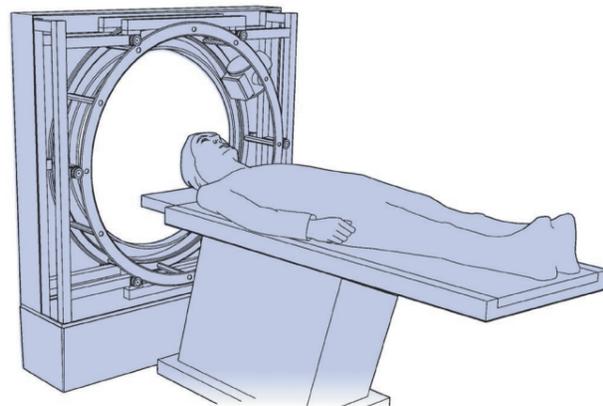
**Simple pick & place attachment**

Ring rail gears realize 360° rotation and support strength roughly equivalent to load. The empty central space can be used for wiring routes, etc.



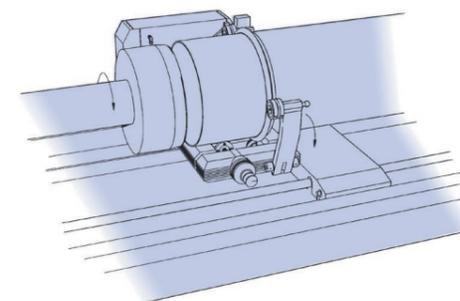
**Body scanner**

An image head is mounted on the ring rail gears surrounding the patient. The smooth, quiet movement with no play realizes high resolution.



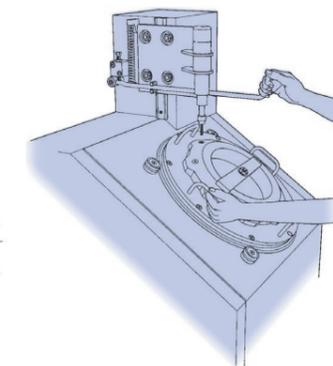
**Laser platemaker for rotary printing screen**

Dedicated ring rail gears move on the screen tube, keeping its shape consistent. Hinge-type bearing bracket enables rapid mounting and removal.



**Rotary assembler**

Ring rail gears enable friction-free manual rotation, making it possible to control and support the load location.



**3-axis assembly robot**

Highly safe ring rail gears, rotating without friction, enable smooth, high-rigidity movement.

