



Bevel Gears



MHP	MBSG	SBSG	MBSA/MBSB	SBS	SB	SBY
High-Ratio Hypoid Gears	Ground Spiral Bevel Gears	Ground Spiral Bevel Gears	Finished Bore Spiral Bevel Gears	Spiral Bevel Gears	Bevel Gears	Bevel Gears
Gear Ratio 15~60	Gear Ratio 2	Gear Ratio 1.5~3	Gear Ratio 1.5~3	Gear Ratio 1.5~4	Gear Ratio 1.5~4	Gear Ratio 2~4
Material: SCM415	Material: SCM415	Material: S45C	Material: SCM415	Material: S45C	Material: S45C	Material: S45C
m1, 1.5 Page 336	m2~4 Page 340	m2~4 Page 342	m2~6 Page 344	m1~5 Page 348	m1~6 Page 352	m5~8 Page 352
SB	SUB	PB	DB	BB	Nissei KSP	
Steel Bevel Gears & Pinion Shafts	Stainless Steel Bevel Gears	Plastic Bevel Gears	Injection Molded Bevel Gears	Sintered Metal Bushings	Ground Spiral Bevel Gears	
Gear Ratio 5	Gear Ratio 1.5~3	Gear Ratio 1.5~3	Gear Ratio 2		Gear Ratio 1~2	
Material: S45C	Material: SUS303	Material: MC901	Material: Duracon (R) (M90-44)	Material: Oil-free copper alloy	Material: SCM415	
m1.5~3 Page 356	m1.5~3 Page 358	m1~3 Page 360	m0.5~1 Page 362	φ5~6 Page 362	m1.5~6 Page 364	

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

Direction of Helix (Right)
 No. of teeth of mating gears (20)
 No. of Teeth (40)
 Module (2)
 Other Products (Ground Gears)
 Type (Spiral Bevel Gears)
 Material (SCM415)

Material
 S S45C
 M SCM415
 SU Stainless Steel
 P MC901
 D Polyacetal

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 Gears

Gearboxes

Other Products

Features



KHK stock bevel gears are available in two types, spiral bevel gears and straight bevel gears, 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 Number	Module	Gear Ratio	Material	Heat Treatment	Tooth Surface Finish	Precision	Secondary Operations	Features
Hypoid Gear	MHP	1, 1.5	15~60	SCM415	Carburized Note 1	Cut	3	△	Hypoid gears that have been tempered, hardened and ground that are capable of rapid deceleration.
Spiral Bevel Gears	MBSG	2~4	2	SCM415	Carburized Note 1	Ground	1	△	Gears that have been hardened and ground that has excellent accuracy, strength and abrasion resistance. Secondary operations are possible except for the teeth.
	SBSG	2~4	1.5~3	S45C	Gear teeth induction hardened	Ground	2	△	Gears that have been hardened and ground with a good balance of accuracy, wear resistance and cost. Secondary operations are possible except for the teeth.
	KSP	1.5~6	1~2	SCM415	Carburized Note 1	Ground	0	△	Gears that have been hardened and ground that has grade-0 accuracy, strength, abrasion resistance and quietness. Secondary operations can be given except for the teeth.
	MBSA/MBSB	2~6	1.5~3	SCM415	Carburized	Cut	4	×	Gears that have been fully hardened that have excellent strength and wear resistance. Can be used in the finished shape.
	SBS	1~5	1.5~4	S45C	Gear teeth induction hardened	Cut	4	△	Gears that have been hardened with excellent wear resistance. Secondary operations are possible except for the teeth.
Straight Bevel Gears	SB/SBY	1~8	1.5~5	S45C	—	Cut	3	○	Many lineups are available at a low price. The teeth can be additionally hardened.
	SUB	1.5~3	1.5~3	SUS303	—	Cut	3	○	Stainless steel gears with rust resistance.
	PB	1~3	1.5~3	MC901	—	Cut	4	○	Nylon gears can be used with no lubrication.
	DB	0.5~1	2	Duracon (R) (M90-44) NOTE 2	—	Injection Molded	6	△	Low-priced gears made through injection molding. Suitable for light loads.

[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, note that high hardness (HRC40 at maximum) occurs in some cases.

[NOTE 2] "Duracon (R)" is a registered trademark of Polyplastics Co., Ltd. in Japan as well as other countries.

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

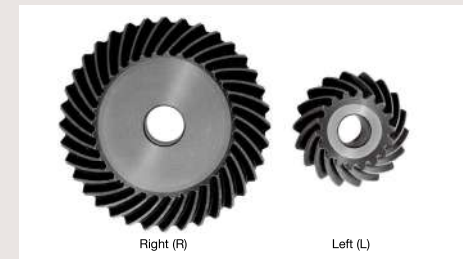
Selection Hints



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.



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

Gears	SB	SUB	PB	DB
Pinion				
SB	○	○	○	×
SUB	○	○	○	×
PB	○	○	○	×
DB	×	×	×	○

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

Gears	MBSG	SBSG	MBSA MBSB	SBS
Pinion				
MBSG	○	×	×	×
SBSG	×	○	×	×
MBSA/MBSB	×	×	○	×
SBS	×	×	×	○

2. Caution in Selecting Gears Based on Gear Strength

The gear strength values shown in the product pages were computed by assuming the application environment in the table below. 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 calculations, please refer to the technical information contained in the "Bending Strength of Bevel Gears" section, and the "Surface Durability of Bevel Gears" section.

Calculation of Bending Strength of Gears

Catalog Number	MBSG MBSA MBSB	SBSG/SBS	SB NOTE 2 SBY	SUB	PB	DB
Formula NOTE 1	Formula of bevel gears on bending strength (JGMA403-01)				The Lewis formula	
No. of teeth of mating gears	No. of teeth of the mating gear of the set				—	
Rotational Speed of Pinion	100rpm (600rpm for MBSG and SBSG)				100rpm	
Design Life (Durability)	Over 10 ⁷ cycles				—	
Impact from motor	Uniform load				Allowable bending stress (kgf/mm ²)	
Impact from load	Uniform load				—	
Direction of load	Bidirectional load (calculated with allowable bending stress of 2/3)				—	
Allowable bending stress at root σ_{Hlim} (kgf/mm ²)	47	21	19 (24.5)	10.5	1.15 (40°C with No Lubrication)	
Safety factor K_R	1.2				m 0.5 4.0 m 0.8 4.0 m 1.0 3.5 (40°C with Grease Lubrication)	

Calculation of Surface Durability (Except where it is common with bending strength)

Formula NOTE 1	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 σ_{Hlim} (kgf/mm ²)	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 Mitsubishi Chemical Advanced Materials and "Duracon (R) Gear" by Polyplastics Co. The units for the rotational speed (rpm) and the stress (kgf/mm²) are adjusted to the units needed in the formula.

[NOTE 2] 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



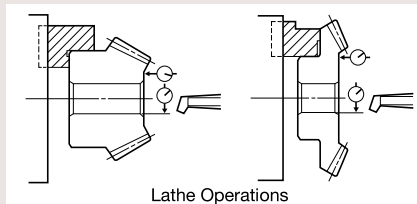
In order to use KHK stock bevel gears safely, carefully read the Application Hints before proceeding.
If there are questions or you require clarifications, please contact our technical department or your nearest distributor.
E-mail: info@khkgears.net

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. Plastic gears and ring gears deform particularly easily, so please handle with care.

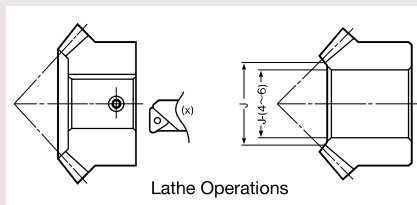
2. Caution on Performing Secondary Operations

- ① If reborring, it is important to pay special attention to locating the center in order to avoid runout.
- ② The reference datum for gear machining is the bore. Therefore, 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.



Lathe Operations

- ④ For items with induction hardened teeth, the hardness is high near the tooth root. When machining the front face, the machined area should be 4 to 6mm smaller than the dimension, J.



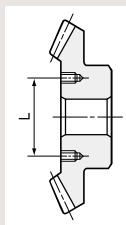
Lathe Operations

- ⑤ For tapping and keyway operations, see the examples given in "Caution on Performing Secondary Operations" in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentration, always round the 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 induction-hardening S45C products, thermal stress cracks may appear. Also, note that the precision grade of the product declines by 1 or 2 grades, as deformation on material may occur. If you require tolerance for bore or other parts, machining is necessary after heat treatment.

- ⑧ For the handling conveniences, the SB and SBY series listed below have the tapped holes (180° apart, 2 places) on the holding surface. We appreciate your understanding.

Please pay attention to the machining position.

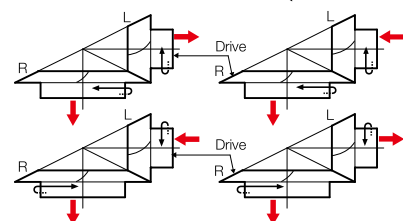


Catalog Number	L(mm)	Tap Size
SB6-4515	130	M10 deep 20
SBY8-4020	160	M10 deep 20
SBY8-4515	210	M10 deep 20
SBY5-6015	160	M10 deep 20
SBY6-6015	220	M10 deep 20

3. Points of Caution during Assembly

- ① Since bevel gears are cone shaped, they produce axial thrust forces. Especially for spiral bevel gears, the directions of thrust change 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 our separate technical reference book, section of "Gear Forces".

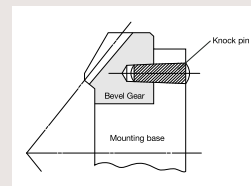
Direction of Rotation and Thrust Force



[NOTE] Bevel gears with the gear ratio 1.57 or less, produce a thrust force which is the same as miter gears. For details, please see Page 304.

- ② If a gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend designing bevel gears to be as close to the bearings as possible. Design the gear box, shaft and bearing with high rigidity.
- ③ Be sure to fasten the bevel gear to prevent the gears from moving, as thrust acts on it while rotating.

- ④ When installing MBSA or MBSB spiral bevel gears produced in B7 style (ring gear), 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 The recommended assemble distance tolerance of KHK stock bevel gears is H7 for ground gears and H8 for cut gears. Mounting distance error, offset error and shaft angle error must be minimized to avoid excessive noise and wear. Inaccurate assembly will lead to irregular noises and uneven wear. Various conditions of tooth contact are shown below. Also, when changing the normal direction backlash, adjust the mounting distance according to the amount of axial movement shown in the table below so as not to change the tooth contact.

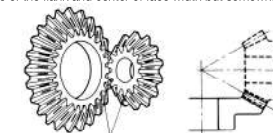
Gear Ratio (Reduction Ratio)	Normal direction backlash	Travel in axial direction	
		Pinion	Gears
1.5	j_n	$0.81 \times j_n$	$1.22 \times j_n$
2		$0.65 \times j_n$	$1.31 \times j_n$
2.5		$0.54 \times j_n$	$1.36 \times j_n$
3		$0.46 \times j_n$	$1.39 \times j_n$
4		$0.35 \times j_n$	$1.42 \times j_n$
5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

4. Cautions on Starting

- ① Check the following items before starting.
 - Are the gears fastened 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 For more technical information on lubricating gears, please see the section "Gear Lubrication" in our separate technical reference book.
- ④ If there is any abnormality such as noise or vibration during startup, stop the operation immediately and check the assembly condition such as tooth contact, eccentricity and looseness. For more technical information, please see the section "Gear Noise and Countermeasures" in our separate 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.

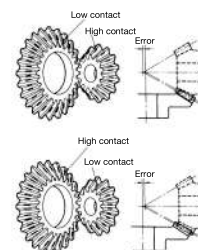


Center contact closer to toes

Incorrect Tooth Contact

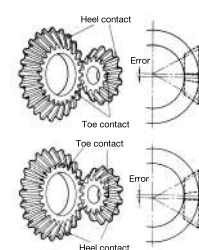
■ Mounting Distance Error

- 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.



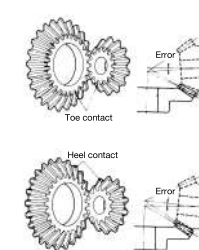
■ Offset Error

- 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°.

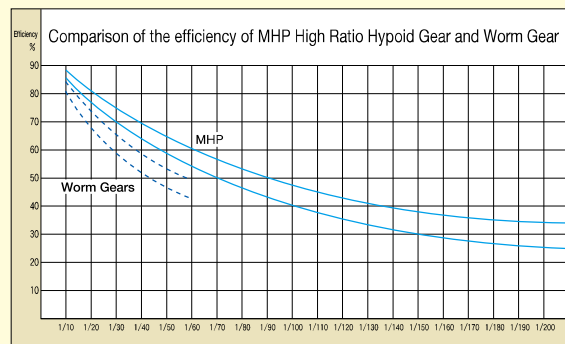




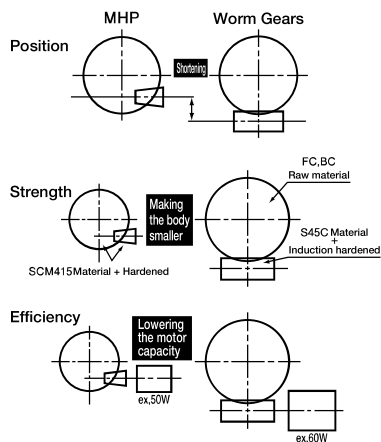
Features of MHP High Ratio Hypoid Gears

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

- Total-cost reduction**
The MHP provides a compact gearing body replacing several stages of reduction gears. This reduces the cost sharply.
- High efficiency**
Compared to worm gear drives, the MHP has less sliding contact. The resulting higher efficiency allows the use of smaller motors. (See graph on the right)
- High rigidity**
The carburized hypoid gears lead to smaller size than comparable worms gears.
- Compact gear assembly**
The size of the gear housing is nearly the same as outer diameter of the large gear. (See the diagrams below)



Comparison of MHP and Worm Gear



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.

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

W_{XP} : Thrust load on the pinion or L(N)

$$W_{XP} = W_{NP} \times T_G \times \frac{n}{z}$$

W_{NP} : 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)

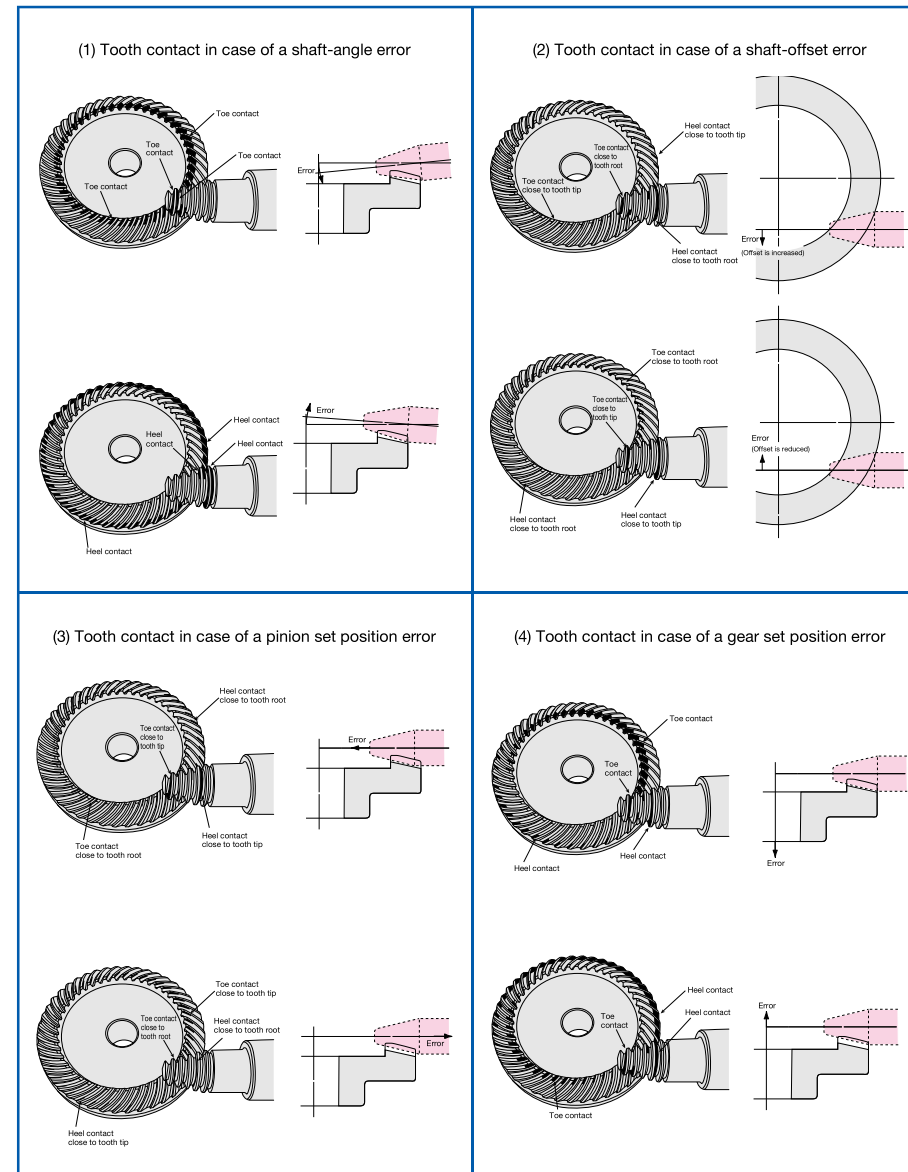
$$W_{XG} = W_{NG} \times T_G$$

W_{NG} : 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

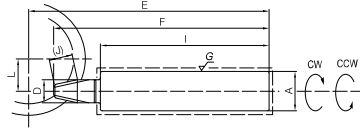
If the gear engagement position is out of the normal position, variations in tooth contact, as illustrated below, may appear.



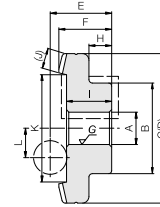


Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	SCM415
Heat treatment	Tooth area carburized
Tooth hardness	60 to 63HRC

* 22°/30' for MHP1.5-0453R/3045L and MHP1.5-0451R/1045L



B8



B9

Catalog Number	Reduction ratio	Nominal module	Actual module	No. of teeth	Direction of spiral	Shape	Bore/Shaft Dia. A (Bore: H7/Shaft: h7)	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Hub width	Length of bore and shaft
MHP1-0453R MHP1-3045L	15	m1	1.067	45 3	R L	B9 B8	12 22.1	30 —	48 10.3	48 10.3	19 127	16.3 113	7 —	14 94
MHP1.5-0453R MHP1.5-3045L	15	m1.5	1.733	45 3	R L	B9 B8	14 31.1	40 —	78 17.6	78 17.6	28 170	23.7 148	10 —	20 116
MHP1.5-0603R MHP1.5-3060L	20	m1.5	1.633	60 3	R L	B9 B8	20 36.1	50 —	98 15.7	98 15.7	33 199	28.7 168	13 —	25 135
MHP1-0602R MHP1-2060L	30	m1	1.05	60 2	R L	B9 B8	12 22.1	34 —	63 12.8	63 12.8	21 134	17.8 120	8 —	16 94
MHP1-0451R MHP1-1045L	45	m1	1.067	45 1	R L	B9 B8	12 20.1	30 —	48 10.1	48 10.1	19 115	16.5 104	7 —	14 85
MHP1.5-0451R MHP1.5-1045L	45	m1.5	1.733	45 1	R L	B9 B8	14 26.1	40 —	78 18.3	78 18.3	28 152	23.9 138	10 —	20 102
MHP1-0601R MHP1-1060L	60	m1	1.05	60 1	R L	B9 B8	12 22.1	34 —	63 12.9	63 12.9	21 134	17.9 122	8 —	16 94
MHP1.5-0601R MHP1.5-1060L	60	m1.5	1.633	60 1	R L	B9 B8	20 31.1	50 —	98 17.7	98 17.7	33 175	28.2 151	13 —	25 116

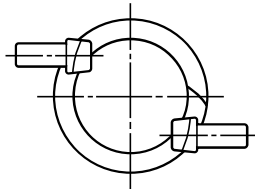
[Caution on Product Characteristics] ① Radial and thrust load coefficients are the factors used for calculation of those loads. As shown in the figure B8, CW and CCW stand for clockwise and counterclockwise rotation. A plus sign means that the two gears in a set move away each other when load is applied. A minus sign means that two gears in a set approach each other when load is applied. For more details, see the section "How to determine the radial and thrust loads" on Page 336.

Face width×holding surface dia.		Offset	Radial load coefficient		Thrust load coefficient		Backlash (mm)	Weight (kg)	Catalog Number
(J)	K	L	CW	CCW	CW	CCW			
(6)	35.1 —	10	48.48 147.3	-37.67 523.74	13 969.92	31.74 -831.16	0.05~0.15	0.15 0.29	MHP1-0453R MHP1-3045L
(10)	56.5 —	18	26.78 100.09	-18.67 338.45	8.98 566.72	21.19 -466.63	0.10~0.20	0.50 0.73	MHP1.5-0453R MHP1.5-3045L
(10)	76.8 —	22	20.44 119.32	-16.54 302.18	7.15 577.56	13.95 -511.77	0.10~0.20	0.94 1.15	MHP1.5-0603R MHP1.5-3060L
(8)	46.4 —	18	33.59 186.59	-24.15 784.31	8.21 1461.23	24.77 -1248.6	0.05~0.15	0.29 0.28	MHP1-0602R MHP1-2060L
(6)	34.9 —	14	48.04 400.81	-35.58 1579.79	11.13 3014.6	34.11 -2605.26	0.05~0.15	0.16 0.22	MHP1-0451R MHP1-1045L
(10)	56 —	25	26.36 233.59	-16.04 1034.08	6.88 1755.84	22.02 -1439.58	0.10~0.20	0.50 0.48	MHP1.5-0451R MHP1.5-1045L
(8)	46.3 —	20	33.34 357.61	-23.12 1564.81	7.41 2936.72	25.14 -2514.09	0.05~0.15	0.29 0.28	MHP1-0601R MHP1-1060L
(10)	76.8 —	30	22.63 303.06	-17.19 974.4	5.82 1912.11	15.81 -1675.65	0.10~0.20	0.94 0.77	MHP1.5-0601R MHP1.5-1060L

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.
② In the illustration, the area surrounded with - - - - line is masked during the carburization process and can be modified. However, note that high hardness (HRC40 at maximum) occurs in some cases.

Helix Hands and Offset Position

MHP High Ratio Hypoid Gears are designed to be right hand helix for gears, left hand helix for pinions. The opposite helix hand gears are not available for these products. Also, the offset position is already set, so please refer to the illustration below when designing or assembling.



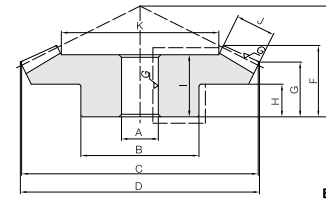
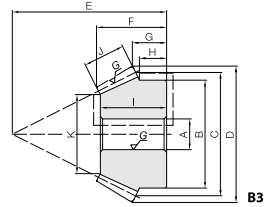
MHP allowable transmission torque table

Reduction ratio	Combination	Unit	Rotational speed of pinion / Allowable torque (Gear side)					
			600rpm	900rpm	1200rpm	1800rpm	3000rpm	
15	MHP1-0453R	N·m	10.3	9.61	8.82	7.35	3.72	
	MHP1-3045L	kgf·m	1.05	0.98	0.9	0.75	0.38	
15	MHP1.5-0453R	N·m	41.2	38.2	35.3	29.4	14.7	
	MHP1.5-0345L	kgf·m	4.2	3.9	3.6	3	1.5	
20	MHP1.5-0603R	N·m	82.4	76.7	69.2	54.9	—	
	MHP1.5-0306L	kgf·m	8.4	7.82	7.06	5.6	—	
30	MHP1-0602R	N·m	24.1	22.5	20.7	17.3	8.62	
	MHP1-0206L	kgf·m	2.46	2.29	2.11	1.76	0.88	
45	MHP1-0451R	N·m	11.3	10.5	9.61	8.04	4.02	
	MHP1-1045L	kgf·m	1.15	1.07	0.98	0.82	0.41	
45	MHP1.5-0451R	N·m	46.6	43.2	39.9	33.2	16.7	
	MHP1.5-0145L	kgf·m	4.75	4.41	4.07	3.39	1.7	
60	MHP1-0601R	N·m	25.3	23.4	21.7	18	9.02	
	MHP1-1060L	kgf·m	2.58	2.39	2.21	1.84	0.92	
60	MHP1.5-0601R	N·m	93.9	87.2	76.3	54.9	—	
	MHP1.5-1060L	kgf·m	9.58	8.89	7.78	5.6	—	

The allowable torques in the table are obtained from the results of experimentation lubricated with Kingstar SG-0 (NIHON GREASE).



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



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

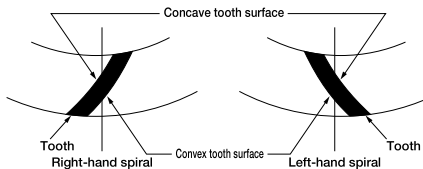
[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.
② Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ These gears produce axial thrust forces. Please see Page 334 for more details.

Hub width H	Hole length I	Face width J	Holding surface dia. K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
				Bending strength	Surface durability	Bending strength	Surface durability			
18 13.75	29 27	14	52.7 25.39	56.5 28.2	94.2 47.1	5.76 2.88	9.61 4.80	0.04~0.10	0.57 0.18	MBSG2-4020R MBSG2-2040L
16 13.25	30 29	17	66.99 29.97	108 54.1	184 91.8	11.0 5.52	18.7 9.37	0.05~0.11	1.01 0.31	MBSG2.5-4020R MBSG2.5-2040L
20 18	35 36.5	20	80.28 36.56	185 92.4	318 159	18.8 9.42	32.4 16.2	0.06~0.12	1.64 0.56	MBSG3-4020R MBSG3-2040L
22 17.5	42 43	27	106.63 51.25	441 221	778 389	45.0 22.5	79.3 39.7	0.09~0.15	3.55 1.20	MBSG4-4020R MBSG4-2040L

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.
② In the illustration, the area surrounded with --- line is masked during the carburization process and can be modified. However, note that high hardness (HRC40 at maximum) occurs in some cases.

■ Mating surface of spiral bevel gears

Spiral bevel gears have convex and concave tooth surfaces. If the direction of rotation of the drive gear differs, the meshing tooth surface will also change. The table on the right shows how to view the convex and concave tooth surfaces and the meshing tooth surface with respect to the direction of rotation of the drive gear.



For right-hand drive gear

Direction of rotation of drive gear NOTE 1	Meshing tooth surface	
	Right-hand drive gear	Left-hand driven gear
Clockwise	Convex tooth surface	Concave tooth surface
Counterclockwise	Concave tooth surface	Convex tooth surface

For left-hand drive gear

Direction of rotation of drive gear NOTE 1	Meshing tooth surface	
	Left-hand drive gear	Right-hand driven gear
Clockwise	Concave tooth surface	Convex tooth surface
Counterclockwise	Convex tooth surface	Concave tooth surface

[NOTE 1] The direction of rotation in the table is as seen from the hub of the gear.

■ The force applied to the teeth of the spiral bevel gear

The table below shows, for spiral bevel gears with an axis angle of $\Sigma = 90^\circ$, pressure angle of $\alpha_n = 20^\circ$ and spiral angle of $\beta_m = 35^\circ$, the magnitudes of the axial force F_x and radial force F_r where the tangential force F_t at the center of the tooth width is 100. For details, please refer to our separate technical reference book, section of "Gear Forces".

Thrust force F_x
Radial force F_r value

(1) Force applied to pinion

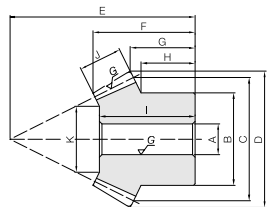
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 -18.1	82.9 -1.9	82.5 8.4	81.5 15.2	80.5 20.0	78.7 26.1	77.4 29.8
Convex tooth surface	-18.1 80.9	-33.6 75.8	-42.8 71.1	-48.5 67.3	-52.4 64.3	-57.2 60.1	-59.9 57.3

(2) Force applied to gear

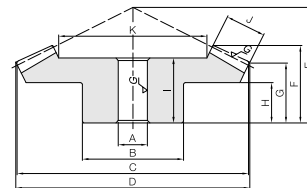
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 -18.1	75.8 -33.6	71.1 -42.8	67.3 -48.5	64.3 -52.4	60.1 -57.2	57.3 -59.9
Convex tooth surface	-18.1 80.9	-1.9 82.9	8.4 82.5	15.2 81.5	20.0 80.5	26.1 78.7	29.8 77.4



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



B3



B4

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A _{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mouring distance E	Total length F	Crown to back G
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
SBSG2.5-3020R SBSG2.5-2030L		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
SBSG3-3020R SBSG3-2030L		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		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	44.1	60	34.04	21.02
SBSG2.5-4020R SBSG2.5-2040L		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	26.3
SBSG3-4020R SBSG3-2040L		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		m4	40	R	B4	20	70	160	162.07	80	53.69	42.07
			20	L	B3	20	60	80	88.5	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	15.8
SBSG2.5-4515R SBSG2.5-1545L		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
SBSG3-4515R SBSG3-1545L		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

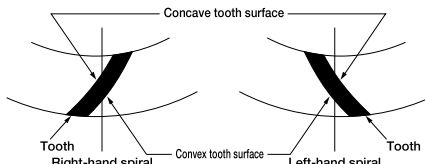
[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.

② Dimensions of the outside diameter, the total 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 334 for more details.

■ Mating surface of spiral bevel gears

Spiral bevel gears have convex and concave tooth surfaces. If the direction of rotation of the drive gear differs, the meshing tooth surface will also change. The table on the right shows how to view the convex and concave tooth surfaces and the meshing tooth surface with respect to the direction of rotation of the drive gear.



For right-hand drive gear

Direction of rotation of drive gear NOTE 1	Meshing tooth surface	
	Right-hand drive gear	Left-hand driven gear
Clockwise	Convex tooth surface	Concave tooth surface
Counterclockwise	Concave tooth surface	Convex tooth surface

For left-hand drive gear

Direction of rotation of drive gear NOTE 1	Meshing tooth surface	
	Left-hand drive gear	Right-hand driven gear
Clockwise	Concave tooth surface	Convex tooth surface
Counterclockwise	Convex tooth surface	Concave tooth surface

[NOTE 1] The direction of rotation in the table is as seen from the hub of the gear.

Hub width H	Hole length I	Face width J	Holding surface dia. K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
				Bending strength	Surface durability	Bending strength	Surface durability			
15 11.67	23 22	11	37.56 21.34	14.1 9.61	14.2 9.44	1.44 0.98	1.44 0.96	0.05~0.11	0.26 0.13	SBSG2-3020R SBSG2-2030L
18 14.17	30 28		45.61 27.42	29.0 19.8	29.7 19.8	2.96 2.02	3.03 2.02	0.06~0.12	0.55 0.28	SBSG2.5-3020R SBSG2.5-2030L
17 20	31 37		57.14 34.71	48.4 33.1	50.4 33.6	4.94 3.37	5.14 3.42	0.07~0.13	0.82 0.49	SBSG3-3020R SBSG3-2030L
25 23.33	40 43	20	78.59 46.89	106 72.2	113 75.3	10.8 7.36	11.5 7.68	0.10~0.16	1.90 1.05	SBSG4-3020R SBSG4-2030L
18 18	27 32		48.46 20.92	25.5 12.8	26.7 13.4	2.60 1.30	2.73 1.36	0.05~0.11	0.51 0.19	SBSG2-4020R SBSG2-2040L
20 22.5	34 40		59.28 20.56	51.7 25.9	55.1 27.6	5.27 2.64	5.62 2.81	0.06~0.12	1.06 0.42	SBSG2.5-4020R SBSG2.5-2040L
24 27.5	38 47	22	73.81 29.61	84.8 42.5	91.9 46.0	8.65 4.33	9.38 4.69	0.07~0.13	1.67 0.69	SBSG3-4020R SBSG3-2040L
28 35	45 62		102.39 42.78	195 97.9	217 109	19.9 9.98	22.2 11.1	0.10~0.16	3.33 1.53	SBSG4-4020R SBSG4-2040L
17 14	26 29		59.04 19.13	34.8 11.2	28.1 9.38	3.55 1.14	2.87 0.96	0.05~0.11	0.60 0.095	SBSG2-4515R SBSG2-1545L
22 17.5	35 37	20	72.84 20.51	59.0 18.9	48.3 16.1	6.01 1.93	4.93 1.64	0.06~0.12	1.21 0.19	SBSG2.5-4515R SBSG2.5-1545L
20 21.33	35 44		88.18 28.54	99.3 31.8	82.5 27.5	10.1 3.24	8.41 2.80	0.07~0.13	1.99 0.34	SBSG3-4515R SBSG3-1545L

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.

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).

■ The force applied to the teeth of the spiral bevel gear

The table below shows, for spiral bevel gears with an axis angle of $\Sigma = 90^\circ$, pressure angle of $\alpha_n = 20^\circ$ and spiral angle of $\beta_m = 35^\circ$, the magnitudes of the axial force F_x and radial force F_r where the tangential force F_t at the center of the tooth width is 100. For details, please refer to our separate technical reference book, section of "Gear Forces".

Thrust force F_x
Radial force F_r value

(1) Force applied to pinion

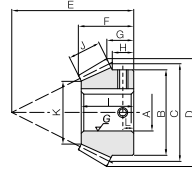
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 -18.1	82.9 -1.9	82.5 8.4	81.5 15.2	80.5 20.0	78.7 26.1	77.4 29.8
Convex tooth surface	-18.1 80.9	-33.6 75.8	-42.8 71.1	-48.5 67.3	-52.4 64.3	-57.2 60.1	-59.9 57.3

(2) Force applied to gear

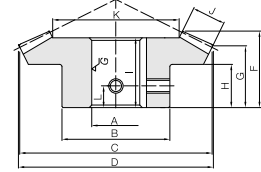
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 -18.1	75.8 -33.6	71.1 -42.8	67.3 -48.5	64.3 -52.4	60.1 -57.2	57.3 -59.9
Convex tooth surface	-18.1 80.9	-1.9 82.9	8.4 82.5	15.2 81.5	20.0 80.5	26.1 78.7	29.8 77.4



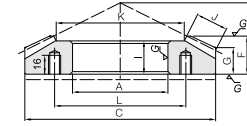
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Carburized
Tooth hardness	55 to 60HRC



BK



B4



B7

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A _{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back G	Hub width H	Hole length I
MBSA2-3020R MBSB2-3020R	1.5	m2	30	R	B4	20	40	60	61.36	40	26.8	21.02	14	23
MBSA2-2030L MBSB2-2030L		m2	20	L	BK	15	35	40	43.49	45	24.96	16.16	13.33	23
MBSA2.5-3020R MBSB2.5-3020R		m2.5	30	R	B4	22	48	75	76.74	50	33.6	26.31	18	30
MBSA2.5-2030L MBSB2.5-2030L		m2.5	20	L	BK	18	43	50	54.43	55	30.08	18.98	15.17	28
MBSA3-3020R MBSB3-3020R		m3	30	R	B4	25	60	90	92.21	60	40.34	31.66	21	36
MBSA3-2030L MBSB3-2030L		m3	20	L	BK	22	53	60	65.58	65	35.17	21.86	17.67	32.5
MBSA4-3020R MBSB4-3020R		m4	30	R	B4	35	75	120	122.91	70	43.99	32.18	21	39
MBSA4-2030L MBSB4-2030L		m4	20	L	BK	30	70	80	87.34	85	45.53	27.45	21.67	42
MBSA5-3020R MBSA5-2030L MBSB5-2030L		m5	30	R	B7	80	—	150	—	70	35.53	23.8	—	31
MBSA5-3020R MBSA5-2030L MBSB5-2030L		m5	20	L	BK	35	87	100	109.2	105	55.05	33.07	25.67	51
MBSA6-3020R MBSA6-2030L MBSB6-2030L		m6	30	R	B7	90	—	180	—	80	38.86	24.37	—	33
MBSA6-3020R MBSA6-2030L MBSB6-2030L		m6	20	L	BK	45	105	120	130.48	125	65.57	38.49	30	60
MBSA2-4020R MBSB2-4020R	2	m2	40	R	B4	20	45	80	81.06	45	31.83	26.06	18	29
MBSA2-2040L MBSB2-2040L		m2	20	L	BK	15	35	40	44.2	55	28.16	16.05	13.75	27
MBSA2.5-4020R MBSB2.5-4020R		m2.5	40	R	B4	25	55	100	101.29	50	33.35	26.29	16	30
MBSA2.5-2040L MBSB2.5-2040L		m2.5	20	L	BK	20	43	50	55.12	65	31.01	16.28	13.25	29
MBSA3-4020R MBSB3-4020R		m3	40	R	B4	30	65	120	121.57	60	39.81	31.57	21	35
MBSA3-2040L MBSB3-2040L		m3	20	L	BK	22	53	60	66.03	80	38.9	21.51	18.25	36.5
MBSA4-4020R MBSA4-2040L MBSB4-2040L		m4	40	R	B7	80	—	160	—	60	32.08	22.53	—	28
MBSA4-4020R MBSA4-2040L MBSB4-2040L		m4	20	L	BK	30	70	80	88.46	100	45.38	22.12	17.5	43
MBSA5-4020R MBSA5-2040L MBSB5-2040L		m5	40	R	B7	90	—	200	—	70	35.2	22.98	—	30
MBSA5-4020R MBSA5-2040L MBSB5-2040L		m5	20	L	BK	40	87	100	109.91	125	57.11	27.48	21.75	53.5
MBSA6-4020R MBSA6-2040L MBSB6-2040L		m6	40	R	B7	110	—	240	—	80	37.89	23.62	—	32
MBSA6-4020R MBSA6-2040L MBSB6-2040L		m6	20	L	BK	50	105	120	132.04	150	67.8	33.01	26.25	64

[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.

② Dimensions of the outside diameter, the total 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 334 for more details.

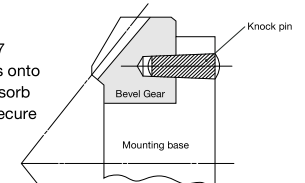
④ Although the dimensions of the keyway are made to the JIS B1301 (Js9) tolerance, there may be some deviations due to the effects of the heat treatment.

⑤ For products having a tapped hole (excludes B7), a set screw is included.

[Caution on Secondary Operations] ① Secondary operations cannot be performed on fully carburized parts, but can be on portions of the B7 style marked — as this section is not carburized. However, note that hardness of about HRC40 occurs in some cases.

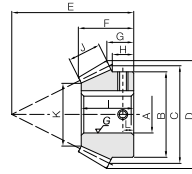
Face width		Keyway		Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability				
11	37.56	6 x 2.8 6 x 2.8	2-M5 2-M5	7	34.4	38.4	3.51	3.91	0.06~0.16	0.26	0.24	MBSA2-3020R
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		0.14		MBSB2-3020R
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	MBSA2-2030L
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		0.26		MBSB2.5-3020R
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	MBSA2.5-2030L
17	36.2	6 x 2.8 8 x 3.3	2-M5 2-M6	9	80.7	90.1	8.23	9.19		0.46		MBSB2.5-2030L
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	MBSA3-3020R
23	48.07	8 x 3.3 10 x 3.3	2-M6 2-M8	11	193	219	19.7	22.3		1.03		MBSB3-3020R
28	97.36	—	6-M10	110	544	637	55.4	64.9	0.14~0.34	2.80	2.01	MBSA3-2030L
28	62.04	10 x 3.3 12 x 3.3	2-M8 2-M8	13	371	425	37.8	43.3		1.89		MBSB3-2030L
34	115.61	—	6-M10	120	927	1120	94.6	114	0.16~0.36	4.55	3.56	MBSA5-3020R
34	72.41	14 x 3.8 14 x 3.8	2-M10 2-M10	15	633	745	64.5	76.0		3.38		MBSA5-2030L
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	MBSA6-3020R
14	25.39	5 x 2.3 6 x 2.8	2-M4 2-M5	7	29.9	34.8	3.05	3.55		0.16		MBSA6-2030L
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	MBSA2-4020R
17	29.97	6 x 2.8 6 x 2.8	2-M5 2-M5	7	57.3	67.6	5.84	6.89		0.26		MBSB2-4020R
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	MBSA2.5-2040L
20	36.56	6 x 2.8 8 x 3.3	2-M5 2-M6	9.5	97.7	116	9.97	11.9		0.51		MBSB2.5-2040L
27	107.63	—	6-M10	110	466	564	47.5	57.5	0.12~0.27	3.11	3.08	MBSA3-4020R
27	51.25	8 x 3.3 10 x 3.3	2-M6 2-M8	9	234	282	23.8	28.8		1.05		MBSB3-4020R
34	133.97	—	6-M10	120	915	1120	93.3	114	0.14~0.34	5.59	5.59	MBSA4-2040L
34	61.95	12 x 3.3 14 x 3.8	2-M8 2-M10	11	458	559	46.7	57.0		1.96		MBSA4-4020R
40	162.56	—	6-M10	140	1530	1920	156	196	0.16~0.36	8.48	8.48	MBSA5-2040L
40	77.11	14 x 3.8 16 x 4.3	2-M10 2-M10	14	766	961	78.1	97.9		3.33		MBSB5-2040L

When installing products 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.

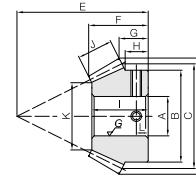




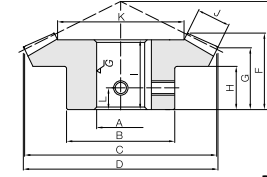
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Carburized
Tooth hardness	55 to 60HRC



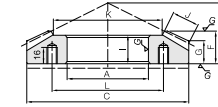
BK



BT



B4



B7

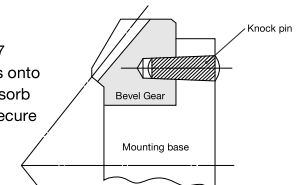
Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length
						A-H7	B							
MBSA2-4515R MBSB2-4515R	3	m2	45	R	B4	20 22	48	90	90.66	40	30.01	25.99	18	27
MBSA2-1545L MBSB2-1545L		m2	15	L	BT BK	10 12	26	30	34.59	55	23.78	10.77	9.33	22.5
MBSA2.5-4515R MBSB2.5-4515R		m2.5	45	R	B4	22 25	55	112.5	113.28	45	32.43	27.42	18	28
MBSA2.5-1545L MBSB2.5-1545L		m2.5	15	L	BK	12 15	32	37.5	43.06	70	30.51	14.68	12.84	29
MBSA3-4515R MBSB3-4515R		m3	45	R	B4	30 32	65	135	136.03	55	39.94	34.05	22	35
MBSA3-1545L MBSB3-1545L		m3	15	L	BK	18 20	38	45	52	85	38.12	18.67	16.33	36.5
MBSA4-4515R MBSA4-1545L MBSB4-1545L		m4	45	R	B7	80 22 25	— 52	180 60	— 69.24	50 110	28.85 47.51	22.14 21.54	— 18.67	25 45.5
MBSA5-4515R MBSA5-1545L MBSB5-1545L		m5	45	R	B7	90 28 32	— 65	225 75	— 86.55	60 135	33.57 56.89	25.16 24.43	— 20.83	28 54
MBSA6-4515R MBSA6-1545L MBSB6-1545L		m6	45	R	B7	110 35 40	— 78	270 90	— 103.13	70 160	38.28 66.39	28.05 27.19	— 23	32 63

- [Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.
② Dimensions of the outside diameter, the total 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 334 for more details.
④ Although the dimensions of the keyway are made to the JIS B1301 (Js9) tolerance, there may be some deviations due to the effects of the heat treatment.
⑤ For products having a tapped hole (excludes B7), a set screw is included.

- [Caution on Secondary Operations] ① Secondary operations cannot be performed on fully carburized parts, but can be on portions of the B7 style marked ---- as this section is not carburized.
However, note that hardness of about HRC40 occurs in some cases.

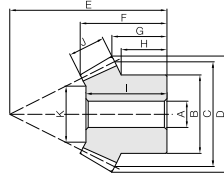
Face width	J	K	Keyway	Socket head screw	Size	L	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
							Bending strength	Surface durability	Bending strength	Surface durability			
14	61.82	6 x 2.8 6 x 2.8	2-M5 2-M5	9	67.8	61.3	6.91	6.25	0.06~0.16	0.61 0.60	0.06~0.16	0.61 0.60	MBSA2-4515R MBSB2-4515R
14	16.46	— 4 x 1.8	2-M4 2-M4	5	21.7	20.4	2.22	2.08	0.081 0.073	0.081 0.073		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	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	0.16 0.15		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	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	0.26 0.24		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	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	0.63 0.58		0.63 0.58	MBSA4-1545L MBSB4-1545L
35	154.88	—	6-M10	120	1060	1000	108	102	0.14~0.34	7.38	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	1.16 1.07		1.16 1.07	MBSA5-1545L MBSB5-1545L
42	186.12	—	6-M10	140	1790	1740	183	178	0.16~0.36	12.0	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	1.90 1.75		1.90 1.75	MBSA6-1545L MBSB6-1545L

When installing products 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.

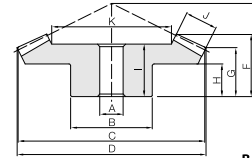




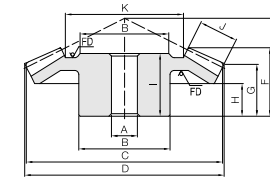
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	S45C
Heat treatment	Gear teeth induction hardened
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating



B3



B4



B5

* FD has a forged finish surface.

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back
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
SBS2.5-3020R SBS2.5-2030L		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
SBS3-3020R SBS3-2030L		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
SBS4-3020R SBS4-2030L		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
SBS5-3020R SBS5-2030L		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
SBS1.5-4020R SBS1.5-2040L		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
SBS2-4020R SBS2-2040L		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
SBS2.5-4020R SBS2.5-2040L		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	26.3
SBS3-4020R SBS3-2040L		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
SBS4-4020R SBS4-2040L		m4	40	R	B4	20	70	160	162.07	80	53.69	42.07
			20	L	B3	20	60	80	88.5	120	66.24	42.12
SBS5-4020R SBS5-2040L		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	50.3	64	34.06	20.32
SBS3-3618R SBS3-1836L		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
SBS4-3618R SBS4-1836L		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
SBS2.5-4518R SBS2.5-1845L		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
SBS3-4518R SBS3-1845L		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
SBS4-4518R SBS4-1845L		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
SBS5-4518R SBS5-1845L		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

[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.
 ② Dimensions of the outside diameter, the total 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 334 for more details.
 ④ The bore may slightly vary due to the effect of heat treatment. When using with the indicated hole diameter, provide machining with a reamer or the like before use.

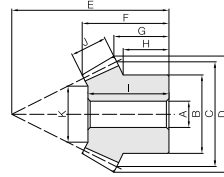
Hub width	Hole length	Face width	Holding surface dia	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog Number
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	
15	23	11	37.56	15.4	11.3	1.57	1.15	SBS2-3020R
11.67	22		21.34	10.5	7.52	1.07	0.77	SBS2-2030L
18	30	15	45.61	31.7	23.6	3.23	2.40	SBS2.5-3020R
14.17	28		27.42	21.6	15.7	2.20	1.60	SBS2.5-2030L
17	31	17	57.14	52.9	39.7	5.39	4.05	SBS3-3020R
20	37		34.71	36.1	26.5	3.68	2.70	SBS3-2030L
25	40	20	78.59	115	88.1	8.99	6.99	SBS4-3020R
23.33	43		46.89	78.7	58.8	8.03	5.99	SBS4-2030L
24	50	30	91.22	253	195	25.8	19.9	SBS5-3020R
28.33	56		54.83	173	130	17.6	13.3	SBS5-2030L
8	12	6	26.58	3.01	2.22	0.31	0.23	SBS1-4020R
7	12		9.17	1.51	1.11	0.15	0.11	SBS1-2040L
15	22	10	39.64	10.9	8.22	1.11	0.84	SBS1.5-4020R
14.75	24		17.28	5.46	4.11	0.56	0.42	SBS1.5-2040L
18	27	15	48.46	27.8	21.3	2.83	2.17	SBS2-4020R
18	32		20.92	13.9	10.7	1.42	1.09	SBS2-2040L
20	34	20	59.28	56.4	43.7	5.75	4.46	SBS2.5-4020R
22.5	40		20.56	28.2	21.9	2.88	2.23	SBS2.5-2040L
24	38	22	73.81	92.5	72.6	9.44	7.40	SBS3-4020R
27.5	47		29.61	46.4	36.3	4.73	3.70	SBS3-2040L
28	45	28	102.39	213	170	21.7	17.3	SBS4-4020R
35	62		42.78	107	84.8	10.9	8.65	SBS4-2040L
26	50	30	138.92	376	302	38.3	30.8	SBS5-4020R
35	63		57.84	188	151	19.2	15.4	SBS5-2040L
13	24	16	57.72	41.7	29.3	4.26	2.99	SBS2.5-3618R
17.25	32		25.45	20.9	14.7	2.13	1.49	SBS2.5-1836L
17	30	20	68.27	74.0	52.4	7.54	5.35	SBS3-3618R
19	37		28.56	37.0	26.2	3.78	2.67	SBS3-1836L
25	42	26	91.87	173	124	17.6	12.7	SBS4-3618R
25	49		39.72	86.4	62.1	8.81	6.33	SBS4-1836L
15	25	14	62.24	31.0	21.9	3.16	2.23	SBS2-4518R
14.2	27.5		23.11	12.2	8.74	1.24	0.89	SBS2-1845L
18	31	18	76.53	61.6	44.0	6.28	4.49	SBS2.5-4518R
14.75	31.5		26.82	24.2	17.6	2.47	1.80	SBS2.5-1845L
22	37	21	92.96	104	75.4	10.7	7.69	SBS3-4518R
16.3	36		33.41	41.0	30.2	4.18	3.07	SBS3-1845L
24	45	29	122.33	253	185	25.8	18.9	SBS4-4518R
18	46		45.83	99.5	74.1	10.2	7.56	SBS4-1845L
28	51	34	156.56	474	350	48.4	35.7	SBS5-4518R
20.5	52.5		56.9	186	140	19.0	14.3	SBS5-1845L

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.
 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).

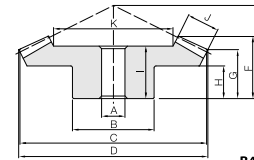


Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°~
Material	S45C
Heat treatment	Gear teeth induction hardened
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating

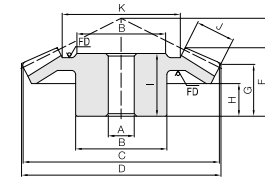
* 6015R and 1560L of SBS1.5 and 2 are 39°.



B3



B4



B5

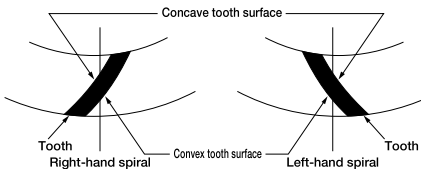
* FD has a forged finish surface.

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back
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	15.8
SBS2.5-4515R SBS2.5-1545L		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		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		m4	45	R	B5	20	80	180	181.3	70	50.62	41.95
			15	L	B3	16	50	60	69.3	115	54.37	26.55
SBS5-4515R SBS5-1545L		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		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		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		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] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.
- ② Dimensions of the outside diameter, the total 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 334 for more details.
- ④ The bore may slightly vary due to the effect of heat treatment. When using with the indicated hole diameter, provide machining with a reamer or the like before use.

■ Mating surface of spiral bevel gears

Spiral bevel gears have convex and concave tooth surfaces. If the direction of rotation of the drive gear differs, the meshing tooth surface will also change. The table on the right shows how to view the convex and concave tooth surfaces and the meshing tooth surface with respect to the direction of rotation of the drive gear.



For right-hand drive gear

Direction of rotation of drive gear NOTE 1	Meshing tooth surface	
	Right-hand drive gear	Left-hand driven gear
Clockwise	Convex tooth surface	Concave tooth surface
Counterclockwise	Concave tooth surface	Convex tooth surface

For left-hand drive gear

Direction of rotation of drive gear NOTE 1	Meshing tooth surface	
	Left-hand drive gear	Right-hand driven gear
Clockwise	Concave tooth surface	Convex tooth surface
Counterclockwise	Convex tooth surface	Concave tooth surface

[NOTE 1] The direction of rotation in the table is as seen from the hub of the gear.

Hub width	Hole length	Face width	Holding surface dia	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
				Bending strength	Surface durability	Bending strength	Surface durability			
H	I	J	K							
17	26	15	59.04	31.7	18.8	3.23	1.92	0.06~0.16	0.60	SBS2-4515R
14	29		19.13	10.1	6.27	1.03	0.64		0.095	SBS2-1545L
22	35	20	72.82	64.3	38.7	6.56	3.94	0.07~0.17	1.21	SBS2.5-4515R
17.5	37		20.51	20.6	12.9	2.10	1.31		0.19	SBS2.5-1545L
20	35	23	88.18	108	65.8	11.1	6.71	0.08~0.18	1.99	SBS3-4515R
21.33	44		28.54	34.7	21.9	3.54	2.24		0.34	SBS3-1545L
24	45	30	118.08	253	156	25.8	15.9	0.12~0.27	4.04	SBS4-4515R
23.33	52		32.26	81.1	52.0	8.27	5.30		0.76	SBS4-1545L
20	44	35	152.88	473	295	48.3	30.0	0.14~0.34	6.08	SBS5-4515R
30	65		48.64	152	98.2	15.5	10.0		1.44	SBS5-1545L
12	21	12	65.39	17.9	12.9	1.83	1.31	0.05~0.15	0.70	SBS1.5-6015R
10.43	22.5		15.55	4.22	3.21	0.43	0.33		0.042	SBS1.5-1560L
16	27	16	87.02	42.5	30.9	4.33	3.15	0.06~0.16	1.59	SBS2-6015R
14.25	30		18.06	10.0	7.73	1.02	0.79		0.10	SBS2-1560L
20	34	20	108.64	96.1	58.4	9.79	5.95	0.07~0.17	3.13	SBS2.5-6015R
18.06	37.5		20.58	22.6	14.6	2.31	1.49		0.20	SBS2.5-1560L
25	41	22	134.4	156	95.7	15.9	9.76	0.08~0.18	5.38	SBS3-6015R
21.12	43		31.58	36.8	23.9	3.75	2.44		0.35	SBS3-1560L

- [Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.
- 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).

■ The force applied to the teeth of the spiral bevel gear

The table below shows, for spiral bevel gears with an axis angle of $\Sigma = 90^\circ$, pressure angle of $\alpha_n = 20^\circ$ and spiral angle of $\beta_m = 35^\circ$, the magnitudes of the axial force F_x and radial force F_r where the tangential force F_t at the center of the tooth width is 100. For details, please refer to our separate technical reference book, section of "Gear Forces".

Thrust force F_x
Radial force F_r value

(1) Force applied to pinion

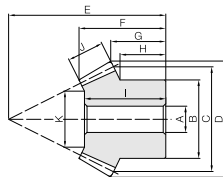
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 -18.1	82.9 -1.9	82.5 8.4	81.5 15.2	80.5 20.0	78.7 26.1	77.4 29.8
Convex tooth surface	-18.1 80.9	-33.6 75.8	-42.8 71.1	-48.5 67.3	-52.4 64.3	-57.2 60.1	-59.9 57.3

(2) Force applied to gear

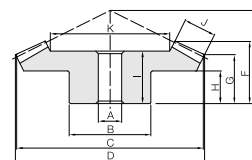
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 -18.1	75.8 -33.6	71.1 -42.8	67.3 -48.5	64.3 -52.4	60.1 -57.2	57.3 -59.9
Convex tooth surface	-18.1 80.9	-1.9 75.8	8.4 71.1	15.2 67.3	20.0 64.3	26.1 60.1	29.8 57.3



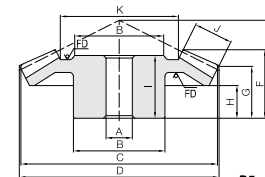
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



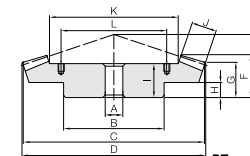
B3



B4



BS



BT

* FD has a forged finish surface

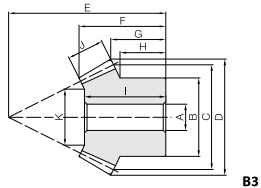
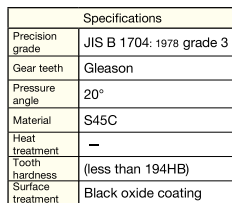
Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mating distance	Total length	Crown to back	Hub width
					A _{H7}	B	C	D	E	F	G	H
SB1.5-3020 SB1.5-2030	1.5	m1.5	30	B4	10	30	45	46.24	28	18.53	13.93	8
			20	B3	8	25	30	33.13	33	18.63	11.54	8.83
SB2-3020 SB2-2030		m2	30	B4	10	35	60	61.65	40	26.87	21.24	15
			20	B3	10	30	40	44.18	45	25.06	16.39	11.67
SB2.5-3020 SB2.5-2030		m2.5	30	B4	15	45	75	77.07	50	34.22	26.55	18
			20	B3	12	35	50	55.22	55	31.06	19.24	12.5
SB3-3020 SB3-2030		m3	30	B4	15	50	90	92.48	55	35.56	26.86	17
			20	B3	15	45	60	66.27	70	40.48	27.09	20
SB4-3020 SB4-2030		m4	30	B4	20	70	120	123.3	75	47.71	37.48	25
			20	B3	15	60	80	88.32	90	48.53	32.77	23.33
SB5-3020 SB5-2030	m5	30	B4	25	90	150	154.13	90	58.45	43.1	24	
		20	B3	20	80	100	110.45	110	62.11	38.48	28.33	
SB1.5-3015 SB1.5-1530	2	m1.5	30	B4	8	25	45	45.88	25	17.85	14.63	9
			15	B3	6	16	22.5	26.11	32	17.23	10.4	7.88
SB2-3015 SB2-1530		m2	30	B4	10	30	60	61.17	31	21.6	17.17	10
			15	B3	8	22	30	34.81	40	20.59	11.2	8
SB2.5-3015 SB2.5-1530		m2.5	30	B4	15	40	75	76.46	40	28.75	22.71	15
			15	B3	12	30	37.5	43.51	55	31.81	19	15.63
SB3-3015 SB3-1530		m3	30	B4	16	50	90	91.76	50	37.31	29.26	18
			15	B3	12	35	45	52.22	70	43.88	26.8	22.5
SB4-3015 SB4-1530		m4	30	B4	20	60	120	122.34	60	42.4	32.34	20
			15	B3	16	50	60	69.62	85	48.74	27.41	22.5
SB5-3015 SB5-1530	m5	30	B5	20	70	150	152.93	75	52.5	40.43	25	
		15	B3	20	60	75	87.03	110	63.61	38.01	31.25	
SB6-3015 SB6-1530	m6	30	B5	25	80	180	183.5	90	62.56	48.49	28	
		15	B3	25	70	90	104.44	125	68.48	38.6	30	
SB2.5-3618 SB2.5-1836	2	m2.5	36	B4	15	55	90	91.46	43	28.52	21.96	13
			18	B3	12	38	45	51.01	64	34.27	20.5	17.25
SB3-3618 SB3-1836		m3	36	B4	20	60	108	109.76	52	34.95	26.76	17
			18	B3	16	46	54	61.22	75	40.01	22.8	19
SB4-3618 SB4-1836		m4	36	B4	20	70	144	146.34	72	49	38.34	25
			18	B3	20	60	72	81.62	100	52.77	30.41	25
SB1-4020 SB1-2040	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
SB1.25-4020 SB1.25-2040		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
SB1.5-4020 SB1.5-2040		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
SB2-4020 SB2-2040		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
SB2.5-4020 SB2.5-2040		m2.5	40	B4	15	50	100	101.46	55	39.73	31.46	20
			20	B3	12	40	50	56.01	75	43.78	26.5	22.5
SB3-4020 SB3-2040	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	
SB4-4020 SB4-2040	m4	40	B4	20	70	160	162.34	80	53.92	42.34	28	
		20	B3	20	60	80	89.62	120	66.59	42.41	35	
SB5-4020 SB5-2040	m5	40	B5	25	100	200	202.93	90	55.33	42.93	26	
		20	B3	20	80	100	112.03	140	68.92	43.01	35	
SB6-4020 SB6-2040	m6	40	B5	25	85	240	243.52	105	65.05	48.52	28	
		20	B3	25	90	120	134.44	160	78.16	43.6	32.5	
SBY8-4020 SBY8-2040	m8	40	BT	35	180	320	324.69	130	75.36	54.69	25	
		20	B3	30	120	160	179.25	210	98	54.81	40	

② Dimensions of the outside diameter, the total 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 the handling conveniences, the BT series has the tapped holes on the holding surface. Please see Page 334 for L and tap sizes.

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
			Bending strength	Surface durability	Bending strength	Surface durability			
16	9	27.37	5.82	0.65	0.59	0.07	0.05~0.15	0.12	SB1.5-3020
17		17.05	4.04	0.44	0.41	0.04		0.063	SB1.5-2030
23	11	37.56	13.1	1.52	1.33	0.16	0.06~0.16	0.26	SB2-3020
22		21.34	9.07	1.01	0.92	0.10		0.14	SB2-2030
30	15	45.61	26.9	3.21	2.75	0.33	0.07~0.17	0.55	SB2.5-3020
28		27.42	18.7	2.14	1.91	0.22		0.25	SB2.5-2030
31	17	57.14	44.9	5.45	4.58	0.56	0.08~0.18	0.83	SB3-3020
37		34.71	31.2	3.63	3.18	0.37		0.50	SB3-2030
40	20	78.59	98.2	12.3	10.0	1.25	0.12~0.27	1.91	SB4-3020
43		46.89	68.1	8.20	6.95	0.84		1.10	SB4-2030
51	30	91.22	215	27.6	22.0	2.81	0.14~0.34	4.13	SB5-3020
56		54.83	150	18.4	15.3	1.87		2.34	SB5-2030
15	8	28.36	5.02	0.47	0.51	0.05	0.05~0.15	0.10	SB1.5-3015
15.5		10.72	2.60	0.24	0.26	0.02		0.028	SB1.5-1530
18	11	37.4	12.1	1.18	1.24	0.12	0.06~0.16	0.21	SB2-3015
19		16.81	6.28	0.59	0.64	0.06		0.064	SB2-1530
24	15	44.21	24.9	2.48	2.54	0.25	0.07~0.17	0.41	SB2.5-3015
29		16.42	12.9	1.24	1.32	0.13		0.15	SB2.5-1530
30	20	47.78	45.6	4.60	4.65	0.47	0.08~0.18	0.83	SB3-3015
41		19.56	23.6	2.30	2.41	0.23		0.31	SB3-1530
36	25	70.1	104	10.9	10.7	1.11	0.12~0.27	1.64	SB4-3015
46		32.2	54.0	5.43	5.51	0.55		0.66	SB4-1530
48	30	90.41	199	21.3	20.3	2.17	0.14~0.34	2.72	SB5-3015
58		32.83	103	10.6	10.5	1.09		1.28	SB5-1530
57	35	109.74	336	36.9	34.2	3.77	0.16~0.36	4.75	SB6-3015
63		45.47	174	18.5	17.7	1.88		1.94	SB6-1530
24	16	57.72	35.9	4.08	3.66	0.42	0.07~0.17	0.72	SB2.5-3618
32		25.44	18.1	2.04	1.84	0.21		0.27	SB2.5-1836
30	20	68.28	63.7	7.34	6.49	0.75	0.08~0.18	1.15	SB3-3618
37		28.56	32.0	3.67	3.27	0.37		0.44	SB3-1836
42	26	91.86	149	17.7	15.2	1.80	0.12~0.27	2.66	SB4-3618
49		39.72	74.8	8.85	7.62	0.90		1.04	SB4-1836
12	6	26.58	2.61	0.29	0.27	0.03	0.03~0.13	0.068	SB1-4020
12		9.17	1.32	0.15	0.13	0.02		0.019	SB1-2040
16	8	33.61	5.33	0.61	0.54	0.06	0.04~0.14	0.14	SB1.25-4020
17		13.22	2.69	0.31	0.27	0.03		0.046	SB1.25-2040
22	10	39.64	9.47	1.11	0.97	0.11	0.05~0.15	0.27	SB1.5-4020
24		17.28	4.77	0.56	0.49	0.06		0.089	SB1.5-2040
27	15	48.46	24.2	2.92	2.46	0.30	0.06~0.16	0.51	SB2-4020
32		20.92	12.2	1.46	1.24	0.15		0.19	SB2-2040
35	20	60.28	49.0	6.04	4.99	0.62	0.07~0.17	1.09	SB2.5-4020
41		24.56	24.7	3.02	2.52	0.31		0.40	SB2.5-2040
38	22	73.81	80.4	10.1	8.20	1.03	0.08~0.18	1.68	SB3-4020
47		29.61	40.5	5.06	4.13	0.52		0.70	SB3-2040
45	28	102.39	185	24.1	18.9	2.46	0.12~0.27	3.34	SB4-4020
62		42.78	93.3	12.0	9.51	1.23		1.47	SB4-2040
50	30	138.92	327	43.9	33.3	4.47	0.14~0.34	5.63	SB5-4020
63		57.84	165	21.9	16.8	2.24		2.67	SB5-2040
58	40	158.56	600	83.2	61.2	8.48	0.16~0.36	7.77	SB6-4020
70		61.11	302	41.6	30.8	4.24		4.08	SB6-2040
61	50	219.2	1350	196	138	20.0	0.20~0.45	25.75	SBY8-4020
90		96.39	679	98.1	69.3	10.0		9.41	SBY8-2040

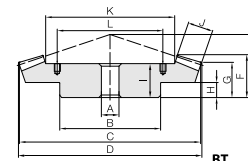
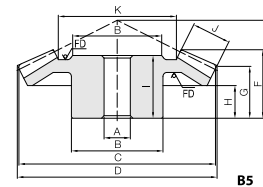
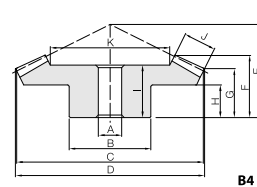
[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.



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

[Caution on Product Characteristics]

- ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.
- ② Dimensions of the outside diameter, the total 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 the handling conveniences, the BT series has the tapped holes on the holding surface. Please see Page 334 for L and tap sizes.



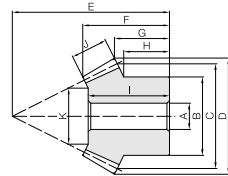
* FD has a forged finish surface.

Hole length I	Face width J	Holding surface dia. K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
			Bending strength	Surface durability	Bending strength	Surface durability			
15	7	70.73	3.35	0.35	0.34	0.04	0.03~0.13	0.11	SB1-4518 SB1-1845
15.5		10.31	1.33	0.14	0.14	0.01		0.019	
16		37.86	6.67	0.72	0.68	0.07		0.04~0.14	
19.5	12.16	2.65	0.29	0.27	0.03	0.038			
18	11	45	11.7	1.29	1.19	0.13	0.05~0.15		0.28
21		16.51	4.64	0.51	0.47	0.05		0.063	
25		62.24	26.8	3.05	2.74	0.31		0.06~0.16	0.65
27.5	23.11	10.7	1.22	1.09	0.12	0.16			
31	18	76.53	53.4	6.20	5.44	0.63	0.07~0.17		1.23
31.5		26.82	21.2	2.48	2.16	0.25		0.28	
37		92.96	90.5	10.7	9.23	1.09		0.08~0.18	2.05
36	33.41	36.0	4.29	3.67	0.44	0.46			
45	29	122.33	220	26.8	22.4	2.73	0.12~0.27		4.69
46		45.83	87.3	10.7	8.91	1.09		1.01	
51		156.56	411	51.8	41.9	5.28		0.14~0.34	8.31
52.5	56.9	164	20.7	16.7	2.11	1.95			
9	6	32.02	2.84	0.27	0.29	0.027	0.03~0.13		0.078
12		10.05	0.98	0.09	0.10	0.0091		0.095	
12		8	39.63	5.80	0.56	0.59		0.057	0.04~0.14
15	10.9		2.00	0.19	0.20	0.019	0.018		
17	10		46.58	10.3	1.02	1.05	0.10	0.05~0.15	
22.5		14.75	3.56	0.34	0.36	0.035	0.041		
26		15	59.04	26.4	2.68	2.69	0.27		0.06~0.16
29	19.13		9.10	0.89	0.93	0.091	0.096		
35	20		72.84	53.6	5.55	5.46	0.57	0.07~0.17	
37		20.51	18.5	1.85	1.89	0.19	0.19		
35		23	88.18	90.2	9.53	9.20	0.97		0.08~0.18
43	22.53		31.2	3.18	3.18	0.32	0.34		
45	30		118.09	211	23.0	21.5	2.35	0.12~0.27	
52		32.26	72.8	7.67	7.43	0.78	0.77		
44		35	152.88	394	44.3	40.2	4.52		0.14~0.34
65	48.64		136	14.8	13.9	1.51	1.46		
62	50		169.26	751	87.0	76.6	8.87	0.16~0.36	
86		49.77	259	39.9	26.4	4.06	2.61		
67		50	255.92	1470	179	150	18.3		0.20~0.45
93	61.77		506	59.7	51.6	6.09	5.80		

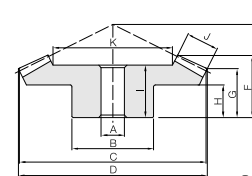
[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.



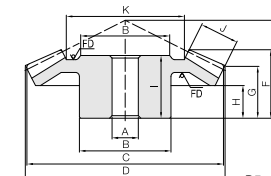
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



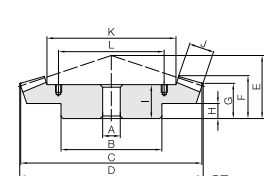
B3



B4



B5



BT

* FD has a forged finish surface.

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore A _{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back G	Hub width H
SB1.5-6015 SB1.5-1560	4	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	71.1	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] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.

② Dimensions of the outside diameter, the total 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 the handling conveniences, the BT series has the tapped holes on the holding surface. Please see Page 334 for L and tap sizes.

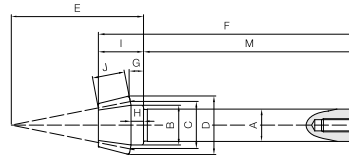
Hole length I	Face width J	Holding surface dia. K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
			Bending strength	Surface durability	Bending strength	Surface durability			
21 22.5	12	65.38 15.54	17.3 4.46	1.75 0.44	1.77 0.45	0.18 0.045	0.05~0.15	0.62 0.043	SB1.5-6015 SB1.5-1560
27 30	16	87.02 18.06	41.3 10.6	4.30 1.07	4.21 1.08	0.44 0.11	0.06~0.16	1.35 0.10	SB2-6015 SB2-1560
34 37.5	20	108.64 20.57	80.2 20.6	8.54 2.13	8.18 2.10	0.87 0.22	0.07~0.17	2.51 0.21	SB2.5-6015 SB2.5-1560
41 43	22	134.4 31.58	130 33.5	14.2 3.54	13.3 3.42	1.44 0.36	0.08~0.18	4.16 0.36	SB3-6015 SB3-1560
53 60	32	174.03 36.12	328 84.5	37.0 9.24	33.5 8.62	3.77 0.94	0.12~0.27	6.00 0.91	SB4-6015 SB4-1560
45 73	40	218.79 49.15	642 165	74.4 18.6	65.4 16.8	7.59 1.90	0.14~0.34	17.5 1.58	SBY5-6015 SBY5-1560
56 82	45	267.73 54.92	1050 270	126 31.5	107 27.5	12.8 3.21	0.16~0.36	30.7 2.83	SBY6-6015 SBY6-1560

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.



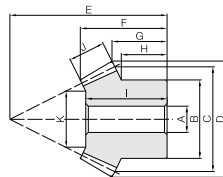
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)*
Surface treatment	Black oxide coating

* The pinion is tempered and has the teeth hardness of 200 to 270 HB.

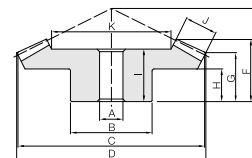




Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	SUS303
Heat treatment	—
Tooth hardness	(less than 187HB)



B3



B4

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	
					A _{H7}	B	C	D	E	F	G	H	
SUB1.5-3020	1.5	m1.5	30	B4	10	30	45	46.24	28	18.53	13.93	8	
SUB1.5-2030			20	B3	8	25	30	33.13	33	18.63	11.54	8.83	
SUB2-3020		m2	30	B4	10	35	60	61.65	40	26.87	21.24	15	
SUB2-2030			20	B3	10	35	40	44.18	45	25.06	16.39	13.33	
SUB2.5-3020		m2.5	30	B4	15	45	75	77.07	50	34.22	26.55	18	
SUB2.5-2030			20	B3	12	40	50	55.22	55	31.06	19.24	14.16	
SUB3-3020		m3	30	B4	15	60	90	92.48	55	35.56	26.86	17	
SUB3-2030			20	B3	15	50	60	66.27	70	40.48	27.09	21.66	
SUB1.5-4020		2	m1.5	40	B4	10	38	60	60.88	35	25.01	20.88	15
SUB1.5-2040				20	B3	8	25	30	33.61	46	25.54	16.9	14.75
SUB2-4020	m2		40	B4	12	50	80	81.17	45	32.37	26.17	18	
SUB2-2040			20	B3	12	32	40	44.81	60	34.16	21.2	18	
SUB2.5-4020	m2.5		40	B4	15	60	100	101.46	55	39.73	31.46	20	
SUB2.5-2040			20	B3	12	40	50	56.01	75	43.78	26.5	22.5	
SUB3-4020	m3		40	B4	20	70	120	121.76	65	45.85	36.76	24	
SUB3-2040			20	B3	16	50	60	67.22	90	50.81	31.8	27.5	
SUB1.5-4515	3		m1.5	45	B4	10	36	67.5	68.06	28	20.44	17.59	11
SUB1.5-1545				15	B3	8	18	22.5	26.54	47	23.19	13.92	12.5
SUB2-4515		m2	45	B4	12	60	90	90.75	40	30.4	26.12	17	
SUB2-1545			15	B3	10	24	30	35.35	60	29.8	15.89	14	
SUB2.5-4515		m2.5	45	B4	15	60	112.5	113.43	50	38.35	32.65	22	
SUB2.5-1545			15	B3	12	30	37.5	44.18	75	38.41	19.86	17.5	
SUB3-4515		m3	45	B4	20	80	135	136.12	55	40.74	34.18	20	
SUB3-1545			15	B3	15	38	45	53.02	90	45.17	23.84	21.3	

[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.

② Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

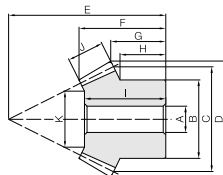
Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
			Bending strength	Surface durability	Bending strength	Surface durability			
16	9	27.37	3.22	0.46	0.33	0.047	0.05~0.15	0.12	SUB1.5-3020
17		17.05	2.23	0.31	0.23	0.032		0.063	SUB1.5-2030
23	11	37.56	7.22	1.08	0.74	0.11	0.06~0.16	0.26	SUB2-3020
22		21.34	5.01	0.72	0.51	0.074		0.16	SUB2-2030
30	15	45.61	14.9	2.28	1.52	0.23	0.07~0.17	0.54	SUB2.5-3020
28		27.42	10.3	1.52	1.05	0.15		0.28	SUB2.5-2030
31	17	57.14	24.8	3.87	2.53	0.39	0.08~0.18	0.94	SUB3-3020
37		34.71	17.2	2.58	1.76	0.26		0.55	SUB3-2030
22	10	39.64	5.23	0.79	0.53	0.081	0.05~0.15	0.27	SUB1.5-4020
24		17.28	2.64	0.40	0.27	0.040		0.088	SUB1.5-2040
27	15	48.46	13.4	2.07	1.36	0.21	0.06~0.16	0.61	SUB2-4020
32		20.92	6.72	1.04	0.69	0.11		0.19	SUB2-2040
35	20	60.28	27.1	4.29	2.76	0.44	0.07~0.17	1.21	SUB2.5-4020
41		24.56	13.6	2.15	1.39	0.22		0.40	SUB2.5-2040
38	22	73.81	44.4	7.19	4.53	0.73	0.08~0.18	1.86	SUB3-4020
47		29.61	22.4	3.60	2.28	0.37		0.69	SUB3-2040
17	10	46.58	5.70	0.72	0.58	0.074	0.05~0.15	0.25	SUB1.5-4515
22.5		14.75	1.97	0.24	0.20	0.025		0.041	SUB1.5-1545
26	15	59.04	14.6	1.90	1.49	0.19	0.06~0.16	0.80	SUB2-4515
29		19.13	5.03	0.63	0.51	0.065		0.095	SUB2-1545
35	20	72.84	29.6	3.94	3.02	0.40	0.07~0.17	1.36	SUB2.5-4515
37		20.51	10.2	1.31	1.04	0.13		0.19	SUB2.5-1545
35	23	88.18	49.9	6.77	5.09	0.69	0.08~0.18	2.32	SUB3-4515
43		22.53	17.2	2.26	1.76	0.23		0.34	SUB3-1545

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.

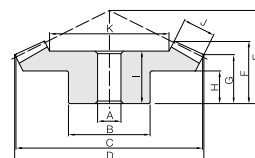


Specifications	
Precision grade	JIS B 1704: 1978 grade 4*
Gear teeth	Gleason
Pressure angle	20°
Material	MC901
Heat treatment	—
Tooth hardness	(115 to 120HRR)

* The precision grade is equivalent to the value shown in the table.



B3



B4

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width
PB1.5-3020	1.5	m1.5	30	B4	10	30	45	46.24	28	18.53	13.93	8
PB1.5-2030			20	B3	8	25	30	33.13	38	18.63	11.54	8.83
PB2-3020		m2	30	B4	10	35	60	61.65	40	26.87	21.24	15
PB2-2030			20	B3	10	35	40	44.18	45	25.06	16.39	13.33
PB2.5-3020		m2.5	30	B4	15	45	75	77.07	50	34.22	26.55	18
PB2.5-2030			20	B3	12	40	50	55.22	55	31.06	19.24	14.16
PB3-3020	2	m3	30	B4	15	60	90	92.48	55	35.56	26.86	17
PB3-2030			20	B3	15	50	60	66.27	70	40.48	27.09	21.66
PB1-4020		m1	40	B4	8	25	40	40.59	22	15.07	12.59	8
PB1-2040			20	B3	6	16	20	22.41	28	13.78	8.6	7
PB1.25-4020		m1.25	40	B4	10	32	50	50.73	27	18.54	15.23	10
PB1.25-2040			20	B3	8	22	25	28.01	36	18.66	11.75	10.25
PB1.5-4020		m1.5	40	B4	10	38	60	60.88	35	25.01	20.88	15
PB1.5-2040			20	B3	8	25	30	33.61	46	25.54	16.9	14.75
PB2-4020		m2	40	B4	12	40	80	81.17	45	32.37	26.17	18
PB2-2040			20	B3	12	32	40	44.81	60	34.16	21.2	18
PB2.5-4020		m2.5	40	B4	15	50	100	101.47	55	39.73	31.47	20
PB2.5-2040			20	B3	12	40	50	56.01	75	43.78	26.5	22.5
PB3-4020		m3	40	B4	20	60	120	121.76	65	45.85	36.76	24
PB3-2040			20	B3	16	50	60	67.22	90	50.81	31.8	27.5
PB1.5-4515	3	m1.5	45	B4	10	40	67.5	68.06	28	20.44	17.59	11
PB1.5-1545			15	B3	8	18	22.5	26.54	47	23.19	13.92	12.5
PB2-4515		m2	45	B4	12	60	90	90.75	40	30.4	26.12	17
PB2-1545			15	B3	10	24	30	35.35	60	29.8	15.89	14
PB2.5-4515		m2.5	45	B4	15	60	112.5	113.43	50	38.35	32.65	22
PB2.5-1545			15	B3	12	30	37.5	44.18	75	38.41	19.86	17.5
PB3-4515		m3	45	B4	20	80	135	136.12	55	40.74	34.18	20
PB3-1545			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, including bore size (H8 when produced), tooth diameter, and backlash. Please see the section "Design of Plastic Gears" in our separate technical reference book.
 - ② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 333 for more details.
 - ③ Dimensions of the outside diameter, the total 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.

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability			
16	9	27.37	1.61	—	0.16	—	0~0.25	0.018	PB1.5-3020
17		17.05	0.87		0.089			0.0093	PB1.5-2030
23	11	37.56	3.65		0.37		0~0.26	0.039	PB2-3020
22		21.34	1.97		0.20			0.024	PB2-2030
30	15	45.61	7.46		0.76		0~0.27	0.081	PB2.5-3020
28		27.42	4.04		0.41			0.042	PB2.5-2030
31	17	57.14	12.5		1.28		0~0.28	0.14	PB3-3020
37		34.71	6.77		0.69			0.082	PB3-2030
12	6	26.58	0.74		0.075		0~0.23	0.010	PB1-4020
12		9.17	0.28		0.028			0.0029	PB1-2040
16	8	33.61	1.50		0.15		0~0.24	0.021	PB1.25-4020
17		13.22	0.56		0.058			0.0068	PB1.25-2040
22	10	39.64	2.66		0.27		0~0.25	0.039	PB1.5-4020
24		17.28	1.00		0.10			0.013	PB1.5-2040
27	15	48.46	6.72		0.69		0~0.26	0.076	PB2-4020
32		20.92	2.52		0.26			0.028	PB2-2040
35	20	60.28	13.5		1.38		0~0.27	0.16	PB2.5-4020
41		24.56	5.08		0.52			0.060	PB2.5-2040
38	22	73.81	22.4		2.29		0~0.28	0.25	PB3-4020
47		29.61	8.42		0.86			0.10	PB3-2040
17	10	46.58	3.18	—	0.32	—	0~0.25	0.040	PB1.5-4515
22.5		14.75	0.68		0.070			0.0061	PB1.5-1545
26	15	59.04	8.07		0.82		0~0.26	0.12	PB2-4515
29		19.13	1.73		0.18			0.014	PB2-1545
35	20	72.84	16.3		1.66		0~0.27	0.20	PB2.5-4515
37		20.51	3.50		0.36			0.028	PB2.5-1545
35	23	88.18	27.6		2.81		0~0.28	0.35	PB3-4515
43		22.54	5.92		0.60			0.050	PB3-1545

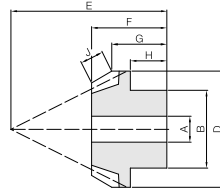
- [Caution on Secondary Operations]
- ① Please read "Cautions on Performing Secondary Operations" (Page 334) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
 - ② Plastic gears are susceptible to the effects of temperature and moisture. Dimensional changes may occur while performing secondary operations and during post-machining operations.

* In regard to MC Nylon gears, other materials are available for plastic gears, including Ultra High Molecular Weight Polyethylene (U-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. Please see Page 24 for more details on quotations and orders.

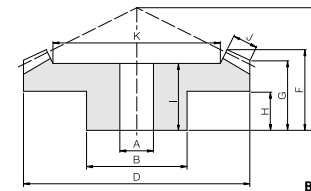


Specifications	
Precision grade	JIS B 1704: 1978 grade 6
Gear teeth	Gleason
Pressure angle	20°
Material	Duracon (R) (M90-44) *
Heat treatment	—
Tooth hardness	(110 to 120HRR)

* "Duracon (R)" is a registered trademark of Polyplastics Co., Ltd. in Japan as well as other countries.



B1



B9

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back
					A	B					
DB0.5-4020 DB0.5-2040	2	m0.5	40	B9	4	12	20	20.29	12	8.33	7.29
			20	B1	3	8	10	11.2	16	8.46	6.3
DB0.8-4020 DB0.8-2040		m0.8	40	B9	5	15	32	32.47	18	11.91	10.47
			20	B1	4	12	16	17.92	24	11.5	8.48
DB1-4020 DB1-2040		m1	40	B9	6	18	40	40.59	22	14.45	12.59
			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 calculated values according to the assumed usage conditions. Please see Page 333 for more details.

② The bore tolerance is -0.05 to -0.3, but it may be slightly higher at the center of the hole.

③ For the dimensional accuracy of each part, see the dimensional tolerance of molded items in the separate table.

Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash (mm)	Weight (g)	Catalog Number
H	I	J	K	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		0.54	
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		1.87	
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		3.54	

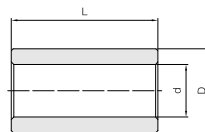
[Caution on Secondary Operations] ① As it is a molded item, bubbles may form inside the material. Avoid performing secondary operations.

Dimensional tolerance of molded item (unit: mm)

Grade	Rough grade
Dimensional classification	
3 or less	±0.20
4 to 6	±0.25
7 to 10	±0.30
11 to 18	±0.35
19 to 30	±0.40
Over 30	±0.50



When using the injection molded bevel gear with an idler gear (bearing metal press fitting) and diameter smaller than the inside diameter of the molded gear, please press fit the following standard bushing.



T8

Catalog Number	Inner dia.	Outside dia.	Length	Gear example
	d ^{+0.02} ₋₀	D ^{+0.02} _{-0.01}	L ⁺⁰ _{-0.3}	
BB30507	3	5	7	DB0.8
BB40612	4	6	12	DB1

Material: Oil-free copper alloy





Catalog number

Note that the catalog numbers for KSP ground spiral bevel gears have a different configuration compared to other miters and bevel gears.

KSP 031 001 G U L

Direction of spiral (left)

Product shape (prevents carburizing)

Tooth surface finish (ground)

Gear Ratio (1)

Gear outer diameter (31 mm)

Type (Spiral Miter)

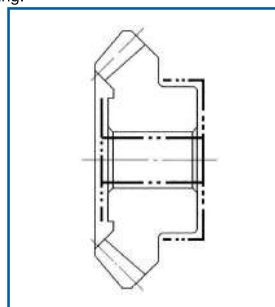
Features of KSP spiral bevel gears

1. High-strength, high-precision product of JIS grade 0.
2. Superior performance with regard to high speed, low noise, and low vibration.
3. Module is 1.5 to 6
4. Gear ratio types are 1, 1.5 and 2

Shape

Shape for secondary operations (with margin)

* The parts ----- in the figure below are protected from carburizing.



Transmission capacity table

1. The values in the transmission capacity table below are where the service factor is 1. Be sure to correct the load torque according to the table on the right. The corrected load torque is calculated by multiplying the load torque applied to the output shaft by service factor (Sf).
 2. When using at increased speed (where gear is drive and pinion is driven), the torque of the pinion is the value obtained by multiplying the value shown in the transmission capacity table by the speed ratio.
- NOTE 1: When the speed ratio is 1/1.5, the pinion torque is 1/1.5 of the value shown in the transmission capacity table.

Service factor (Sf)

Impact from motor	Impact from load		
	Uniform load	Moderate impact	Severe impact
Uniform load (electric motor, turbine, hydraulic motor, etc.)	1.0	1.25	1.75
Mild impact (multi-cylinder engine)	1.25	1.5	2.0
Moderate impact (single-cylinder engine)	1.5	1.75	2.25

Transmission capacity table (speed ratio 1/1)

Upper transmission capacity (kw) Lower output torque (N-m)

Figure number	Rotational speed (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	676.6	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 capacity table (speed ratio 1/1.5)

Upper transmission capacity (kw) Lower output torque (N-m)

Figure number	Rotational Speed of Pinion (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 capacity table (speed ratio 1/2)

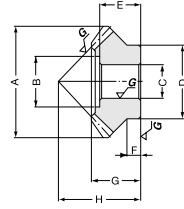
Upper transmission capacity (kw) Lower output torque (N-m)

Figure number	Rotational Speed of Pinion (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	

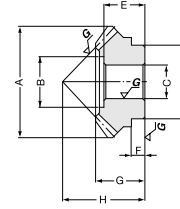


Specifications	
Precision grade	JIS B 1704: 1978 grade 0
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415*
Heat treatment	Carburized (Bore and hub are carburized)
Tooth hardness	60 to 63HRC**

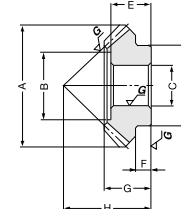
* The material of module 3.5 and above is SCM420.
** Modules 1.5 and 2 have the tooth hardness of 80 to 83 HRA.



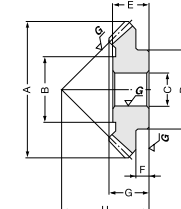
A



A'



B



C

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Pitch dia.	Face width	Shape	Outside dia.	Holding surface dia.	Bore	Hub dia.	Hole length
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
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
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
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
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

[Caution on Product Characteristics] ① The permissible torque shown is a reference value calculated by converting the gear output torque (N·m) when the rotational speed of the pinion is 600 rpm in the transmission capacity table on Page 365 into kgf·m.
② These bevel gears produce axial thrust forces. Please see Page 334 (Page 304 for gear ratio "1") for more details.

Hub width	Total length	Mounting distance	Machinable MAX bore	Allowable torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog Number
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
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
6 12	22 29	46 45	20 35	7.15	0.05~0.10	0.20 0.49	KSP0741.5GU P KSP0741.5GU G
7.6 7	14.5 15	28 22	— 20	0.89	0 ~0.05	0.02 0.07	KSP039002GU P KSP039002GU 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 Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 334) 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.



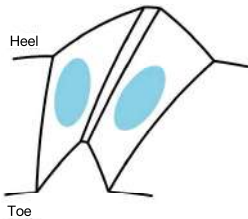
■ Adjustment of tooth contact

<Center of tooth contact>

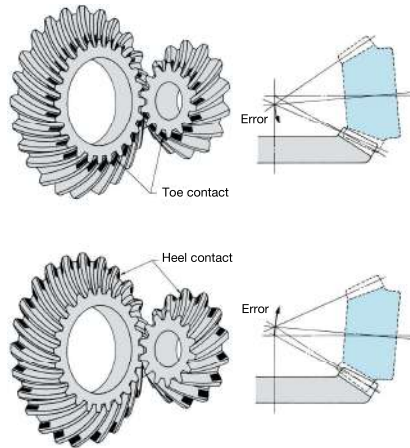
- (1) Near the center of the tooth length for the length direction
- (2) Ideally, the tooth width direction should be at the center of the width or slightly closer to the toe.

When adjusting the backlash and mounting the gear in the case, adjust the case in order to achieve the tooth contact as shown in the figure below.

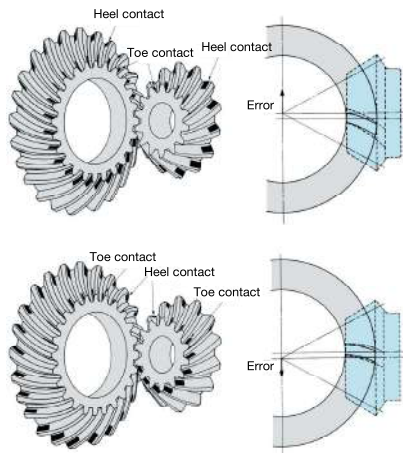
Deviation of the tooth contact from the normal position may adversely affect the strength and quietness.



(1) Tooth contact in case of a shaft-angle error



(2) Tooth contact in case of a shaft-offset error



(3) Tooth contact in case of a pinion set position error

