Moment of Inertia of KBX Bevel Box

Unit: kg·m²

Model	Item	Pinion Axis (X)	Gear Axis (Y)
L	KBX-101L	4.45×10^{-6}	4.45×10^{-6}
	KBX-102L	2.16×10^{-6}	8.65×10^{-6}
	KBX-151L	5.30×10^{-5}	5.30×10^{-5}
	KBX-152L	3.65×10^{-5}	1.47×10^{-4}
	KBX-201L	1.79×10^{-4}	1.79×10^{-4}
	KBX-202L	7.85×10^{-5}	3.15×10^{-4}
T	KBX-101T	4.75×10^{-6}	4.75×10^{-6}
	KBX-102T	2.23×10^{-6}	8.93×10^{-6}
	KBX-151T	5.60×10^{-5}	5.60×10^{-5}
	KBX-152T	3.37×10^{-5}	1.50×10^{-4}
	KBX-201T	1.94×10^{-4}	1.94×10^{-4}
	KBX-202T	8.20×10^{-5}	3.28×10^{-4}

[NOTES] Consider the indicated moment of inertia as reference values.

Moment of Inertia of CBX Bevel Box

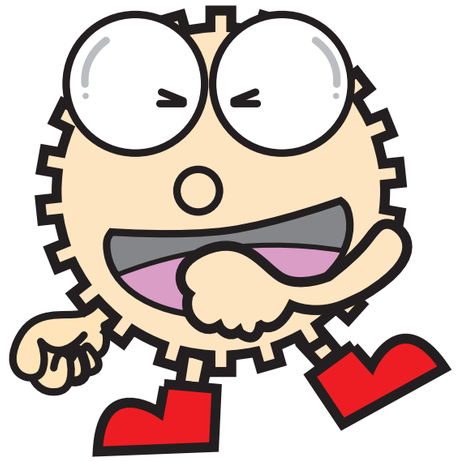
Unit: kg·m²

Model	Item	Pinion Axis (X)	Gear Axis (Y)
L	CBX-191L	4.00×10^{-4}	4.00×10^{-4}
	CBX-192L	1.86×10^{-4}	7.43×10^{-4}
	CBX-251L	2.48×10^{-3}	2.48×10^{-3}
	CBX-252L	1.03×10^{-3}	4.13×10^{-3}
	CBX-321L	4.00×10^{-3}	4.00×10^{-3}
	CBX-322L	1.29×10^{-3}	5.18×10^{-3}
	CBX-401L	8.95×10^{-3}	8.95×10^{-3}
	CBX-402L	3.83×10^{-3}	1.53×10^{-2}
T	CBX-191T	4.05×10^{-4}	4.05×10^{-4}
	CBX-192T	1.87×10^{-4}	7.48×10^{-4}
	CBX-251T	2.50×10^{-3}	2.50×10^{-3}
	CBX-252T	1.04×10^{-3}	4.15×10^{-3}
	CBX-321T	4.08×10^{-3}	4.08×10^{-3}
	CBX-322T	1.31×10^{-3}	5.25×10^{-3}
	CBX-401T	9.20×10^{-3}	9.20×10^{-3}
	CBX-402T	3.88×10^{-3}	1.55×10^{-2}

[NOTES] Consider the indicated moment of inertia as reference values.

SRT/SRT-C Ratchets & Pawls — J — Material: S45C — P2.09~12.57 Page 474
SRTB/SRT-C Ratchets & Pawls — M — Material: S45C — P2.09~12.57 Page 476
GC/GC-I Gear Couplings — J — Material: S45C — *m*2, 2.5 Page 478
SV/SVI Involute Spline Shafts, Spline Bushings — Material: S45C — *m*1.667 Page 480
HEPCO Ring Rail Gears, Accessories — M — Material: - — Page 482
GCU Gear Assembly Kit — Material: - — Page 490
Rack & Pinion Lubrication System — Additional M — Material: - — Page 492
Racks & Pinions Aluminum Frame Transport Device — 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

- S: Material (S45C)
- V: Type (Involute Spline Shafts)
- 20: Outer diameter (20mm)
- 200: Total Length (200mm)

Material

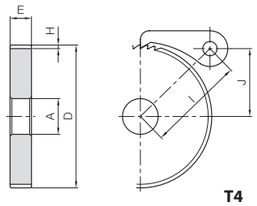
S	S45C

Type

RT	Ratchets
GC	Gear Couplings
V	Involute Spline

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

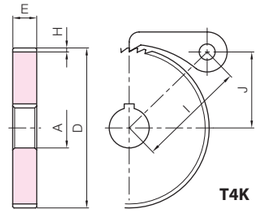
■ Characteristics of Pawls and Ratchets

- 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 A	Hub dia. B	Outside dia. D	Face width E	Hub width F	Total length G	Tooth height H	Center distance I	Mounting height J	Allowable torque (N·m) Bending strength	Allowable torque (kgf·m) Bending strength	Weight (kg)
SRT2/3-50	**2.09**	50	T4	10	—	33.3	6	—	6	1	33.84	15.67	3.07	0.31	0.035
SRT2/3-60		60		10		40					35.51	19	4.10	0.42	0.053
SRT2/3-80		80		12		53.3					39.48	25.67	6.00	0.61	0.096
SRT2/3-100		100		12		66.6					44.11	32.33	8.24	0.84	0.15
SRT1-50	**3.14**	50		12	—	50	12	—	12	1.6	45.48	23.4	14.7	1.50	0.16
SRT1-60		60		15		60					48.24	28.4	19.5	1.99	0.24
SRT1-80		80		15		80					54.73	38.4	29.4	3.00	0.44
SRT1-90		90		15		90					58.35	43.4	34.5	3.52	0.56
SRT1-100		100		15		100					62.16	48.4	39.4	4.02	0.70
SRT2-30	**6.28**	30		15	—	60	15	—	15	3.1	61.23	26.9	29.0	2.96	0.28
SRT2-40		40				80					66.23	36.9	49.2	5.02	0.53
SRT2-50		50				100					72.28	46.9	70.8	7.22	0.85
SRT2-60		60				120					79.14	56.9	94.3	9.61	1.24
SRT3-30	**9.42**	30		15	—	90	20	—	20	5	76.32	40	92.6	9.44	0.86
SRT3-40		40		20		120					85.15	55	158	16.1	1.58
SRT3-50		50		20		150					95.52	70	229	23.3	2.54
SRT4-30	**12.57**	30		20	—	120	25	—	25	7.4	95.74	52.6	226	23.0	1.89
SRT4-40		40				160					108.03	72.6	385	39.3	3.53
SRT4-50		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.

J Series



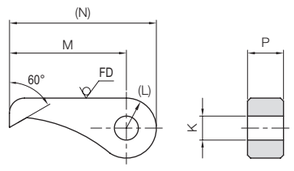
T4K

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	4×1.8		5×2.3				6×2.8				8×3.3			10×3.3		12×3.3	14×3.8	
Catalog Number	—																	
SRT2/3-50J BORE																		
SRT2/3-60 J BORE																		
SRT2/3-80 J BORE																		
SRT2/3-100 J BORE																		
SRT1-50 J BORE																		
SRT1-60 J BORE																		
SRT1-80 J BORE																		
SRT1-90 J BORE																		
SRT1-100 J BORE																		
SRT2-30 J BORE																		
SRT2-40 J BORE																		
SRT2-50 J BORE																		
SRT2-60 J BORE																		
SRT3-30 J BORE																		
SRT3-40 J BORE																		
SRT3-50 J BORE																		
SRT4-30 J BORE																		
SRT4-40 J BORE																		
SRT4-50 J BORE																		

[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 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.

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.

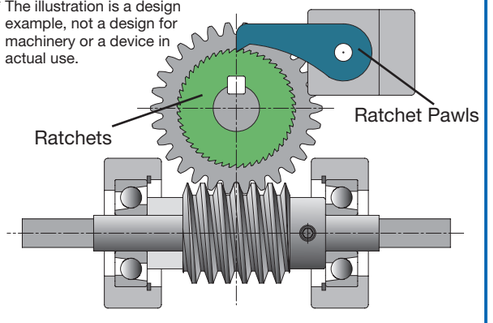
T5

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.

■ 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

σ_b : Bending stress → Assumed 225.55MPa (23kgf/mm^2)
b : Face width mm → Dimension Table ratchet face width E
e : Root length mm

$$\rightarrow e=h \times \tan\left(60\text{-}\frac{360}{\text{No. of teeth}}\right)$$ 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

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

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

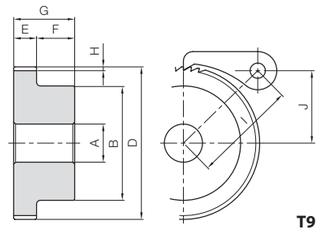
SRTB Pitch 2.09~12.57 Ratchets

Made to Order

M

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)		50		10	25	33.3				
SRTB2/3-60 (Made to Order)		60		10	30	40				
SRTB2/3-80 (Made to Order)	**2.09**	80		12	35	53.3	6	10	16	1
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)		50		12	35	50				
SRTB1-60 (Made to Order)		60		15	40	60				
SRTB1-80 (Made to Order)	**3.14**	80		15	50	80	12	12	24	1.6
SRTB1-90 (Made to Order)		90		15	50	90				
SRTB1-100 (Made to Order)		100		15	50	100				
SRTB2-30 (Made to Order)		30			50	60				
SRTB2-40 (Made to Order)	**6.28**	40		15	60	80	15	14	29	3.1
SRTB2-50 (Made to Order)		50			60	100				
SRTB2-60 (Made to Order)		60			65	120				
SRTB3-30 (Made to Order)		30		15	75	90				
SRTB3-40 (Made to Order)	**9.42**	40		20	80	120	20	16	36	5
SRTB3-50 (Made to Order)		50		20	85	150				
SRTB4-30 (Made to Order)		30			90	120				
SRTB4-40 (Made to Order)	**12.57**	40		20	90	160	25	18	43	7.4
SRTB4-50 (Made to Order)		50			100	200				

T9

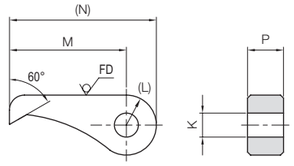
Center distance	Mounting height	Allowable torque (N-m)	Allowable torque (kgf-m)	Weight	Catalog Number
I	J	Bending strength	Bending strength	(kg)	
33.84	15.67	3.07	0.31	0.067	**SRTB2/3-50** (Made to Order)
35.51	19	4.10	0.42	0.10	**SRTB2/3-60** (Made to Order)
39.48	25.67	6.00	0.61	0.16	**SRTB2/3-80** (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)

[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.

SRT-C Pitch 2.09~12.57 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.

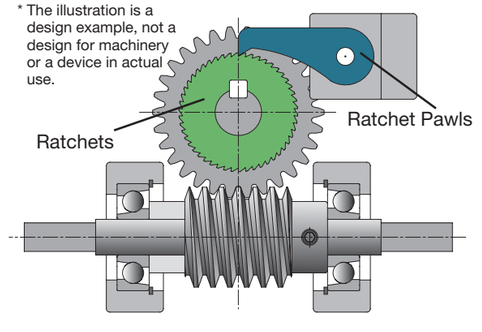
T5

Catalog Number	Shape	K	(L)	M	(N)	P	Weight (kg)
SRT2/3-C		5	(8)	30	(38)	6	0.020
SRT1-C		8	(10)	39	(49)	12	0.057
SRT2-C	T5	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.

■ 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.

$$T=F_b \cdot r_f$$

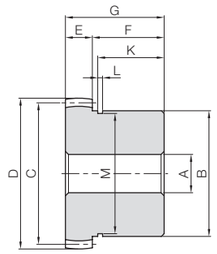
Where
σ_b : Bending stress → Assumed 225.55MPa (23kgf/mm^2)
b : Face width mm → Dimension Table ratchet face width E
e : Root length mm
→ $e=h \times \tan\left(60 - \frac{360}{\text{No. of teeth}}\right)$ is the calculation
h : Depth of teeth mm → Dimension Table ratchet tooth depth H
S_F : Safety factor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

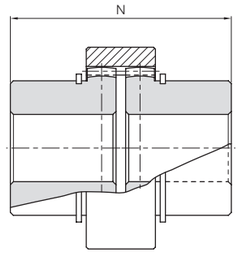
Gear Couplings (Inner Hubs)

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).



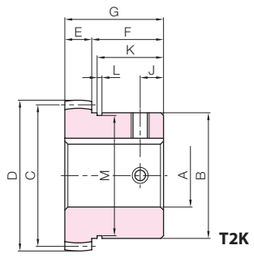
T2



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 bolt length	Backlash (mm)	Weight (kg)
				A_{H8}	B	C	D	E	F	G	K	L	M	N		
GC1-12S	***m*2**	25	T2	12	45	50	54	10	25	35	23	1.95	42.5	73	0.40~0.60	0.43
GC2-20S	***m*2**	40		20	70	80	84	15	40	55	37	2.7	67	115		1.66
GC3-20S	***m*2.5**	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.

J Series



T2K

Catalog Number	J
GC1-12SJ BORE	10
GC2-20SJ BORE	13
GC3-20SJ BORE	20

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

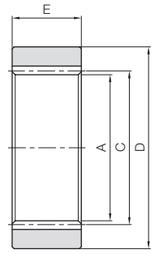
Bore H7	* The product shapes of J Series items are identified by background color.																	
Keyway Js9	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50	
Screw size	4×1.8	5×2.3				6×2.8				8×3.3			10×3.3		12×3.3	14×3.8		
Catalog Number	M4					M5				M6			M8			M10		
GC1-12SJ BORE	*																	
GC2-20SJ BORE								*										
GC3-20SJ BORE								*										

[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.

Gear Couplings (Outer Rings)

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		
GC1-I	***m*2**	25	T1	46	50	68	25	0.40~0.60	0.33
GC2-I	***m*2**	40		76	80	105	36		1.03
GC3-I	***m*2.5**	42		100	105	145	48		2.96

■ 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-I (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.

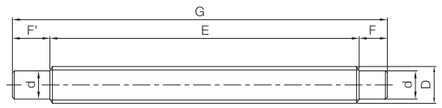
$$T=\frac{F\cdot d}{2000}$$

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^2)
S : Safety Factor → Optionally set
d : Bore size (mm) → Bore size A of the inner hub of the GC Gear Coupling

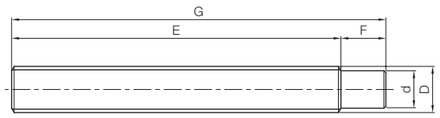
Caution: Safety Factor (S) must be set at a value between 1 to 3, depending on the load types or the coupling displacement.

SV Module 1.667 Involute Spline Shafts

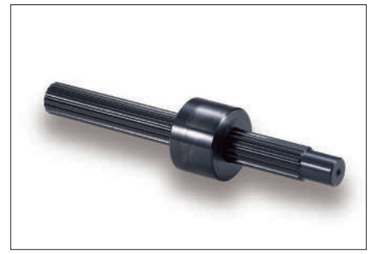
Specifications	
Gear teeth	Stub teeth
Pressure angle	20°
Material	S45C
Heat treatment	Thermal refined
Tooth hardness	200 to 270HB
Surface treatment	Black oxide coating



TA



TB



Catalog Number	Module	No. of teeth	Shape	Outside dia. D	Hub dia. d $^{+0.25}_{+0.15}$	Face width E	Hub width (left) F'	Hub width (right) F	Total length G	Backlash (mm)	Weight (kg)
SV17-170	***m*1.667**	8	TA	16.67	13	135	20	15	170	0.06~0.15	0.26
SV20-200		10	TA	19.67	15	165	20	15	200		0.43
SV25-250		13	TB	24.67	20	220	—	30	250		0.88
SV30-300		16	TB	29.67	25	270	—	30	300		1.55

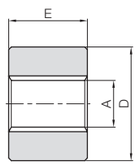
[Caution on Secondary Operations] ① When modifying the SV involute spline shaft with secondary operations, be careful not to crush the teeth or bend the shaft.

■ 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.

SVI Module 1.667 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. A	Outside dia. D	Face width E	Allowable torque (N·m) Surface durability	Allowable torque (kgf·m) Surface durability	Backlash (mm)	Weight (kg)
SVI17-40	***m*1.667**	8	T1	13.7	40	25	33.2	3.38	0.06~0.15	0.21
SVI20-45		10		16.7	45	30	59.6	6.08		0.31
SVI25-55		13		21.7	55	38	125	12.8		0.57
SVI30-65		16		26.7	65	45	222	22.6		0.93

[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.

■ 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.

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

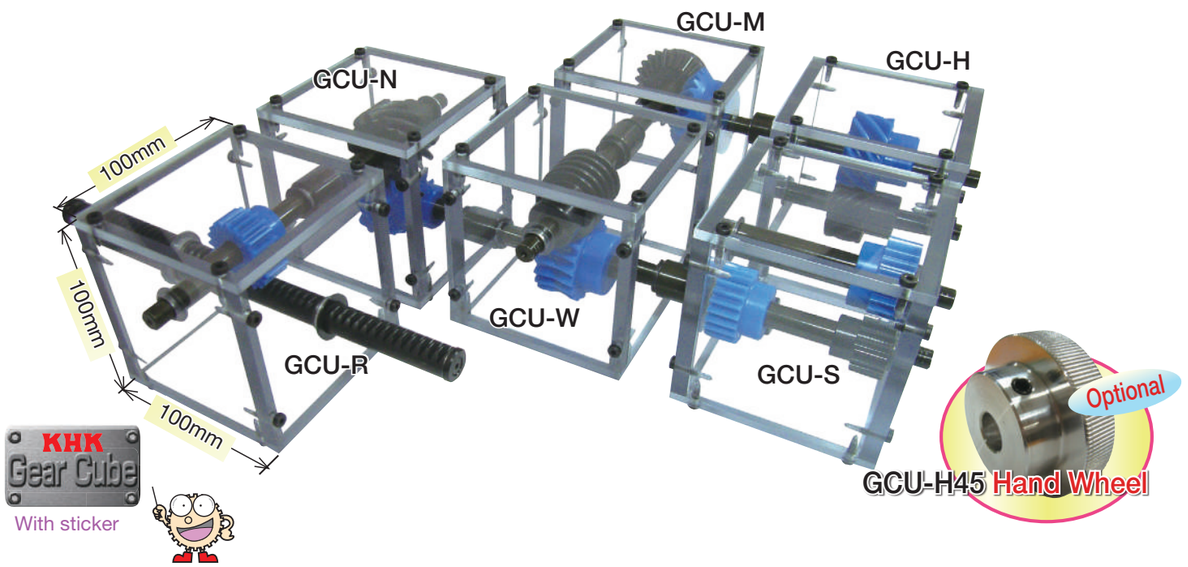
And the formula of allowable torque T (N·m) of spline with respect to the surface strength.

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

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

η : 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
σ : Allowable surface stress of spline → 19.61MPa (2kgf/mm^2) (assumed)
d_w : Contact diameter (mm) → Tip diameter of spline shaft D - h_w

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



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

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

■ Features of GearCube

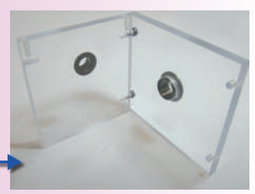
- Assembly kits can be connected flexibly.
- The frame is made of polycarbonate with high transparency and impact resistance.
- Gears combine MC nylon and metal, making lubrication unnecessary.
- An instruction manual is included, enabling easily assembly by anyone.

Assembly Procedure

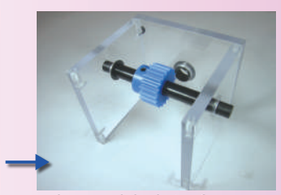
Details are available on the Japanese website

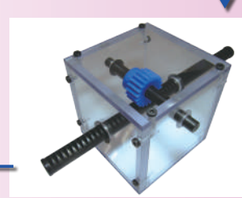
Photo shows GCU-R

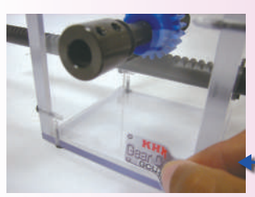

Remove protective sheet


Insert bushing


Set in shaft


Assemble into frame


Screw-fasten


Adhere the sticker and it's complete!

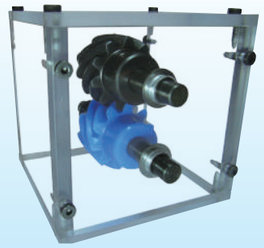
All six types of assembly kit and input/output shafts can be connected.

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

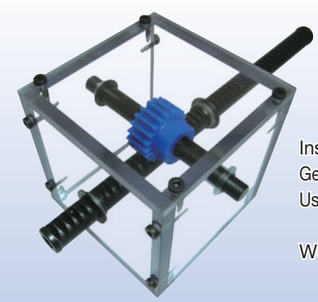
Helical gears have more strength than spur gears of the same dimensions and have the advantage of being less noisy.

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.

Rack & Pinion Lubrication System *Additional* M

System Configuration

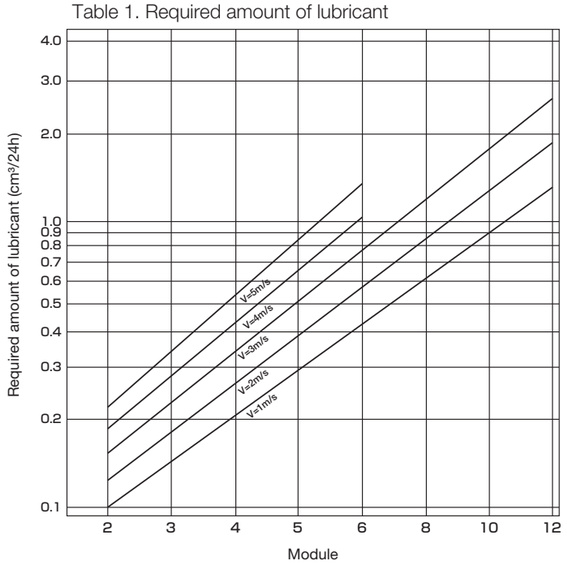
NO.	Product Name
1	Flex pump
2	Grease cartridge
3	Tube connector
4	Tube
5	Mounting shaft
6	Lubricating gear

Features

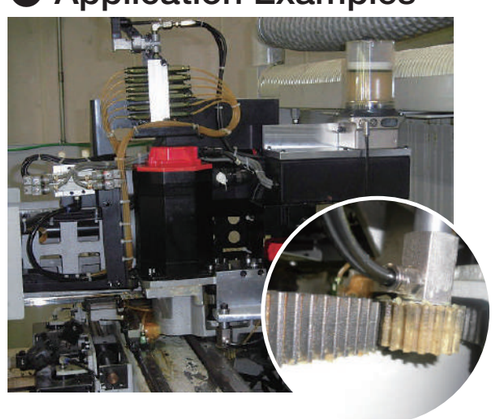
- Ideal lubrication system for racks & pinions used in open environments.
- A small amount of grease extruded from the pump is automatically supplied through the lubricating gear.
- The amount of lubricant* can be adjusted according to the application.
- If pump errors are detected, an error signal is 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)

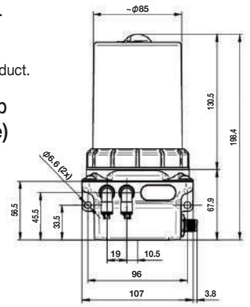
* A tube connector (right angle type) and power cable (5m) are included.
* Secondary operations cannot be performed. Do not disassemble or modify the product.

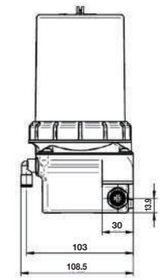
Flex pump FP402

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	400cm³
Minimum lubricant supply amount	0.15cm³
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_{max}≤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	400cm³

Tube T-6×4-5 T-6×4-10

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-6×4-5	Polyamide 6	6mm×4mm×5m
T-6×4-10		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

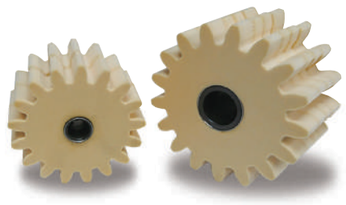
Note: Catalog codes M6, M10 and G1/8 are the screw sizes. Please select according to the mounting shaft.

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

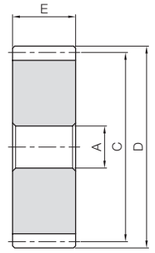
PUS/PUSCP lubricated spur gear

Module 1.5~10 Circular pitch 5, 10

M *Lubrication Spur Gears*



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



S5

Catalog Number	Module	No. of teeth	Shape	Bore A	Pitch dia. C	Outside dia. D	Face width E	Mounting shaft to be set
PUS1.5-24	***m*1.5**	24	S5	12	36	39	15	MAS1.5 or MAR1.5
PUS2-17	***m*2**	17			34	38	20	MAS2 or MAR2
PUS2.5-17	***m*2.5**				42.5	47.5	24	MAS2.5 or MAR2.5
PUS3-17	***m*3**				51	57	30	MAS3 or MAR3
PUS4-17	***m*4**				68	76	40	MAS4 or MAR4
PUS5-17	***m*5**			20	85	95	50	MAS5 or MAR5
PUS6-17	***m*6**				102	114	60	MAS6 or MAR6
PUS8-17 (made to order)	***m*8**	17	S5	20	136	152	80	MAS8 or MAR8
PUS10-17 (made to order)	***m*10**				170	190	100	MAS10 or MAR10

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

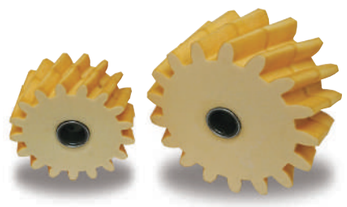
[Application Hints] ① Can be used in temperatures from -30 to 150 °C.
② Setting is possible to either a rack or a pinion, but we recommend a pinion.
③ Avoid operations with high load until grease is applied to the gear teeth of the rack gears and pinion gears.

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

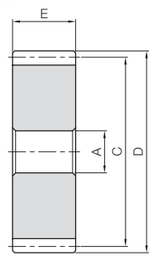
PUH Lubricated Helical Gears

Module 1.5~10

M *Lubrication 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 A	Pitch dia. C	Outside dia. D	Face width E	Mounting shaft to be set
PUH1.5-24R **PUH1.5-24L**	***m*1.5**	24	R L	S5	12	38.2	41.2	15	MAS1.5 or MAR1.5
PUH2-17R **PUH2-17L**	***m*2**	17	R L			36.1	40.1	20	MAS2 or MAR2
PUH3-17R **PUH3-17L**	***m*3**		R L			54.1	60.1	30	MAS3 or MAR3
PUH4-17R **PUH4-17L**	***m*4**		R L			72.2	80.2	40	MAS4 or MAR4
PUH5-17R **PUH5-17L**	***m*5**		R L		20	90.2	100.2	50	MAS5 or MAR5
PUH6-17R **PUH6-17L**	***m*6**		R L			108.2	120.2	60	MAS6 or MAR6
PUH8-17R **PUH8-17L** (made to order)	***m*8**	17	R L	S5	20	144.3	160.3	80	MAS8 or MAR8
PUH10-17R **PUH10-17L** (made to order)	***m*10**		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.

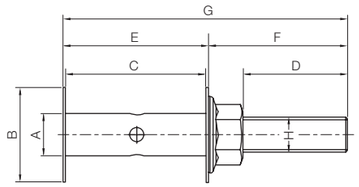
[Precautions for Made to Order Products] ① Prices and lead times for Made to Order products require separate estimates. Contact your dealer.

DLS Schmiersysteme

Mounting Shaft for Lubricated Gears

M *Mounting Axes*

● Straight Type



Set Example

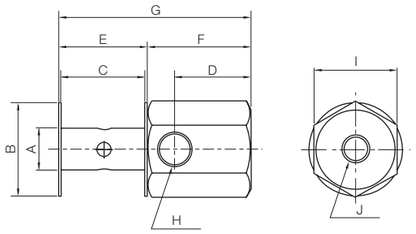
Surface treatment: Nickel plated

Catalog Number	A	B	C	D	E	F	G	H Connected screw	I	J Connected screw
MAS1.5	12	27	15.2	29.8	16.4	39.8	60.4	M10	15	M6
MAS2			20.2		21.4		61.2			
MAS2.5			24.2		25.4		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 Connected screw	I	J
MAR1.5	12	27	15.2	22	16.4	30	46.4	M10 (Fine)	24	M8×10
MAR2			20.2		21.4		51.4			
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		51.4		81.4			
MAR6			60.2		61.4		91.4			
MAR8 (made to order)	20	60	80.2	22	81.4	30	111.4	M10 (Fine)	24	M8×10
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.