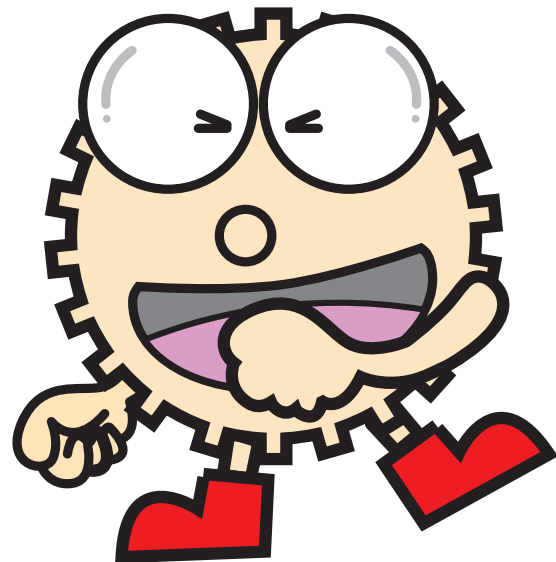




# Other Products

SRT/SRT-C Ratchets & Pawls	SRTB/SRT-C Ratchets & Pawls	GC/GC-I Gear Couplings	SV/SVI Involute Spline Shafts, Spline Bushings	HEPCO Ring Rail Gears, Accessories	GCU Gear Assembly Kit	Rack & Pinion Lubrication System	Racks & Pinions Aluminum Frame Transport Device
							
Material: S45C P2.09-12.57 Page 474	Material: S45C P2.09-12.57 Page 476	Material: S45C m2, 2.5 Page 478	Material: S45C m1.667 Page 480	Material: - Page 482	Material: - Page 490	Material: - Page 492	Material: - Page 30

**M** Includes Made to Order

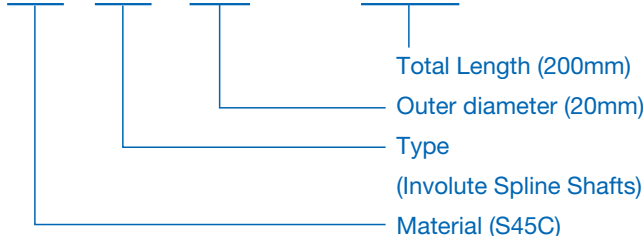


## Catalog Number of KHK Stock Gears

The Catalog Number for KHK stock gears is based on the simple formula listed below. Please order KHK gears by specifying the Catalog Numbers.

(Example) Other Products

**S V 20 - 200**



**Material**  
S S45C

**Type**  
RT Ratchets  
GC Gear Couplings  
V Involute Spline

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gears

Gearboxes

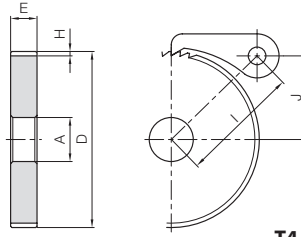
Other Products



# Ratchets



Specifications	
Tooth groove angle	60°
Material	S45C
Heat treatment	Gear teeth induction hardened *
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating



\* Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).

T4

## Characteristics of Pawls and Ratchets

- A simple structure used to restrict the rotational direction in one-way.
- The tips of pawls and the teeth of ratchets are induction hardened and therefore have superior durability.

Catalog Number	Pitch	No. of teeth	Shape	Bore	Hub dia.	Outside dia.	Face width	Hub width	Total length	Tooth height	Center distance	Mounting height	Allowable torque (N·m)	Allowable torque (kgf·m)	Weight (kg)
				A	B	D	E	F	G	H	I	J	Bending strength	Bending strength	
<b>SRT2/3-50</b>	<b>2.09</b>	50	T4	10		33.3					33.84	15.67	3.07	0.31	0.035
<b>SRT2/3-60</b>		60		10	—	40					35.51	19	4.10	0.42	0.053
<b>SRT2/3-80</b>		80		12		53.3	6	—	6	1	39.48	25.67	6.00	0.61	0.096
<b>SRT2/3-100</b>		100		12		66.6					44.11	32.33	8.24	0.84	0.15
<b>SRT1-50</b>	<b>3.14</b>	50		12		50					45.48	23.4	14.7	1.50	0.16
<b>SRT1-60</b>		60		15		60					48.24	28.4	19.5	1.99	0.24
<b>SRT1-80</b>		80		15	—	80	12	—	12	1.6	54.73	38.4	29.4	3.00	0.44
<b>SRT1-90</b>		90		15		90					58.35	43.4	34.5	3.52	0.56
<b>SRT1-100</b>	100	15			100					62.16	48.4	39.4	4.02	0.70	
<b>SRT2-30</b>	<b>6.28</b>	30		12		60					61.23	26.9	29.0	2.96	0.28
<b>SRT2-40</b>		40	15	—	80	15	—	15	3.1	66.23	36.9	49.2	5.02	0.53	
<b>SRT2-50</b>		50			100					72.28	46.9	70.8	7.22	0.85	
<b>SRT2-60</b>		60			120					79.14	56.9	94.3	9.61	1.24	
<b>SRT3-30</b>	<b>9.42</b>	30	15		90					76.32	40	92.6	9.44	0.86	
<b>SRT3-40</b>		40	20	—	120	20	—	20	5	85.15	55	158	16.1	1.58	
<b>SRT3-50</b>		50	20		150					95.52	70	229	23.3	2.54	
<b>SRT4-30</b>	<b>12.57</b>	30	20		120					95.74	52.6	226	23.0	1.89	
<b>SRT4-40</b>		40	20	—	160	25	—	25	7.4	108.03	72.6	385	39.3	3.53	
<b>SRT4-50</b>		50			200					122.37	92.6	559	57.0	5.66	

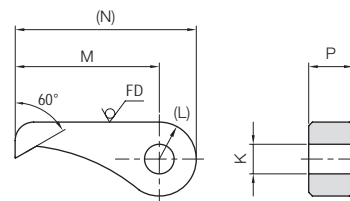
[Caution on Product Characteristics] ① The bore may slightly vary due to the effect of heat treatment. When using with the indicated hole diameter, provide machining with a reamer or the like before use.



# Ratchet Pawls



Specifications	
Tooth angle	60°
Material	S45C
Heat treatment	Pawl induction hardened
Pawl hardness	50 to 60HRC
Surface treatment	Black oxide coating

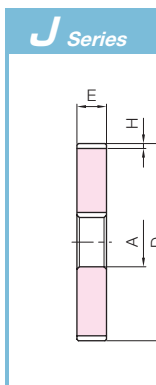


\* FD has a forged finish surface.

T5

Catalog Number	Shape	K	(L)	M	(N)	P	Weight (kg)
<b>SRT2/3-C</b>	T5	5	(8)	30	(38)	6	0.020
<b>SRT1-C</b>		8	(10)	39	(49)	12	0.057
<b>SRT2-C</b>		10	(12.5)	55	(67.5)	15	0.13
<b>SRT3-C</b>		12	(15)	65	(80)	20	0.23
<b>SRT4-C</b>		13	(18)	80	(98)	25	0.38

[Caution on Product Characteristics] ① SRT2/3-C is a lost wax product that uses S45C-equivalent material.  
 ② The ratchet pawl is for preventing reverse rotation. It cannot be used for feeding or indexing.



Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gears

Other Products

To order J Series products, please specify: **Catalog No. + J + BORE.**

Bore H7	* The product shapes of J Series items are identified by background color.																	
Keyway JS9	10	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50
Screw size	4x1.8		5x2.3				6x2.8			8x3.3			10x3.3		12x3.3	14x3.8		
Catalog Number	-																	
SRT2/3-50J BORE																		
SRT2/3-60J BORE																		
SRT2/3-80J BORE																		
SRT2/3-100J BORE																		
SRT1-50J BORE																		
SRT1-60J BORE																		
SRT1-80J BORE																		
SRT1-90J BORE																		
SRT1-100J BORE																		
SRT2-30J BORE																		
SRT2-40J BORE																		
SRT2-50J BORE																		
SRT2-60J BORE																		
SRT3-30J BORE																		
SRT3-40J BORE																		
SRT3-50J BORE																		
SRT4-30J BORE																		
SRT4-40J BORE																		
SRT4-50J BORE																		

- ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.
- ② Number of pieces we can process for one order is 1 to 20 units. For larger orders, please request a price and delivery quote.
- ③ Black oxide is not re-applied after hole and key secondary operations.
- ④ Keyways are made according to JIS B1301 standards, Js9 tolerance. Also note that tooth phase matching is not performed.

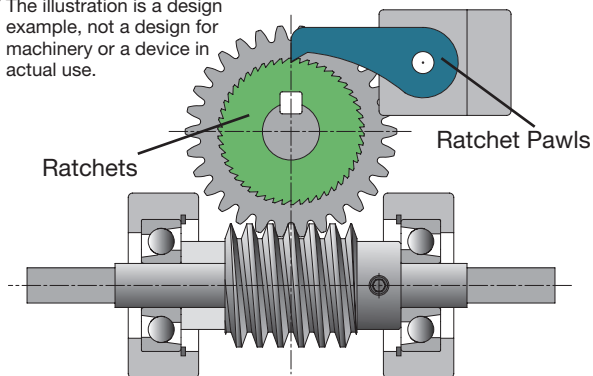
Pawls

Gearboxes

Other Products

Application Examples

\* The illustration is a design example, not a design for machinery or a device in actual use.



Example: ratchets used for complete reverse prevention of worm gears

Bending Strength of Ratchets

The allowable transmission force  $F_b$  (N) of ratchets is the value calculated by the following formula.

$$F_b = \sigma_b \cdot \frac{b \cdot e^2}{6} \cdot \frac{1}{h} \cdot \frac{1}{S_F}$$

Also, the SRT Ratchet's allowable torque  $T$  (N·m) for bending strength is calculated by the following formula.

$$T = F_b \cdot r_f$$

Where

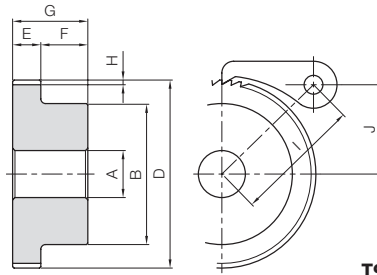
- $\sigma_b$  : Bending stress → Assumed 225.55MPa (23kgf/mm<sup>2</sup>)
- $b$  : Face width mm → Dimension Table ratchet face width  $E$
- $e$  : Root length mm  
→  $e = h \times \tan\left(60 - \frac{360}{\text{No. of teeth}}\right)$  is the calculation
- $h$  : Depth of teeth mm → Dimension Table ratchet tooth depth  $H$
- $S_F$  : Safety factor → Assumed 2
- $r_f$  : Tooth root radius m  
→  $r_f = \frac{\text{Outside dia. } D - 2h}{2000}$  is the calculation

For information on misprints in the catalog, please visit our website.



Specifications	
Tooth groove angle	60°
Material	S45C
Heat treatment	Gear teeth induction hardened *
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating

\* Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).



T9

## Characteristics of Pawls and Ratchets

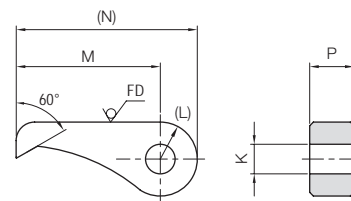
- A simple structure used to restrict the rotational direction in one-way.
- The tips of pawls and the teeth of ratchets are induction hardened and therefore have superior durability.

Catalog Number	Pitch	No. of teeth	Shape	Bore	Hub dia.	Outside dia.	Face width	Hub width	Total length	Tooth height	
				A	B	D	E	F	G	H	
SRTB2/3-50 (Made to Order)	2.09	50	T9	10	25	33.3	6	10	16	1	
SRTB2/3-60 (Made to Order)		60		10	30	40					
SRTB2/3-80 (Made to Order)		80		12	35	53.3					
SRTB2/3-90 (Made to Order)		90		12	40	60					
SRTB2/3-100 (Made to Order)		100		12	40	66.6					
SRTB1-50 (Made to Order)	3.14	50		12	35	50	12	12	24	1.6	
SRTB1-60 (Made to Order)		60		15	40	60					
SRTB1-80 (Made to Order)		80		15	50	80					
SRTB1-90 (Made to Order)		90		15	50	90					
SRTB1-100 (Made to Order)		100		15	50	100					
SRTB2-30 (Made to Order)	6.28	30		15	50	60	15	14	29	3.1	
SRTB2-40 (Made to Order)		40				60					80
SRTB2-50 (Made to Order)		50				60					100
SRTB2-60 (Made to Order)		60				65					120
SRTB3-30 (Made to Order)	9.42	30		15	75	90	20	16	36	5	
SRTB3-40 (Made to Order)		40	80			120					
SRTB3-50 (Made to Order)		50	85			150					
SRTB4-30 (Made to Order)	12.57	30	20	90	120	25	18	43	7.4		
SRTB4-40 (Made to Order)		40			90					160	
SRTB4-50 (Made to Order)		50			100					200	

- [Caution on Product Characteristics] ① For the ratchet with SRTB hub, pay attention to the orientation of the teeth with respect to the hub. Items with opposite orientation can be made to order.  
 ② The bore may slightly vary due to the effect of heat treatment. When using with the indicated hole diameter, provide machining with a reamer or the like before use.
- [Precautions for Made to Order Products] ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.



Specifications	
Tooth angle	60°
Material	S45C
Heat treatment	Pawl induction hardened
Pawl hardness	50 to 60HRC
Surface treatment	Black oxide coating



\* FD has a forged finish surface.

T5

Catalog Number	Shape	K	(L)	M	(N)	P	Weight (kg)
SRT2/3-C	T5	5	(8)	30	(38)	6	0.020
SRT1-C		8	(10)	39	(49)	12	0.057
SRT2-C		10	(12.5)	55	(67.5)	15	0.13
SRT3-C		12	(15)	65	(80)	20	0.23
SRT4-C		13	(18)	80	(98)	25	0.38

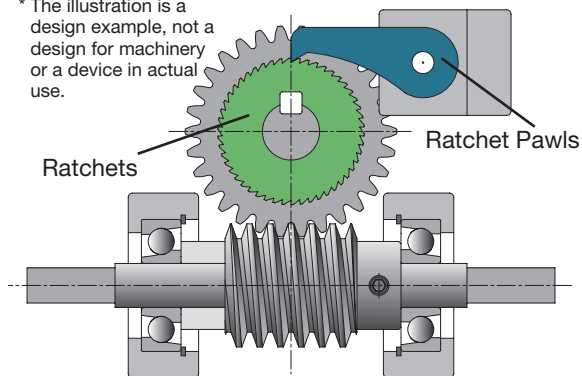
- [Caution on Product Characteristics] ① SRT2/3-C is a lost wax product that uses S45C-equivalent material.  
 ② The ratchet pawl is for preventing reverse rotation. It cannot be used for feeding or indexing.

Center distance	Mounting height	Allowable torque (N·m)	Allowable torque (kgf·m)	Weight	Catalog Number
I	J	Bending strength	Bending strength	(kg)	
33.84	15.67	3.07	0.31	0.067	SRTB2/3-50 (Made to Order)
35.51	19	4.10	0.42	0.10	SRTB2/3-60 (Made to Order)
39.48	25.67	6.00	0.61	0.16	SRTB2/3-80 (Made to Order)
41.73	29	7.11	0.73	0.21	SRTB2/3-90 (Made to Order)
44.11	32.33	8.24	0.84	0.24	SRTB2/3-100 (Made to Order)
45.48	23.4	14.7	1.50	0.24	SRTB1-50 (Made to Order)
48.24	28.4	19.5	1.99	0.34	SRTB1-60 (Made to Order)
54.73	38.4	29.4	3.00	0.61	SRTB1-80 (Made to Order)
58.35	43.4	34.5	3.52	0.73	SRTB1-90 (Made to Order)
62.16	48.4	39.4	4.02	0.87	SRTB1-100 (Made to Order)
61.23	26.9	29.0	2.96	0.47	SRTB2-30 (Made to Order)
66.23	36.9	49.2	5.02	0.82	SRTB2-40 (Made to Order)
72.28	46.9	70.8	7.22	1.14	SRTB2-50 (Made to Order)
79.14	56.9	94.3	9.61	1.59	SRTB2-60 (Made to Order)
76.32	40	92.6	9.44	1.40	SRTB3-30 (Made to Order)
85.15	55	158	16.1	2.17	SRTB3-40 (Made to Order)
95.52	70	229	23.3	3.22	SRTB3-50 (Made to Order)
95.74	52.6	226	23.0	2.75	SRTB4-30 (Made to Order)
108.03	72.6	385	39.3	4.38	SRTB4-40 (Made to Order)
122.37	92.6	559	57.0	6.72	SRTB4-50 (Made to Order)

Pawls

Application Examples

\* The illustration is a design example, not a design for machinery or a device in actual use.



Example: ratchets used for complete reverse prevention of worm gears

Bending Strength of Ratchets

The allowable transmission force  $F_b$  (N) of ratchets is the value calculated by the following formula.

$$F_b = \sigma_b \cdot \frac{b \cdot e^2}{6} \cdot \frac{1}{h} \cdot \frac{1}{S_F}$$

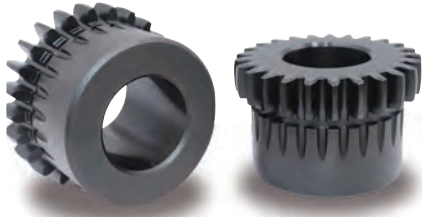
Also, the SRT Ratchet's allowable torque  $T$  (N·m) for bending strength is calculated by the following formula.

$$T = F_b \cdot r_f$$

Where

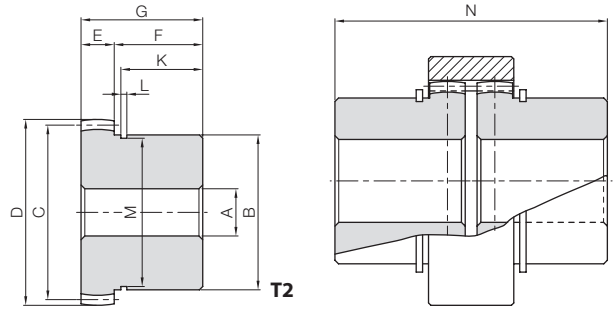
- $\sigma_b$  : Bending stress → Assumed 225.55MPa (23kgf/mm<sup>2</sup>)
- $b$  : Face width mm → Dimension Table ratchet face width E
- $e$  : Root length mm  
→  $e = h \times \tan\left(60 - \frac{360}{\text{No. of teeth}}\right)$  is the calculation
- $h$  : Depth of teeth mm → Dimension Table ratchet tooth depth H
- $S_F$  : Safety factor → Assumed 2
- $r_f$  : Tooth root radius m

$$\rightarrow r_f = \frac{\text{Outside dia. } D - 2h}{2000} \text{ is the calculation}$$



Specifications	
Gear teeth	Normal teeth (crowning)
Pressure angle	20°
Material	S45C
Heat treatment	Gear teeth induction hardened *
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating

\* Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).



Catalog Number	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Face width	Hub width	Total length	C-shaped retaining ring groove	Mounting total length	Backlash (mm)	Weight (kg)		
				A <sub>H8</sub>	B	C	D	E	F	G	K	L			M	N
<b>GC1-12S</b>	<b>m2</b>	25	T2	12	45	50	54	10	25	35	23	1.95	42.5	0.40~0.60	0.43	
<b>GC2-20S</b>	<b>m2</b>	40		20	70	80	84	15	40	55	37	2.7	67		115	1.66
<b>GC3-20S</b>	<b>m2.5</b>	42		20	90	105	110	20	45	65	42	3.2	86.5		135	3.43

[Caution on Product Characteristics] ① A snap ring is included as an accessory.

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gears

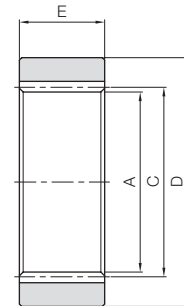
Gearboxes

Other Products



Specifications	
Gear teeth	Standard full depth
Pressure angle	20°
Material	S45C
Heat treatment	Gear teeth induction hardened *
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating

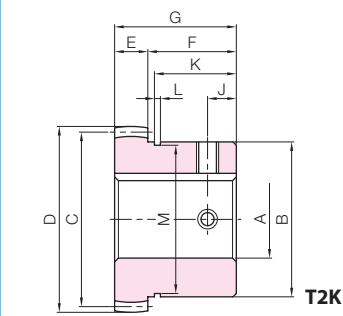
\* Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).




T1

Catalog Number	Module	No. of teeth	Shape	Inside dia.	Pitch dia.	Outside dia.	Face width	Backlash (mm)	Weight (kg)
				A	C	D	E		
<b>GC1-I</b>	<b>m2</b>	25	T1	46	50	68	25	0.40~0.60	0.33
<b>GC2-I</b>	<b>m2</b>	40		76	80	105	36		1.03
<b>GC3-I</b>	<b>m2.5</b>	42		100	105	145	48		2.96

**J Series**



Catalog Number	J
<b>GC1-12SJ BORE</b>	10
<b>GC2-20SJ BORE</b>	13
<b>GC3-20SJ BORE</b>	20



To order J Series products, please specify: **Catalog No. + J + BORE.**

Bore H7	* The product shapes of J Series items are identified by background color.																	
Keyway Js9	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50	
Screw size	4x1.8			5x2.3			6x2.8			8x3.3			10x3.3		12x3.3		14x3.8	
Catalog Number	M4					M5					M6			M8			M10	
<b>GC1-12SJ BORE</b>	*																	
<b>GC2-20SJ BORE</b>								*										
<b>GC3-20SJ BORE</b>								*										

- [Caution on J series]
- ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.
  - ② Number of pieces we can process for one order is 1 to 20 units. For larger orders, please request a price and delivery quote.
  - ③ Black oxide is not re-applied to parts undergoing secondary operations.
  - ④ Keyways are made according to JIS B1301 standards, Js9 tolerance. Also note that keyway tooth position alignment is not performed.
  - ⑤ Certain products which would otherwise have a very long tapped hole are counterbored. Please see the Website for more details.
  - ⑥ For products having a tapped hole, a set screw is included.
  - ⑦ Products marked with an \* have a bore tolerance of H8.

### Characteristics of Gear Couplings

- There are many ways to couple shafts to transmit power. We have developed these standardized gear couplings of our own design. They are easier to connect or disconnect than chain couplings.
- As the external gear (inner cylinder) is crowned, the shaft angle can be up to 5°.
- Due to the induction hardened gear teeth, these couplings have excellent durability.
- The GCJ units are machined complete with keyways, set screw holes and finished bores and are ready for immediate installation. We also offer minimum bore models for users who want to perform their own secondary operations.

### Gear Coupling Ordering Method

Gear coupling outer rings and inner hubs can each be purchased individually: however, normal usage requires a set of 1 outer ring and 2 inner hubs.

<E.g.> For 1 set of GC2-20S  
GC2-1 (outer ring) x 1 piece and GC2-20S (inner hub) x 2 piece set.

### Strength of Gear Couplings

The allowable torques of the gear couplings are determined in accordance with the shear strength of the keys.  
Allowable shear force of keys F (N) is calculated from the following formula.

$$F = b \cdot L \cdot \sigma \cdot \frac{1}{S}$$

Additionally, allowable torques T(N·m) of the inner hubs of the GC gear coupling is calculated using the following formula.

$$T = \frac{F \cdot d}{2000}$$

- b : Key Width mm → Keyway width of inner hubs of the GC Gear Coupling
- L : Key Length mm → Set at G-2 mm from the total length of the inner hub of the GC Gear Coupling
- σ : Allowable Shear Force of keys → Set at 49MPa (5kgf/mm<sup>2</sup>)
- S : Safety Factor → Optionally set
- d : Bore size (mm) → Bore size A of the inner hub of the GC Gear Coupling

Caution: Safety Factor (S) must be set at a value between 1 to 3, depending on the load types or the coupling displacement.



# Involute Spline Shafts

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

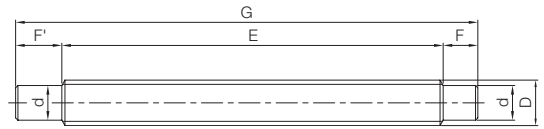
Worm Gears

Gearboxes

Other Products



Specifications	
Gear teeth	Stub teeth
Pressure angle	20°
Material	S45C
Heat treatment	Thermal refined
Tooth hardness	200 to 270HB
Surface treatment	Black oxide coating



TA

Catalog Number	Module	No. of teeth	Shape	Outside dia.	Hub dia.	Face width	Hub width (left)	Hub width (right)	Total length	Backlash (mm)	Weight (kg)
				D	d <sup>+0.25 +0.15</sup>	E	F'	F	G		
<b>SV17-170</b>	<b>m1.667</b>	8	TA	16.67	13	135	20	15	170	0.06~0.15	0.26
<b>SV20-200</b>		10	TA	19.67	15	165	20	15	200		
<b>SV25-250</b>		13	TB	24.67	20	220	—	30	250		
<b>SV30-300</b>		16	TB	29.67	25	270	—	30	300		

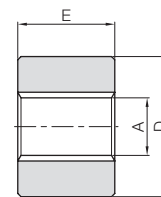
[Caution on Secondary Operations] ① When modifying the SV involute spline shaft with secondary operations, be careful not to crush the teeth or bend the shaft.



# Involute Spline Bushings



Specifications	
Gear teeth	Stub teeth
Pressure angle	20°
Material	S45C
Heat treatment	Thermal refined
Tooth hardness	200 to 270HB
Surface treatment	Black oxide coating

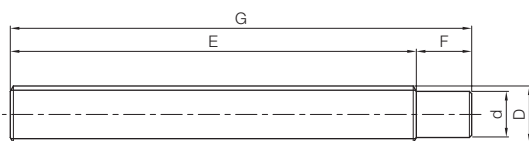


T1

Catalog Number	Module	No. of teeth	Shape	Outside dia.	Outside dia.	Face width	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash (mm)	Weight (kg)
				A	D	E	Surface durability	Surface durability		
<b>SVI17-40</b>	<b>m1.667</b>	8	T1	13.7	40	25	33.2	3.38	0.06~0.15	0.21
<b>SVI20-45</b>		10		16.7	45	30	59.6	6.08		
<b>SVI25-55</b>		13		21.7	55	38	125	12.8		
<b>SVI30-65</b>		16		26.7	65	45	222	22.6		

[Caution on Product Characteristics] ① The allowable torque shown are reference values calculated from “Surface strength of splines” on Page 481.

② Lubrication is always required on the mating surface of the spline shaft and hub to prevent wear damage.



TB

### ■ Characteristics of Involute Spline Shafts

- SV and SVI series are made according to the automotive involute spline standard, JIS B 1603: 1995 (Straight cylindrical involute splines, backlash 0.06 to 0.15).
- Involute spline shafts and bushings are thermal refined to have good abrasion-resistance.
- Spline bushings may be made in CAC (copper) type material as a special custom order item.

### Bushings

### ■ Surface Strength of Splines

The design concept of the spline surface strength is the same as that of a key. Here is the formula for the allowable transmission force F(N) of spline.

$$F = \eta \cdot z \cdot h_w \cdot l \cdot \sigma$$

And the formula of allowable torque T (N·m) of spline with respect to the surface strength.

$$T = \frac{F \cdot d_w}{2000}$$

In designing a spline shaft, besides considering the surface strength, we should take into account the torsional and bending stresses of the spline.

Where

- $\eta$  : Contact ratio of surface → 0.75 (assumed)
- $z$  : Number of teeth → number of teeth of spline from the table
- $h_w$  : Contact depth of tooth (mm) → 1.485
- $l$  : Contact length of spline → spline hub face width E from the table
- $\sigma$  : Allowable surface stress of spline → 19.61MPa (2kgf/mm<sup>2</sup>) (assumed)
- $d_w$  : Contact diameter (mm) → Tip diameter of spline shaft D -  $h_w$



## 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.



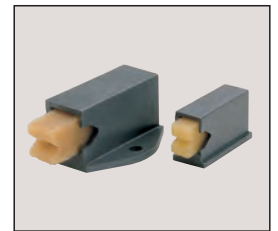
Bearing (fixed)



Bearing (eccentric)

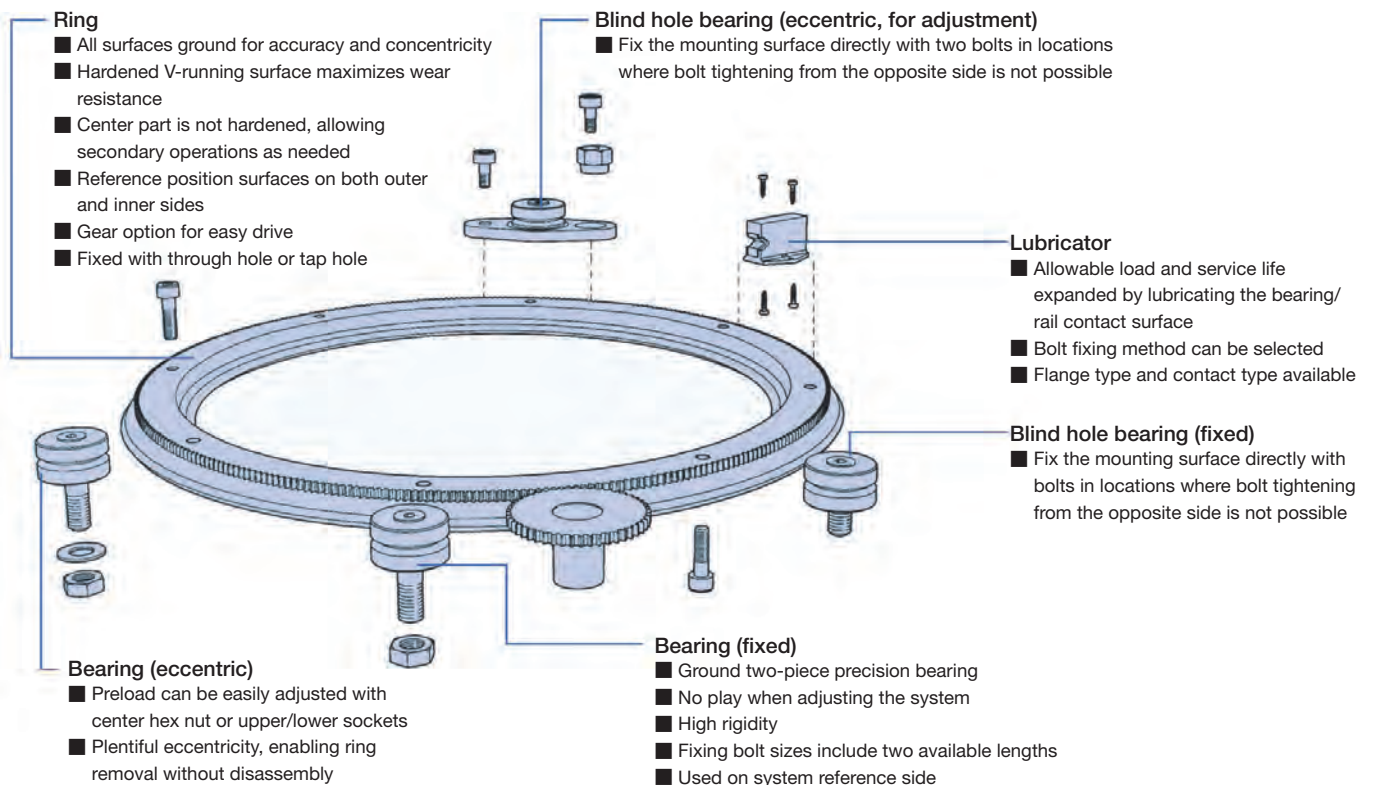


Blind hole bearing (fixed)

Blind hole bearing  
(eccentric, for adjustment)

Lubricator

## 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.

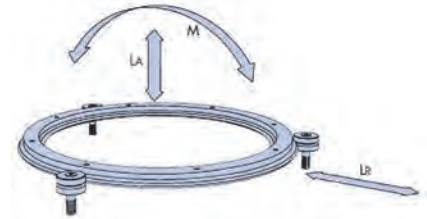
This lubrication vastly extends the allowable load and system life.

[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.

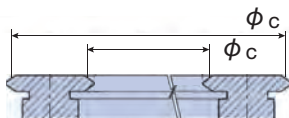
### System allowable load

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	3	300	170	$72 \times \phi_c$	960	510	$230 \times \phi_c$
	R25-255	4	370	200	$87 \times \phi_c$	1190	600	$278 \times \phi_c$
	R25-351	For each 1 pc added	48	30	$9 \times \phi_c$	230	150	$48 \times \phi_c$
RSJ/BHJ-34	R44-468	3	600	340	$140 \times \phi_c$	2400	1200	$570 \times \phi_c$
	R44-612	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	3	1350	765	$320 \times \phi_c$	5400	2740	$1290 \times \phi_c$
	R76-1033	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

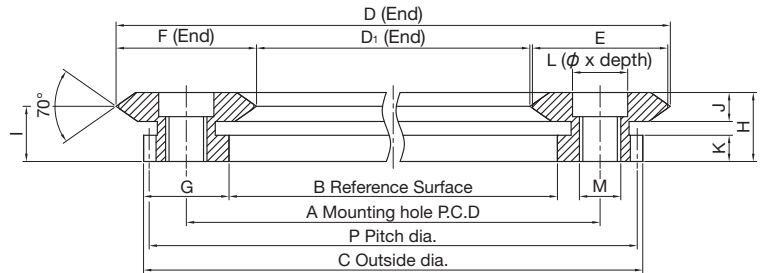


- Spur Gears
- Helical Gears
- Internal Gears
- Racks
- CP Racks & Pinions
- Miter Gears
- Bevel Gears
- Screw Gears
- Worm Gears
- Gearboxes
- Other Products

## External Ring Gears



External ring gear (P type)

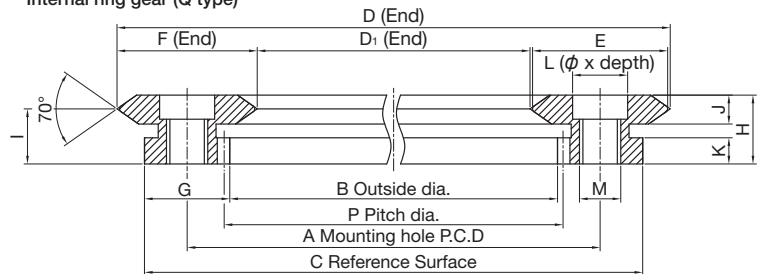


Type	Catalog Number	±0.2			±0.025							Face width			No. of holes	Counterbore	Socket head screw
		A	B	C	D	D1	E	F	G	H	I	J	K	L			
External ring gear	R20-210P (made to order)	210	197.6	222.4	230.37	189.63	20	20.37	12.4	10	8	4.2	3.8	8	8 x 3.5	M6 x 1	
	R25-159P	159	143.6	174.4	184.74	133.26	25	25.74	15.4	12.25	10	4.5	5.75	8	9 x 6	M8 x 1.25	
	R25-255P	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	
	R25-351P	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	
	R44-468P	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	
	R44-612P	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	
	R76-799P (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	
	R76-1033P (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



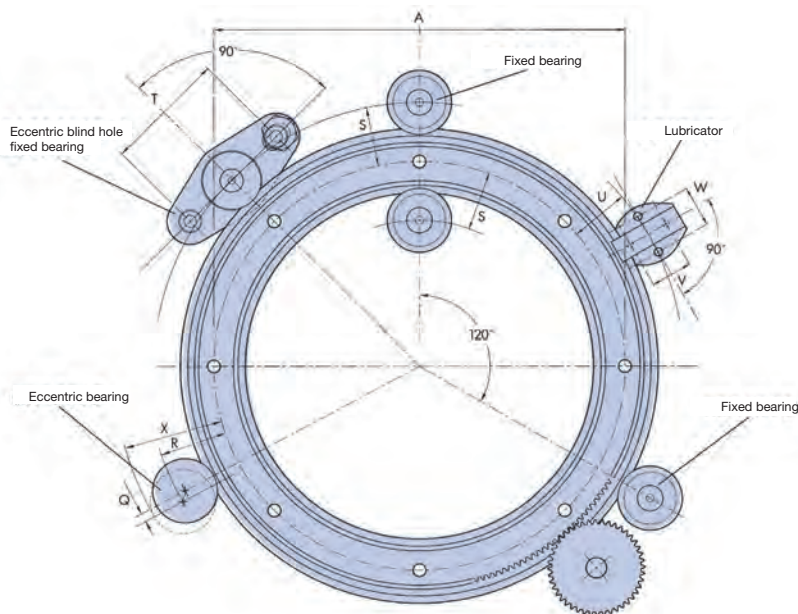
Internal ring gear (Q type)



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	K	L			
Internal Ring Gears	R20-210Q (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	
	R25-159Q	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	
	R25-255Q	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	
	R25-351Q	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	
	R44-468Q	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	
	R44-612Q	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	
	R76-799Q (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	
	R76-1033Q (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]
- ① For each bearing size, two fixing bolt lengths are available.
  - ② Series including SSY Spur Gears are available as ring rail gear drive pinions.
  - ③ 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.

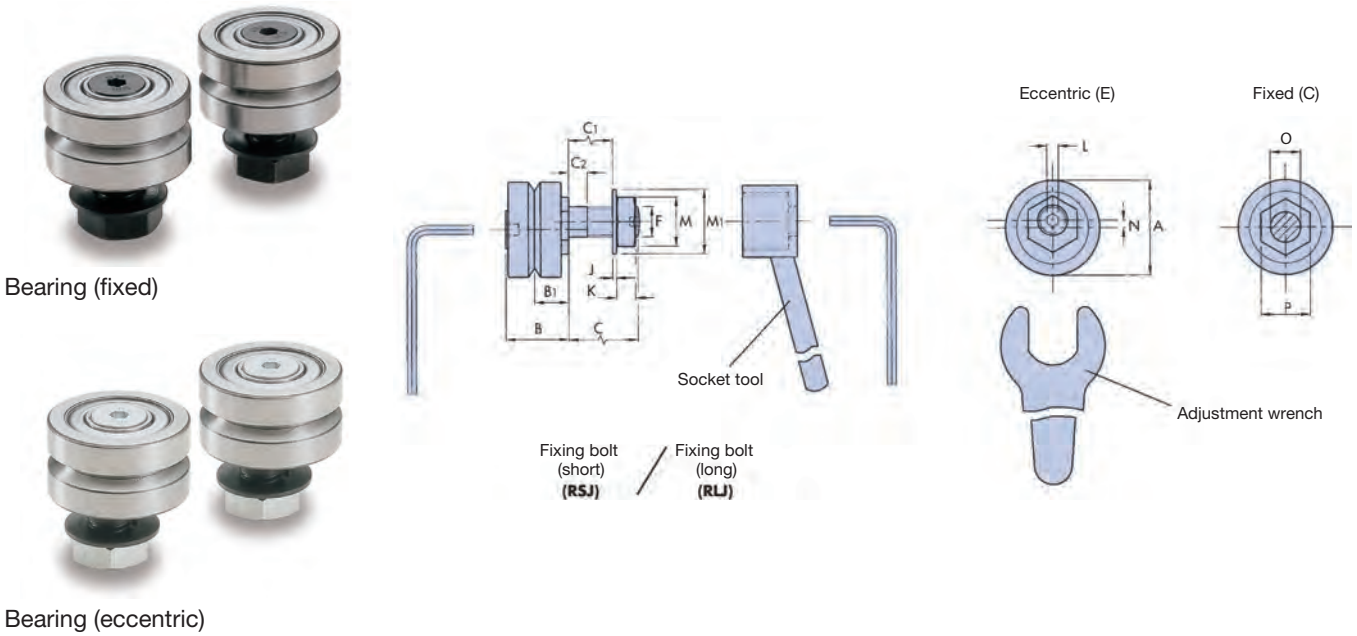
[Precautions for Made to Order Products] ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.

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.



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)	<b>RSJ-18-C</b>	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	—	
	<b>RLJ-18-C</b>	Through hole fixed (long)				14	10	2.5									
	<b>RSJ-18-E</b>	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	
	<b>RLJ-18-E</b>	Through hole eccentric (long)				14	10	2.5									
	<b>BHJ-18-C</b>	Blind hole fixed	18	12.4	6.75	7.4	—	—	14.00	7	M6 x 0.75	10	0.6	—	—	—	2.5
	<b>BHJ-18-E</b>	Blind hole eccentric															
For R25	<b>RSJ-25-C</b>	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	—	
	<b>RLJ-25-C</b>	Through hole fixed (long)				19	13	4.9									
	<b>RSJ-25-E</b>	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	
	<b>RLJ-25-E</b>	Through hole eccentric (long)				19	13	4.9									
	<b>BHJ-25-C</b>	Blind hole fixed	25	16.6	9	9.8	—	—	20.27	10	M8 x 1	14	0.5	—	—	—	3
	<b>BHJ-25-E</b>	Blind hole eccentric															
For R44	<b>RSJ-34-C</b>	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	—	
	<b>RLJ-34-C</b>	Through hole fixed (long)				22	14.8	5.9									
	<b>RSJ-34-E</b>	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	
	<b>RLJ-34-E</b>	Through hole eccentric (long)				22	14.8	5.9									
	<b>BHJ-34-C</b>	Blind hole fixed	34	21.3	11.5	13.8	—	—	27.13	12	M10 x 1.25	18	0.7	—	—	—	4
	<b>BHJ-34-E</b>	Blind hole eccentric															
For R76 (Made to Order)	<b>RSJ-54-C</b>	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	—	
	<b>RLJ-54-C</b>	Through hole fixed (long)				30	20.4	7.9									
	<b>RSJ-54-E</b>	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	
	<b>RLJ-54-E</b>	Through hole eccentric (long)				30	20.4	7.9									
	<b>BHJ-54-C</b>	Blind hole fixed	54	34.7	19	17.8	—	—	41.76	25	M14 x 1.5	28	1.6	—	—	—	6
	<b>BHJ-54-E</b>	Blind hole eccentric															

- [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.

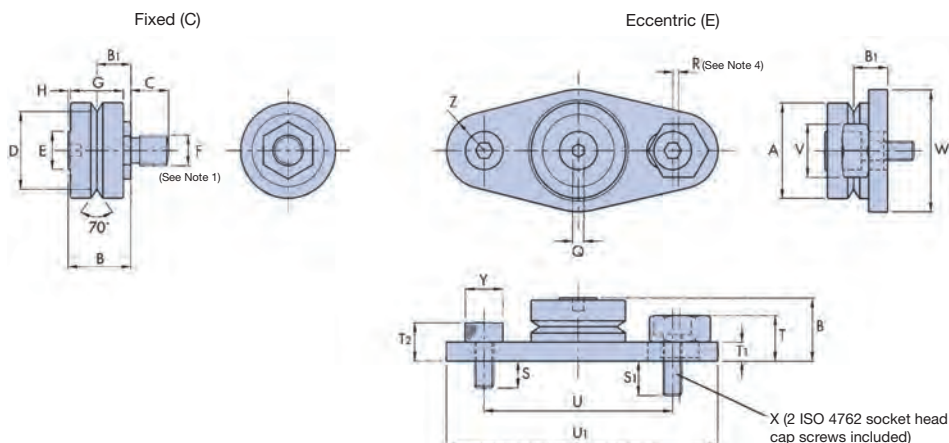
### ■ Bearings (Blind Hole Type)

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 (fixed)

Blind hole bearing (eccentric, for adjustment)



M	M1	N	<sup>0</sup> / <sub>-0.03</sub> O	P	Q	R	S	S1	T	T1	T2	±0.2 U	U1	V	W	X	Y	Z	Weight (g)	Catalog Number
10	13	—	6	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19.0	RSJ-18-C
																			20.0	RLJ-18-C
10	13	2.6	6	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19.0	RSJ-18-E
																			20.0	RLJ-18-E
—	—	—	—	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	18.0	BHJ-18-C
					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
																			51.0	RLJ-25-C
13	17	2	8	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48.0	RSJ-25-E
																			51.0	RLJ-25-E
—	—	—	—	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	43.0	BHJ-25-C
					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
																			120	RLJ-34-C
17	21	2.5	10	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	115	RSJ-34-E
																			120	RLJ-34-E
—	—	—	—	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	105	BHJ-34-C
					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
																			425	RLJ-54-C
22	28	4.5	14	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	415	RSJ-54-E
																			425	RLJ-54-E
—	—	—	—	27	—	—	—	—	—	—	—	—	—	—	—	—	—	—	390	BHJ-54-C
					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



**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.

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

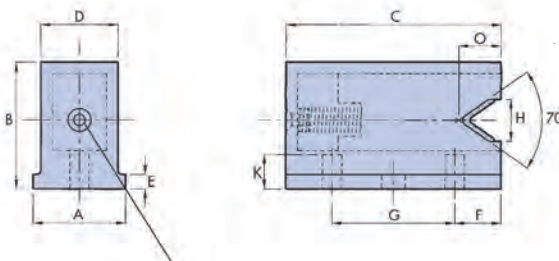
Screw Gears

Worm Gears

Gearboxes

Other Products

Compact type (C)



Oil lubrication point  
(See Note 2)

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											

[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.

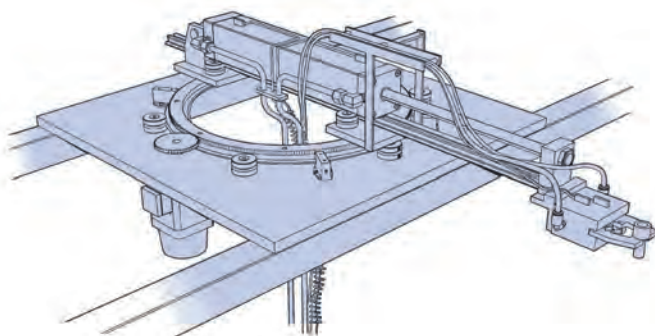
② For oil replenishment, use BP Energol GHL68 or 68-viscosity EP mineral oil from the lubrication point.

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

**Usage Examples**

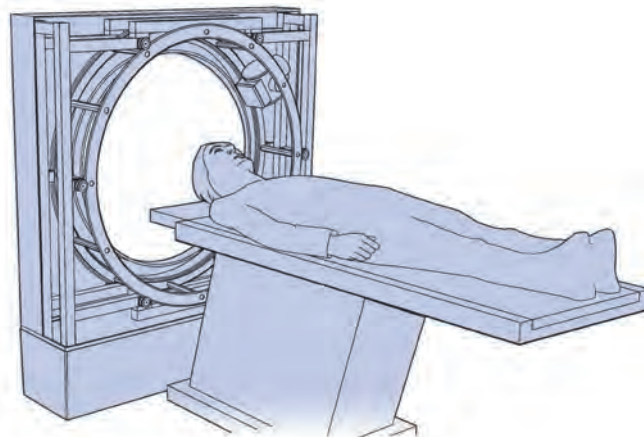
**Simple pick & place attachment**

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

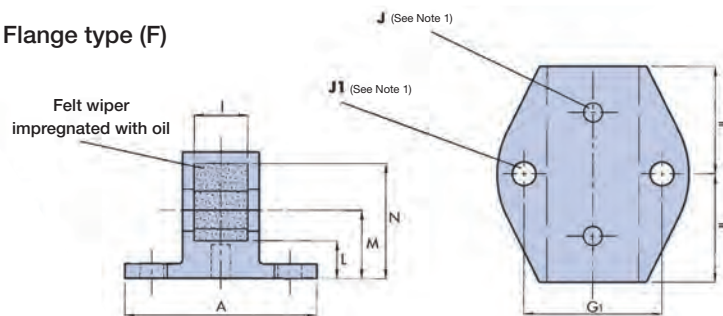


**Body scanner**

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



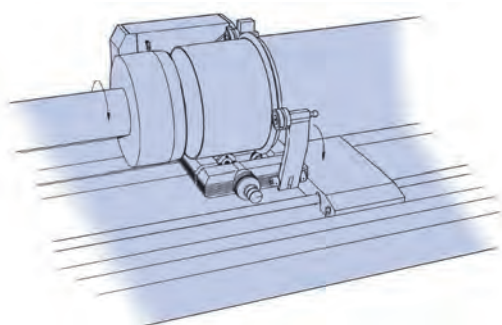
Flange type (F)



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>

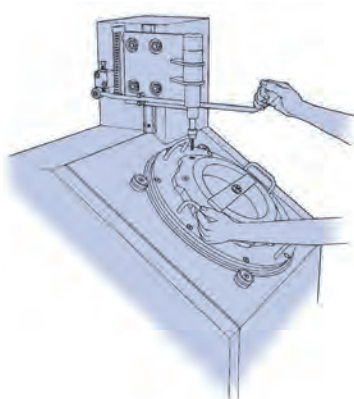
■ Laser platemaker for rotary printing screen

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



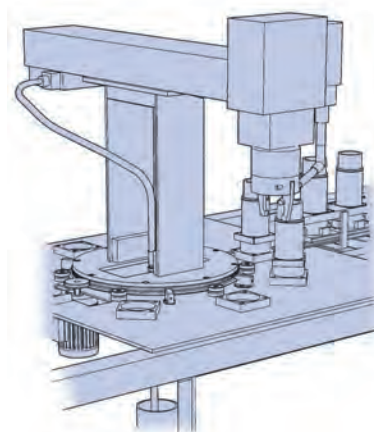
■ Rotary assembler

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.



Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gears

Gearboxes

Other Products



See the gears with your own eyes and move them with your own hands to learn about their mechanisms and characteristics.

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

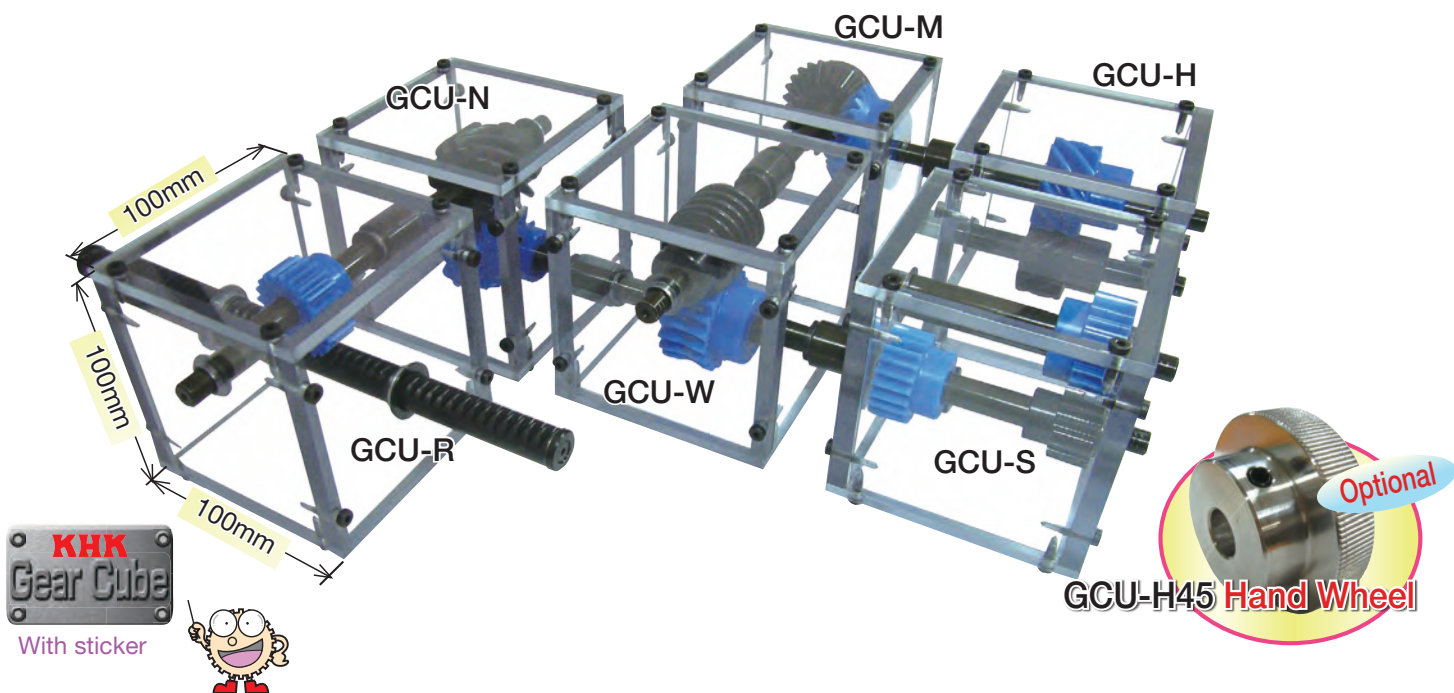
Bevel Gears

Screw Gears

Worm Gears

Gearboxes

Other Products



\* These kits are not for actual use to transmit power. Please use only as representations of gear systems.



This product is certified by KAWAGUCHI i-mono i-waza

## Features of GearCube

- Assembly kits can be connected flexibly.
- The frame is made of polycarbonate with high transparency and impact resistance.
- Gears combine MC nylon and metal, making lubrication unnecessary.
- An instruction manual is included, enabling easily assembly by anyone.

## Assembly Procedure

Details are available on the Japanese website

Photo shows GCU-R



Remove protective sheet



Insert bushing



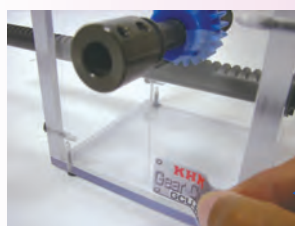
Set in shaft



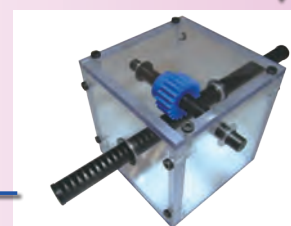
Assemble into frame



Photo shows GCU-R



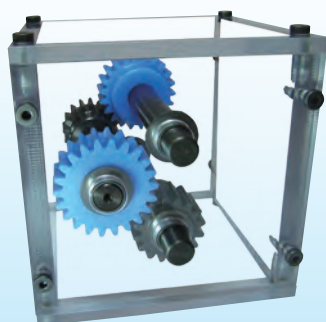
Adhere the sticker and it's complete!



Screw-fasten

All six types of assembly kit and input/output shafts can be connected.

### GCU-S Spur Gear Kit



Installation: Parallel Axes  
(Two-stage)  
Gear Type: Spur Gear  
Used Product: 2 units of  
SS1.5-16  
2 units of  
PS1.5-22  
Gear Ratio: 1.89  
Weight: Approx. 1kg

The Gear Kit contains a two-stage spur gear train and allows speed increases / reductions, and includes the most commonly used combinations of gears.

### GCU-H Helical Gear Kit



Installation: Parallel Axes  
Gear Type: Helical Gears  
(also for  
Screw Gears)  
Gears: SN2.5-10L  
PN2.5-10R equivalent  
Gear Ratio: 1  
Weight: Approx. 1kg

Helical gears have more strength than spur gears of the same dimensions and have the advantage of being less noisy.

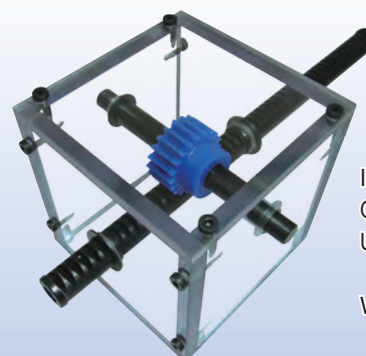
### GCU-M Miter Gear Kit



Installation:  
Intersecting Axes  
Gear Type: Miter  
Gears: SM2-25  
PM2-25  
Gear Ratio: 1  
Weight: Approx. 1kg

The shaft angle of bevel gears can be changed by 90°. It is used to change the direction of the power.

### GCU-R Rack Kit



Installation: Parallel Axes  
Gear Type: Racks & Pinions  
Used Product: SRO1.5-500  
PS1.5-20  
Weight: Approx. 1kg

Racks can be used to convert rotation to linear. They are used for elevating devices, etc.

### GCU-N Screw Gear Kit



Installation: Nonparallel and  
nonintersecting  
gears  
Gear Type: Screw Gears  
Gears: SN2.5-10R  
PN2.5-10R equivalent  
Gear Ratio: 1  
Weight: Approx. 1kg

Screw Gears are helical gears used in nonparallel and nonintersecting situations. Applications include devices like conveyers with light loads.

### GCU-W Worm Gear Pair Kit



Installation: Nonparallel and  
nonintersecting gears  
Gear Type: Worm Gear Pair  
Gears: SW2-R1  
PG2-20R1  
Gear Ratio: 20  
Weight: Approx. 1kg

Large deceleration can be made in one step. The worm gear cannot be driven by the worm wheel due to inherent self-locking.

Spur  
Gears

Helical  
Gears

Internal  
Gears

Racks

CP Racks &  
Pinions

Miter  
Gears

Bevel  
Gears

Screw  
Gears

Worm  
Gears

Gearboxes

Other  
Products



## System Configuration



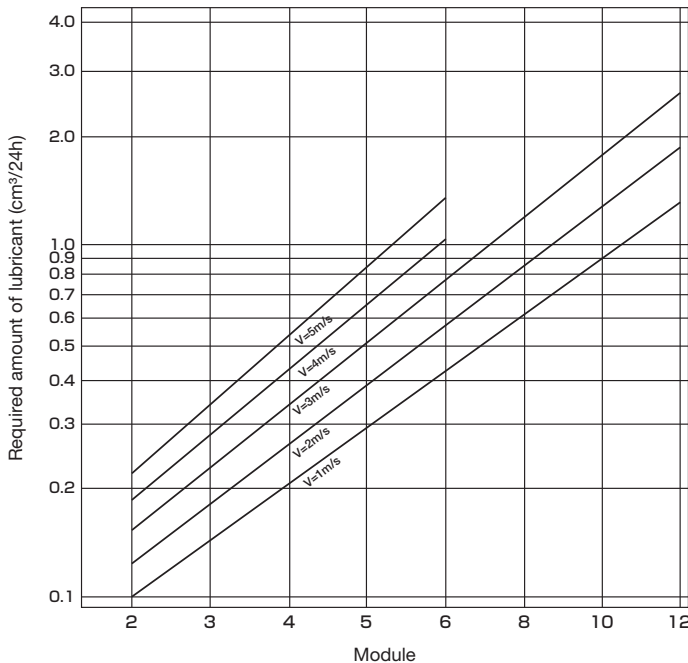
NO.	Product Name
1	Flex pump
2	Grease cartridge
3	Tube connector
4	Tube
5	Mounting shaft
6	Lubricating gear

## Features

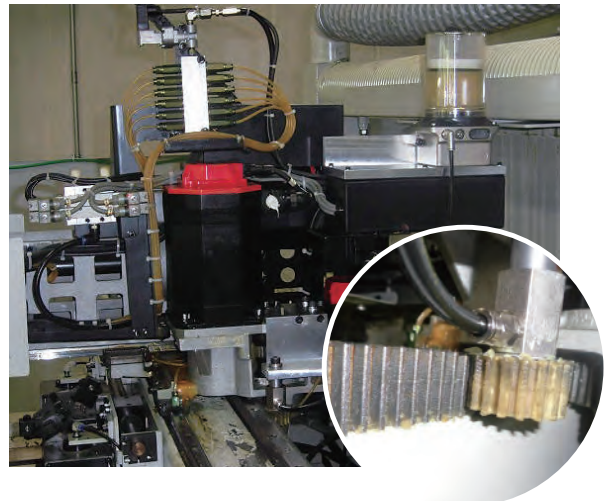
- Ideal lubrication system for racks & pinions used in open environments.
- A small amount of grease extruded from the pump is automatically supplied through the lubricating gear.
- The amount of lubricant\* can be adjusted according to the application.
- If pump errors are detected, an error signal is emitted.
- Grease is applied by a polyurethane lubricating gear to form a uniform lubricating film.
- Grease up to consistency No. 2 can be used regardless of the manufacturer.
- Special grease GC-F01 does not drip or pollute the machine.
- Optimized lubricant improves the durability of racks & pinions and reduces the maintenance costs.

\* Please use the required amount of lubricant in Table 1 as a guide depending on the module of the product used and the peripheral speed (m/s).

Table 1. Required amount of lubricant



## Application Examples



Flex pump

FP401

CE Mark compatible product.

24 VDC automatic time controlled lubrication pump (1-port type)



- \* A tube connector (right angle type) and power cable (5m) are included.
- \* Secondary operations cannot be performed. Do not disassemble or modify the product.

Flex pump

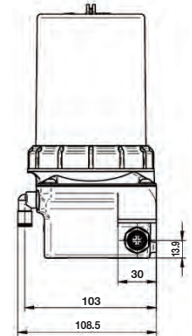
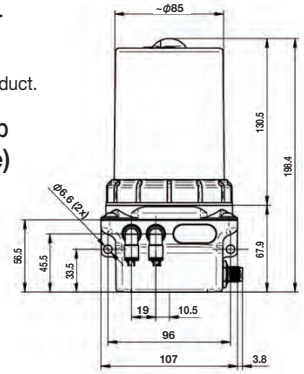
FP402

CE Mark compatible product.

24 VDC automatic time controlled lubrication pump (2-port type)



- \* A tube connector (right angle type) and power cable (5m) are included.
- \* Secondary operations cannot be performed. Do not disassemble or modify the product.



Flex pump

FP400B (Made to Order) M

CE Mark compatible product.

6 V battery automatic time controlled lubrication pump (1-port type)



- \* A tube connector (right angle type) and power cable (5m) are included.
- \* Secondary operations cannot be performed. Do not disassemble or modify the product.

Specifications	
Dimensions (W x H x D)	Max: 111 x 200 x 108mm
Weight (no lubricant)	1130g
Operation method	Piston pump type
Lubricating oil amount	400cm <sup>3</sup>
Minimum lubricant supply amount	0.15cm <sup>3</sup>
Operating pressure	Up to 70 bar
Lubricant	Grease of consistency up to NLGI No. 2
Operating temperature	-15 to 60°C
Operating voltage	24 VDC (±5%) (battery type is 6V)
Consumption voltage (24 VDC)	I <sub>max</sub> ≤ 300mA
Mounting direction	Omni-directional mounting available * Vertical direction is recommended
Control device	Built-in, electronic type
Pressure monitor	Built-in, electronic type
Lubricant level monitor	Built-in, lead contact type
Error detection	Grease shortage / back pressure increase / battery level decrease
Dustproof/waterproof class	IEC Standard IP54

Grease cartridge

GC-F01

Special grease that contains additives considering the optimum adhesion to metal surfaces. Ideal for racks & pinions used in high-temperature and high-load environments.



(Empty cartridge GC-0)

Specifications	
Consistency number	No. 1
Dropping point	220°C
Operating temperature range	-30 to 150°C
Withstand pressure load	4800N
Internal capacity	400cm <sup>3</sup>

Tube

T-6x4-5  
T-6x4-10

This tube has excellent pressure resistance, elasticity, restoring force and bending strength. GC-F01 grease is provided before shipment.



Specifications		
Product Name	Material	Outer diameter x Inner diameter x Length
T-6x4-5	Polyamide 6	6mm×4mm×5m
T-6x4-10		6mm×4mm×10m

Tube connector

TCS/TCR

A tube connector with hex socket has high fluidity.

■ Straight Type



- TCS-M6
- TCS-M10
- TCS-G1/8

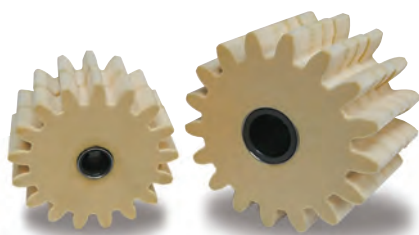
■ Right Angle Type



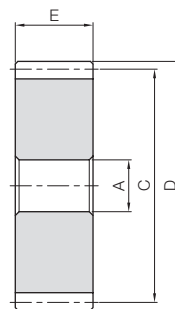
- TCR-M6
- TCR-M10
- TCR-G1/8

Specifications	
Material	CW614N (brass)
Surface treatment	Nickel plated
Operating pressure	Up to 80 bar
Operating temperature	-30 to 100°C

Note: Catalog codes M6, M10 and G1/8 are the screw sizes. Please select according to the mounting shaft.



Specifications	
Gear teeth	Standard full depth
Pressure angle	20°
Material	Polyurethane foam



S5

Catalog Number	Module	No. of teeth	Shape	Bore				Mounting shaft to be set
				A	C	D	E	
<b>PUS1.5-24</b>	<b>m1.5</b>	24	S5	12	36	39	15	MAS1.5 or MAR1.5
<b>PUS2-17</b>	<b>m2</b>				34	38	20	MAS2 or MAR2
<b>PUS2.5-17</b>	<b>m2.5</b>				42.5	47.5	24	MAS2.5 or MAR2.5
<b>PUS3-17</b>	<b>m3</b>				51	57	30	MAS3 or MAR3
<b>PUS4-17</b>	<b>m4</b>				68	76	40	MAS4 or MAR4
<b>PUS5-17</b>	<b>m5</b>				85	95	50	MAS5 or MAR5
<b>PUS6-17</b>	<b>m6</b>	17	S5	20	102	114	60	MAS6 or MAR6
<b>PUS8-17 (made to order)</b>	<b>m8</b>				136	152	80	MAS8 or MAR8
<b>PUS10-17 (made to order)</b>	<b>m10</b>				170	190	100	MAS10 or MAR10

Catalog Number	Pitch mm (Module)	No. of teeth	Shape	Bore				Mounting shaft to be set
				A	C	D	E	
<b>PUSCP5-24</b>	<b>CP5 (1.5915)</b>	24	S5	12	38.2	41.4	15	MAS1.5 or MAR1.5
<b>PUSCP10-15</b>	<b>CP10 (3.1831)</b>	15			47.7	54.1	30	MAS3 or MAR3

[Application Hints]

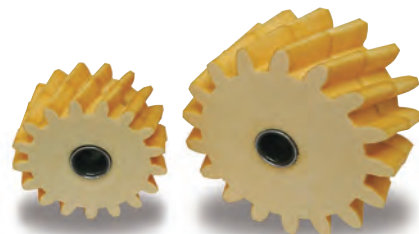
- ① Can be used in temperatures from -30 to 150 °C.
- ② Setting is possible to either a rack or a pinion, but we recommend a pinion.
- ③ Avoid operations with high load until grease is applied to the gear teeth of the rack gears and pinion gears.

[Precautions for Made to Order Products]

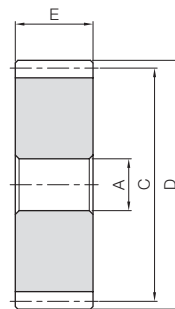
- ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.



# PUH Lubricated Helical Gears



Specifications	
Reference section of gear	Normal plane
Gear teeth	Standard full depth
Pressure angle	20°
Helix angle	19°31'41"
Material	Polyurethane foam



S5

Catalog Number	Module	No. of teeth	Direction of spiral	Shape	Bore				Mounting shaft to be set
					A	C	D	E	
<b>PUH1.5-24R</b> <b>PUH1.5-24L</b>	<b>m1.5</b>	24	R L	S5	12	38.2	41.2	15	MAS1.5 or MAR1.5
<b>PUH2-17R</b> <b>PUH2-17L</b>	<b>m2</b>		R L			36.1	40.1	20	MAS2 or MAR2
<b>PUH3-17R</b> <b>PUH3-17L</b>	<b>m3</b>		R L			54.1	60.1	30	MAS3 or MAR3
<b>PUH4-17R</b> <b>PUH4-17L</b>	<b>m4</b>		R L			72.2	80.2	40	MAS4 or MAR4
<b>PUH5-17R</b> <b>PUH5-17L</b>	<b>m5</b>		R L			90.2	100.2	50	MAS5 or MAR5
<b>PUH6-17R</b> <b>PUH6-17L</b>	<b>m6</b>		R L			108.2	120.2	60	MAS6 or MAR6
<b>PUH8-17R (made to order)</b> <b>PUH8-17L (made to order)</b>	<b>m8</b>	17	R L	S5	20	144.3	160.3	80	MAS8 or MAR8
<b>PUH10-17R (made to order)</b> <b>PUH10-17L (made to order)</b>	<b>m10</b>		R L			180.4	200.4	100	MAS10 or MAR10

[Application Hints]

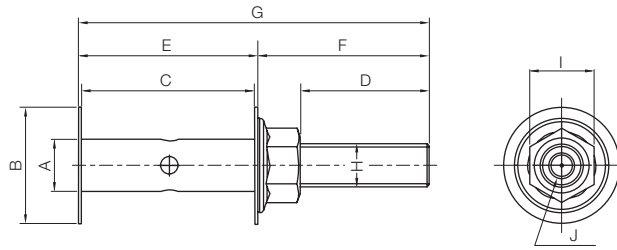
- ① Can be used in temperatures from -30 to 150 °C.
- ② Setting is possible to either a rack or a pinion, but we recommend a pinion.
- ③ Avoid operations with high load until grease is applied to the gear teeth of the rack gears and pinion gears.

[Precautions for Made to Order Products]

- ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.



## ● Straight Type



Set Example

Surface treatment: Nickel plated

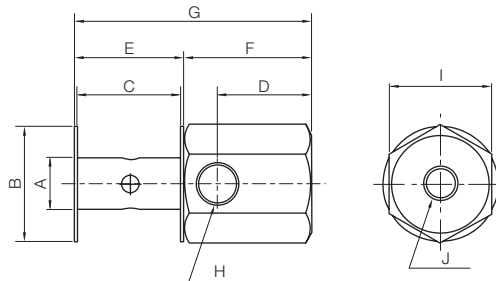
Catalog Number	A	B	C	D	E	F	G	H	I	J	
										Connected screw	
MAS1.5	12	27	15.2	34.2	16.4	44	60.4	M10	15	M6	
MAS2			20.2		21.4						
MAS2.5			24.2	29.8	25.4		39.8				65.2
MAS3			30.2		31.4						71.2
MAS4			40.2		41.4						81.2
MAS5	20	60	50.2	49.1	51.4	64.9	116.3	M16	24	M10 (Fine)	
MAS6			60.2		61.4		126.3				
MAS8 (made to order)	20	60	80.2	49.1	81.4	64.9	146.3	M16	24	M10 (Fine)	
MAS10 (made to order)		100	100.2		101.4		166.3				

[Application Hints] ① Tube connector is not included.

② Due to specification changes, the connecting screw G1/8" has been changed to M10 (fine).

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

## ● Right Angle Type



Set Example

Surface treatment: Nickel plated

Catalog Number	A	B	C	D	E	F	G	H	I	J
								Connected screw		
MAR1.5	12	27	15.2	22	16.4	30	46.4	M10 (Fine)	24	M8x10
MAR2			20.2		21.4					
MAR2.5			24.2	25.4	55.4					
MAR3			30.2	31.4	61.4					
MAR4			40.2	41.4	71.4					
MAR5	20	60	50.2	22	51.4	30	81.4	M10 (Fine)	24	M8x10
MAR6			60.2		61.4		91.4			
MAR8 (made to order)	20	60	80.2	22	81.4	30	111.4	M10 (Fine)	24	M8x10
MAR10 (made to order)		100	100.2		101.4		131.4			

[Application Hints] ① Tube connector is not included.

② Due to specification changes, the connecting screw G1/8" has been changed to M10 (fine).

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