

# Bevel Gears

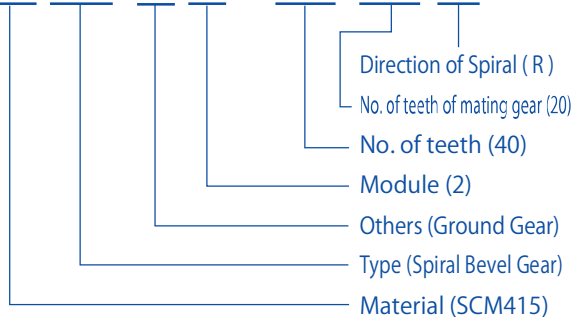
<b>MHP</b> <b>High-Ratio Hypoid Gears</b> Gear Ratio 15 ~ 60  Precision: 3 Material: SCM415 Heat Treatment: Tooth area carburized m1, 1.5 Page 308	<b>MBSG</b> <b>Ground Spiral Bevel Gears</b> Gear Ratio 2  Precision: 1 Material: SCM415 Heat Treatment: Tooth area carburized m2 ~ 4 Page 310	<b>SBSG</b> <b>Ground Spiral Bevel Gears</b> Gear Ratio 1.5 ~ 3  Precision: 2 Material: S45C Heat Treatment: Gear teeth induction hardened m2 ~ 4 Page 312	<b>MBSA/MBSB</b> <b>Finished Bore Spiral Bevel Gears</b> Gear Ratio 1.5 ~ 3  Precision: 4 Material: SCM415 Heat Treatment: Carburized m2 ~ 6 Page 314	<b>SBS</b> <b>Spiral Bevel Gears</b> Gear Ratio 1.5 ~ 4  Precision: 4 Material: S45C Heat Treatment: Gear teeth induction hardened m1 ~ 5 Page 318	<b>SBZG</b> <b>Ground Zerol Bevel Gears</b> Gear Ratio 1.5 ~ 2  Precision: 2 Material: S45C Heat Treatment: Gear teeth induction hardened m2 ~ 3 Page 322
<b>SB</b> <b>Steel Bevel Gears</b> Gear Ratio 1.5 ~ 4  Precision: 3 Material: S45C m1 ~ 6 Page 324	<b>SBY</b> <b>Steel Bevel Gears</b> Gear Ratio 2 ~ 4  Precision: 3 Material: S45C m5 ~ 8 Page 324	<b>SB</b> <b>Steel Bevel Gears &amp; Pinion Shafts</b> Gear Ratio 5  Precision: 3 Material: S45C m1.5 ~ 3 Page 328	<b>SUB</b> <b>Stainless Steel Bevel Gears</b> Gear Ratio 1.5 ~ 3  Precision: 3 Material: SUS303 m1.5 ~ 3 Page 330	<b>PB</b> <b>Plastic Bevel Gears</b> Gear Ratio 1.5 ~ 3  Precision: 4 Material: MC901 m1 ~ 3 Page 332	<b>DB</b> <b>Injection Molded Bevel Gears</b> Gear Ratio 2  Precision: 6 Material: Duracon (M90-44) m0.5 ~ 1 Page 334
<b>BB</b> <b>Sintered Metal Bushings</b>  Material: Oil free copper alloy φ5 ~ 6 Page 334	<b>Nissei KSP</b> <b>Ground Spiral Bevel Gears</b> Gear Ratio 1.5 ~ 2  Precision: 0 Material: SCM415 Heat Treatment: Tooth area carburized m1.5 ~ 5 Page 336				

## 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) Bevel Gears

**M B S G 2 - 40 20 R**



**Material**  
 S S45C  
 M SCM415  
 SU SUS303  
 P MC901  
 D DURACON

**Type**  
 B Straight Bevel Gears  
 BS Spiral Bevel Gears  
 HP High Ratio Hypoid Gears

**Other Information**  
 G Ground Gears

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pairs

Bevel Gearboxes

Other Products

## Characteristics



KHK stock bevel gears are available in two types, spiral and straight tooth, in gear ratios of 1.5 through 5, and are offered in a large variety of modules, numbers of teeth, materials and styles. The following table lists the main features for easy selection.

Type	Catalog No.	Module	Gear Ratio	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704 : 1978	Secondary Operations	Features
Hybrid Gear	<b>MHP</b>	1, 1.5	15 ~ 60	SCM415	Carburized Note 1	Cut	3	△	High speed reduction ratio, high efficiency, high rigidity and compact gear assembly.
Spiral bevel gears	<b>MBSG</b>	2 ~ 4	2	SCM415	Carburized Note 1	Ground	1	△	High strength, abrasion-resistant and compact for high-speed & torque use.
	<b>SBSG</b>	2 ~ 4	1.5 ~ 3	S45C	Gear teeth induction hardened	Ground	2	△	Reasonably priced ground gear, yet remachinable except for the gear teeth.
	<b>KSP</b>	1.5 ~ 5	1.5, 2	SCM415	Carburized Note 1	Ground	0	△	Superior performance with regard to high speed, low noise, and low vibration.
	<b>MBSA · MBSB</b>	2 ~ 6	1.5 ~ 3	SCM415	Carburized	Cut	4	×	Ready to use without performing secondary operations. Strong and abrasion resistant.
	<b>SBS</b>	1 ~ 5	1.5 ~ 4	S45C	Gear teeth induction hardened	Cut	4	△	Large nos. of teeth and modules are offered in these affordable spiral bevel gears.
Zerol Gear	<b>SBZG</b>	2 ~ 3	1.5 ~ 2	S45C	Gear teeth induction hardened	Ground	2	△	A spiral bevel gears with a helix angle less than 10°. Receives forces from the same directions straight bevel gears receive and have excellent precision.
Straight bevel gears	<b>SB · SBY</b>	1 ~ 8	1.5 ~ 5	S45C	—	Cut	3	○	Popular series of straight bevel gears for many uses.
	<b>SUB</b>	1.5 ~ 3	1.5 ~ 3	SUS303	—	Cut	3	○	Suitable for food machinery due to SUS303's rust-resistant quality.
	<b>PB</b>	1 ~ 3	1.5 ~ 3	MC901	—	Cut	4	○	MC nylon products are light and can be used without lubricant.
	<b>DB</b>	0.5 ~ 1	2	Duracon (M90-44)	—	Injection Molded	6	△	Injection molded, mass-produced productions, suitable for office machines.

**(NOTE 1)** Although these are carburized products, secondary operations can be performed as the bore and the hub portions are masked during the carburization. However, as a precaution, high hardness (HRC40 at maximum) occurs in some cases.

○ Possible △ Partly possible  
× Not possible

## Application Examples



KHK stock bevel gears are used as gears for power transmission of intersecting axes in various devices.

### Differential Gear Mechanism Example



Image provided by: PK Design

### SHESCO 2WD Bike



SB Bevel Gears are used in the driving components in both the front and rear wheels

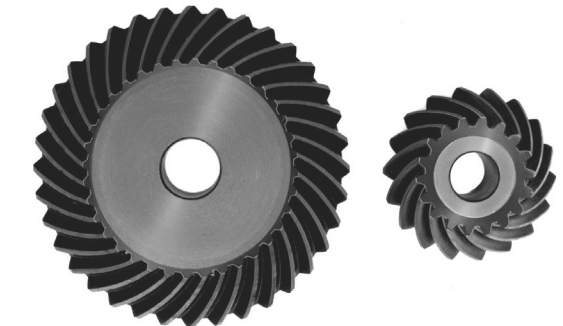
## Selection Hints



Please select the most suitable products by carefully considering the characteristics of items and contents of the product tables. It is also important to read all applicable "CAUTION" notes shown below before the final selection.

### 1. Caution in Selecting the Mating Gears

Basically, KHK stock bevel gears should be selected as shown in the catalog in pairs (e.g. MBSG2-4020R should mate with MBSG2-2040L). But, for straight tooth bevel gears, there is some interchangeability with different series. For plastic bevel gears, we recommend metal mating gears for good heat conductivity.



Right (R)

Left (L)

#### Selection Chart for Straight Bevel Gears (○ Allowable × Not allowable)

Pinion \ Gear	SB	SUB	PB	DB
SB	○	○	○	×
SUB	○	○	○	×
PB	○	○	○	×
DB	×	×	×	○

#### Zerol Bevel Gears

SBZG products are not interchangeable with products in other series.

### 2. Caution in Selecting Gears Based on Gear Strength

The gear strength values shown in the product pages were computed by assuming a certain application environment. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. To learn more about strength calculation, please refer to the technical information contained in the "Bending Strength of Bevel Gears" section on Page 87, and the "Surface Durability of Bevel Gears" section on Page 92.

#### Calculation assumptions for Bending Strength of Gears

Item \ Catalog No.	MBSG MBSA MBSB	SBSG SBZG SBS	SB SBY	SUB	PB	DB
Formula <sup>NOTE 1</sup>	Formula of bevel gears on bending strength(JGMA403-01)				The Lewis formula	
No. of teeth of mating gear	No. of teeth of the mating gear of the set				—	
Rotational Speed	100rpm (600rpm for MBSG, SBSG and SBZG)				100rpm	
Design Life (Durability)	Over 10 <sup>7</sup> cycles				—	
Impact from motor	Uniform load				Allowable bending stress (kgf/mm <sup>2</sup> )	
Impact from load	Uniform load				1.15 (40°C with No Lubrication)	m 0.5 4.0 m 0.8 4.0 m 1.0 3.5 (40°C with Grease Lubrication)
Direction of load	Bidirectional					
Allowable bending stress at root, $\sigma_{Ftm}$ (kgf/mm <sup>2</sup> ) <sup>NOTE 2</sup>	47	21	19 (24.5)	10.5		
Safety factor $K_R$	1.2					

#### Calculation assumptions for Surface Durability (Except those in common with bending strength)

Item \ Catalog No.	MBSG MBSA MBSB	SBSG SBZG SBS	SB SBY	SUB
Formula <sup>NOTE 1</sup>	Formula of bevel gears on surface durability (JGMA404-01)			
Kinematic viscosity of lubricant	100cSt (50°C)			
Gear support	Shafts & gear box have normal stiffness, and gears are supported on one end			
Allowable Hertz stress $\sigma_{Hlim}$ (kgf/mm <sup>2</sup> )	166	90	49 (62.5)	41.3
Safety factor $C_R$	1.15			

**(NOTE 1)** The gear strength formula is based on JGMA (Japanese Gear Manufacturers Association) specifications. "MC Nylon Technical Data" by Nippon Polypenco Limited and "Duracon Gear Data" by Polyplastic Co. Also, the units (rpm) of number of rotations and unit (kgf/mm<sup>2</sup>) of stress are adjusted to the units needed in the formula.

**(NOTE 2)** The allowable bending stress at the root  $\sigma_{Ftm}$  is calculated from JGMA403-01, and set to 2/3 of the value in the consideration of the use of planetary-, idler-, or other gear systems, loaded in both directions.

**(NOTE 3)** Since SB Bevel Pinion Shafts are thermally refined, the allowable tooth-root bending stress and allowable hertz stress are the value shown in parentheses.

## Application Hints

In order to use KHK stock gears safely, carefully read the Application Hints before proceeding. If there are questions or you require clarifications, please contact our technical department or your nearest distributor.

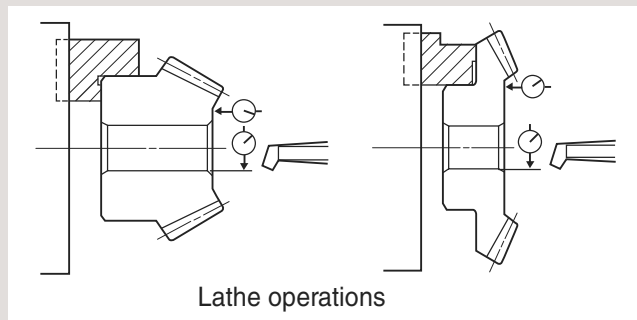
TEL: 81-48-254-1744 FAX: 81-48-254-1765 E-mail: info@khkgears.net

### 1. Cautions on Handling

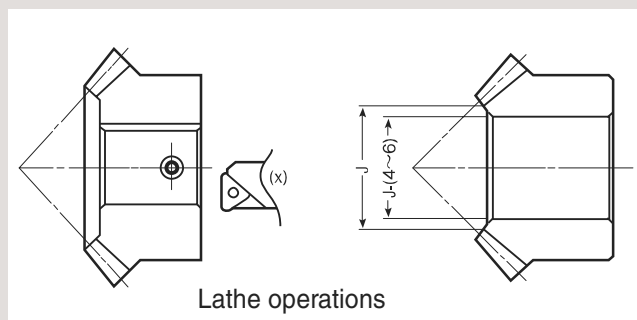
- ① KHK products are packaged one by one to prevent scratches and dents, but if you find issues such as rust, scratches, or dents when the product is removed from the box after purchase, please contact the supplier.
- ② Depending on the handling method, the product may become deformed or damaged. Resin gears and ring gears deform particularly easily, so please handle with care.

### 2. Caution on Performing Secondary Operations

- ① If you are re-boring, it is important to pay special attention to locating the center in order to avoid runout.
- ② The reference datum for gear cutting is the bore. Therefore, it is best to use the bore for locating the center. If it is too difficult to do for small bores, the alternative is to use one spot on the bore and the runout of the side surface.
- ③ If reworking using scroll chucks, we recommend the use of new or rebored jaws for improved precision. Please exercise caution not to crush the teeth by applying too much pressure. Any scarring will cause noise during operation.

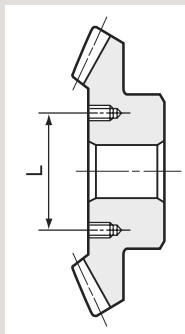


- ④ For items with induction hardened teeth, such as SBSG and SBS series, the hardness is high near the tooth root. When machining the front end, the machined area should be 4 to 6mm smaller than the dimension, J.



- ⑤ For tapping and keyway operations, see the examples given in "1. Caution on Performing Secondary Operations" in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentrations, always leave radii on corners.
- ⑥ PB plastic bevel gears are susceptible to changes due to temperature and humidity. Dimensions may change between, during, and after re-machining operations.

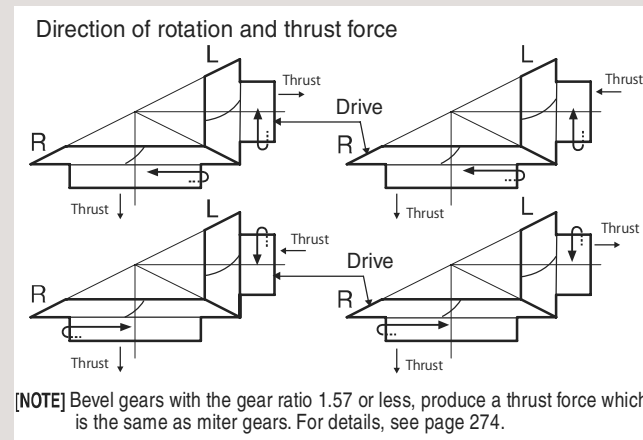
- ⑦ When heat treating S45C products, it is possible to get thermal stress cracks. It is best to subject them to penetrant inspection afterwards. While the teeth strength may increase four fold, the precision of the gear will drop approximately one grade.
- ⑧ For the handling conveniences, the SB and SBY series listed below have the tapped holes (180° apart, 2 places) on the holding surface.



Catalog No.	L (mm)	Tap Size
SB6-4515	130	M10 deep 20
SBY8-4020	160	M10 deep 20
SBY8-4515	210	M10 deep 20
SBY5-6015	160	M10 deep 20
SBY6-6015	220	M10 deep 20

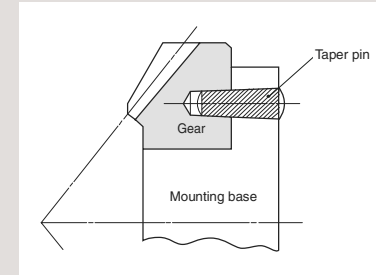
### 3. Points of Caution in Assembling

- ① Since bevel gears are cone shaped, they produce axial thrust forces. Especially for spiral bevel gears, the directions of thrust changes with the hand of spiral and the direction of rotation. This is illustrated below. The bearings must be selected properly to be able to handle these thrust forces. For details, please refer to separate technical reference book, section of "Gear Forces" (Page 107).



- ② If a bevel gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend mounting bevel gears as close to the bearings as possible. This is especially important since most bevel gears are supported on one end. The bending of shafts will cause abnormal noise and wear, and may even cause fatigue failure of the shafts. Both shafts and bearings must be designed with sufficient strength.
- ③ Due to the thrust load of bevel gears, the gears, shafts and bearings have the tendency to loosen up during operation. Bevel gears should be fastened to the shaft with keys and set screws, taper pins, step shafts, etc.

- ④ When installing MBSA or MBSB spiral bevel gears produced in B7 style (ring type), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only.



- ⑤ KHK stock bevel gears are designed such that, when assembled according to the specified mounting distance with a tolerance of H7 to H8, the normal direction backlash shown in the table is obtained. Mounting distance error, offset error and shaft angle error must be minimized to avoid excessive noise and wear. For various conditions of teeth contact, please see the following illustrations, "Correct Tooth Contact" and "Incorrect Tooth Contact".

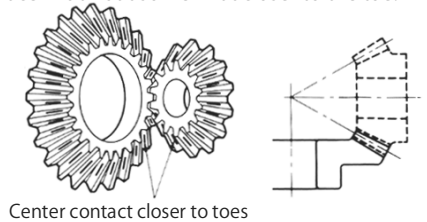
Gear Ratio (Reduction Ratio)	Normal direction Backlash	Travel in axial direction	
		Pinions	Gears
1.5	$j_n$	$0.81 \times j_n$	$1.22 \times j_n$
2		$0.65 \times j_n$	$1.31 \times j_n$
2.5		$0.54 \times j_n$	$1.36 \times j_n$
3		$0.46 \times j_n$	$1.39 \times j_n$
4		$0.35 \times j_n$	$1.42 \times j_n$
5		$0.29 \times j_n$	$1.43 \times j_n$
15 or more		$1.4 \times j_n \div \text{Gear Ratio}$	$1.40 \times j_n$

### 4. Cautions on Starting

- ① Check the following items before starting.
  - Are the gears installed securely?
  - Is there uneven tooth contact?
  - Is there adequate backlash? Be sure to avoid zero-backlash.
  - Has proper lubrication been supplied?
- ② If gears are exposed, be sure to attach a safety cover to ensure safety. Also, be careful not to touch rotating gears.
- ③ Gears can be lubricated with the "grease lubrication method", "splash lubrication method (oil bath method)," or "forced lubrication method (circulation lubrication method)". For initial operation, the lubricant may deteriorate markedly, so check the condition of the lubricant after starting. For more technical information, please see the section "Gear Lubrication" (Page 112) of our technical reference book.
- ④ If there is any abnormality such as noise or vibration during startup, check the gears and assembly condition. "High gear accuracy", "smooth gear teeth surface" and "correct tooth contact" are some of the measures against gear noise. For more technical information, please see the section "Gear Noise and Countermeasures" (Page 119) of our technical reference book.

#### Correct Tooth Contact

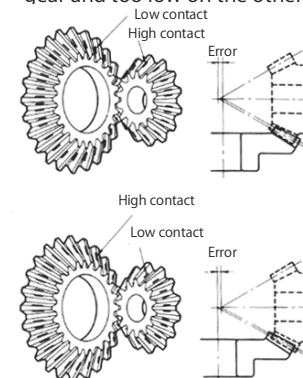
- When assembled correctly, the contact will occur on both gears in the middle of the flank and center of face width but somewhat closer to the toe.



#### Incorrect Tooth Contact

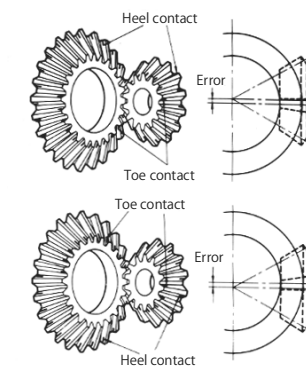
##### Mounting Distance Error

- When the mounting distance of the pinion is incorrect, the contact will occur too high on the flank on one gear and too low on the other.



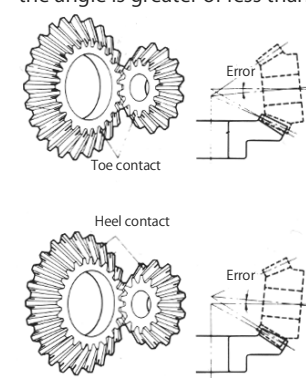
##### Offset Error

- When the pinion shaft is offset, the contact surface is near the toe of one gear and near the heel of the other.



##### Shaft Angle Error

- When there is an angular error of shafts, the gears will contact at the toes or heels depending on whether the angle is greater or less than 90°.



Features of MHP High Ratio Hypoid Gears

A pair of MHP high-ratio hypoid gears are able to produce an amazing reduction of speed of 60:1 in one stage.

1. Total-cost reduction

The MHP provides a compact gearing body replacing several stages of reduction gears. This reduces the cost sharply.

2. High efficiency

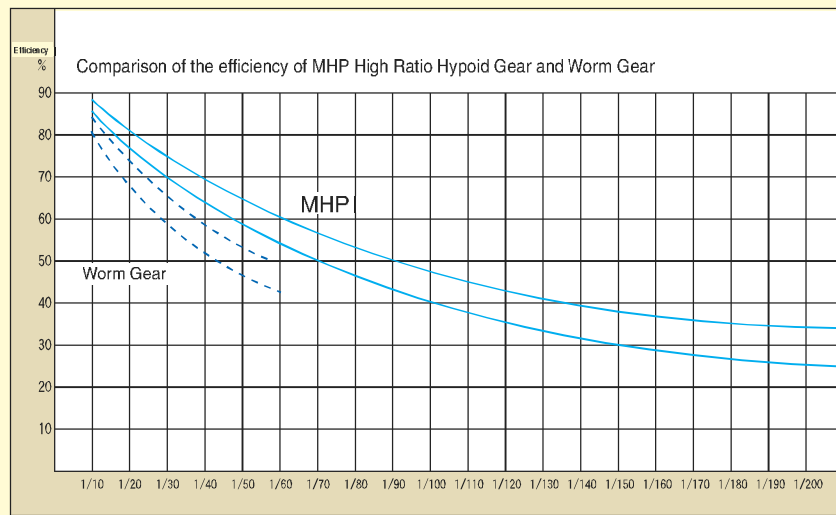
Compared to worm gear drives, the MHP has less sliding contact. The resulting higher efficiency allows the use of smaller motors (See the graph on the right).

3. High rigidity

The carburized hypoid gears lead to smaller size than comparable worms gears.

4. Compact gear assembly

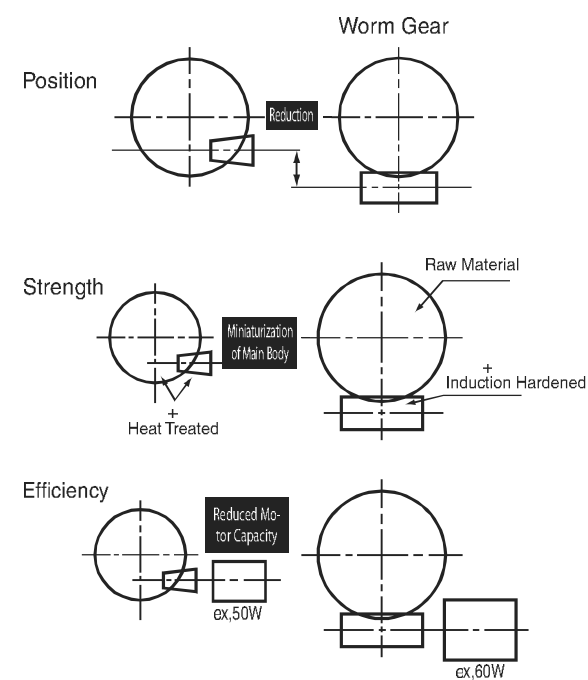
The size of the gear housing is nearly the same as outer diameter of the large gear. (See the diagrams below)



How to determine the radial and thrust loads

Before using the MHP high-ratio hypoid gears, be sure to confirm the direction of radial and thrust loads. Following equations are used to compute these loads. The radial and thrust load coefficients are given on the product pages.

Comparison of MHP and Worm Gear



Radial load calculation

$W_{RP}$  : Radial load on the pinion or L(N)  
 $W_{RP} = W_{KP} \times T_G \times \frac{n}{z}$   
 $W_{KP}$  : Radial load coefficient of pinion or L (given on the product pages)  
 $T_G$  : Torque of gear or R(N·m)  
 $n$  : Number of teeth of pinion or L  
 $z$  : Number of teeth of gear or R

$W_{RG}$  : Radial load on the gear or R(N)  
 $W_{RG} = W_{KG} \times T_G$   
 $W_{KG}$  : Radial load coefficient of gear or R (given on the product pages)  
 $T_G$  : Torque of gear or R(N·m)

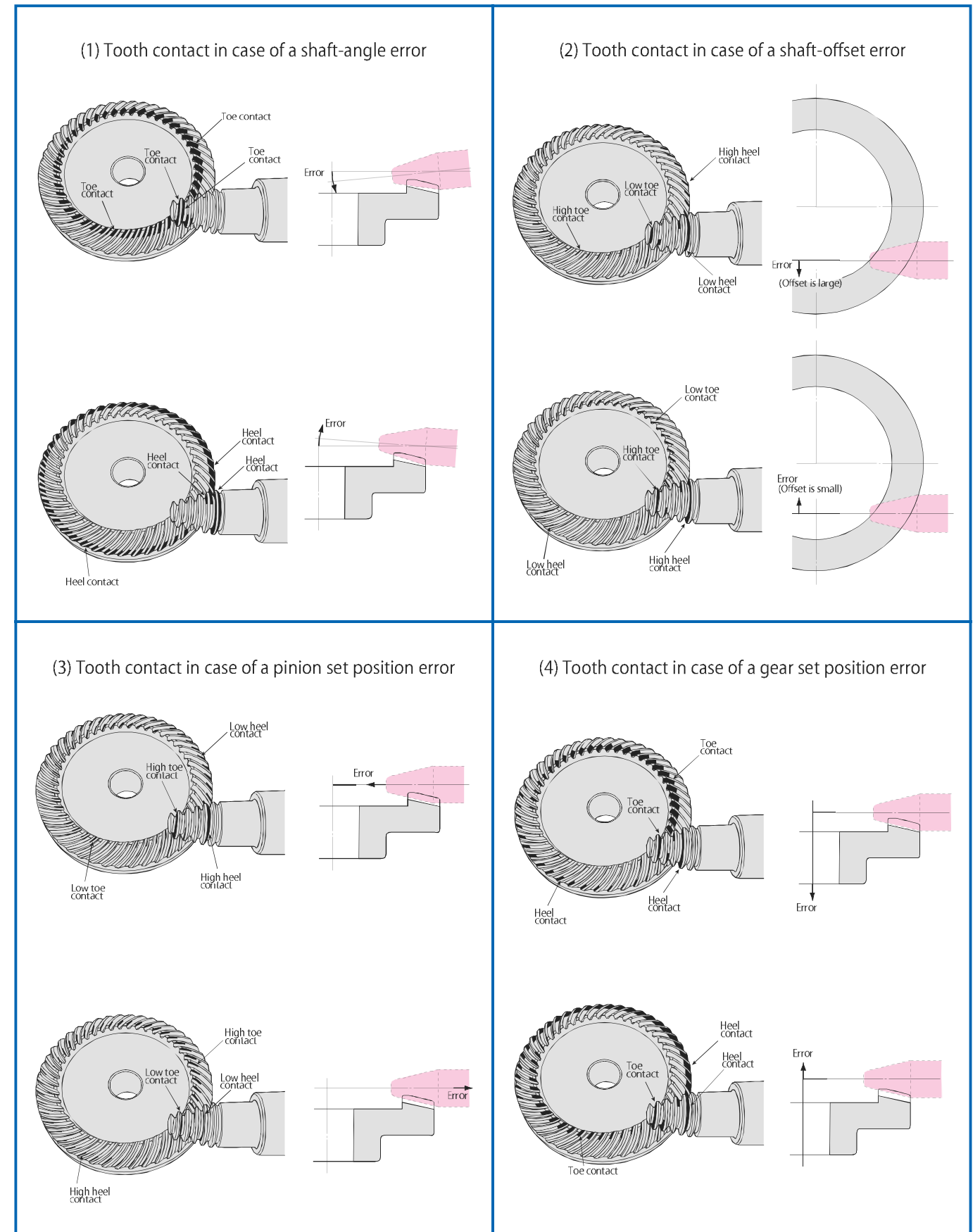
Thrust load calculation

$W_{XP}$  : Thrust load on the pinion or L(N)  
 $W_{XP} = W_{MP} \times T_G \times \frac{n}{z}$   
 $W_{MP}$  : Thrust load coefficient of pinion or L (given on the product page)  
 $T_G$  : Torque of gear or R(N·m)  
 $n$  : Number of teeth of pinion or L  
 $z$  : Number of teeth of gear or R

$W_{XG}$  : Thrust load of gear or R(N)  
 $W_{XG} = W_{MG} \times T_G$   
 $W_{MG}$  : Thrust load coefficient of gear or R (given on the product pages)  
 $T_G$  : Torque of gear or R(N·m)

Variations in tooth contact due to poor alignment of gears

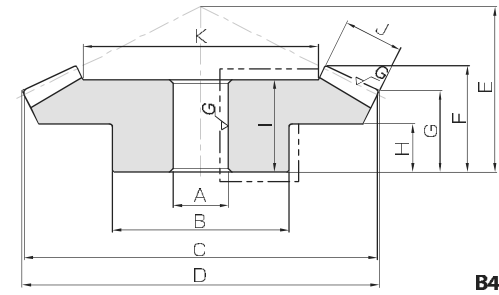
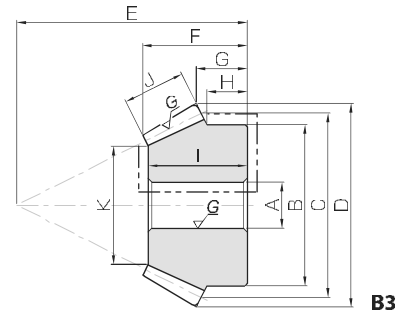
If the gear engagement position is out of the normal position, variations in tooth contact, as illustrated below, may appear.







Specifications	
Precision grade	JIS B 1704:1978 grade 1
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Carburizing
Tooth hardness	55 ~ 60HRC



Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	
						A <sub>H7</sub>	B						
MBSG2-4020R	2	m2	40	R	B4	15	45	80	81.1	45	31.78	26.1	
MBSG2-2040L			20	L	B3	12	35	40	44.1	55	28.16	16.02	
MBSG2.5-4020R			m2.5	40	R	B4	16	55	100	101.29	50	33.35	26.29
MBSG2.5-2040L				20	L	B3	12	43	50	55.12	65	31.01	16.28
MBSG3-4020R		m3	40	R	B4	20	65	120	121.57	60	39.81	31.57	
MBSG3-2040L			20	L	B3	16	52	60	66.03	80	38.9	21.51	
MBSG4-4020R		m4	40	R	B4	25	80	160	162.06	75	48.27	37.06	
MBSG4-2040L			20	L	B3	20	70	80	88.46	100	45.38	22.12	

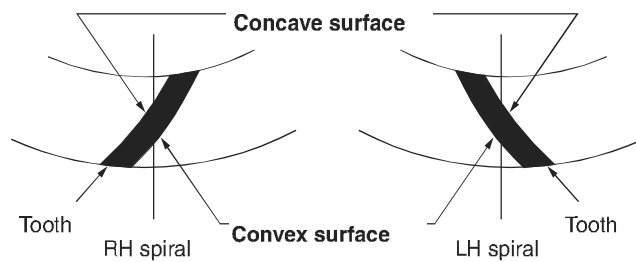
- [Caution on Product Characteristics]
- Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - These gears produce axial thrust forces. Please see Page 304 for more details.

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
18	29	14	52.7	56.5	5.76	9.61	0.04~0.10	0.57	MBSG2-4020R	
13.75	27		25.39	28.2	2.88	4.80				
16	30	17	66.99	108	11.0	18.7	0.05~0.11	1.01	MBSG2.5-4020R	
13.25	29		29.97	54.1	5.52	9.37				
20	35	20	80.28	185	18.8	32.4	0.06~0.12	1.64	MBSG3-4020R	
18	36.5		36.56	92.4	9.42	16.2				
22	42	27	106.63	441	45.0	79.3	0.09~0.15	3.55	MBSG4-4020R	
17.5	43		51.25	221	22.5	39.7				

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
  - In the illustration, the area surrounded with ---- line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

### Contact Surface of Spiral Bevel Gears

Tooth surfaces of spiral gears have concave and convex sides. Changes in the rotational direction of the driving gear alter the contact surface accordingly. The illustrations show the top view of RH and LH Spiral Gears, and the tables on the right explain the different contact surface depending on the situation.



### RH Spiral as a driving gear

Rotating Direction of Driving Gear <small>Note 1</small>	Contact Surface	
	Driving Gear (RH Spiral)	Driving Gear (LH Spiral)
RH Rotation (Clockwise)	Convex Surface	Concave Surface
LH rotation (counterclockwise)	Concave Surface	Convex Surface

### LH Spiral as a driving gear

Rotating Direction of Driving Gear <small>Note 1</small>	Contact Surface	
	Driving Gear (LH Spiral)	Driving Gear (RH Spiral)
RH Rotation (Clockwise)	Concave Surface	Convex Surface
LH Rotation (Counterclockwise)	Convex Surface	Concave Surface

[Note 1] Rotation directions given in the tables are for viewing the gears from the hub side.

### Forces Acting on Spiral Bevel Gear Teeth

For a spiral bevel gear with shaft angle  $\Sigma=90^\circ$ , pressure angle  $\alpha_n=20^\circ$ , and spiral angle  $\beta_m=35^\circ$ , the tables below show the axial thrust force  $F_x$  and the radial force  $F_r$  when a tangential force  $F_t$  of 100 units is applied at the center of face width. For details, please refer to separate technical reference book, section of "Features of Tooth Surface Contact" (Page 107).

The tables show the values of  $\frac{\text{Axial Thrust Force } F_x}{\text{Radial Force } F_r}$

#### (1) Forces acting upon pinion

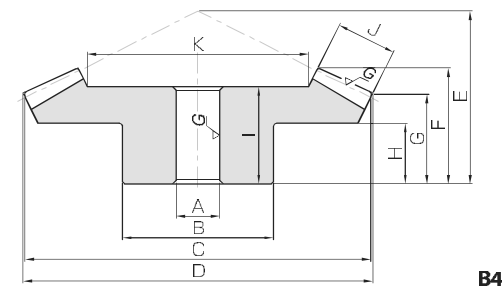
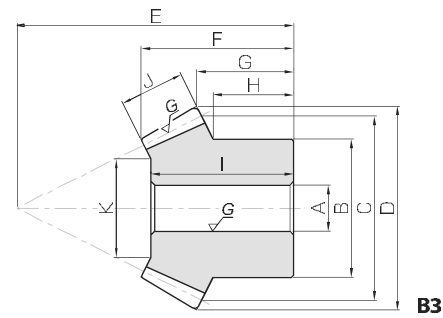
Contact Surface	Gear Ratio $z_2/z_1$						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9	82.9	82.5	81.5	80.5	78.7	77.4
	-18.1	-1.9	8.4	15.2	20.0	26.1	29.8
Convex Surface	-18.1	-33.6	-42.8	-48.5	-52.4	-57.2	-59.9
	80.9	75.8	71.1	67.3	64.3	60.1	57.3

#### (2) Forces acting upon gear

Contact Surface	Gear Ratio $z_2/z_1$						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9	75.8	71.1	67.3	64.3	60.1	57.3
	-18.1	-33.6	-42.8	-48.5	-52.4	-57.2	-59.9
Convex Surface	-18.1	-1.9	8.4	15.2	20.0	26.1	29.8
	80.9	82.9	82.5	81.5	80.5	78.7	77.4



Specifications	
Precision grade	JIS B 1704: 1978 grade 2
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ~ 60HRC
Surface treatment	Black oxide coated except for ground part



Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						AH7	B					
SBSG2-3020R SBSG2-2030L	1.5	m2	30	R	B4	12	35	60	61.6	40	26.6	21.2
			20	L	B3	10	30	40	43.55	45	24.91	16.18
		m2.5	30	R	B4	15	45	75	77.09	50	33.86	26.56
			20	L	B3	12	40	50	54.43	55	30.88	18.98
		m3	30	R	B4	16	50	90	92.21	55	35.34	26.66
			20	L	B3	16	45	60	65.58	70	40.17	26.86
SBSG4-3020R SBSG4-2030L	1.5	m4	30	R	B4	20	70	120	122.85	75	47.49	37.14
			20	L	B3	20	60	80	87.34	90	48.17	32.45
SBSG2-4020R SBSG2-2040L	2	m2	40	R	B4	12	40	80	80.99	45	32.26	25.99
			20	L	B3	12	32	40	44.10	60	34.04	21.02
		m2.5	40	R	B4	15	50	100	101.27	55	39.65	31.27
			20	L	B3	12	40	50	55.21	75	43.61	26.30
		m3	40	R	B4	20	60	120	121.48	65	45.76	36.48
			20	L	B3	16	50	60	66.06	90	50.63	31.52
SBSG4-4020R SBSG4-2040L	2	m4	40	R	B4	20	70	160	162.07	80	53.69	42.07
			20	L	B3	20	60	80	88.50	120	66.24	42.12
SBSG2-4515R SBSG2-1545L	3	m2	45	R	B4	12	40	90	90.67	40	30.29	26.01
			15	L	B3	10	24	30	34.78	60	29.66	15.80
		m2.5	45	R	B4	15	50	112.5	113.32	50	38.25	32.47
			15	L	B3	12	30	37.5	43.36	75	38.27	19.73
		m3	45	R	B4	20	60	135	135.99	55	40.59	33.98
			15	L	B3	15	38	45	52.08	90	44.98	23.68

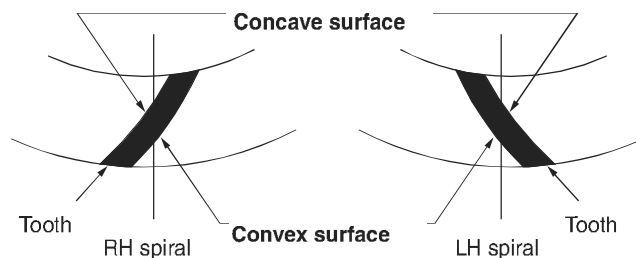
Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
15	23	11	37.56	14.1	14.2	1.44	1.44	0.05~0.11	0.26	SBSG2-3020R SBSG2-2030L
11.67	22	11	21.34	9.61	9.44	0.98	0.96			
18	30	15	45.61	29.0	29.7	2.96	3.03	0.06~0.12	0.55	SBSG2.5-3020R SBSG2.5-2030L
14.17	28	15	27.42	19.8	19.8	2.02	2.02			
17	31	17	57.14	48.4	50.4	4.94	5.14	0.07~0.13	0.82	SBSG3-3020R SBSG3-2030L
20	37	17	34.71	33.1	33.6	3.37	3.42			
25	40	20	78.59	106	113	10.8	11.5	0.10~0.16	1.90	SBSG4-3020R SBSG4-2030L
23.33	43	20	46.89	72.2	75.3	7.36	7.68			
18	27	15	48.46	25.5	26.7	2.60	2.73	0.05~0.11	0.51	SBSG2-4020R SBSG2-2040L
18	32	15	20.92	12.8	13.4	1.30	1.36			
20	34	20	59.28	51.7	55.1	5.27	5.62	0.06~0.12	1.06	SBSG2.5-4020R SBSG2.5-2040L
22.5	40	20	20.56	25.9	27.6	2.64	2.81			
24	38	22	73.81	84.8	91.9	8.65	9.38	0.07~0.13	1.67	SBSG3-4020R SBSG3-2040L
27.5	47	22	29.61	42.5	46.0	4.33	4.69			
28	45	28	102.39	195	217	19.9	22.2	0.10~0.16	3.33	SBSG4-4020R SBSG4-2040L
35	62	28	42.78	97.9	109	9.98	11.1			
17	26	15	59.04	34.8	28.1	3.55	2.87	0.05~0.11	0.60	SBSG2-4515R SBSG2-1545L
14	29	15	19.13	11.2	9.38	1.14	0.96			
22	35	20	72.84	59.0	48.3	6.01	4.93	0.06~0.12	1.21	SBSG2.5-4515R SBSG2.5-1545L
17.5	37	20	20.51	18.9	16.1	1.93	1.64			
20	35	23	88.18	99.3	82.5	10.1	8.41	0.07~0.13	1.99	SBSG3-4515R SBSG3-1545L
21.33	44	23	28.54	31.8	27.5	3.24	2.80			

[Caution on Product Characteristics] ① Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.  
 ② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.  
 ③ These gears produce axial thrust forces. Please see Page 304 for more details.

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.  
 ② 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).

### Contact Surface of Spiral Bevel Gears

Tooth surfaces of spiral gears have concave and convex sides. Changes in the rotational direction of the driving gear alter the contact surface accordingly. The illustrations show the top view of RH and LH Spiral Gears, and the tables on the right explain the different contact surface depending on the situation.



### RH Spiral as a driving gear

Rotating Direction of Driving Gear <sup>Note 1</sup>	Contact Surface	
	Driving Gear (RH Spiral)	Driving Gear (LH Spiral)
RH Rotation (Clockwise)	Convex Surface	Concave Surface
LH rotation (counterclockwise)	Concave Surface	Convex Surface

### LH Spiral as a driving gear

Rotating Direction of Driving Gear <sup>Note 1</sup>	Contact Surface	
	Driving Gear (LH Spiral)	Driving Gear (RH Spiral)
RH Rotation (Clockwise)	Concave Surface	Convex Surface
LH Rotation (Counterclockwise)	Convex Surface	Concave Surface

[Note 1] Rotation directions given in the tables are for viewing the gears from the hub side.

### Forces Acting on Spiral Bevel Gear Teeth

For a spiral bevel gear with shaft angle  $\Sigma=90^\circ$ , pressure angle  $\alpha_n=20^\circ$ , and spiral angle  $\beta_m=35^\circ$ , the tables below show the axial thrust force  $F_x$  and the radial force  $F_r$  when a tangential force  $F_t$  of 100 units is applied at the center of face width. For details, please refer to separate technical reference book, section of "Features of Tooth Surface Contact" (Page 107).

The tables show the values of  $\frac{\text{Axial Thrust Force } F_x}{\text{Radial Force } F_r}$

#### (1) Forces acting upon pinion

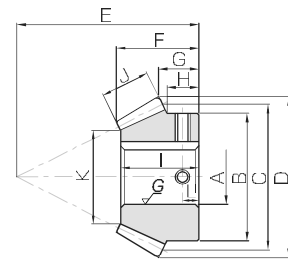
Contact Surface	Gear Ratio $z_2/z_1$						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9	82.9	82.5	81.5	80.5	78.7	77.4
	-18.1	-1.9	8.4	15.2	20.0	26.1	29.8
Convex Surface	-18.1	-33.6	-42.8	-48.5	-52.4	-57.2	-59.9
	80.9	75.8	71.1	67.3	64.3	60.1	57.3

#### (2) Forces acting upon gear

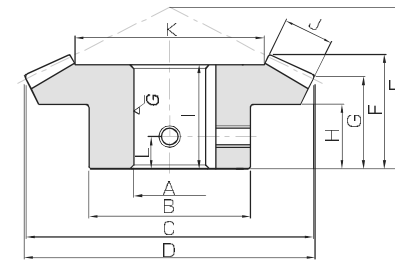
Contact Surface	Gear Ratio $z_2/z_1$						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9	75.8	71.1	67.3	64.3	60.1	57.3
	-18.1	-33.6	-42.8	-48.5	-52.4	-57.2	-59.9
Convex Surface	-18.1	-1.9	8.4	15.2	20.0	26.1	29.8
	80.9	82.9	82.5	81.5	80.5	78.7	77.4



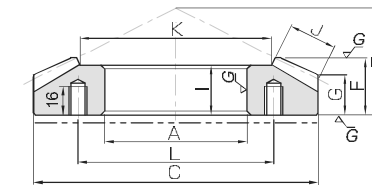
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Overall carburizing
Tooth hardness	55 ~ 60HRC



BK



B4



B7

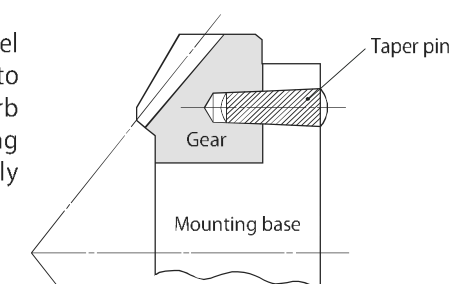
Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	
						AH7	B								
MBSA2-3020R MBSB2-3020R	1.5	m2	30	R	B4	20	40	60	61.36	40	26.8	21.02	14	23	
22															
MBSA2-2030L MBSB2-2030L		m2	20	L	BK	15	35	40	43.49	45	24.96	16.16	13.33	23	
18															
MBSA2.5-3020R MBSB2.5-3020R		m2.5	30	R	B4	22	48	75	76.74	50	33.6	26.31	18	30	
25															
MBSA2.5-2030L MBSB2.5-2030L		m2.5	20	L	BK	18	43	50	54.43	55	30.08	18.98	15.17	28	
20															
MBSA3-3020R MBSB3-3020R		m3	30	R	B4	25	60	90	92.21	60	40.34	31.66	21	36	
30															
MBSA3-2030L MBSB3-2030L		m3	20	L	BK	22	53	60	65.58	65	35.17	21.86	17.67	32.5	
25															
MBSA4-3020R MBSB4-3020R		m4	30	R	B4	35	75	120	122.91	70	43.99	32.18	21	39	
40															
MBSA4-2030L MBSB4-2030L		m4	20	L	BK	30	70	80	87.34	85	45.53	27.45	21.67	42	
35															
MBSA5-3020R MBSA5-2030L MBSB5-2030L		m5	30	R	B7	80	—	150	—	70	35.53	23.8	—	31	
40															
MBSA6-3020R MBSA6-2030L MBSB6-2030L		m6	30	R	B7	90	—	180	—	80	38.86	24.37	—	33	
50															
MBSA2-4020R MBSB2-4020R		1.5	m2	40	R	B4	20	45	80	81.06	45	31.83	26.06	18	29
22															
MBSA2-2040L MBSB2-2040L			m2	20	L	BK	15	35	40	44.2	55	28.16	16.05	13.75	27
18															
MBSA2.5-4020R MBSB2.5-4020R	m2.5		40	R	B4	25	55	100	101.29	50	33.35	26.29	16	30	
28															
MBSA2.5-2040L MBSB2.5-2040L	m2.5		20	L	BK	20	43	50	55.12	65	31.01	16.28	13.25	29	
22															
MBSA3-4020R MBSB3-4020R	m3		40	R	B4	30	65	120	121.57	60	39.81	31.57	21	35	
35															
MBSA3-2040L MBSB3-2040L	m3		20	L	BK	22	53	60	66.03	80	38.9	21.51	18.25	36.5	
25															
MBSA4-4020R MBSA4-2040L MBSB4-2040L	m4		40	R	B7	80	—	160	—	60	32.08	22.53	—	28	
35															
MBSA5-4020R MBSA5-2040L MBSB5-2040L	m5		40	R	B7	90	—	200	—	70	35.2	22.98	—	30	
45															
MBSA6-4020R MBSA6-2040L MBSB6-2040L	m6		40	R	B7	110	—	240	—	80	37.89	23.62	—	32	
55															

Face width	Holding surface dia.	Keyway	Set Screw	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
11	37.56	6 x 2.8 6 x 2.8	2-M5 2-M5	7	34.4	38.4	3.51	3.91	0.06~0.16	0.26 0.24
11	24.34	5 x 2.3 6 x 2.8	2-M4 2-M5	6.5	23.5	25.6	2.39	2.61	0.06~0.16	0.14 0.13
14	48.01	6 x 2.8 8 x 3.3	2-M5 2-M6	9	68.0	76.8	6.93	7.84	0.07~0.17	0.52 0.49
14	31.02	6 x 2.8 6 x 2.8	2-M5 2-M5	7.5	46.4	51.2	4.73	5.22	0.07~0.17	0.26 0.25
17	57.14	8 x 3.3 8 x 3.3	2-M6 2-M6	11	118	135	12.1	13.8	0.08~0.18	0.96 0.90
17	36.2	6 x 2.8 8 x 3.3	2-M5 2-M6	9	80.7	90.1	8.23	9.19	0.08~0.18	0.46 0.43
23	76.72	10 x 3.3 12 x 3.3	2-M8 2-M8	10	283	328	28.9	33.5	0.12~0.27	1.77 1.68
23	48.07	8 x 3.3 10 x 3.3	2-M6 2-M8	11	193	219	19.7	22.3	0.12~0.27	1.03 0.95
28	97.36	—	6-M10	110	544	637	55.4	64.9	0.14~0.34	2.80
28	62.04	10 x 3.3 12 x 3.3	2-M8 2-M8	13	371	425	37.8	43.3	0.14~0.34	2.01 1.89
34	115.61	—	6-M10	120	927	1120	94.6	114	0.16~0.36	4.55
34	72.41	14 x 3.8 14 x 3.8	2-M10 2-M10	15	633	745	64.5	76.0	0.16~0.36	3.56 3.38
14	52.7	6 x 2.8 6 x 2.8	2-M5 2-M5	9	59.6	69.6	6.08	7.09	0.06~0.16	0.53 0.51
14	25.39	5 x 2.3 6 x 2.8	2-M4 2-M5	7	29.9	34.8	3.05	3.55	0.06~0.16	0.16 0.14
17	66.99	8 x 3.3 8 x 3.3	2-M6 2-M6	8	114	135	11.7	13.8	0.07~0.17	0.93 0.90
17	29.97	6 x 2.8 6 x 2.8	2-M5 2-M5	7	57.3	67.6	5.84	6.89	0.07~0.17	0.26 0.25
20	80.28	8 x 3.3 10 x 3.3	2-M6 2-M8	11	195	233	19.9	23.7	0.08~0.18	1.47 1.40
20	36.56	6 x 2.8 8 x 3.3	2-M5 2-M6	9.5	97.7	116	9.97	11.9	0.08~0.18	0.51 0.48
27	107.63	—	6-M10	110	466	564	47.5	57.5	0.12~0.27	3.11
27	51.25	8 x 3.3 10 x 3.3	2-M6 2-M8	9	234	282	23.8	28.8	0.12~0.27	1.05 0.96
34	133.97	—	6-M10	120	915	1120	93.3	114	0.14~0.34	5.59
34	61.95	12 x 3.3 14 x 3.8	2-M8 2-M10	11	458	559	46.7	57.0	0.14~0.34	1.96 1.82
40	162.56	—	6-M10	140	1530	1920	156	196	0.16~0.36	8.48
40	77.11	14 x 3.8 16 x 4.3	2-M10 2-M10	14	766	961	78.1	97.9	0.16~0.36	3.33 3.11

- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - These gears produce axial thrust forces. See Page 304 for more details.
  - Although the dimensions of the keyway are made to the JIS (Js9) tolerance, there may be some deviations due to the effects of heat treatment.
  - For products having a tapped hole (Except for B7-shaped products), a set screw is attached as an accessory.

- [Caution on Secondary Operations]
- These products which are hardened by carburizing allow no secondary machining. However, for B7 type gears, the area surrounded with ----- line (in the illustration) is masked during the carburization process and can be modified. Care should be exercised since the hardness is high (approx. HRC40, maximum).

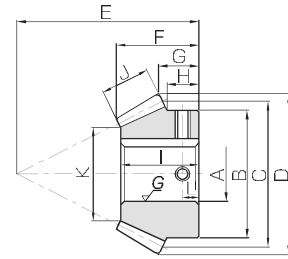
When installing B7 type (ring type) Spiral Bevel Gears to the base, always secure the gears onto the mounting base with taper pins to absorb the rotational loads. Fastening and securing with only mounting screws could possibly cause the screws to snap due to heavy loads.



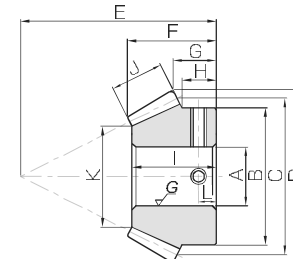




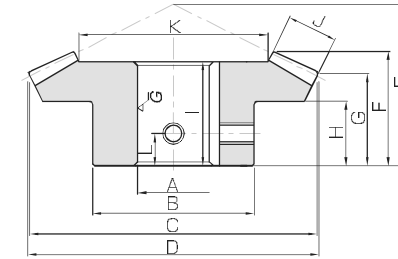
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Overall carburizing
Tooth hardness	55 ~ 60HRC



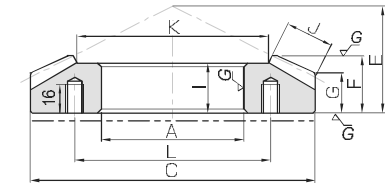
BK



BT



B4



B7

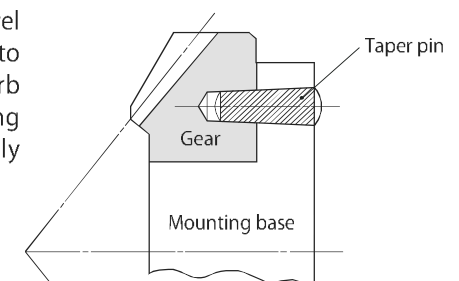
Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore
						AH7	B							
MBSA2-4518R MBSB2-4518R	2.5	m2	45	R	B4	20	48	90	90.79	40	27.67	22.98	15	25
25														
MBSA2-1845L MBSB2-1845L		m2	18	L	BK	12	32	36	40.42	60	28.54	15.88	14.2	27.5
16														
MBSA2.5-4518R MBSB2.5-4518R		m2.5	45	R	B4	25	55	112.5	113.49	50	34.94	28.74	19	31
30														
MBSA2.5-1845L MBSB2.5-1845L		m2.5	18	L	BK	15	40	45	50.35	72	33.19	16.82	14.75	31.5
20														
MBSA3-4518R MBSB3-4518R		m3	45	R	B4	30	65	135	136.24	60	41.65	34.55	22	37
35														
MBSA3-1845L MBSB3-1845L		m3	18	L	BK	20	48	54	60.69	85	37.82	18.84	16.3	36
25														
MBSA4-4518R MBSB4-4518R	m4	45	R	B7	80	—	180	—	55	29.77	21.25	—	25	
28														
MBSA4-1845L MBSB4-1845L	m4	18	L	BK	32	63	72	80.86	110	48.03	21.77	18.2	46	
32														
MBSA5-4518R MBSB5-4518R	m5	45	R	B7	100	—	225	—	65	33.37	22.82	—	28	
35														
MBSA5-1845L MBSB5-1845L	m5	18	L	BK	42	80	90	101.07	135	57.3	24.71	20.5	54.5	
42														
MBSA6-4518R MBSB6-4518R	m6	45	R	B7	110	—	270	—	75	36.97	24.19	—	30	
45														
MBSA6-1845L MBSB6-1845L	m6	18	L	BK	50	95	108	120.55	160	66.73	27.51	22.4	63	
50														
MBSA2-4515R MBSB2-4515R	3	m2	45	R	B4	20	48	90	90.66	40	30.01	25.99	18	27
22														
MBSA2-1545L MBSB2-1545L		m2	15	L	BT BK	10	26	30	34.59	55	23.78	10.77	9.33	22.5
12														
MBSA2.5-4515R MBSB2.5-4515R		m2.5	45	R	B4	22	55	112.5	113.28	45	32.43	27.42	18	28
25														
MBSA2.5-1545L MBSB2.5-1545L		m2.5	15	L	BK	12	32	37.5	43.06	70	30.51	14.68	12.84	29
15														
MBSA3-4515R MBSB3-4515R		m3	45	R	B4	30	65	135	136.03	55	39.94	34.05	22	35
32														
MBSA3-1545L MBSB3-1545L		m3	15	L	BK	18	38	45	52	85	38.12	18.67	16.33	36.5
20														
MBSA4-4515R MBSB4-4515R	m4	45	R	B7	80	—	180	—	50	28.85	22.14	—	25	
22														
MBSA4-1545L MBSB4-1545L	m4	15	L	BK	25	52	60	69.24	110	47.51	21.54	18.67	45.5	
25														
MBSA5-4515R MBSB5-4515R	m5	45	R	B7	90	—	225	—	60	33.57	25.16	—	28	
28														
MBSA5-1545L MBSB5-1545L	m5	15	L	BK	32	65	75	86.55	135	56.89	24.43	20.83	54	
32														
MBSA6-4515R MBSB6-4515R	m6	45	R	B7	110	—	270	—	70	38.28	28.05	—	32	
110														
MBSA6-1545L MBSB6-1545L	m6	15	L	BK	40	78	90	103.13	160	66.39	27.19	23	63	
40														

Face width	Holding surface dia.	Keyway	Set Screw	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog No.	
				Bending strength	Surface durability	Bending strength	Surface durability				
J	K	Width×Depth	Size	L							
14	62.24	6 x 2.8 8 x 3.3	2-M5 2-M6	8	69.3	74.3	7.06	7.58	0.06~0.16	0.60 0.56	MBSA2-4518R MBSB2-4518R
14	23.11	4 x 1.8 5 x 2.3	2-M4 2-M4	7	27.2	29.7	2.77	3.03		0.14 0.12	MBSA2-1845L MBSB2-1845L
18	76.53	8 x 3.3 8 x 3.3	2-M6 2-M6	10	138	150	14.1	15.3	0.07~0.17	1.09 1.04	MBSA2.5-4518R MBSB2.5-4518R
18	26.82	5 x 2.3 6 x 2.8	2-M4 2-M5	8	54.1	59.9	5.52	6.11		0.26 0.22	MBSA2.5-1845L MBSB2.5-1845L
21	92.96	8 x 3.3 10 x 3.3	2-M6 2-M8	11	234	256	23.8	26.1	0.08~0.18	1.92 1.84	MBSA3-4518R MBSB3-4518R
21	33.41	6 x 2.8 8 x 3.3	2-M5 2-M6	9	91.8	103	9.36	10.5		0.41 0.36	MBSA3-1845L MBSB3-1845L
29	122.33	—	6-M10	110	567	630	57.8	64.3	0.12~0.27	3.92	MBSA4-4518R
29	45.83	8 x 3.3 10 x 3.3	2-M6 2-M8	10	223	252	22.7	25.7		0.89 0.82	MBSA4-1845L MBSB4-1845L
36	153.85	—	6-M10	130	1100	1240	112	126	0.14~0.34	6.82	MBSA5-4518R
36	56.13	10 x 3.3 12 x 3.3	2-M8 2-M8	11	433	495	44.2	50.5		1.68 1.50	MBSA5-1845L MBSB5-1845L
43	184.57	—	6-M10	140	1860	2150	190	219	0.16~0.36	11.1	MBSA6-4518R
43	66.44	14 x 3.8 14 x 3.8	2-M10 2-M10	12	731	859	74.6	87.6		2.66 2.48	MBSA6-1845L MBSB6-1845L
14	61.82	6 x 2.8 6 x 2.8	2-M5 2-M5	9	67.8	61.3	6.91	6.25	0.06~0.16	0.61 0.60	MBSA2-4515R MBSB2-4515R
14	16.46	—	2-M4 2-M4	5	21.7	20.4	2.22	2.08		0.081 0.073	MBSA2-1545L MBSB2-1545L
17	77.83	6 x 2.8 8 x 3.3	2-M5 2-M6	9	130	119	13.3	12.1	0.07~0.17	1.01 0.98	MBSA2.5-4515R MBSB2.5-4515R
17	21.48	4 x 1.8 5 x 2.3	2-M4 2-M4	7	41.6	39.6	4.24	4.04		0.16 0.15	MBSA2.5-1545L MBSB2.5-1545L
21	92.39	8 x 3.3 10 x 3.3	2-M6 2-M8	11	229	211	23.3	21.6	0.08~0.18	1.78 1.75	MBSA3-4515R MBSB3-4515R
21	26.18	6 x 2.8 6 x 2.8	2-M5 2-M5	9	73.3	70.5	7.48	7.18		0.26 0.24	MBSA3-1545L MBSB3-1545L
28	124.3	—	6-M10	110	542	508	55.3	51.8	0.12~0.27	3.93	MBSA4-4515R
28	35.91	6 x 2.8 8 x 3.3	2-M5 2-M6	10	174	169	17.7	17.3		0.63 0.58	MBSA4-1545L MBSB4-1545L
35	154.88	—	6-M10	120	1060	1000	108	102	0.14~0.34	7.38	MBSA5-4515R
35	42.64	8 x 3.3 10 x 3.3	2-M6 2-M8	11	339	334	34.6	34.1		1.16 1.07	MBSA5-1545L MBSB5-1545L
42	186.12	—	6-M10	140	1790	1740	183	178	0.16~0.36	12.0	MBSA6-4515R
42	52.37	10 x 3.3 12 x 3.3	2-M8 2-M8	12	575	581	58.6	59.3		1.90 1.75	MBSA6-1545L MBSB6-1545L

- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - These gears produce axial thrust forces. See Page 304 for more details.
  - Although the dimensions of the keyway are made to the JIS (Js9) tolerance, there may be some deviations due to the effects of heat treatment.
  - For products having a tapped hole (Except for B7-shaped products), a set screw is attached as an accessory.

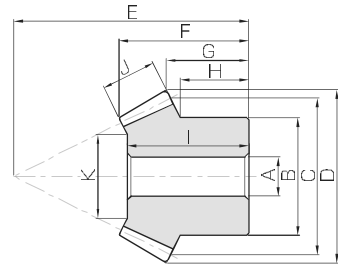
- [Caution on Secondary Operations]
- These products which are hardened by carburizing allow no secondary machining. However, for B7 type gears, the area surrounded with - - - - line (in the illustration) is masked during the carburization process and can be modified. Care should be exercised since the hardness is high (approx. HRC40, maximum).

When installing B7 type (ring type) Spiral Bevel Gears to the base, always secure the gears onto the mounting base with taper pins to absorb the rotational loads. Fastening and securing with only mounting screws could possibly cause the screws to snap due to heavy loads.

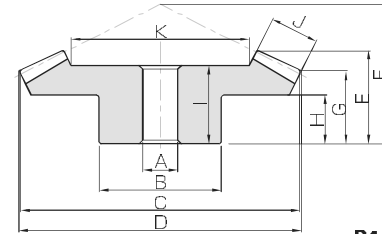




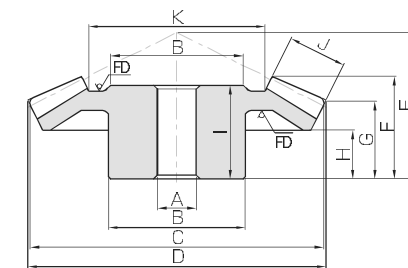
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ~ 60HRC
Surface treatment	Black oxide coating



B3



B4



B5

\* FD has die-forged finish.

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A	B					
SBS2-3020R SBS2-2030L	1.5	m2	30	R	B4	12	35	60	61.36	40	26.8	21.02
			20	L	B3	10	30	40	43.49	45	24.96	16.16
		m2.5	30	R	B4	15	45	75	77.09	50	33.86	26.56
			20	L	B3	12	40	50	54.43	55	30.88	18.98
		m3	30	R	B4	16	50	90	92.21	55	35.34	26.66
			20	L	B3	16	45	60	65.58	70	40.17	26.86
m4	30	R	B4	20	70	120	122.85	75	47.49	37.14		
	20	L	B3	20	60	80	87.34	90	48.17	32.45		
m5	30	R	B4	25	90	150	153.67	90	58.08	42.75		
	20	L	B3	22	80	100	109.2	110	61.62	38.07		
SBS1-4020R SBS1-2040L	2	m1	40	R	B4	8	25	40	40.52	22	15.02	12.52
			20	L	B3	6	16	20	22.08	28	13.73	8.52
		m1.5	40	R	B4	10	38	60	60.75	35	24.93	20.75
			20	L	B3	8	25	30	33.08	46	25.45	16.77
		m2	40	R	B4	12	40	80	81	45	32.27	26
			20	L	B3	12	32	40	44.1	60	34.04	21.02
m2.5	40	R	B4	15	50	100	101.27	55	39.65	31.27		
	20	L	B3	12	40	50	55.2	75	43.61	26.30		
m3	40	R	B4	20	60	120	121.48	65	45.76	36.47		
	20	L	B3	16	50	60	66.07	90	50.63	31.52		
m4	40	R	B4	20	70	160	162.07	80	53.69	42.07		
	20	L	B3	20	60	80	88.50	120	66.24	42.12		
m5	40	R	B5	25	100	200	202.54	90	55.02	42.54		
	20	L	B3	22	80	100	110.45	140	68.48	42.61		
SBS2.5-3618R SBS2.5-1836L	2	m2.5	36	R	B4	15	55	90	91.29	43	28.38	21.79
			18	L	B3	12	38	45	50.30	64	34.06	20.32
		m3	36	R	B4	20	60	108	109.53	52	34.82	26.53
			18	L	B3	16	46	54	60.28	75	39.78	22.57
		m4	36	R	B4	20	70	144	145.99	72	48.84	37.99
			18	L	B3	20	60	72	80.19	100	52.51	30.05
SBS2-4518R SBS2-1845L	2.5	m2	45	R	B4	12	48	90	90.79	40	27.67	22.98
			18	L	B3	10	32	36	40.42	60	28.54	15.88
		m2.5	45	R	B4	15	55	112.5	113.49	50	34.94	28.74
			18	L	B3	12	40	45	50.35	72	33.19	16.82
		m3	45	R	B4	20	65	135	136.24	60	41.65	34.55
			18	L	B3	16	48	54	60.69	85	37.82	18.84
m4	45	R	B4	25	80	180	181.57	75	50.98	40.96		
	18	L	B3	20	62	72	80.86	110	48.03	21.77		
m5	45	R	B4	30	100	225	225.81	90	57.9	46.01		
	18	L	B3	22	80	90	103.87	135	56.02	25.27		

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
15 11.67	23 22	11	37.56 21.34	15.4 10.5	11.3 7.52	1.57 1.07	1.15 0.77	0.06~0.16	0.26 0.13	SBS2-3020R SBS2-2030L
18 14.17	30 28	15	45.61 27.42	31.7 21.6	23.6 15.7	3.23 2.20	2.40 1.60	0.07~0.17	0.55 0.28	SBS2.5-3020R SBS2.5-2030L
17 20	31 37	17	57.14 34.71	52.9 36.1	39.7 26.5	5.39 3.68	4.05 2.70	0.08~0.18	0.82 0.49	SBS3-3020R SBS3-2030L
25 23.33	40 43	20	78.59 46.89	115 78.7	88.1 58.8	11.8 8.03	8.99 5.99	0.12~0.27	1.90 1.05	SBS4-3020R SBS4-2030L
24 28.33	50 56	30	91.22 54.83	253 173	195 130	25.8 17.6	19.9 13.3	0.14~0.34	4.11 2.29	SBS5-3020R SBS5-2030L
8 7	12 12	6	26.58 9.17	3.01 1.51	2.22 1.11	0.31 0.15	0.23 0.11	0.03~0.13	0.068 0.019	SBS1-4020R SBS1-2040L
15 14.75	22 24	10	39.64 17.28	10.9 5.46	8.22 4.11	1.11 0.56	0.84 0.42	0.05~0.15	0.27 0.088	SBS1.5-4020R SBS1.5-2040L
18 18	27 32	15	48.46 20.92	27.8 13.9	21.3 10.7	2.83 1.42	2.17 1.09	0.06~0.16	0.51 0.19	SBS2-4020R SBS2-2040L
20 22.5	34 40	20	59.28 20.56	56.4 28.2	43.7 21.9	5.75 2.88	4.46 2.23	0.07~0.17	1.06 0.40	SBS2.5-4020R SBS2.5-2040L
24 27.5	38 47	22	73.81 29.61	92.5 46.4	72.6 36.3	9.44 4.73	7.40 3.70	0.08~0.18	1.67 0.69	SBS3-4020R SBS3-2040L
28 35	45 62	28	102.39 42.78	213 107	170 84.8	21.7 10.9	17.3 8.65	0.12~0.27	3.33 1.46	SBS4-4020R SBS4-2040L
26 35	50 63	30	138.92 57.84	376 188	302 151	38.3 19.2	30.8 15.4	0.14~0.34	5.67 2.61	SBS5-4020R SBS5-2040L
13 17.25	24 32	16	57.72 25.45	41.7 20.9	29.3 14.7	4.26 2.13	2.99 1.49	0.07~0.17	0.72 0.27	SBS2.5-3618R SBS2.5-1836L
17 19	30 37	20	68.27 28.56	74.0 37.0	52.4 26.2	7.54 3.78	5.35 2.67	0.08~0.18	1.15 0.44	SBS3-3618R SBS3-1836L
25 25	42 49	26	91.87 39.72	173 86.4	124 62.1	17.6 8.81	12.7 6.33	0.12~0.27	2.65 1.03	SBS4-3618R SBS4-1836L
15 14.2	25 27.5	14	62.24 23.11	31.0 12.2	21.9 8.74	3.16 1.24	2.23 0.89	0.06~0.16	0.65 0.15	SBS2-4518R SBS2-1845L
18 14.75	31 31.5	18	76.53 26.82	61.6 24.2	44.0 17.6	6.28 2.47	4.49 1.80	0.07~0.17	1.23 0.28	SBS2.5-4518R SBS2.5-1845L
22 16.3	37 36	21	92.96 33.41	104 41.0	75.4 30.2	10.7 4.18	7.69 3.07	0.08~0.18	2.05 0.45	SBS3-4518R SBS3-1845L
24 18	45 46	29	122.33 45.83	253 99.5	185 74.1	25.8 10.2	18.9 7.56	0.12~0.27	4.62 1.00	SBS4-4518R SBS4-1845L
28 20.5	51 52.5	34	156.56 56.9	474 186	350 140	48.4 19.0	35.7 14.3	0.14~0.34	8.11 1.94	SBS5-4518R SBS5-1845L

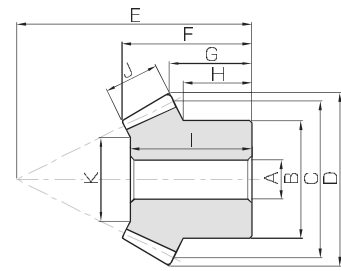
- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - These gears produce axial thrust forces. See Page 304 for more details.
  - Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 304) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
  - 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).

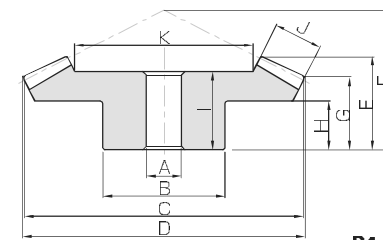


Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35° *
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ~ 60HRC
Surface treatment	Black oxide coating

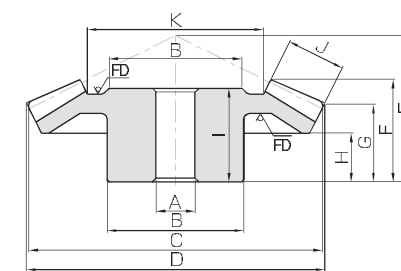
\* 39° for 6015R and 1560L of SBS1.5/2 products.



B3



B4



B5

\* FD has die-forged finish.

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A	B						
SBS2-4515R SBS2-1545L	3	m2	45	R	B4	12	40	90	90.67	40	30.29	26.01	
			15	L	B3	10	24	30	34.78	60	29.66	15.80	
SBS2.5-4515R SBS2.5-1545L	3	m2.5	45	R	B4	15	50	112.5	113.32	50	38.25	32.47	
			15	L	B3	12	30	37.5	43.36	75	38.27	19.73	
SBS3-4515R SBS3-1545L	3	m3	45	R	B4	20	60	135	135.99	55	40.59	33.98	
			15	L	B3	15	38	45	52.08	90	44.98	23.68	
SBS4-4515R SBS4-1545L	3	m4	45	R	B5	20	80	180	181.3	70	50.62	41.95	
			15	L	B3	16	50	60	69.30	115	54.37	26.55	
SBS5-4515R SBS5-1545L	3	m5	45	R	B5	30	90	225	226.61	75	50.05	39.92	
			15	L	B3	20	60	75	86.55	145	66.89	34.43	
SBS1.5-6015R SBS1.5-1560L	4	m1.5	60	R	B4	12	60	90	90.36	32	24.08	21.48	
			15	L	B3	8	18	22.5	26.09	56	22.95	11.45	
SBS2-6015R SBS2-1560L	4	m2	60	R	B4	15	80	120	120.46	42	31.5	27.91	
			15	L	B3	10	24	30	34.68	75	30.94	15.58	
SBS2.5-6015R SBS2.5-1560L	4	m2.5	60	R	B4	20	100	150	150.5	53	39.68	35.24	
			15	L	B3	12	30	37.5	44.16	94	38.9	19.83	
SBS3-6015R SBS3-1560L	4	m3	60	R	B4	20	120	180	180.57	64	47.61	42.64	
			15	L	B3	15	38	45	52.64	112	44.01	22.96	

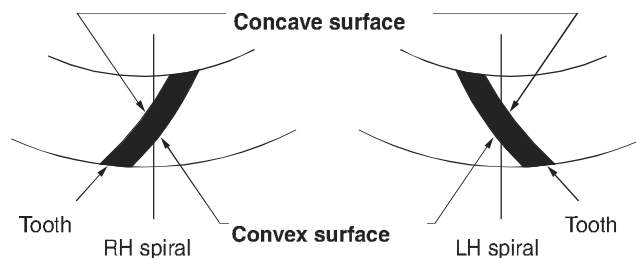
- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - These gears produce axial thrust forces. See Page 304 for more details.
  - Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
17 14	26 29	15	59.04 19.13	31.7 10.1	18.8 6.27	3.23 1.03	1.92 0.64	0.06~0.16	0.60 0.095	SBS2-4515R SBS2-1545L
22 17.5	35 37	20	72.82 20.51	64.3 20.6	38.7 12.9	6.56 2.10	3.94 1.31	0.07~0.17	1.21 0.19	SBS2.5-4515R SBS2.5-1545L
20 21.33	35 44	23	88.18 28.54	108 34.7	65.8 21.9	11.1 3.54	6.71 2.24	0.08~0.18	1.99 0.34	SBS3-4515R SBS3-1545L
24 23.33	45 52	30	118.08 32.26	253 81.1	156 52.0	25.8 8.27	15.9 5.30	0.12~0.27	4.04 0.76	SBS4-4515R SBS4-1545L
20 30	44 65	35	152.88 48.64	473 152	295 98.2	48.3 15.5	30.0 10.0	0.14~0.34	6.08 1.44	SBS5-4515R SBS5-1545L
12 10.43	21 22.5	12	65.39 15.55	17.9 4.22	12.9 3.21	1.83 0.43	1.31 0.33	0.05~0.15	0.70 0.042	SBS1.5-6015R SBS1.5-1560L
16 14.25	27 30	16	87.02 18.06	42.5 10.0	30.9 7.73	4.33 1.02	3.15 0.79	0.06~0.16	1.59 0.10	SBS2-6015R SBS2-1560L
20 18.06	34 37.5	20	108.64 20.58	96.1 22.6	58.4 14.6	9.79 2.31	5.95 1.49	0.07~0.17	3.13 0.20	SBS2.5-6015R SBS2.5-1560L
25 21.12	41 43	22	134.4 31.58	156 36.8	95.7 23.9	15.9 3.75	9.76 2.44	0.08~0.18	5.38 0.35	SBS3-6015R SBS3-1560L

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 304) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
  - 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).

### Contact Surface of Spiral Bevel Gears

Tooth surfaces of spiral gears have concave and convex sides. Changes in the rotational direction of the driving gear alter the contact surface accordingly. The illustrations show the top view of RH and LH Spiral Gears, and the tables on the right explain the different contact surface depending on the situation.



#### RH Spiral as a driving gear

Rotating Direction of Driving Gear <sup>Note 1</sup>	Contact Surface	
	Driving Gear (RH Spiral)	Driving Gear (LH Spiral)
RH Rotation (Clockwise)	Convex Surface	Concave Surface
LH rotation (counterclockwise)	Concave Surface	Convex Surface

#### LH Spiral as a driving gear

Rotating Direction of Driving Gear <sup>Note 1</sup>	Contact Surface	
	Driving Gear (LH Spiral)	Driving Gear (RH Spiral)
RH Rotation (Clockwise)	Concave Surface	Convex Surface
LH Rotation (Counterclockwise)	Convex Surface	Concave Surface

[Note 1] Rotation directions given in the tables are for viewing the gears from the hub side.

### Forces Acting on Spiral Bevel Gear Teeth

For a spiral bevel gear with shaft angle  $\Sigma=90^\circ$ , pressure angle  $\alpha_n=20^\circ$ , and spiral angle  $\beta_m=35^\circ$ , the tables below show the axial thrust force  $F_x$  and the radial force  $F_r$  when a tangential force  $F_t$  of 100 units is applied at the center of face width. For details, please refer to separate technical reference book, section of "Features of Tooth Surface Contact" (Page 107).

The tables show the values of  $\frac{\text{Axial Thrust Force } F_x}{\text{Radial Force } F_r}$

#### (1) Forces acting upon pinion

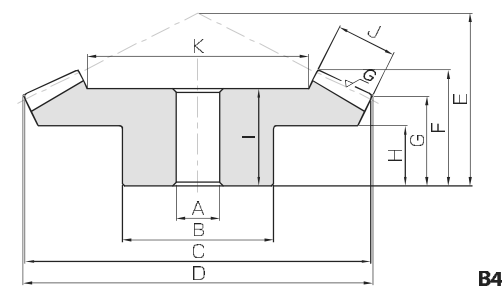
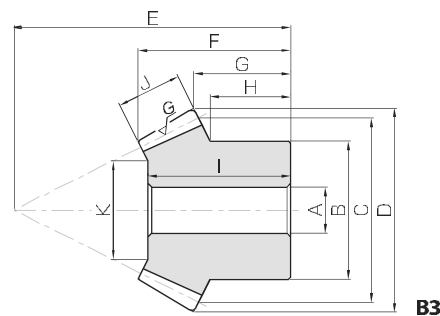
Contact Surface	Gear Ratio $z_2/z_1$						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9 -18.1	82.9 -1.9	82.5 8.4	81.5 15.2	80.5 20.0	78.7 26.1	77.4 29.8
Convex Surface	-18.1 80.9	-33.6 75.8	-42.8 71.1	-48.5 67.3	-52.4 64.3	-57.2 60.1	-59.9 57.3

#### (2) Forces acting upon gear

Contact Surface	Gear Ratio $z_2/z_1$						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9 -18.1	75.8 -33.6	71.1 -42.8	67.3 -48.5	64.3 -52.4	60.1 -57.2	57.3 -59.9
Convex Surface	-18.1 80.9	-1.9 82.9	8.4 82.5	15.2 81.5	20.0 80.5	26.1 78.7	29.8 77.4



Specifications	
Precision grade	JIS B 1704 : 1978 grade 2
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ~ 60HRC
Surface treatment	Black oxide coated except for ground part



Catalog No.	Gear ratio	Module	No. of teeth	Helix angle	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	
							A	B						
SBZG2-3020R SBZG2-2030L	1.5	m2	30	7°	R	B4	10	35	60	62.16	40	26.48	21.62	
20			B3			10	30	40	44.18	45	25.05	16.39		
SBZG2.5-3020R SBZG2.5-2030L		m2.5	30	7°	R	B4	15	45	75	77.77	50	33.69	27.08	
20			B3			12	35	50	55.23	55	31.05	19.24		
SBZG3-3020R SBZG3-2030L		2	m3	30	7°	R	B4	15	50	90	93.27	55	35.01	27.45
20				B3			15	45	60	66.32	70	40.50	27.11	
SBZG2-4020R SBZG2-2040L	m2		40	9°	R	B4	12	40	80	81.58	45	31.91	26.58	
20			B3			12	32	40	44.76	60	34.15	21.19		
SBZG2.5-4020R SBZG2.5-2040L	m2.5		40	9°	R	B4	15	50	100	102.01	55	39.16	32.01	
20			B3			12	40	50	55.99	75	43.77	26.50		
SBZG3-4020R SBZG3-2040L	m3	40	9°	R	B4	20	60	120	122.31	65	45.30	37.31		
20		B3			16	50	60	67.21	90	50.81	31.80			

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
15 11.67	23 22	11 11	37.56 21.34	14.3 9.89	8.88 5.92	1.46 1.01	0.91 0.60	0.05~0.11	0.27 0.14	SBZG2-3020R SBZG2-2030L
18 12.5	30 28	15 15	45.61 27.42	29.4 20.4	18.8 12.5	3.00 2.08	1.92 1.28			
17 20	31 37	17 17	57.14 34.71	51.7 35.8	31.6 21.1	5.27 3.65	3.22 2.15	0.07~0.13	0.84 0.50	SBZG3-3020R SBZG3-2030L
18 18	27 32	15 15	48.46 20.92	26.0 13.1	18.4 9.18	2.66 1.33	1.87 0.94			
20 22.5	35 41	20 20	60.28 24.56	55.6 27.9	38.5 19.2	5.67 2.85	3.92 1.96	0.06~0.12	1.10 0.40	SBZG2.5-4020R SBZG2.5-2040L
24 27.5	38 47	22 22	73.81 29.61	96.3 48.4	62.8 31.4	9.82 4.93	6.40 3.20			

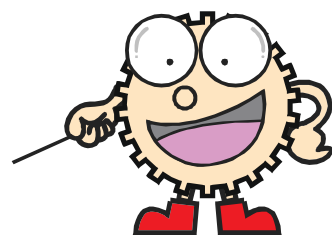
- [Caution on Product Characteristics]
- Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - It produces an axial thrust force, which has the same direction as straight bevel gears. For details, see separate technical reference book (Page 108).

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 304) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
  - 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).

### Features of Zerol Bevel Gears

Zerol Bevel Gears are spiral Bevel gears with a helix angle of less than 10 degree. Balanced, and superior performance as they combine the features of straight and spiral bevel gears.

- Allows compact design as no inward thrust force (\* Reference to the figure) is produced, which causes problems when using spiral Bevel gears.
- Unlike straight Bevel gears, Zerol Bevel Gears can be ground finished, allowing higher precision, wear-resistance and are quieter, compared with straight Bevel gears.
- Drop in replacement for SB Bevel Gears can easily be made due to the gears have similar dimensions for the mounting distance. When replacing, please use a set of Zerol Bevel gears with opposite spiral hands, one right-hand and the other left-hand.



### Performance Comparison

Gear Type	Bearing Design *	Interchangeability Mounting Distance	Precision JIS B 1704 : 1978	Strength Bending Strength	Durability Surface Durability	Noise/Vibration Surface Roughness/Total Contact Ratio	Price for single item
Bevel Gears 	 No thrust force produced inward	Many SUB, PB, SBZG	Normal grade 3	Normal 24.2N·m/12.2N·m	Bad 2.92N·m/1.46N·m	Normal 3.2a/1.63	Low
Ground Zerol Bevel Gears 	 No thrust force produced inward	Many SB, SUB, PB	Good grade 2	Normal 26.0N·m/13.1N·m	Good 18.4N·m/9.18N·m	Low 0.4a/1.84	Normal
Ground Spiral Bevel Gears 	 Thrust force produced inward	None -	Good grade 2	Strong 56.5N·m/28.2N·m	Good 94.2N·m/47.1N·m	Low 0.4a/3.13	Normal

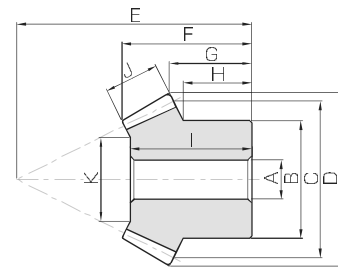
NOTE: The above evaluations were based on a comparison of 3 products.

### Zerol Bevel Gear Set Example

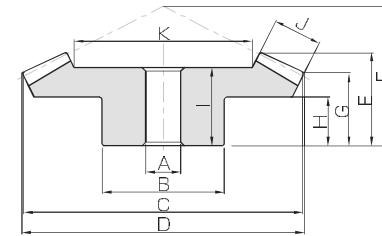




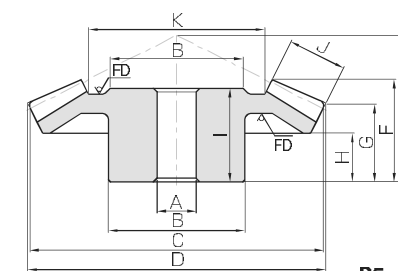
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



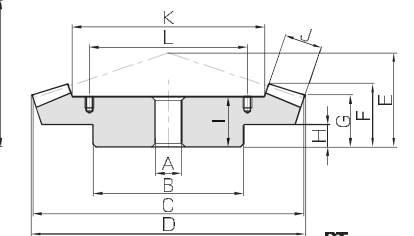
B3



B4



B5



BT

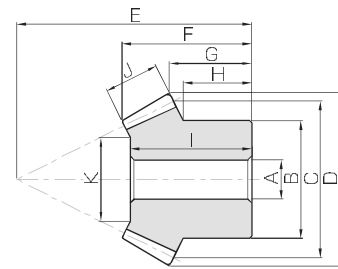
\* FD has die-forged finish.

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width
					A/H <sub>7</sub>	B					C	D	
SB1.5-3020	1.5	m1.5	30	B4	10	30	45	46.24	28	18.53	13.93	8	
SB1.5-2030			20	B3	8	25	30	33.13	33	18.63	11.54	8.83	
SB2-3020		m2	30	B4	10	35	60	61.65	40	26.87	21.24	15	
SB2-2030			20	B3	10	30	40	44.18	45	25.06	16.39	11.67	
SB2.5-3020		m2.5	30	B4	15	45	75	77.07	50	34.22	26.55	18	
SB2.5-2030			20	B3	12	35	50	55.22	55	31.06	19.24	12.5	
SB3-3020		m3	30	B4	15	50	90	92.48	55	35.56	26.86	17	
SB3-2030			20	B3	15	45	60	66.27	70	40.48	27.09	20	
SB4-3020		m4	30	B4	20	70	120	123.3	75	47.71	37.48	25	
SB4-2030			20	B3	15	60	80	88.32	90	48.53	32.77	23.33	
SB5-3020	m5	30	B4	25	90	150	154.13	90	58.45	43.1	24		
SB5-2030		20	B3	20	80	100	110.45	110	62.11	38.48	28.33		
SB1.5-3015	2	m1.5	30	B4	8	25	45	45.88	25	17.85	14.63	9	
SB1.5-1530			15	B3	6	16	22.5	26.11	32	17.23	10.4	7.88	
SB2-3015		m2	30	B4	10	30	60	61.17	31	21.6	17.17	10	
SB2-1530			15	B3	8	22	30	34.81	40	20.59	11.2	8	
SB2.5-3015		m2.5	30	B4	15	40	75	76.46	40	28.75	22.71	15	
SB2.5-1530			15	B3	12	30	37.5	43.51	55	31.81	19	15.63	
SB3-3015		m3	30	B4	16	50	90	91.76	50	37.31	29.26	18	
SB3-1530			15	B3	12	35	45	52.22	70	43.88	26.8	22.5	
SB4-3015		m4	30	B4	20	60	120	122.34	60	42.4	32.34	20	
SB4-1530			15	B3	16	50	60	69.62	85	48.74	27.41	22.5	
SB5-3015	m5	30	B5	20	70	150	152.93	75	52.5	40.43	25		
SB5-1530		15	B3	20	60	75	87.03	110	63.61	38.01	31.25		
SB6-3015	m6	30	B5	25	80	180	183.5	90	62.56	48.49	28		
SB6-1530		15	B3	25	70	90	104.44	125	68.48	38.6	30		
SB2.5-3618	2	m2.5	36	B4	15	55	90	91.46	43	28.52	21.96	13	
SB2.5-1836			18	B3	12	38	45	51.01	64	34.27	20.5	17.25	
SB3-3618		m3	36	B4	20	60	108	109.76	52	34.95	26.76	17	
SB3-1836			18	B3	16	46	54	61.22	75	40.01	22.81	19	
SB4-3618	m4	36	B4	20	70	144	146.34	72	49	38.34	25		
SB4-1836		18	B3	20	60	72	81.62	100	52.77	30.41	25		
SB1-4020	2	m1	40	B4	8	25	40	40.59	22	15.07	12.59	8	
SB1-2040			20	B3	6	16	20	22.41	28	13.78	8.6	7	
SB1.25-4020		m1.25	40	B4	10	32	50	50.73	27	18.54	15.23	10	
SB1.25-2040			20	B3	8	22	25	28.01	36	18.66	11.75	10.25	
SB1.5-4020		m1.5	40	B4	10	38	60	60.88	35	25.01	20.88	15	
SB1.5-2040			20	B3	8	25	30	33.61	46	25.54	16.9	14.75	
SB2-4020		m2	40	B4	12	40	80	81.17	45	32.37	26.17	18	
SB2-2040			20	B3	12	32	40	44.81	60	34.16	21.2	18	
SB2.5-4020		m2.5	40	B4	15	50	100	101.46	55	39.73	31.46	20	
SB2.5-2040			20	B3	12	40	50	56.01	75	43.78	26.5	22.5	
SB3-4020	m3	40	B4	20	60	120	121.76	65	45.85	36.76	24		
SB3-2040		20	B3	16	50	60	67.22	90	50.81	31.8	27.5		
SB4-4020	m4	40	B4	20	70	160	162.34	80	53.92	42.34	28		
SB4-2040		20	B3	20	60	80	89.62	120	66.59	42.41	35		
SB5-4020	m5	40	B5	25	100	200	202.93	90	55.33	42.93	26		
SB5-2040		20	B3	20	80	100	112.03	140	68.92	43.01	35		
SB6-4020	m6	40	B5	25	85	240	243.52	105	65.05	48.52	28		
SB6-2040		20	B3	25	90	120	134.44	160	78.16	43.6	32.5		
SBY8-4020	m8	40	BT	35	180	320	324.69	130	75.36	54.69	25		
SBY8-2040		20	B3	30	120	160	179.25	210	98	54.81	40		

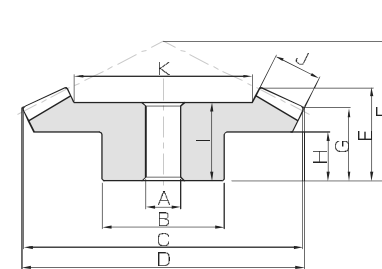
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
16	9	27.37	5.82	0.65	0.59	0.07	0.12	0.063	SB1.5-3020 SB1.5-2030
17		17.05	4.04	0.44	0.41	0.04			
23	11	37.56	13.1	1.52	1.33	0.16	0.26	0.14	SB2-3020 SB2-2030
22		21.34	9.07	1.01	0.92	0.10			
30	15	45.61	26.9	3.21	2.75	0.33	0.55	0.25	SB2.5-3020 SB2.5-2030
28		27.42	18.7	2.14	1.91	0.22			
31	17	57.14	44.9	5.45	4.58	0.56	0.83	0.50	SB3-3020 SB3-2030
37		34.71	31.2	3.63	3.18	0.37			
40	20	78.59	98.2	12.3	10.0	1.25	1.91	1.10	SB4-3020 SB4-2030
43		46.89	68.1	8.20	6.95	0.84			
50	30	91.22	215	27.6	22.0	2.81	4.13	2.34	SB5-3020 SB5-2030
56		54.83	150	18.4	15.3	1.87			
15	8	28.36	5.02	0.47	0.51	0.05	0.10	0.028	SB1.5-3015 SB1.5-1530
15.5		10.72	2.60	0.24	0.26	0.02			
18	11	37.4	12.1	1.18	1.24	0.12	0.21	0.064	SB2-3015 SB2-1530
19		16.81	6.28	0.59	0.64	0.06			
24	15	44.21	24.9	2.48	2.54	0.25	0.41	0.15	SB2.5-3015 SB2.5-1530
29		16.42	12.9	1.24	1.32	0.13			
30	20	47.78	45.6	4.60	4.65	0.47	0.83	0.31	SB3-3015 SB3-1530
41		19.56	23.6	2.30	2.41	0.23			
36	25	70.1	104	10.9	10.7	1.11	1.64	0.66	SB4-3015 SB4-1530
46		32.2	54.0	5.43	5.51	0.55			
48	30	90.41	199	21.3	20.3	2.17	2.72	1.28	SB5-3015 SB5-1530
58		32.83	103	10.6	10.5	1.09			
57	35	109.74	336	36.9	34.2	3.77	4.75	1.94	SB6-3015 SB6-1530
63		45.47	174	18.5	17.7	1.88			
24	16	57.72	35.9	4.08	3.66	0.42	0.72	0.27	SB2.5-3618 SB2.5-1836
32		25.44	18.1	2.04	1.84	0.21			
30	20	68.28	63.7	7.34	6.49	0.75	1.15	0.44	SB3-3618 SB3-1836
37		28.56	32.0	3.67	3.27	0.37			
42	26	91.86	149	17.7	15.2	1.80	2.66	1.04	SB4-3618 SB4-1836
49		39.72	74.8	8.85	7.62	0.90			
12	6	26.58	2.61	0.29	0.27	0.03	0.068	0.019	SB1-4020 SB1-2040
12		9.17	1.32	0.15	0.13	0.02			
16	8	33.61	5.33	0.61	0.54	0.06	0.14	0.046	SB1.25-4020 SB1.25-2040
17		13.22	2.69	0.31	0.27	0.03			
22	10	39.64	9.47	1.11	0.97	0.11	0.27	0.089	SB1.5-4020 SB1.5-2040
24		17.28	4.77	0.56	0.49	0.06			
27	15	48.46	24.2	2.92	2.46	0.30	0.51	0.19	SB2-4020 SB2-2040
32		20.92	12.2	1.46	1.24	0.15			
35	20	60.28	49.0	6.04	4.99	0.62	1.09	0.40	SB2.5-4020 SB2.5-2040
41		24.56	24.7	3.02	2.52	0.31			
38	22	73.81	80.4	10.1	8.20	1.03	1.68	0.70	SB3-4020 SB3-2040
47		29.61	40.5	5.06	4.13	0.52			
45	28	102.39	185	24.1	18.9	2.46	3.34	1.47	SB4-4020 SB4-2040
62		42.78	93.3	12.0	9.51	1.23			
50	30	138.92	327	43.9	33.3	4.47	5.63	2.67	SB5-4020 SB5-2040
63		57.84	165	21.9	16.8	2.24			
58	40	158.56	600	83.2	61.2	8.48	7.77	4.08	SB6-4020 SB6-2040
70		61.11	302	41.6	30.8	4.24			
61	50	219.2	1350	196	138	20.0	25.75	9.41	



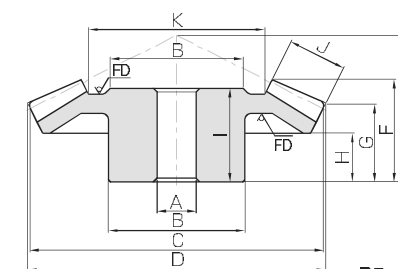
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



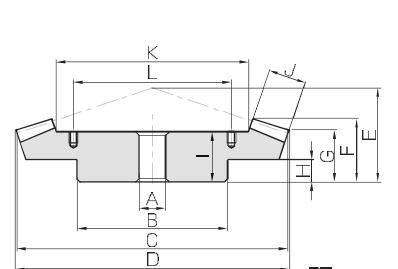
B3



B4



B5



BT

\* FD has die-forged finish.

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width
					A/H7	B					C	G	
SB1-4518	2.5	m1	45	B4	8	30	45	45.46	23	16.95	14.57	10	
SB1-1845			18	B3	6	15	18	20.57	32	16.34	10.02	8.9	
SB1.25-4518		m1.25	45	B4	10	34	56.25	56.82	26	18.53	15.46	10	
SB1.25-1845			18	B3	8	19	22.5	25.72	40	20.66	12.52	11.17	
SB1.5-4518		m1.5	45	B4	10	36	67.5	68.18	30	21.1	17.35	10	
SB1.5-1845			18	B3	8	23	27	30.86	45	21.97	12.02	10.45	
SB2-4518		m2	45	B4	12	48	90	90.91	40	27.91	23.14	15	
SB2-1845			18	B3	10	32	36	41.15	60	28.69	16.03	14.2	
SB2.5-4518		m2.5	45	B4	15	55	112.5	113.64	50	35.06	28.92	18	
SB2.5-1845			18	B3	12	40	45	51.44	72	33.31	17.04	14.75	
SB3-4518		m3	45	B4	20	65	135	136.37	60	41.86	34.71	22	
SB3-1845			18	B3	16	48	54	61.72	85	38.04	19.05	16.3	
SB4-4518		m4	45	B4	20	80	180	181.82	75	51.16	41.28	24	
SB4-1845			18	B3	20	62	72	82.3	110	48.28	22.06	18	
SB5-4518		m5	45	B4	25	100	225	227.28	90	59.43	47.85	28	
SB5-1845			18	B3	20	80	90	102.87	135	55.82	25.07	20.5	
SB1-4515		3	m1	45	B4	8	30	45	45.37	17	11.77	10.06	5
SB1-1545				15	B3	6	12	15	17.67	29	12.51	6.95	6
SB1.25-4515			m1.25	45	B4	10	34	56.25	56.72	21	14.61	12.33	6
SB1.25-1545				15	B3	8	15	18.75	22.09	36	15.85	8.43	7.25
SB1.5-4515	m1.5		45	B4	10	36	67.5	68.06	28	20.44	17.59	11	
SB1.5-1545			15	B3	8	18	22.5	26.54	47	23.19	13.92	12.5	
SB2-4515	m2		45	B4	12	40	90	90.75	40	30.4	26.12	17	
SB2-1545			15	B3	10	24	30	35.35	60	29.8	15.89	14	
SB2.5-4515	m2.5		45	B4	15	50	112.5	113.43	50	38.35	32.65	22	
SB2.5-1545			15	B3	12	30	37.5	44.18	75	38.41	19.86	17.5	
SB3-4515	m3		45	B4	20	60	135	136.12	55	40.74	34.18	20	
SB3-1545			15	B3	15	38	45	53.02	90	45.17	23.84	21.33	
SB4-4515	m4		45	B5	20	80	180	181.5	70	50.79	42.24	24	
SB4-1545			15	B3	16	50	60	70.69	115	54.6	26.78	23.33	
SB5-4515	m5		45	B5	25	90	225	226.87	75	50.28	40.3	20	
SB5-1545			15	B3	20	60	75	88.37	145	67.19	34.73	30	
SB6-4515	m6		45	BT	30	160	270	272.24	100	72.62	58.36	30	
SB6-1545			15	B3	25	70	90	106.03	175	89.04	42.67	36.67	
SBY8-4515	m8		45	BT	35	200	360	362.99	125	83.74	69.49	30	
SBY8-1545			15	B3	30	100	120	141.39	230	99.93	53.56	46.67	

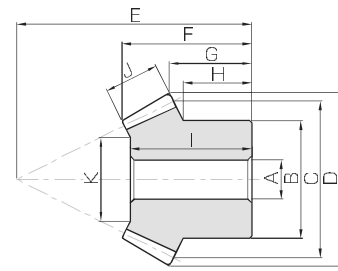
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
15	7	30.73	3.35	0.35	0.34	0.04	0.03~0.13	0.11	SB1-4518
15.5		10.31	1.33	0.14	0.14	0.01			
16	9	37.86	6.67	0.72	0.68	0.07	0.04~0.14	0.17	SB1.25-4518
19.5		12.16	2.65	0.29	0.27	0.03			
18	11	45	11.7	1.29	1.19	0.13	0.05~0.15	0.28	SB1.5-4518
21		16.51	4.64	0.51	0.47	0.05			
25	14	62.24	26.8	3.05	2.74	0.31	0.06~0.16	0.65	SB2-4518
27.5		23.11	10.7	1.22	1.09	0.12			
31	18	76.53	53.4	6.20	5.44	0.63	0.07~0.17	1.23	SB2.5-4518
31.5		26.82	21.2	2.48	2.16	0.25			
37	21	92.96	90.5	10.7	9.23	1.09	0.08~0.18	2.05	SB3-4518
36		33.41	36.0	4.29	3.67	0.44			
45	29	122.33	220	26.8	22.4	2.73	0.12~0.27	4.69	SB4-4518
46		45.83	87.3	10.7	8.91	1.09			
51	34	156.56	411	51.8	41.9	5.28	0.14~0.34	8.31	SB5-4518
52.5		56.9	164	20.7	16.7	2.11			
9	6	32.02	2.84	0.27	0.29	0.027	0.03~0.13	0.078	SB1-4515
12		10.05	0.98	0.09	0.10	0.0091			
12	8	39.63	5.80	0.56	0.59	0.057	0.04~0.14	0.15	SB1.25-4515
15		10.9	2.00	0.19	0.20	0.019			
17	10	46.58	10.3	1.02	1.05	0.10	0.05~0.15	0.25	SB1.5-4515
22.5		14.75	3.56	0.34	0.36	0.035			
26	15	59.04	26.4	2.68	2.69	0.27	0.06~0.16	0.60	SB2-4515
29		19.13	9.10	0.89	0.93	0.091			
35	20	72.84	53.6	5.55	5.46	0.57	0.07~0.17	1.22	SB2.5-4515
37		20.51	18.5	1.85	1.89	0.19			
35	23	88.18	90.2	9.53	9.20	0.97	0.08~0.18	1.99	SB3-4515
43		22.53	31.2	3.18	3.18	0.32			
45	30	118.09	211	23.0	21.5	2.35	0.12~0.27	3.89	SB4-4515
52		32.26	72.8	7.67	7.43	0.78			
44	35	152.88	394	44.3	40.2	4.52	0.14~0.34	6.10	SB5-4515
65		48.64	136	14.8	13.9	1.51			
62	50	169.26	751	87.0	76.6	8.87	0.16~0.36	18.0	SB6-4515
86		49.77	259	39.9	26.4	4.06			
67	50	255.92	1470	179	150	18.3	0.20~0.45	36.4	SBY8-4515
93		61.77	506	59.7	51.6	6.09			

- [Caution on Product Characteristics]
- ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - ② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - ③ For convenience in handling, BT Shaped Gears have tapped holes on their holding surface. To find the L dimensions and tap sizes, please refer to Page 304.

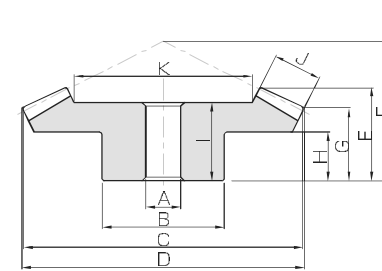
- [Caution on Secondary Operations]
- ① Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.



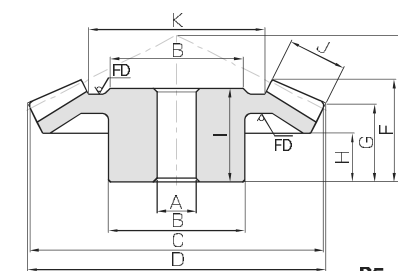
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



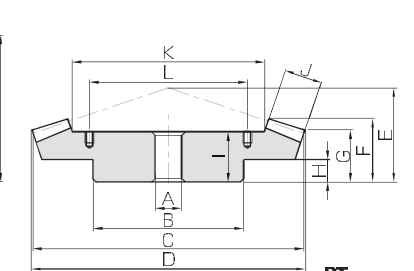
B3



B4



B5



BT

\* FD has die-forged finish.

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width
					A <sub>H7</sub>	B					C	G	
SB1.5-6015 SB1.5-1560		m1.5	60	B4	12	50	90	90.41	32	24.2	21.58	12	
			15	B3	8	18	22.5	26.66	56	23.01	11.52	10.43	
SB2-6015 SB2-1560		m2	60	B4	15	60	120	120.55	42	31.6	28.1	16	
			15	B3	10	24	30	35.55	75	31.01	15.69	14.25	
SB2.5-6015 SB2.5-1560		m2.5	60	B4	20	70	150	150.69	53	40	35.63	20	
			15	B3	12	30	37.5	44.44	94	39.02	19.87	18.06	
SB3-6015 SB3-1560		m3	60	B4	20	80	180	180.83	64	47.97	43.15	25	
			15	B3	15	38	45	53.33	112	44.1	23.04	21.12	
SB4-6015 SB4-1560		m4	60	B5	25	85	240	241.1	80	59.2	52.2	36	
			15	B3	16	50	60	71.10	150	62.03	31.4	28.75	
SBY5-6015 SBY5-1560		m5	60	BT	30	180	300	301.36	80	53.97	45.22	20	
			15	B3	25	60	75	88.9	185	75.03	36.74	33.13	
SBY6-6015 SBY6-1560		m6	60	BT	35	200	360	361.66	100	68.16	58.31	25	
			15	B3	25	75	90	106.66	220	85.17	42.08	38.13	

- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - For convenience in handling, BT Shaped Gears have tapped holes on their holding surface. To find the L dimensions and tap sizes, please refer to Page 304.

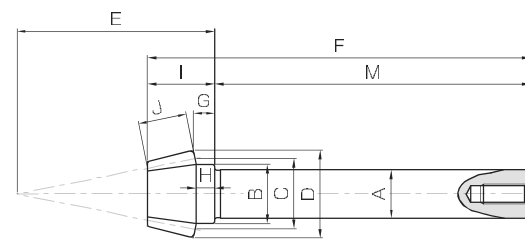
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
21	12	65.38	17.3	1.75	1.77	0.18	0.05~0.15	0.62	SB1.5-6015 SB1.5-1560
22.5			4.46	0.44	0.45	0.045			
27	16	87.02	41.3	4.30	4.21	0.44	0.06~0.16	1.35	SB2-6015 SB2-1560
30			10.6	1.07	1.08	0.11			
34	20	108.64	80.2	8.54	8.18	0.87	0.07~0.17	2.51	SB2.5-6015 SB2.5-1560
37.5			20.6	2.13	2.10	0.22			
41	22	134.4	130	14.2	13.3	1.44	0.08~0.18	4.16	SB3-6015 SB3-1560
43			33.5	3.54	3.42	0.36			
53	32	174.03	328	37.0	33.5	3.77	0.12~0.27	6.00	SB4-6015 SB4-1560
60			84.5	9.24	8.62	0.94			
45	40	218.79	642	74.4	65.4	7.59	0.14~0.34	17.5	SBY5-6015 SBY5-1560
73			165	18.6	16.8	1.90			
56	45	267.73	1050	126	107	12.8	0.16~0.36	30.7	SBY6-6015 SBY6-1560
82			270	31.5	27.5	3.21			

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

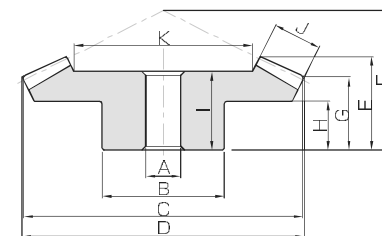


Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—*
Tooth hardness	(less than 194HB) *
Surface treatment	Black oxide coating

\* Pinions are thermal refined. The hardness of a gear tooth is 200 to 270HB.



B8



B4

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore • Shaft dia.		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width	Length of bore • shaft
					A <sub>H7</sub> (Bore)	A <sub>H7</sub> (Shaft)					B	C		
SB1.5-6012 SB1.5-1260		m1.5	60	B4	12	50	90	90.33	30	23.89	21.82	12	21	
			12	B8	12.2	15	18	22.24	50	97.06	5.42	4.7	17.06	
SB2-6012 SB2-1260		m2	60	B4	15	60	120	120.43	40	31.85	29.09	16	27	
			12	B8	15.2	20	24	29.65	66	117.08	6.56	5.6	22.08	
SB2.5-6012 SB2.5-1260		m2.5	60	B4	20	70	150	150.54	50	39.81	36.36	20	34	
			12	B8	20.2	25	30	37.06	83	143.1	8.7	7.5	28.1	
SB3-6012 SB3-1260		m3	60	B4	20	80	180	180.65	60	47.43	43.64	25	41	
			12	B8	25.25	30	36	44.48	100	172.19	10.85	9.4	32.19	

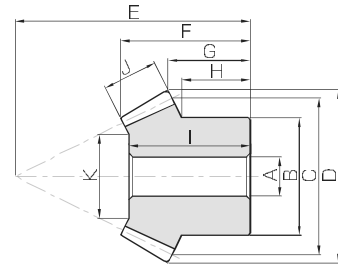
- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

Face width	Holding surface dia.	Shaft length	Screw size	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
12	65.52	—	—	18.0	1.41	1.83	0.14	0.05~0.15	0.62	SB1.5-6012 SB1.5-1260
				4.01	0.46	0.41	0.047			
16	86.96	—	—	42.6	3.43	4.34	0.35	0.06~0.16	1.34	SB2-6012 SB2-1260
				9.50	1.12	0.97	0.11			
20	108.8	—	—	83.2	6.85	8.48	0.70	0.07~0.17	2.54	SB2.5-6012 SB2.5-1260
				18.5	2.23	1.89	0.23			
22	134.73	—	—	135	11.4	13.8	1.16	0.08~0.18	4.18	SB3-6012 SB3-1260
				30.1	3.70	3.07	0.38			

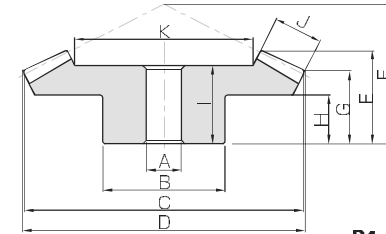
- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.



Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	SUS303
Heat treatment	—
Tooth hardness	(less than 187HB)



**B3**



**B4**

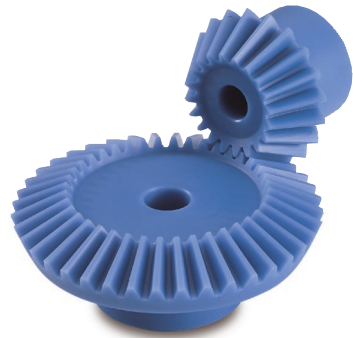
Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Hub dia.		Pitch dia.		Outside dia.		Mounting distance	Total length	Crown to back length		Hub width			
					A <sub>H7</sub>	B	C	D	E	F	G	H								
<b>SUB1.5-3020</b> <b>SUB1.5-2030</b>	1.5	<b>m1.5</b>	30	B4	10	30	45	46.24	28	18.53	13.93	8	28	18.53	13.93	8				
20			B3	8	25	30	33.13	33	18.63	11.54	8.83									
<b>SUB2-3020</b> <b>SUB2-2030</b>		<b>m2</b>	30	B4	10	35	60	61.65	40	26.87	21.24	15					40	26.87	21.24	15
20			B3	10	35	40	44.18	45	25.06	16.39	13.33									
<b>SUB2.5-3020</b> <b>SUB2.5-2030</b>		<b>m2.5</b>	30	B4	15	45	75	77.07	50	34.22	26.55	18					50	34.22	26.55	18
20			B3	12	40	50	55.22	55	31.06	19.24	14.16									
<b>SUB3-3020</b> <b>SUB3-2030</b>	<b>m3</b>	30	B4	15	60	90	92.48	55	35.56	26.86	17	70	40.48	27.09	21.66					
20		B3	15	50	60	66.27	70	40.48	27.09	21.66										
<b>SUB1.5-4020</b> <b>SUB1.5-2040</b>	2	<b>m1.5</b>	40	B4	10	38	60	60.88	35	25.01	20.88	15	35	25.01	20.88	15				
20			B3	8	25	30	33.61	46	25.54	16.9	14.75									
<b>SUB2-4020</b> <b>SUB2-2040</b>		<b>m2</b>	40	B4	12	50	80	81.17	45	32.37	26.17	18					45	32.37	26.17	18
20			B3	12	32	40	44.81	60	34.16	21.2	18									
<b>SUB2.5-4020</b> <b>SUB2.5-2040</b>		<b>m2.5</b>	40	B4	15	60	100	101.46	55	39.73	31.46	20					55	39.73	31.46	20
20			B3	12	40	50	56.01	75	43.78	26.5	22.5									
<b>SUB3-4020</b> <b>SUB3-2040</b>	<b>m3</b>	40	B4	20	70	120	121.76	65	45.85	36.76	24	90	50.81	31.8	27.5					
20		B3	16	50	60	67.22	90	50.81	31.8	27.5										
<b>SUB1.5-4515</b> <b>SUB1.5-1545</b>	3	<b>m1.5</b>	45	B4	10	36	67.5	68.06	28	20.44	17.59	11	28	20.44	17.59	11				
15			B3	8	18	22.5	26.54	47	23.19	13.92	12.5									
<b>SUB2-4515</b> <b>SUB2-1545</b>		<b>m2</b>	45	B4	12	60	90	90.75	40	30.4	26.12	17					40	30.4	26.12	17
15			B3	10	24	30	35.35	60	29.8	15.89	14									
<b>SUB2.5-4515</b> <b>SUB2.5-1545</b>		<b>m2.5</b>	45	B4	15	60	112.5	113.43	50	38.35	32.65	22					50	38.35	32.65	22
15			B3	12	30	37.5	44.18	75	38.41	19.86	17.5									
<b>SUB3-4515</b> <b>SUB3-1545</b>	<b>m3</b>	45	B4	20	80	135	136.12	55	40.74	34.18	20	90	45.17	23.84	21.33					
15		B3	15	38	45	53.02	90	45.17	23.84	21.33										

[Caution on Product Characteristics] ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.  
 ② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
16 17	9	27.37 17.05	3.22 2.23	0.46 0.31	0.33 0.23	0.047 0.032	0.05~0.15	0.12 0.063	<b>SUB1.5-3020</b> <b>SUB1.5-2030</b>
23 22	11	37.56 21.34	7.22 5.01	1.08 0.72	0.74 0.51	0.11 0.074	0.06~0.16	0.26 0.16	<b>SUB2-3020</b> <b>SUB2-2030</b>
30 28	15	45.61 27.42	14.9 10.3	2.28 1.52	1.52 1.05	0.23 0.15	0.07~0.17	0.54 0.28	<b>SUB2.5-3020</b> <b>SUB2.5-2030</b>
31 37	17	57.14 34.71	24.8 17.2	3.87 2.58	2.53 1.76	0.39 0.26	0.08~0.18	0.94 0.55	<b>SUB3-3020</b> <b>SUB3-2030</b>
22 24	10	39.64 17.28	5.23 2.64	0.79 0.40	0.53 0.27	0.081 0.040	0.05~0.15	0.27 0.088	<b>SUB1.5-4020</b> <b>SUB1.5-2040</b>
27 32	15	48.46 20.92	13.4 6.72	2.07 1.04	1.36 0.69	0.21 0.11	0.06~0.16	0.61 0.19	<b>SUB2-4020</b> <b>SUB2-2040</b>
35 41	20	60.28 24.56	27.1 13.6	4.29 2.15	2.76 1.39	0.44 0.22	0.07~0.17	1.21 0.40	<b>SUB2.5-4020</b> <b>SUB2.5-2040</b>
38 47	22	73.81 29.61	44.4 22.4	7.19 3.60	4.53 2.28	0.73 0.37	0.08~0.18	1.86 0.69	<b>SUB3-4020</b> <b>SUB3-2040</b>
17 22.5	10	46.58 14.75	5.70 1.97	0.72 0.24	0.58 0.20	0.074 0.025	0.05~0.15	0.25 0.041	<b>SUB1.5-4515</b> <b>SUB1.5-1545</b>
26 29	15	59.04 19.13	14.6 5.03	1.90 0.63	1.49 0.51	0.19 0.065	0.06~0.16	0.80 0.095	<b>SUB2-4515</b> <b>SUB2-1545</b>
35 37	20	72.84 20.51	29.6 10.2	3.94 1.31	3.02 1.04	0.40 0.13	0.07~0.17	1.36 0.19	<b>SUB2.5-4515</b> <b>SUB2.5-1545</b>
35 43	23	88.18 22.53	49.9 17.2	6.77 2.26	5.09 1.76	0.69 0.23	0.08~0.18	2.32 0.34	<b>SUB3-4515</b> <b>SUB3-1545</b>

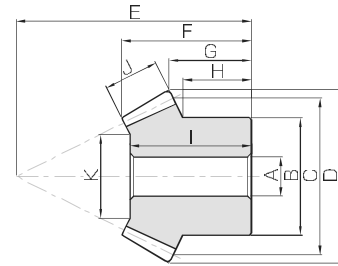
[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.



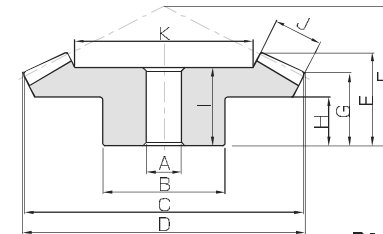


Specifications	
Precision grade	JIS B 1704: 1978 grade 4 *
Gear teeth	Gleason
Pressure angle	20°
Material	MC901
Heat treatment	—
Tooth hardness	(115 ~ 120HRR)

\* The precision grade of this product is equivalent to the value shown in the table.



B3



B4

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length		Hub width
					A	B				F	G	
PB1.5-3020 PB1.5-2030	1.5	m1.5	30	B4	10	30	45	46.24	28	18.53	13.93	8
20			B3	8	25	30	33.13	33	18.63	11.54	8.83	
PB2-3020 PB2-2030		m2	30	B4	10	35	60	61.65	40	26.87	21.24	15
20			B3	10	35	40	44.18	45	25.06	16.39	13.33	
PB2.5-3020 PB2.5-2030		m2.5	30	B4	15	45	75	77.07	50	34.22	26.55	18
20			B3	12	40	50	55.22	55	31.06	19.24	14.16	
PB3-3020 PB3-2030	m3	30	B4	15	60	90	92.48	55	35.56	26.86	17	
20		B3	15	50	60	66.27	70	40.48	27.09	21.66		
PB1-4020 PB1-2040	2	m1	40	B4	8	25	40	40.59	22	15.07	12.59	8
20			B3	6	16	20	22.41	28	13.78	8.6	7	
PB1.25-4020 PB1.25-2040		m1.25	40	B4	10	32	50	50.73	27	18.54	15.23	10
20			B3	8	22	25	28.01	36	18.66	11.75	10.25	
PB1.5-4020 PB1.5-2040		m1.5	40	B4	10	38	60	60.88	35	25.01	20.88	15
20			B3	8	25	30	33.61	46	25.54	16.9	14.75	
PB2-4020 PB2-2040	m2	40	B4	12	40	80	81.17	45	32.37	26.17	18	
20		B3	12	32	40	44.81	60	34.16	21.2	18		
PB2.5-4020 PB2.5-2040	m2.5	40	B4	15	50	100	101.47	55	39.73	31.47	20	
20		B3	12	40	50	56.01	75	43.78	26.5	22.5		
PB3-4020 PB3-2040	m3	40	B4	20	60	120	121.76	65	45.85	36.76	24	
20		B3	16	50	60	67.22	90	50.81	31.8	27.5		
PB1.5-4515 PB1.5-1545	3	m1.5	45	B4	10	40	67.5	68.06	28	20.44	17.59	11
15			B3	8	18	22.5	26.54	47	23.19	13.92	12.5	
PB2-4515 PB2-1545		m2	45	B4	12	60	90	90.75	40	30.4	26.12	17
15			B3	10	24	30	35.35	60	29.8	15.89	14	
PB2.5-4515 PB2.5-1545		m2.5	45	B4	15	60	112.5	113.43	50	38.35	32.65	22
15			B3	12	30	37.5	44.18	75	38.41	19.86	17.5	
PB3-4515 PB3-1545	m3	45	B4	20	80	135	136.12	55	40.74	34.18	20	
15		B3	15	38	45	53.02	90	45.17	23.84	21.33		

- [Caution on Product Characteristics]
- ① Significant variations in temperature or humidity can cause dimensional changes in plastic gears (MC Nylon gears), including bore size (H8 when produced), tooth diameter, and backlash. Please see the section "Design of Plastic Gears" in separate technical reference book. (Page 101).
  - ② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - ③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
  - ④ Without lubrication, using plastic gears in pairs may generate heat and dilation. It is recommended to mate them with steel gears.

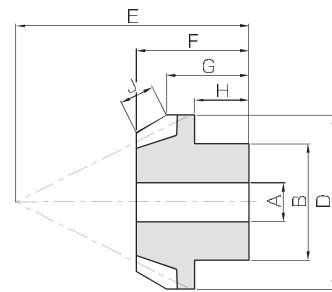
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
16 17	9	27.37 17.05	1.61 0.87	—	0.16 0.089	—	0~0.25	0.018 0.0093	PB1.5-3020 PB1.5-2030
23 22	11	37.56 21.34	3.65 1.97	—	0.37 0.20	—	0~0.26	0.039 0.024	PB2-3020 PB2-2030
30 28	15	45.61 27.42	7.46 4.04	—	0.76 0.41	—	0~0.27	0.081 0.042	PB2.5-3020 PB2.5-2030
31 37	17	57.14 34.71	12.5 6.77	—	1.28 0.69	—	0~0.28	0.14 0.082	PB3-3020 PB3-2030
12 12	6	26.58 9.17	0.74 0.28	—	0.075 0.028	—	0~0.23	0.010 0.0029	PB1-4020 PB1-2040
16 17	8	33.61 13.22	1.50 0.56	—	0.15 0.058	—	0~0.24	0.021 0.0068	PB1.25-4020 PB1.25-2040
22 24	10	39.64 17.28	2.66 1.00	—	0.27 0.10	—	0~0.25	0.039 0.013	PB1.5-4020 PB1.5-2040
27 32	15	48.46 20.92	6.72 2.52	—	0.69 0.26	—	0~0.26	0.076 0.028	PB2-4020 PB2-2040
35 41	20	60.28 24.56	13.5 5.08	—	1.38 0.52	—	0~0.27	0.16 0.060	PB2.5-4020 PB2.5-2040
38 47	22	73.81 29.61	22.4 8.42	—	2.29 0.86	—	0~0.28	0.25 0.10	PB3-4020 PB3-2040
17 22.5	10	46.58 14.75	3.18 0.68	—	0.32 0.070	—	0~0.25	0.040 0.0061	PB1.5-4515 PB1.5-1545
26 29	15	59.04 19.13	8.07 1.73	—	0.82 0.18	—	0~0.26	0.12 0.014	PB2-4515 PB2-1545
35 37	20	72.84 20.51	16.3 3.50	—	1.66 0.36	—	0~0.27	0.20 0.028	PB2.5-4515 PB2.5-1545
35 43	23	88.18 22.54	27.6 5.92	—	2.81 0.60	—	0~0.28	0.35 0.050	PB3-4515 PB3-1545

- [Caution on Secondary Operations]
- ① Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
  - ② Plastic gears are susceptible to the effects of temperature and moisture. Dimensional changes may occur while performing secondary operations and during post-machining operations.

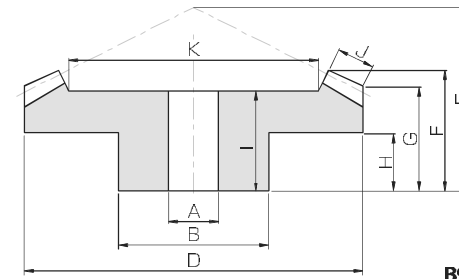
\* In regards to MC Nylon gears, other materials are available, including Ultra High Molecular Weight Polyethylene (UHMW-PE), which has excellent abrasion resistance, and resin conforming to the Plastic Implementation Measure (PIM). A single piece order is acceptable and will be produced as a custom-made gear. For details on quotations and orders please see Page 16.



Specifications	
Precision grade	JIS B 1704: 1978 grade 6
Gear teeth	Gleason
Pressure angle	20°
Material	Duracon (M90-44)
Heat treatment	—
Tooth hardness	(110 ~ 120HRR)



B1



B9

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	
					A	B					C	D
DB0.5-4020	2	m0.5	40	B9	4	12	20	20.29	12	8.33	7.29	
DB0.5-2040			20	B1	3	8	10	11.2	16	8.46	6.3	
DB0.8-4020		m0.8	40	B9	5	15	32	32.47	18	11.91	10.47	
DB0.8-2040			20	B1	4	12	16	17.92	24	11.5	8.48	
DB1-4020	2	m1	40	B9	6	18	40	40.59	22	14.45	12.59	
DB1-2040			20	B1	5	15	20	22.4	30	14.49	10.6	

- [Caution on Product Characteristics]
- ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 303 for more details.
  - ② The bore tolerance is generally -0.05 to -0.3 but may be + values at the central portion of the hole.
  - ③ To find the dimensional tolerance of these gears, please see the Dimensional Tolerance Table.

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Backlash (mm)	Weight (g)	Catalog No.
				Bending strength	Bending strength			
4	7	2.5	14.41	0.24	0.025	0 ~ 0.30	2.00	DB0.5-4020 DB0.5-2040
4	—		—	0.092	0.0094			
6	10	3.5	24.17	0.91	0.093	0 ~ 0.48	6.26	DB0.8-4020 DB0.8-2040
5	—		—	0.34	0.035			
7.5	12.5	4.5	30.44	1.59	0.16	0 ~ 0.60	11.9	DB1-4020 DB1-2040
7	—		—	0.60	0.061			

- [Caution on Secondary Operations]
- ① Avoid performing secondary operations as reworking material may expose air bubbles (voids).

Dimensional tolerance table (Unit : mm)

Range	Tolerance
below 3 mm	± 0.20
3 up to 6 mm	± 0.25
6 up to 10 mm	± 0.30
10 up to 18 mm	± 0.35
18 up to 30 mm	± 0.40
30 mm up	± 0.50

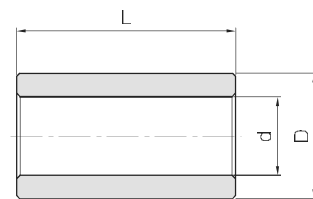


BB Sintered Metal Bushings

Sintered Metal Bushings



The table shows a series of standard metal bushings that can be pressed into standard Injection Molded Gears. They can be used as bearing metal on idler gears or to reduce the bore of the gears.



T8



Catalog No.	I.D. of bushing	O.D. of bushing	Total Length	Products that can use the bushing
	d <sup>+0.02/0</sup>	D <sup>+0.02/-0.01</sup>	L <sup>0/-0.2</sup>	
BB30507	3	5	7	DB0.8
BB40612	4	6	12	DB1

Material : Oil impregnated sintered bronze.

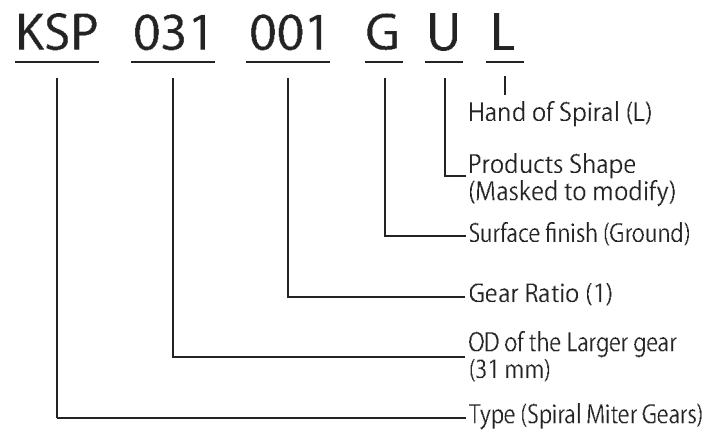


Spur Gears  
Helical Gears  
Internal Gears  
Racks  
CP Racks & Pinions  
Miter Gears  
Bevel Gears  
Screw Gears  
Worm Gear Pairs  
Bevel Gearboxes  
Other Products

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

■ Catalog Number of NISSEI Spiral Bevel Gears

The catalog number systems of KSP Ground Spiral Bevel Gears differs from other miter and bevel gears.

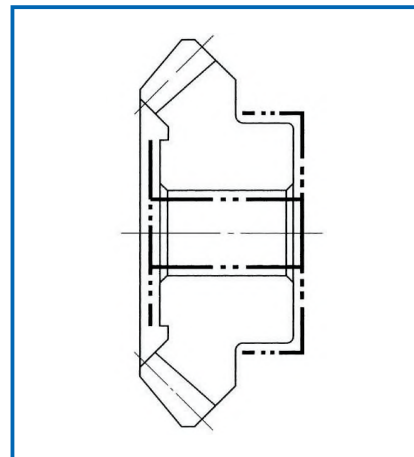


■ The Characteristics of KSP Spiral Bevel Gears

1. JIS Grade 0, high strength, high precision products
2. Superior performance with regard to high speed, low noise, and low vibration.
3. Module range from 1.5 to 6
4. Three gear ratios: 1, 1.5 and 2

■ Products Style

For Type U products - The hub is masked to allow secondary operations  
 ※ The heavy lines in the figure below indicate the masked areas during carburizing.



■ Notes about the Transmission Capability Table

1. The values given in the table are for a service factor, Sf  
 1. Using the table on the right, please modify the value according to the actual conditions. Load torque compensation is calculated from the load torque at the output shaft x service factor (Sf).
2. For speed increaser applications (where the gear is the driver and the pinion is driven), the torque on the pinion is the value in the table multiplied by the speed ratio.

NOTE 1: For speed ratio of 1/1.5, the torque on the pinion is 1/1.5 times the value given in the table.

■ Service Factor Sf

Impact from Prime Mover	Impact from Load Side of Machine		
	Uniform Load	Medium Impact Load	Heavy Impact Load
Uniform Load (Motor, Turbine, Hydraulic Motor)	1.0	1.25	1.75
Light Impact Load (Multicylinder Engine)	1.25	1.5	2.0
Medium Impact Load (Single Cylinder Engine)	1.5	1.75	2.25

■ Transmission Capability Table (Speed Ratio 1/1)

Upper Transmission Capability (kw) Lower Torque (N·m)

Model	Rotation (rpm)	50	100	300	600	900	1200	1800	3000
KSP031001	0.035	0.068	0.195	0.375	0.548	0.716	1.04	1.65	
	6.65	6.51	6.20	5.98	5.82	5.69	5.51	5.25	
KSP040001	0.092	0.179	0.511	0.980	1.43	1.86	2.69	4.25	
	17.6	17.2	16.3	15.6	15.2	14.8	14.3	13.5	
KSP053001	0.211	0.412	1.17	2.23	3.25	4.22	6.08	9.55	
	40.4	39.3	37.3	35.6	34.5	33.6	32.3	30.4	
KSP066001	0.367	0.715	2.02	3.85	5.59	7.26	10.4	16.3	
	70.2	68.3	64.4	61.4	59.3	57.8	55.4	52.0	
KSP078001	0.577	1.12	3.16	6.00	8.68	11.2	16.1	25.1	
	109.8	106.9	101.0	95.5	92.2	89.5	85.5	79.8	
KSP092001	0.901	1.75	4.91	9.31	13.5	17.4	24.9	38.6	
	172.6	166.7	156.9	148.1	143.2	138.3	132.4	122.6	
KSP105001	1.44	2.78	7.80	14.7	21.2	27.4	39.1	60.3	
	274.6	265.8	248.1	234.4	225.6	218.7	207.9	192.2	
KSP132001	2.33	4.50	12.6	23.6	34.0	43.7	62.0	95.0	
	445.2	430.5	400.1	376.6	360.9	348.1	329.5	302.0	
KSP157001	3.68	7.10	19.7	37.0	53.0	68.1	96.2	146	
	704.1	678.6	628.6	589.4	562.9	542.3	510.9	466.8	
KSP184001	5.31	10.2	28.3	52.8	75.5	96.8	136	206	
	1010	976.7	901.2	841.4	801.2	770.8	722.8	656.1	

■ Transmission Capability Table (Speed Ratio 1/1.5)

Upper Transmission Capability (kw) Lower Torque (N·m)

Model	Pinion Rotation(rpm)	50	100	300	600	900	1200	1800	3000
KSP0481.5	0.077	0.151	0.432	0.830	1.21	1.58	2.29	3.64	
	22.2	21.6	20.6	19.8	19.3	18.9	18.2	17.4	
KSP0611.5	0.159	0.309	0.882	1.69	2.46	3.21	4.64	7.33	
	45.4	44.3	42.2	40.4	39.2	38.3	37.0	35.0	
KSP0741.5	0.277	0.540	1.53	2.93	4.27	5.55	8.00	12.6	
	79.4	77.4	73.4	70.1	68.0	66.3	63.7	60.1	
KSP0901.5	0.466	0.908	2.57	4.90	7.12	9.24	13.3	20.8	
	133.4	130.4	122.6	116.7	113.8	110.8	105.9	99.0	
KSP1051.5	0.700	1.36	3.84	7.31	10.6	13.7	19.7	30.7	
	201.0	195.2	183.4	174.6	168.7	163.8	156.9	147.1	
KSP1241.5	1.03	2.00	5.63	10.7	15.5	20.0	28.6	44.5	
	295.2	286.4	268.7	255.0	246.1	239.3	227.5	212.8	
KSP1411.5	1.56	3.03	8.51	16.1	23.2	30.1	42.9	66.4	
	448.2	434.4	406.0	384.4	370.7	358.9	341.3	317.7	
KSP1631.5	2.27	4.39	12.3	23.2	33.4	43.1	61.4	94.6	
	650.2	628.6	587.4	554.1	532.5	514.8	489.4	452.1	
KSP1811.5	2.92	5.64	15.8	29.7	42.7	55.1	78.3	120	
	836.5	809.0	754.1	710.0	680.6	658.0	623.7	574.7	

■ Transmission Capability Table (Speed Ratio 1/2)

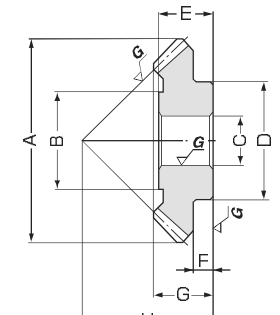
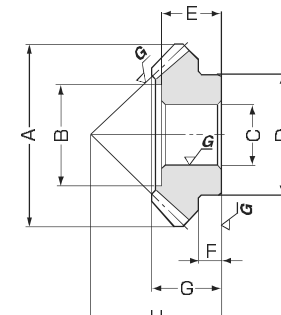
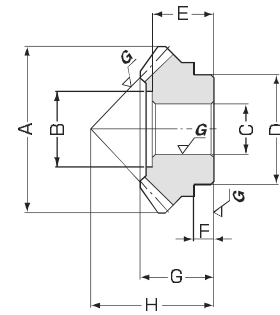
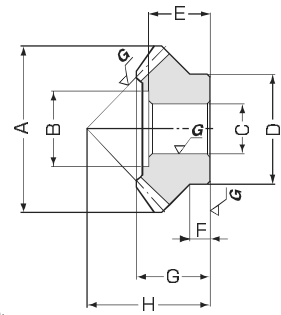
Upper Transmission Capability (kw) Lower Torque (N·m)

Model	Pinion Rotation(rpm)	50	100	300	600	900	1200	1800	3000
KSP039002	0.025	0.049	0.142	0.275	0.404	0.528	0.770	1.23	
	9.63	9.45	9.07	8.76	8.57	8.41	8.17	7.83	
KSP056002	0.075	0.147	0.423	0.814	1.19	1.55	2.26	3.59	
	28.8	28.1	27.0	26.0	25.3	24.8	23.9	22.8	
KSP075002	0.185	0.361	1.03	1.98	2.89	3.76	5.45	8.61	
	70.7	69.0	65.7	63.1	61.3	59.9	57.9	54.8	
KSP096002	0.364	0.710	2.02	3.86	5.62	7.31	10.5	16.6	
	139.3	135.3	128.5	122.6	119.6	116.7	111.8	105.9	
KSP119002	0.649	1.26	3.58	6.82	9.90	12.9	18.5	29.0	
	248.1	241.2	227.5	217.7	209.9	205.0	196.1	184.4	
KSP145002	1.07	2.08	5.87	11.2	16.2	21.0	30.1	46.9	
	408.9	397.2	373.6	356.0	343.2	333.4	319.7	298.1	
KSP172002	1.78	3.45	9.72	18.4	26.6	34.5	49.3	76.5	
	680.6	660.0	618.8	587.4	565.8	549.2	523.7	487.4	



Specifications	
Precision grade	JIS B 1704 : 1978 grade 0
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415*
Heat treatment	Carburizing (bore & hubs are masked)
Tooth hardness	60 ~ 63HRC **

\* Module 3.5 and larger are made of SCM420.  
\*\* Tooth Hardness for module 1.5 and 2 is between 80 to 83 HRA.



Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Pitch dia.	Face width	Shape	Outside dia.	Adding surface dia.	Bore	Hub dia.	Length of bore	
								A	B	C <sub>H7</sub>	D	E	
KSP031001GU L KSP031001GU R	1	m1.5	20	L R	30	7	A	30.5	16.5	10	22	13	
KSP040001GU L KSP040001GU R		m2	20	L R	40	9	B	40	22.5	12	31	14	
KSP053001GU L KSP053001GU R		m2.5	21	L R	52.5	12	B	53	31	14	38	20	
KSP066001GU L KSP066001GU R		m3	21	L R	63	15	B	65	33.5	16	47	25	
KSP078001GU L KSP078001GU R		m3.5	22	L R	77	18	B	78	43	20	54	27	
KSP092001GU L KSP092001GU R		m4	22	L R	88	21	B	91	49	22	63	32	
KSP105001GU L KSP105001GU R		m4.5	23	L R	103.5	25	C	105	50	26	70	35	
KSP132001GU L KSP132001GU R		m5	26	L R	130	29	C	132	64	30	82	41	
KSP157001GU L KSP157001GU R		m5.5	28	L R	154	34	C	157	76	32	92	47	
KSP184001GU L KSP184001GU R		m6	30	L R	180	38	C	184	84	40	101	51	
KSP0481.5GU P KSP0481.5GU G		1.5	m2	16 24	L R	32 48	9	A' B	34 48	17.5 30	10 12	24 30	13 17
KSP0611.5GU P KSP0611.5GU G			m2.25	18 27	L R	40.5 60.75	12	A' B	42 61	22 36	12 14	30 40	17 20
KSP0741.5GU P KSP0741.5GU G	m2.75		18 27	L R	49.5 74.25	15	A' B	52 74	27 44.5	14 20	40 50	20 25	
KSP0901.5GU P KSP0901.5GU G	m3		20 30	L R	60 90	18	B B	63 90	34 54.5	16 20	44 56	24 29	
KSP1051.5GU P KSP1051.5GU G	m3.5		20 30	L R	70 105	21	B C	74 105	38 53	20 22	50 63	25 32	
KSP1241.5GU P KSP1241.5GU G	m3.75		22 33	L R	82.5 123.75	24	B C	87 124	46.5 64	20 26	56 69	29 35	
KSP1411.5GU P KSP1411.5GU G	m4.25		22 33	L R	93.5 140.25	28	B C	99 141	53 68	22 30	63 73	32 41	
KSP1631.5GU P KSP1631.5GU G	m4.5		24 36	L R	108 162	32	B C	113 163	64.5 76	26 32	69 82	35 47	
KSP1811.5GU P KSP1811.5GU G	m5		24 36	L R	120 180	35	B C	126 181	71.5 86	30 38	73 90	41 48	
KSP039002GU P KSP039002GU G	2		m1.5	13 26	L R	19.5 39	7	A B	21 38.5	10.2 24	8 10	16 24	14 13
KSP056002GU P KSP056002GU G			m2	14 28	L R	28 56	10	B B	30 56	15.3 35.5	8 12	20 30	12 18
KSP075002GU P KSP075002GU G			m2.5	15 30	L R	37.5 75	14	A' C	40 75	20 36	12 16	30 44	17 24
KSP096002GU P KSP096002GU G		m3	16 32	L R	48 96	18	B C	53 96	23.5 46	12 20	36 56	19 29	
KSP119002GU P KSP119002GU G		m3.5	17 34	L R	59.5 119	22	A C	65 119	34 54	16 26	44 63	25 34	
KSP145002GU P KSP145002GU G		m4	18 36	L R	72 144	27	A C	78 145	38 60	20 30	54 73	28 39	
KSP172002GU P KSP172002GU G		m4.5	19 38	L R	85.5 171	32	A C	93 172	48 70	26 36	69 79	34 46	

Hub width	Total length	Mounting distance	Keyway	Allowable torque (kgf-m)	Backlash (mm)	Weight (kg)	Catalog No.
F	G	H					
6	15	25	12	0.61	0 ~ 0.05	0.04	KSP031001GU L KSP031001GU R
7	16.5	30	16	1.59	0 ~ 0.05	0.09	KSP040001GU L KSP040001GU R
8	22.8	40	22	3.63	0.05~0.10	0.21	KSP053001GU L KSP053001GU R
13	29.5	50	25	6.26	0.05~0.10	0.39	KSP066001GU L KSP066001GU R
12	32	57	32	9.74	0.05~0.10	0.59	KSP078001GU L KSP078001GU R
14	38	66	38	15.1	0.05~0.10	0.96	KSP092001GU L KSP092001GU R
14	39	72	40	23.9	0.05~0.10	1.33	KSP105001GU L KSP105001GU R
14	45	88	48	38.4	0.05~0.10	2.49	KSP132001GU L KSP132001GU R
20	53.5	105	55	60.1	0.05~0.10	3.90	KSP157001GU L KSP157001GU R
17	56.5	118	62	85.8	0.05~0.10	5.79	KSP184001GU L KSP184001GU R
4.5 7	14.5 19	31 30	— 20	2.02	0 ~ 0.05	0.05 0.14	KSP0481.5GU P KSP0481.5GU G
5.5 10	19 23.5	39 37	16 27	4.12	0.05~0.10	0.10 0.28	KSP0611.5GU P KSP0611.5GU G
6 12	22 29	46 45	20 35	7.15	0.05~0.10	0.20 0.49	KSP0741.5GU P KSP0741.5GU G
8 13	26.5 33	56 53	25 42	11.9	0.05~0.10	0.34 0.84	KSP0901.5GU P KSP0901.5GU G
7 13	28.5 34	63 57	28 42	17.8	0.05~0.10	0.47 1.18	KSP1051.5GU P KSP1051.5GU G
7 14	33 36.5	74 64	36 48	26.0	0.05~0.10	0.80 1.71	KSP1241.5GU P KSP1241.5GU G
7 17	36 43.5	82 74	42 50	39.2	0.05~0.10	1.15 2.46	KSP1411.5GU P KSP1411.5GU G
7 19	38.5 49.5	92 85	48 55	56.5	0.05~0.10	1.64 3.84	KSP1631.5GU P KSP1631.5GU G
10 19	45.5 50.5	105 90	55 60	72.4	0.05~0.10	2.21 4.85	KSP1811.5GU P KSP1811.5GU G
7.6 7	14.5 15	28 22	— 20	0.89	0 ~ 0.05	0.02 0.07	KSP039002GU P KSP039002GU G
2.5 8	13 20.5	32 30	10 20	2.65	0 ~ 0.05	0.04 0.19	KSP056002GU P KSP056002GU G
4.5 11	19.5 25.5	44 38	14 25	6.43	0.05~0.10	0.10 0.44	KSP075002GU P KSP075002GU G
2.5 12	21.5 31	53 47	19 32	12.5	0.05~0.10	0.20 0.91	KSP096002GU P KSP096002GU G
3.6 15	27.5 35.5	67 55	25 40	22.2	0.05~0.10	0.36 1.45	KSP119002GU P KSP119002GU G
3.5 16	33 40.5	80 64	30 42	36.3	0.05~0.10	0.65 2.44	KSP145002GU P KSP145002GU G
4.4 20	38 47	94 75	38 50	59.9	0.05~0.10	0.97 3.80	KSP172002GU P KSP172002GU G

[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 337 to kgf-m, according to assumed usage conditions.  
② These gears produce axial thrust forces. See Page 274 for more details.

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.

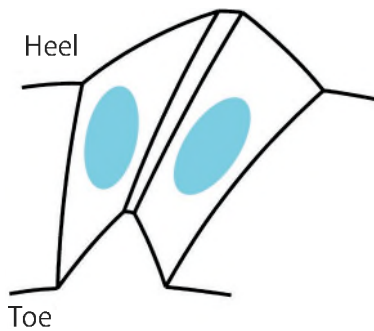


## Adjusting Tooth Contact

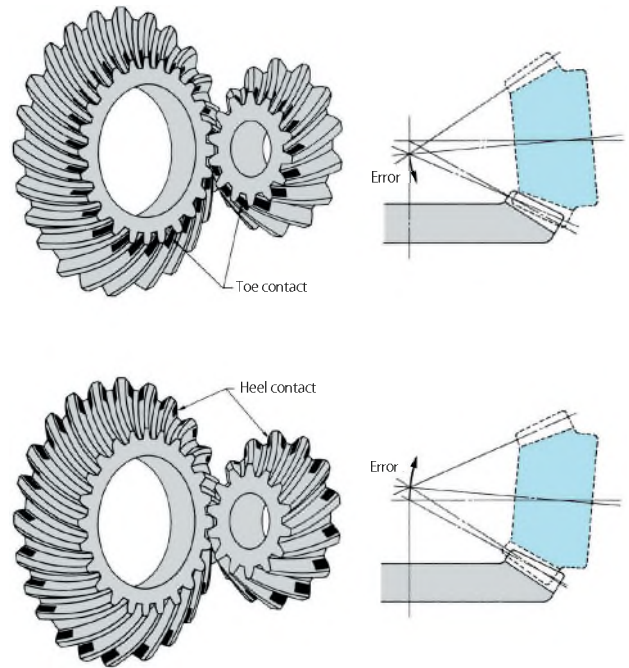
### < Centering tooth contact >

- (1) When assembled correctly, the contact will occur in the middle of the tooth flank.
- (2) The contact area along the tooth face should be in the center of the tooth, but somewhat closer to the toe is ideal.

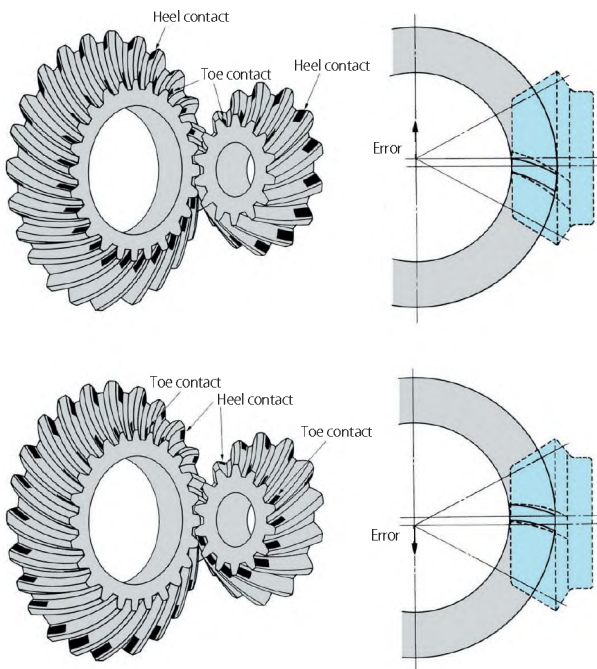
When the gears are assembled in to the gearbox and the backlash is adjusted, adjust the gearbox to obtain the tooth contact as shown below. Inaccurate assembly will lead to irregular noise and uneven wear,



### (1) When there is an angular error of the shafts



### (2) When the pinion shaft is offset



### (3) When the mounting distance of the pinion is incorrect

