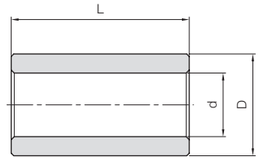
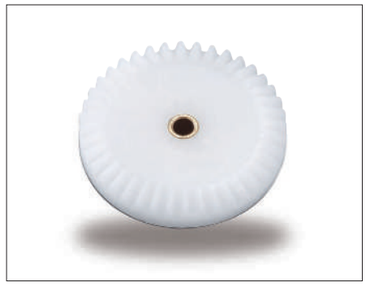
When using the injection molded bevel gear as an idler gear and a shaft diameter smaller than the inside diameter of the molded gear, please press fit one of the following standard bushings.



Catalog Number	Inner dia. $d^{+0.02}_{0}$	Outside dia. $D^{+0.02}_{-0.01}$	Length $L^{0}_{-0.3}$	Gear example
BB30507	3	5	7	DM0.8
BB30608	3	6	8	DM1
BB40609	4	6	9	DM1
BB50814	5	8	14	DM1.5

Material: Oil-free copper alloy

T8



Bevel Gears

MHP — High-Ratio Hypoid Gears
Gear Ratio 15~60

Material: SCM415
***m*1, 1.5** **Page 342**

MBSG — Ground Spiral Bevel Gears
Gear Ratio 2

Material: SCM415
***m*2~4** **Page 346**

SBSG — Ground Spiral Bevel Gears
Gear Ratio 1.5~3

Material: S45C
***m*2~4** **Page 348**

MBSA/MBSB — Finished Bore Spiral Bevel Gears
Gear Ratio 1.5~3

Material: SCM415
***m*2~6** **Page 350**

SBS — Spiral Bevel Gears
Gear Ratio 1.5~4

Material: S45C
***m*1~5** **Page 354**

SB — Bevel Gears
Gear Ratio 1.5~4

Material: S45C
***m*1~6** **Page 358**

SBY — Bevel Gears
Gear Ratio 2~4

Material: S45C
***m*5~8** **Page 358**

SB — Steel Bevel Gears & Pinion Shafts
Gear Ratio 5

Material: S45C
***m*1.5~3** **Page 362**

SUB — Stainless Steel Bevel Gears
Gear Ratio 1.5~3

Material: SUS303
***m*1.5~3** **Page 364**

PB — Plastic Bevel Gears
Gear Ratio 1.5~3

Material: MC901
***m*1~3** **Page 366**

DB — Injection Molded Bevel Gears
Gear Ratio 2

Material: Duracon (R) (M90-44)
***m*0.5~1** **Page 368**

BB — Sintered Metal Bushings

Material: Oil-free copper alloy
ϕ5~6 **Page 368**

Nissei KSP — Ground Spiral Bevel Gears
Gear Ratio 1~2

Material: SCM415
***m*1.5~6** **Page 370**

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 BS G 2 - 40 20 R

- R — Direction of Helix (Right)
- 20 — No. of teeth of mating gears (20)
- 40 — No. of Teeth (40)
- 2 — Module (2)
- G — Other Products (Ground Gears)
- BS — Type (Spiral Bevel Gears)
- M — 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 JIS B 1704: 1978	Secondary Operations	Features
Hypoid Gear	**MHP**	1, 1.5	15~60	SCM415	Carburized Note 1	Cut	3	△	Hypoid gears that have been tempered and hardened 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 has 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.

○ Possible △ Partly possible × Not possible

Application Examples

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

■ Differential Gear Mechanism Example

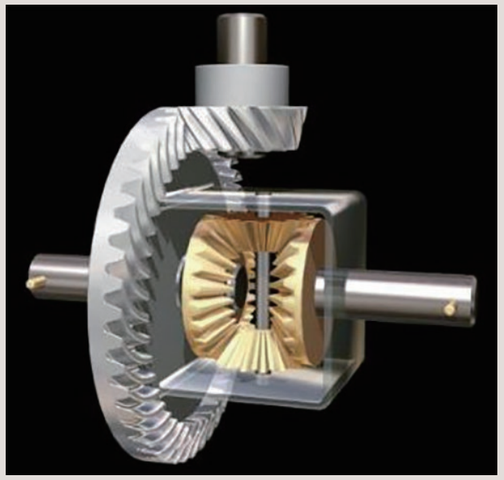


Image provided by: PK Design

■ SHESCO 2WD Bike

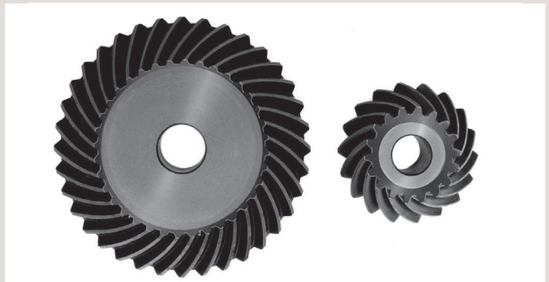
SB Bevel Gears are used in the driving components in both the front and rear wheels

Selection Hints

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

1. Caution in Selecting the Mating Gears

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



Right (R) Left (L)

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

Pinion \ Gears	SB SBY	SUB	PB	DB
SB·SBY	○	○	○	×
SUB	○	○	○	×
PB	○	○	○	×
DB	×	×	×	○

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

Pinion \ Gears	MBSG	SBSG	MBSA MBSB	SBS
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.

■ Calculation of Bending Strength of Gears

Item \ 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/mm²)	
Impact from load	Uniform load				1.15 (40°C with No Lubrication)	*m* 0.5 4.0 *m* 0.8 4.0 *m* 1.0 3.5 (40°C with Grease Lubrication)
Direction of load	Bidirectional load (calculated with allowable bending stress of 2/3)					
Allowable bending stress at root σ_{Flim} (kgf/mm²)	47	21	19 (24.5)	10.5		
Safety factor K_R	1.2					

■ 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/mm²)	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.

Product Precautions

Common Notes

[Caution on Product Characteristics]

(1) The allowable torque shown in the table are calculated values according to the assumed usage conditions. Please see Page 337 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 bevel gears produce axial thrust forces. Please see Page 340 for more details.
(4) Variations in temperature or humidity can cause dimensional changes in plastic gears, including tooth diameter, bore, and backlash. The accuracy and tolerances shown in the catalog are values obtained when machining is performed.
(5) Keyways are made according to JIS B1301 standards, Js9 tolerance. Also note that keyway tooth position alignment is not performed.
(6) For products having a tapped hole, a set screw is included. (excludes B7)

[Caution on Secondary Operations]

(1) Please read "Cautions on Performing Secondary Operations" (Page 340) when performing modifications and/or secondary operations for safety concerns.
(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).
(3) In the illustration, the area surrounded with —·—·— line is masked during the carburization process (max. HRC40 or so) and can be modified.

MHP High Ratio Hypoid Gears

[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.
Use gear calculation software GCSW.

MBS(A,B) Finished Bore Spiral Bevel Gears

[Caution on Product Characteristics]

(1) The keyway tolerance is the value before hardening.

[Caution on Secondary Operations]

(1) No secondary operations can be performed on these finished gears due to the applied carburizing process.

SBS Spiral Bevel Gears

[Caution on Product Characteristics]

(1) The bore may slightly vary due to the effect of heat treatment. When using with the indicated hole diameter, provide machining with a reamer or the like before use.

SB Bevel Gears

[Caution on Product Characteristics]

(1) For the handling conveniences, the BT series has the tapped holes on the holding surface. Please see Page 340 for L and tap sizes.

SBY Bevel Gears

[Caution on Product Characteristics]

(1) For the handling conveniences, the BT series has the tapped holes on the holding surface. Please see Page 340 for L and tap sizes.

PB Plastic Bevel Gears

[Caution on Product Characteristics]

(1) To reduce heat generation, it is recommended to mate them with steel gears.

DB Injection Molded Bevel Gears

[Caution on Product Characteristics]

(1) The bore tolerance is -0.05 to -0.30, but it may be slightly higher at the center of the hole.
(2) For the dimensional accuracy of each part, see the dimensional tolerance of molded items on Page 369.

[Caution on Secondary Operations]

(1) As it is a molded item, bubbles may form inside the material. Avoid performing secondary operations.

KSP_U Nissei Ground Spiral Bevel Gears

[Caution on Product Characteristics]

(1) The allowable torque is the value at RPM 600. For other data, see the Transmission Capacity Table.

Application Hints

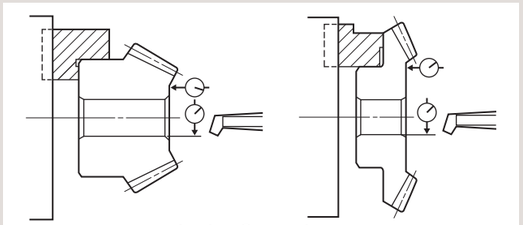
In order to use KHK stock bevel gears safely, carefully read the Application Hints before proceeding.
If there are questions or you require clarifications, please contact our technical department or your nearest distributor.
E-mail: info@khkgears.net

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.

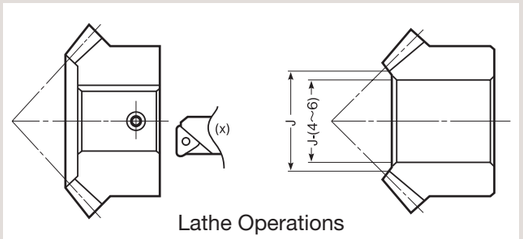
2. Caution on Performing Secondary Operations

① If reboring, 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.



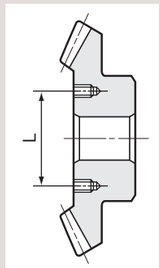
Lathe Operations

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 holding surface diameter dimensions.



Lathe Operations

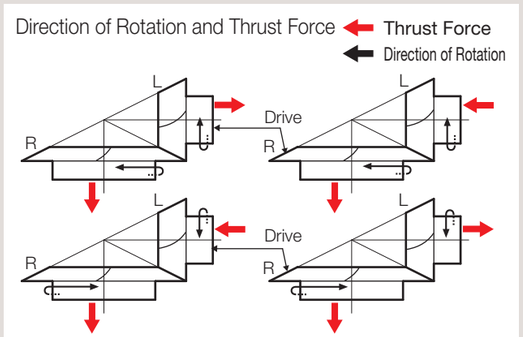
⑤ For tapping and keyway operations, see the examples given in “Caution on Performing Secondary Operations” in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentration, always round the corners.
⑥ PB plastic bevel gears are susceptible to changes due to temperature and humidity. 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

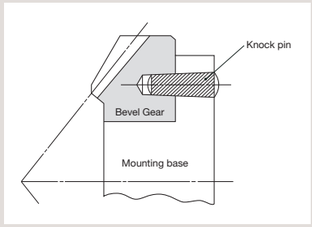
3. Points of Caution during Assembly

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 helix 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, use gear calculation software GCSW.



[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 308.

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		$1.4\times j_n \div$ Gear Ratio	$1.4\times j_n$

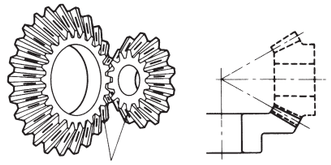
4. Cautions on Starting

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 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.

Correct Tooth Contact

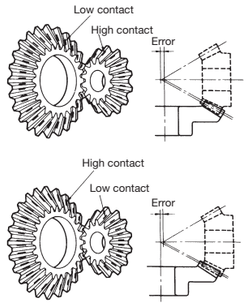
● When assembled correctly, the contact will occur on both gears in the middle of the flank and center of face width but somewhat closer to the toe.



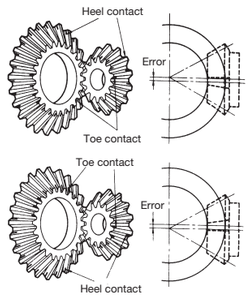
Center contact closer to toes

Incorrect Tooth Contact

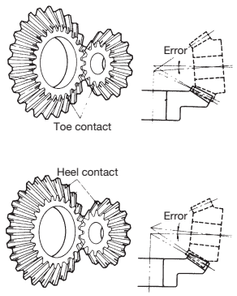
■ Mounting Distance Error
● When the mounting distance of the pinion is incorrect, the contact will occur too high on the flank on one gear and too low on the other.



■ 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.



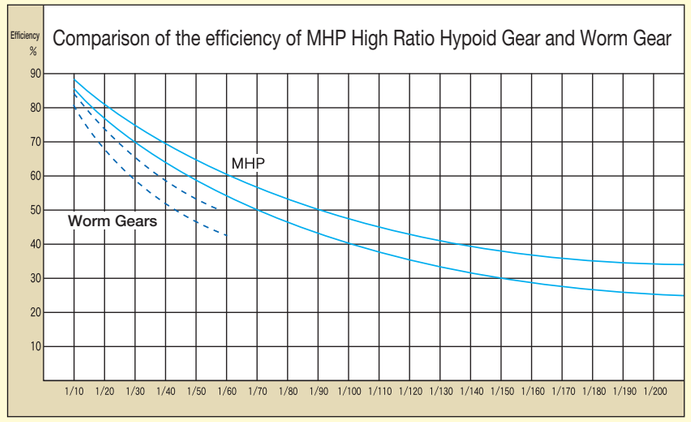
■ Shaft Angle Error
● When there is an angular error of shafts, the gears will contact at the toes or heels depending on whether the angle is greater or less than 90°.



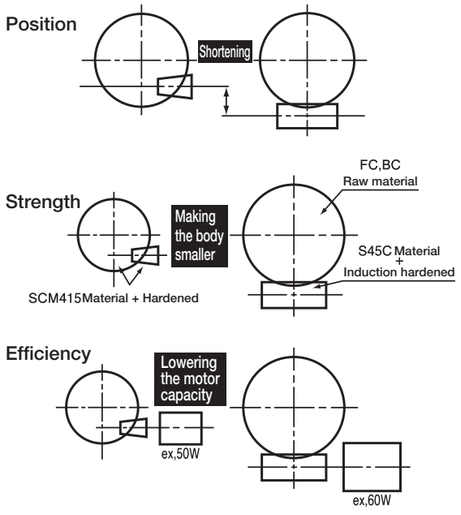
■ Features of MHP High Ratio Hypoid Gears

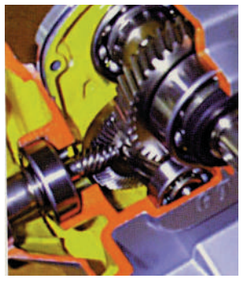
A pair of MHP high-ratio hypoid gears are able to produce an amazing reduction of speed of 60:1 in one stage.

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



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)

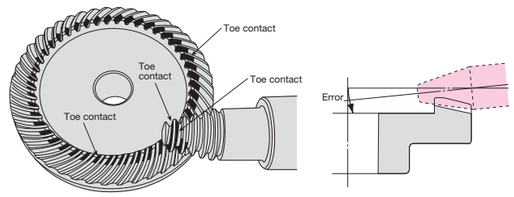
$$W_{XG} = W_{NG} \times T_G$$

W_{NG} : Thrust load coefficient of gear or R (given on the product pages)
T_G : Torque of gear or R(N·m)

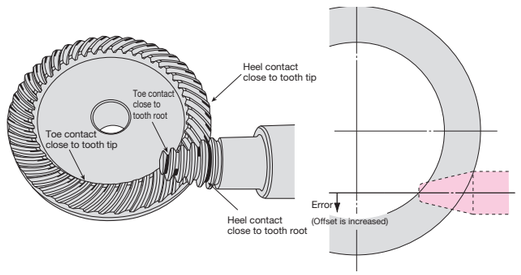
■ Variations in tooth contact due to poor alignment of gears

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

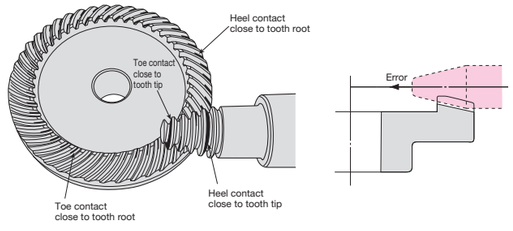
(1) Tooth contact in case of a shaft-angle error



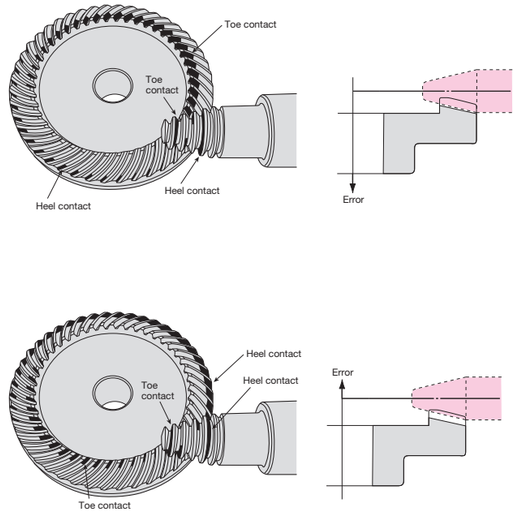
(2) Tooth contact in case of a shaft-offset error



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

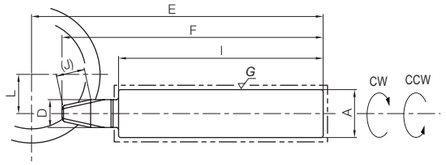


(4) Tooth contact in case of a gear set position error

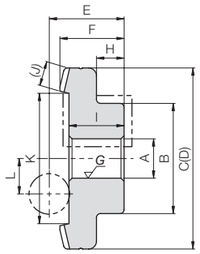


Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°*
Material	SCM415
Heat treatment	Tooth area carburized
Tooth hardness	60 to 63HRC

* 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. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Hub width H	Length of bore and shaft I
MHP1-0453R **MHP1-3045L**	15	***m*1**	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	***m*1.5**	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	***m*1.5**	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	***m*1**	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	***m*1**	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	***m*1.5**	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	***m*1**	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	***m*1.5**	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

Face width (J)	Holding surface dia. K	Offset L	Radial load coefficient CW	Radial load coefficient CCW	Thrust load coefficient CW	Thrust load coefficient CCW	Backlash (mm)	Weight (kg)	Catalog Number
(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**

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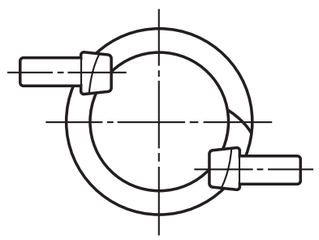
■ Helix Hands and Offset Position

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 bellow when designing or assembling.

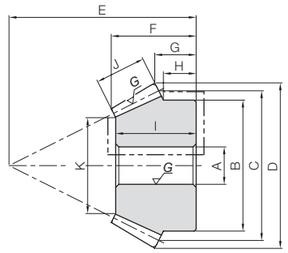


■ MHP allowable transmission torque table

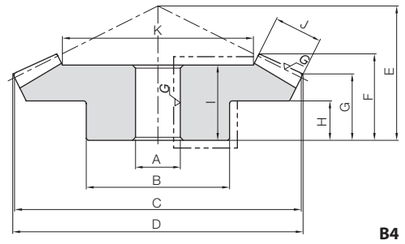
Reduction ratio	Combination	Unit	Rotational speed of pinion / Allowable torque (Gear side) 600rpm	900rpm	1200rpm	1800rpm	3000rpm
15	MHP1-0453R MHP1-3045L	N·m	10.3	9.61	8.82	7.35	3.72
		kgf·m	1.05	0.98	0.9	0.75	0.38
15	MHP1.5-0453R MHP1.5-3045L	N·m	41.2	38.2	35.3	29.4	14.7
		kgf·m	4.2	3.9	3.6	3	1.5
20	MHP1.5-0603R MHP1.5-3060L	N·m	82.4	76.7	69.2	54.9	—
		kgf·m	8.4	7.82	7.06	5.6	—
30	MHP1-0602R MHP1-2060L	N·m	24.1	22.5	20.7	17.3	8.62
		kgf·m	2.46	2.29	2.11	1.76	0.88
45	MHP1-0451R MHP1-1045L	N·m	11.3	10.5	9.61	8.04	4.02
		kgf·m	1.15	1.07	0.98	0.82	0.41
45	MHP1.5-0451R MHP1.5-1045L	N·m	46.6	43.2	39.9	33.2	16.7
		kgf·m	4.75	4.41	4.07	3.39	1.7
60	MHP1-0601R MHP1-1060L	N·m	25.3	23.4	21.7	18	9.02
		kgf·m	2.58	2.39	2.21	1.84	0.92
60	MHP1.5-0601R MHP1.5-1060L	N·m	93.9	87.2	76.3	54.9	—
		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



B3



B4

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
						A_{H7}	B	C	D	E	F	G
MBSG2-4020R	2	***m*2**	40	R	B4	15	45	80	81.1	45	31.78	26.1
MBSG2-2040L			20	L	B3	12	35	40	44.1	55	28.16	16.02
MBSG2.5-4020R		***m*2.5**	40	R	B4	16	55	100	101.29	50	33.35	26.29
MBSG2.5-2040L			20	L	B3	12	43	50	55.12	65	31.01	16.28
MBSG3-4020R		***m*3**	40	R	B4	20	65	120	121.57	60	39.81	31.57
MBSG3-2040L			20	L	B3	16	52	60	66.03	80	38.9	21.51
MBSG4-4020R		***m*4**	40	R	B4	25	80	160	162.06	75	48.27	37.06
MBSG4-2040L			20	L	B3	20	70	80	88.46	100	45.38	22.12

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			
18	29	14	52.7	56.5	94.2	5.76	9.61	0.04~0.10	0.57	**MBSG2-4020R**
13.75	27		25.39	28.2	47.1	2.88	4.80		0.18	**MBSG2-2040L**
16	30	17	66.99	108	184	11.0	18.7	0.05~0.11	1.01	**MBSG2.5-4020R**
13.25	29		29.97	54.1	91.8	5.52	9.37		0.31	**MBSG2.5-2040L**
20	35	20	80.28	185	318	18.8	32.4	0.06~0.12	1.64	**MBSG3-4020R**
18	36.5		36.56	92.4	159	9.42	16.2		0.56	**MBSG3-2040L**
22	42	27	106.63	441	778	45.0	79.3	0.09~0.15	3.55	**MBSG4-4020R**
17.5	43		51.25	221	389	22.5	39.7		1.20	**MBSG4-2040L**

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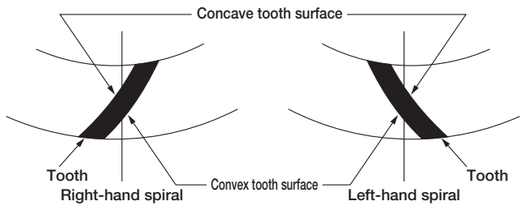
■ Mating surface of spiral bevel gears

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 $\Sigma = 90°$, pressure angle of $\alpha n = 20°$ and spiral angle of $\beta m = 35°$, the magnitudes of the axial force Fx and radial force Fr where the tangential force Ft at the center of the tooth width is 100.

$$\frac{\text{Thrust force } Fx}{\text{Radial force } Fr} \text{ value}$$

(1) Force applied to pinion

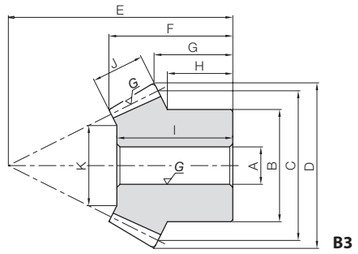
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 / −18.1	82.9 / −1.9	82.5 / 8.4	81.5 / 15.2	80.5 / 20.0	78.7 / 26.1	77.4 / 29.8
Convex tooth surface	−18.1 / 80.9	−33.6 / 75.8	−42.8 / 71.1	−48.5 / 67.3	−52.4 / 64.3	−57.2 / 60.1	−59.9 / 57.3

(2) Force applied to gear

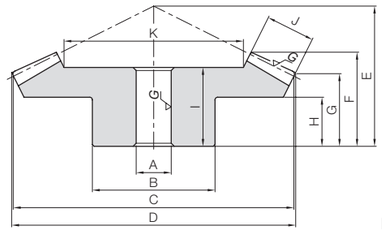
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 / −18.1	75.8 / −33.6	71.1 / −42.8	67.3 / −48.5	64.3 / −52.4	60.1 / −57.2	57.3 / −59.9
Convex tooth surface	−18.1 / 80.9	−1.9 / 82.9	8.4 / 82.5	15.2 / 81.5	20.0 / 80.5	26.1 / 78.7	29.8 / 77.4

Ground Spiral Bevel Gears

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	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back
						A_{H7}	B	C	D	E	F	G
SBSG2-3020R	1.5	***m*2**	30	R	B4	12	35	60	61.6	40	26.6	21.2
SBSG2-2030L			20	L	B3	10	30	40	43.55	45	24.91	16.18
SBSG2.5-3020R		***m*2.5**	30	R	B4	15	45	75	77.09	50	33.86	26.56
SBSG2.5-2030L			20	L	B3	12	40	50	54.43	55	30.88	18.98
SBSG3-3020R		***m*3**	30	R	B4	16	50	90	92.21	55	35.34	26.66
SBSG3-2030L			20	L	B3	16	45	60	65.58	70	40.17	26.86
SBSG4-3020R		***m*4**	30	R	B4	20	70	120	122.85	75	47.49	37.14
SBSG4-2030L			20	L	B3	20	60	80	87.34	90	48.17	32.45
SBSG2-4020R	2	***m*2**	40	R	B4	12	40	80	80.99	45	32.26	25.99
SBSG2-2040L			20	L	B3	12	32	40	44.1	60	34.04	21.02
SBSG2.5-4020R		***m*2.5**	40	R	B4	15	50	100	101.27	55	39.65	31.27
SBSG2.5-2040L			20	L	B3	12	40	50	55.21	75	43.61	26.3
SBSG3-4020R		***m*3**	40	R	B4	20	60	120	121.48	65	45.76	36.48
SBSG3-2040L			20	L	B3	16	50	60	66.06	90	50.63	31.52
SBSG4-4020R		***m*4**	40	R	B4	20	70	160	162.07	80	53.69	42.07
SBSG4-2040L			20	L	B3	20	60	80	88.5	120	66.24	42.12
SBSG2-4515R	3	***m*2**	45	R	B4	12	40	90	90.67	40	30.29	26.01
SBSG2-1545L			15	L	B3	10	24	30	34.78	60	29.66	15.8
SBSG2.5-4515R		***m*2.5**	45	R	B4	15	50	112.5	113.32	50	38.25	32.47
SBSG2.5-1545L			15	L	B3	12	30	37.5	43.36	75	38.27	19.73
SBSG3-4515R		***m*3**	45	R	B4	20	60	135	135.99	55	40.59	33.98
SBSG3-1545L			15	L	B3	15	38	45	52.08	90	44.98	23.68

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

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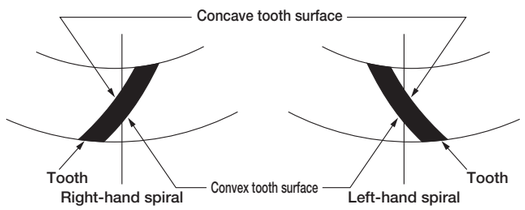
■ Mating surface of spiral bevel gears

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 $\Sigma = 90°$, pressure angle of $\alpha n = 20°$ and spiral angle of $\beta m = 35°$, the magnitudes of the axial force Fx and radial force Fr where the tangential force Ft at the center of the tooth width is 100.

$$\frac{\text{Thrust force } Fx}{\text{Radial force } Fr} \text{ value}$$

(1) Force applied to pinion

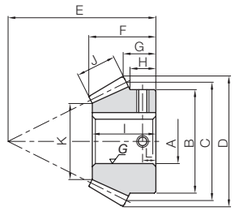
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 / −18.1	82.9 / −1.9	82.5 / 8.4	81.5 / 15.2	80.5 / 20.0	78.7 / 26.1	77.4 / 29.8
Convex tooth surface	−18.1 / 80.9	−33.6 / 75.8	−42.8 / 71.1	−48.5 / 67.3	−52.4 / 64.3	−57.2 / 60.1	−59.9 / 57.3

(2) Force applied to gear

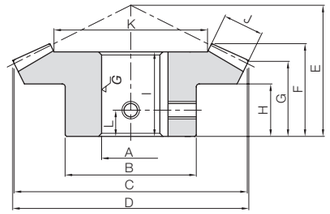
Meshing tooth surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave tooth surface	80.9 / −18.1	75.8 / −33.6	71.1 / −42.8	67.3 / −48.5	64.3 / −52.4	60.1 / −57.2	57.3 / −59.9
Convex tooth surface	−18.1 / 80.9	−1.9 / 82.9	8.4 / 82.5	15.2 / 81.5	20.0 / 80.5	26.1 / 78.7	29.8 / 77.4

Finished Bore Spiral Bevel Gears

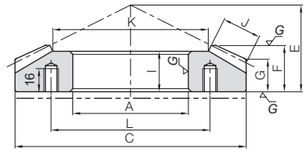
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Carburized
Tooth hardness	55 to 60HRC



BK



B4

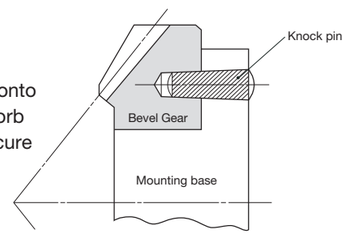


B7

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length
						A_{H7}	B	C	D	E	F	G	H	I
MBSA2-3020R **MBSB2-3020R**	1.5	***m*2**	30	R	B4	20 22	40	60	61.36	40	26.8	21.02	14	23
MBSA2-2030L **MBSB2-2030L**		***m*2**	20	L	BK	15 18	35	40	43.49	45	24.96	16.16	13.33	23
MBSA2.5-3020R **MBSB2.5-3020R**		***m*2.5**	30	R	B4	22 25	48	75	76.74	50	33.6	26.31	18	30
MBSA2.5-2030L **MBSB2.5-2030L**		***m*2.5**	20	L	BK	18 20	43	50	54.43	55	30.08	18.98	15.17	28
MBSA3-3020R **MBSB3-3020R**		***m*3**	30	R	B4	25 30	60	90	92.21	60	40.34	31.66	21	36
MBSA3-2030L **MBSB3-2030L**		***m*3**	20	L	BK	22 25	53	60	65.58	65	35.17	21.86	17.67	32.5
MBSA4-3020R **MBSB4-3020R**		***m*4**	30	R	B4	35 40	75	120	122.91	70	43.99	32.18	21	39
MBSA4-2030L **MBSB4-2030L**		***m*4**	20	L	BK	30 35	70	80	87.34	85	45.53	27.45	21.67	42
MBSA5-3020R		***m*5**	30	R	B7	80	—	150	—	70	35.53	23.8	—	31
MBSA5-2030L **MBSB5-2030L**		***m*5**	20	L	BK	35 40	87	100	109.2	105	55.05	33.07	25.67	51
MBSA6-3020R		***m*6**	30	R	B7	90	—	180	—	80	38.86	24.37	—	33
MBSA6-2030L **MBSB6-2030L**		***m*6**	20	L	BK	45 50	105	120	130.48	125	65.57	38.49	30	60
MBSA2-4020R **MBSB2-4020R**	2	***m*2**	40	R	B4	20 22	45	80	81.06	45	31.83	26.06	18	29
MBSA2-2040L **MBSB2-2040L**		***m*2**	20	L	BK	15 18	35	40	44.2	55	28.16	16.05	13.75	27
MBSA2.5-4020R **MBSB2.5-4020R**		***m*2.5**	40	R	B4	25 28	55	100	101.29	50	33.35	26.29	16	30
MBSA2.5-2040L **MBSB2.5-2040L**		***m*2.5**	20	L	BK	20 22	43	50	55.12	65	31.01	16.28	13.25	29
MBSA3-4020R **MBSB3-4020R**		***m*3**	40	R	B4	30 35	65	120	121.57	60	39.81	31.57	21	35
MBSA3-2040L **MBSB3-2040L**		***m*3**	20	L	BK	22 25	53	60	66.03	80	38.9	21.51	18.25	36.5
MBSA4-4020R		***m*4**	40	R	B7	80	—	160	—	60	32.08	22.53	—	28
MBSA4-2040L **MBSB4-2040L**		***m*4**	20	L	BK	30 35	70	80	88.46	100	45.38	22.12	17.5	43
MBSA5-4020R		***m*5**	40	R	B7	90	—	200	—	70	35.2	22.98	—	30
MBSA5-2040L **MBSB5-2040L**		***m*5**	20	L	BK	40 45	87	100	109.91	125	57.11	27.48	21.75	53.5
MBSA6-4020R		***m*6**	40	R	B7	110	—	240	—	80	37.89	23.62	—	32
MBSA6-2040L **MBSB6-2040L**		***m*6**	20	L	BK	50 55	105	120	132.04	150	67.8	33.01	26.25	64

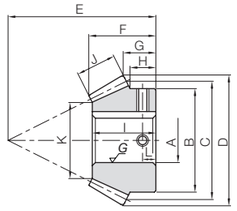
Face width	Holding surface dia.	Keyway	Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability			
11	37.56	6 x 2.8 6 x 2.8	2-M5 2-M5	7	34.4	38.4	3.51	3.91	0.06~0.16	0.26 0.24	**MBSA2-3020R** **MBSB2-3020R**
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 0.13	**MBSA2-2030L** **MBSB2-2030L**
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	**MBSA2.5-3020R** **MBSB2.5-3020R**
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 0.25	**MBSA2.5-2030L** **MBSB2.5-2030L**
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	**MBSA3-3020R** **MBSB3-3020R**
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 0.43	**MBSA3-2030L** **MBSB3-2030L**
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	**MBSA4-3020R** **MBSB4-3020R**
23	48.07	8 x 3.3 10 x 3.3	2-M6 2-M8	11	193	219	19.7	22.3		1.03 0.95	**MBSA4-2030L** **MBSB4-2030L**
28	97.36	—	6-M10	110	544	637	55.4	64.9	0.14~0.34	2.80	**MBSA5-3020R**
28	62.04	10 x 3.3 12 x 3.3	2-M8 2-M8	13	371	425	37.8	43.3		2.01 1.89	**MBSA5-2030L** **MBSB5-2030L**
34	115.61	—	6-M10	120	927	1120	94.6	114	0.16~0.36	4.55	**MBSA6-3020R**
34	72.41	14 x 3.8 14 x 3.8	2-M10 2-M10	15	633	745	64.5	76.0		3.56 3.38	**MBSA6-2030L** **MBSB6-2030L**
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	**MBSA2-4020R** **MBSB2-4020R**
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 0.14	**MBSA2-2040L** **MBSB2-2040L**
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	**MBSA2.5-4020R** **MBSB2.5-4020R**
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 0.25	**MBSA2.5-2040L** **MBSB2.5-2040L**
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	**MBSA3-4020R** **MBSB3-4020R**
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 0.48	**MBSA3-2040L** **MBSB3-2040L**
27	107.63	—	6-M10	110	466	564	47.5	57.5	0.12~0.27	3.11	**MBSA4-4020R**
27	51.25	8 x 3.3 10 x 3.3	2-M6 2-M8	9	234	282	23.8	28.8		1.05 0.96	**MBSA4-2040L** **MBSB4-2040L**
34	133.97	—	6-M10	120	915	1120	93.3	114	0.14~0.34	5.59	**MBSA5-4020R**
34	61.95	12 x 3.3 14 x 3.8	2-M8 2-M10	11	458	559	46.7	57.0		1.96 1.82	**MBSA5-2040L** **MBSB5-2040L**
40	162.56	—	6-M10	140	1530	1920	156	196	0.16~0.36	8.48	**MBSA6-4020R**
40	77.11	14 x 3.8 16 x 4.3	2-M10 2-M10	14	766	961	78.1	97.9		3.33 3.11	**MBSA6-2040L** **MBSB6-2040L**

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.

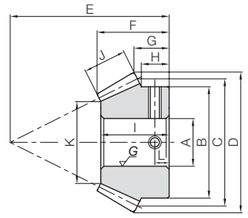


Product Precautions → Page 338

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



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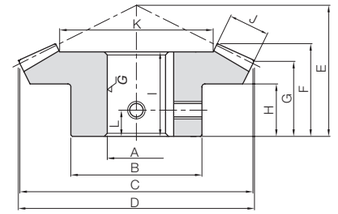
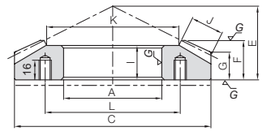


B4

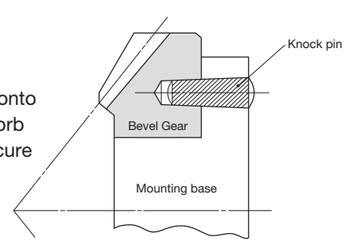


B7

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	Hub width	Hole length
						A_{H7}	B	C	D	E	F	G	H	I
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		***m4***	45	R	B7	80	—	180	—	50	28.85	22.14	—	25
MBSA4-1545L **MBSB4-1545L**		***m4***	15	L	BK	22 25	52	60	69.24	110	47.51	21.54	18.67	45.5
MBSA5-4515R		***m5***	45	R	B7	90	—	225	—	60	33.57	25.16	—	28
MBSA5-1545L **MBSB5-1545L**		***m5***	15	L	BK	28 32	65	75	86.55	135	56.89	24.43	20.83	54
MBSA6-4515R		***m6***	45	R	B7	110	—	270	—	70	38.28	28.05	—	32
MBSA6-1545L **MBSB6-1545L**		***m6***	15	L	BK	35 40	78	90	103.13	160	66.39	27.19	23	63

Face width	Holding surface dia.	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			
14	61.82	6 x 2.8 6 x 2.8	2-M5 2-M5	9	67.8	61.3	6.91	6.25	0.06~0.16	0.61 0.60	**MBSA2-4515R** **MBSB2-4515R**
14	16.46	— 4 x 1.8	2-M4 2-M4	5	21.7	20.4	2.22	2.08		0.081 0.073	**MBSA2-1545L** **MBSB2-1545L**
17	77.83	6 x 2.8 8 x 3.3	2-M5 2-M6	9	130	119	13.3	12.1	0.07~0.17	1.01 0.98	**MBSA2.5-4515R** **MBSB2.5-4515R**
17	21.48	4 x 1.8 5 x 2.3	2-M4 2-M4	7	41.6	39.6	4.24	4.04		0.16 0.15	**MBSA2.5-1545L** **MBSB2.5-1545L**
21	92.39	8 x 3.3 10 x 3.3	2-M6 2-M8	11	229	211	23.3	21.6	0.08~0.18	1.78 1.75	**MBSA3-4515R** **MBSB3-4515R**
21	26.18	6 x 2.8 6 x 2.8	2-M5 2-M5	9	73.3	70.5	7.48	7.18		0.26 0.24	**MBSA3-1545L** **MBSB3-1545L**
28	124.3	—	6-M10	110	542	508	55.3	51.8	0.12~0.27	3.93	**MBSA4-4515R**
28	35.91	6 x 2.8 8 x 3.3	2-M5 2-M6	10	174	169	17.7	17.3		0.63 0.58	**MBSA4-1545L** **MBSB4-1545L**
35	154.88	—	6-M10	120	1060	1000	108	102	0.14~0.34	7.38	**MBSA5-4515R**
35	42.64	8 x 3.3 10 x 3.3	2-M6 2-M8	11	339	334	34.6	34.1		1.16 1.07	**MBSA5-1545L** **MBSB5-1545L**
42	186.12	—	6-M10	140	1790	1740	183	178	0.16~0.36	12.0	**MBSA6-4515R**
42	52.37	10 x 3.3 12 x 3.3	2-M8 2-M8	12	575	581	58.6	59.3		1.90 1.75	**MBSA6-1545L** **MBSB6-1545L**

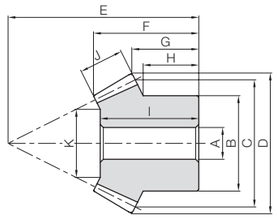
When installing products produced in B7 style (ring type), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only.



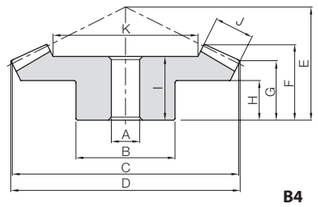
Spur Gears
Helical Gears
Internal Gears
Racks
CP Racks & Pinions
Miter Gears
Bevel Gears
Screw Gears
Worm Gears
Gearboxes
Other Products

Product Precautions → Page 338

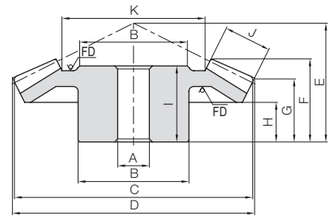
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	S45C
Heat treatment	Gear teeth induction hardened
Tooth hardness	50 to 60HRC
Surface treatment	Black oxide coating



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
						A	B	C	D	E	F	G
SBS2-3020R	1.5	***m*2**	30	R	B4	12	35	60	61.36	40	26.8	21.02
SBS2-2030L			20	L	B3	10	30	40	43.49	45	24.96	16.16
SBS2.5-3020R		***m*2.5**	30	R	B4	15	45	75	77.09	50	33.86	26.56
SBS2.5-2030L			20	L	B3	12	40	50	54.43	55	30.88	18.98
SBS3-3020R		***m*3**	30	R	B4	16	50	90	92.21	55	35.34	26.66
SBS3-2030L			20	L	B3	16	45	60	65.58	70	40.17	26.86
SBS4-3020R		***m*4**	30	R	B4	20	70	120	122.85	75	47.49	37.14
SBS4-2030L			20	L	B3	20	60	80	87.34	90	48.17	32.45
SBS5-3020R		***m*5**	30	R	B4	25	90	150	153.67	90	58.08	42.75
SBS5-2030L			20	L	B3	22	80	100	109.2	110	61.62	38.07
SBS1-4020R	2	***m*1**	40	R	B4	8	25	40	40.52	22	15.02	12.52
SBS1-2040L			20	L	B3	6	16	20	22.08	28	13.73	8.52
SBS1.5-4020R		***m*1.5**	40	R	B4	10	38	60	60.75	35	24.93	20.75
SBS1.5-2040L			20	L	B3	8	25	30	33.08	46	25.45	16.77
SBS2-4020R		***m*2**	40	R	B4	12	40	80	81	45	32.27	26
SBS2-2040L			20	L	B3	12	32	40	44.1	60	34.04	21.02
SBS2.5-4020R		***m*2.5**	40	R	B4	15	50	100	101.27	55	39.65	31.27
SBS2.5-2040L			20	L	B3	12	40	50	55.2	75	43.61	26.3
SBS3-4020R		***m*3**	40	R	B4	20	60	120	121.48	65	45.76	36.47
SBS3-2040L			20	L	B3	16	50	60	66.07	90	50.63	31.52
SBS4-4020R		***m*4**	40	R	B4	20	70	160	162.07	80	53.69	42.07
SBS4-2040L			20	L	B3	20	60	80	88.5	120	66.24	42.12
SBS5-4020R		***m*5**	40	R	B5	25	100	200	202.54	90	55.02	42.54
SBS5-2040L			20	L	B3	22	80	100	110.45	140	68.48	42.61
SBS2.5-3618R	2	***m*2.5**	36	R	B4	15	55	90	91.29	43	28.38	21.79
SBS2.5-1836L			18	L	B3	12	38	45	50.3	64	34.06	20.32
SBS3-3618R		***m*3**	36	R	B4	20	60	108	109.53	52	34.82	26.53
SBS3-1836L			18	L	B3	16	46	54	60.28	75	39.78	22.57
SBS4-3618R		***m*4**	36	R	B4	20	70	144	145.99	72	48.84	37.99
SBS4-1836L			18	L	B3	20	60	72	80.19	100	52.51	30.05
SBS2-4518R	2.5	***m*2**	45	R	B4	12	48	90	90.79	40	27.67	22.98
SBS2-1845L			18	L	B3	10	32	36	40.42	60	28.54	15.88
SBS2.5-4518R		***m*2.5**	45	R	B4	15	55	112.5	113.49	50	34.94	28.74
SBS2.5-1845L			18	L	B3	12	40	45	50.35	72	33.19	16.82
SBS3-4518R		***m*3**	45	R	B4	20	65	135	136.24	60	41.65	34.55
SBS3-1845L			18	L	B3	16	48	54	60.69	85	37.82	18.84
SBS4-4518R		***m*4**	45	R	B4	25	80	180	181.57	75	50.98	40.96
SBS4-1845L			18	L	B3	20	62	72	80.86	110	48.03	21.77
SBS5-4518R		***m*5**	45	R	B4	30	100	225	225.81	90	57.9	46.01
SBS5-1845L			18	L	B3	22	80	90	103.87	135	56.02	25.27

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	0.06~0.16	0.26	**SBS2-3020R**
11.67	22		21.34	10.5	7.52	1.07	0.77		0.13	**SBS2-2030L**
18	30	15	45.61	31.7	23.6	3.23	2.40	0.07~0.17	0.55	**SBS2.5-3020R**
14.17	28		27.42	21.6	15.7	2.20	1.60		0.28	**SBS2.5-2030L**
17	31	17	57.14	52.9	39.7	5.39	4.05	0.08~0.18	0.82	**SBS3-3020R**
20	37		34.71	36.1	26.5	3.68	2.70		0.49	**SBS3-2030L**
25	40	20	78.59	115	88.1	11.8	8.99	0.12~0.27	1.90	**SBS4-3020R**
23.33	43		46.89	78.7	58.8	8.03	5.99		1.05	**SBS4-2030L**
24	50	30	91.22	253	195	25.8	19.9	0.14~0.34	4.11	**SBS5-3020R**
28.33	56		54.83	173	130	17.6	13.3		2.29	**SBS5-2030L**
8	12	6	26.58	3.01	2.22	0.31	0.23	0.03~0.13	0.068	**SBS1-4020R**
7	12		9.17	1.51	1.11	0.15	0.11		0.019	**SBS1-2040L**
15	22	10	39.64	10.9	8.22	1.11	0.84	0.05~0.15	0.27	**SBS1.5-4020R**
14.75	24		17.28	5.46	4.11	0.56	0.42		0.088	**SBS1.5-2040L**
18	27	15	48.46	27.8	21.3	2.83	2.17	0.06~0.16	0.51	**SBS2-4020R**
18	32		20.92	13.9	10.7	1.42	1.09		0.19	**SBS2-2040L**
20	34	20	59.28	56.4	43.7	5.75	4.46	0.07~0.17	1.06	**SBS2.5-4020R**
22.5	40		20.56	28.2	21.9	2.88	2.23		0.40	**SBS2.5-2040L**
24	38	22	73.81	92.5	72.6	9.44	7.40	0.08~0.18	1.67	**SBS3-4020R**
27.5	47		29.61	46.4	36.3	4.73	3.70		0.69	**SBS3-2040L**
28	45	28	102.39	213	170	21.7	17.3	0.12~0.27	3.33	**SBS4-4020R**
35	62		42.78	107	84.8	10.9	8.65		1.46	**SBS4-2040L**
26	50	30	138.92	376	302	38.3	30.8	0.14~0.34	5.67	**SBS5-4020R**
35	63		57.84	188	151	19.2	15.4		2.61	**SBS5-2040L**
13	24	16	57.72	41.7	29.3	4.26	2.99	0.07~0.17	0.72	**SBS2.5-3618R**
17.25	32		25.45	20.9	14.7	2.13	1.49		0.27	**SBS2.5-1836L**
17	30	20	68.27	74.0	52.4	7.54	5.35	0.08~0.18	1.15	**SBS3-3618R**
19	37		28.56	37.0	26.2	3.78	2.67		0.44	**SBS3-1836L**
25	42	26	91.87	173	124	17.6	12.7	0.12~0.27	2.65	**SBS4-3618R**
25	49		39.72	86.4	62.1	8.81	6.33		1.03	**SBS4-1836L**
15	25	14	62.24	31.0	21.9	3.16	2.23	0.06~0.16	0.65	**SBS2-4518R**
14.2	27.5		23.11	12.2	8.74	1.24	0.89		0.15	**SBS2-1845L**
18	31	18	76.53	61.6	44.0	6.28	4.49	0.07~0.17	1.23	**SBS2.5-4518R**
14.75	31.5		26.82	24.2	17.6	2.47	1.80		0.28	**SBS2.5-1845L**
22	37	21	92.96	104	75.4	10.7	7.69	0.08~0.18	2.05	**SBS3-4518R**
16.3	36		33.41	41.0	30.2	4.18	3.07		0.45	**SBS3-1845L**
24	45	29	122.33	253	185	25.8	18.9	0.12~0.27	4.62	**SBS4-4518R**
18	46		45.83	99.5	74.1	10.2	7.56		1.00	**SBS4-1845L**
28	51	34	156.56	474	350	48.4	35.7	0.14~0.34	8.11	**SBS5-4518R**
20.5	52.5		56.9	186	140	19.0	14.3		1.94	**SBS5-1845L**

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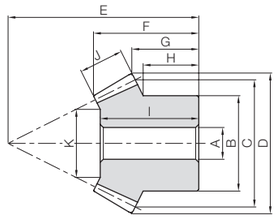
Spiral Bevel Gears

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°.



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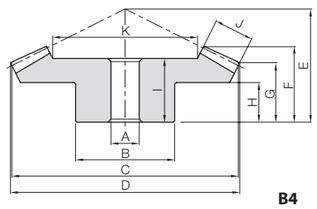

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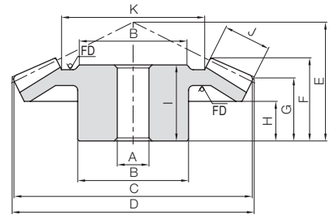

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* FD has a forged finish surface.

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
						A	B	C	D	E	F	G
SBS2-4515R	3	***m*2**	45	R	B4	12	40	90	90.67	40	30.29	26.01
SBS2-1545L			15	L	B3	10	24	30	34.78	60	29.66	15.8
SBS2.5-4515R		***m*2.5**	45	R	B4	15	50	112.5	113.32	50	38.25	32.47
SBS2.5-1545L			15	L	B3	12	30	37.5	43.36	75	38.27	19.73
SBS3-4515R		***m*3**	45	R	B4	20	60	135	135.99	55	40.59	33.98
SBS3-1545L			15	L	B3	15	38	45	52.08	90	44.98	23.68
SBS4-4515R		***m*4**	45	R	B5	20	80	180	181.3	70	50.62	41.95
SBS4-1545L			15	L	B3	16	50	60	69.3	115	54.37	26.55
SBS5-4515R		***m*5**	45	R	B5	30	90	225	226.61	75	50.05	39.92
SBS5-1545L			15	L	B3	20	60	75	86.55	145	66.89	34.43
SBS1.5-6015R	4	***m*1.5**	60	R	B4	12	60	90	90.36	32	24.08	21.48
SBS1.5-1560L			15	L	B3	8	18	22.5	26.09	56	22.95	11.45
SBS2-6015R		***m*2**	60	R	B4	15	80	120	120.46	42	31.5	27.91
SBS2-1560L			15	L	B3	10	24	30	34.68	75	30.94	15.58
SBS2.5-6015R		***m*2.5**	60	R	B4	20	100	150	150.5	53	39.68	35.24
SBS2.5-1560L			15	L	B3	12	30	37.5	44.16	94	38.9	19.83
SBS3-6015R		***m*3**	60	R	B4	20	120	180	180.57	64	47.61	42.64
SBS3-1560L			15	L	B3	15	38	45	52.64	112	44.01	22.96

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			
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**

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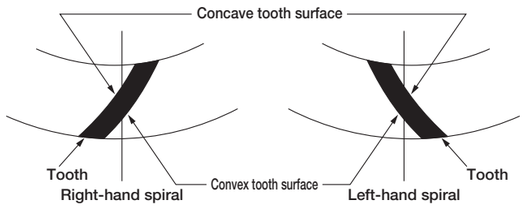
■ Mating surface of spiral bevel gears

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 $\Sigma = 90°$, pressure angle of $\alpha n = 20°$ and spiral angle of $\beta m = 35°$, the magnitudes of the axial force Fx and radial force Fr where the tangential force Ft at the center of the tooth width is 100.

$$\frac{\text{Thrust force } Fx}{\text{Radial force } Fr} \text{ value}$$

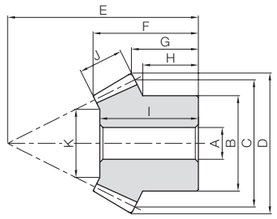
(1) Force applied to pinion

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 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



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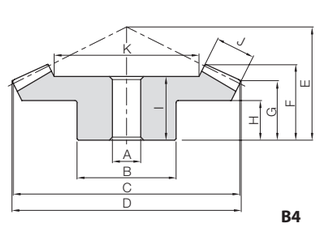

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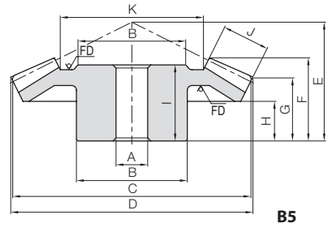

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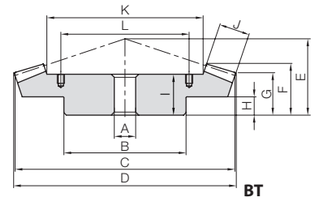


BT

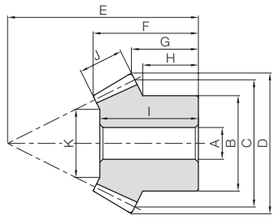
* FD has a forged finish surface.

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
SB1.5-3020	1.5	***m*1.5**	30	B4	10	30	45	46.24	28	18.53	13.93	8
SB1.5-2030			20	B3	8	25	30	33.13	33	18.63	11.54	8.83
SB2-3020		***m*2**	30	B4	10	35	60	61.65	40	26.87	21.24	15
SB2-2030			20	B3	10	30	40	44.18	45	25.06	16.39	11.67
SB2.5-3020		***m*2.5**	30	B4	15	45	75	77.07	50	34.22	26.55	18
SB2.5-2030			20	B3	12	35	50	55.22	55	31.06	19.24	12.5
SB3-3020		***m*3**	30	B4	15	50	90	92.48	55	35.56	26.86	17
SB3-2030			20	B3	15	45	60	66.27	70	40.48	27.09	20
SB4-3020		***m*4**	30	B4	20	70	120	123.3	75	47.71	37.48	25
SB4-2030			20	B3	15	60	80	88.32	90	48.53	32.77	23.33
SB5-3020		***m*5**	30	B4	25	90	150	154.13	90	58.45	43.1	24
SB5-2030			20	B3	20	80	100	110.45	110	62.11	38.48	28.33
SB1.5-3015	2	***m*1.5**	30	B4	8	25	45	45.88	25	17.85	14.63	9
SB1.5-1530			15	B3	6	16	22.5	26.11	32	17.23	10.4	7.88
SB2-3015		***m*2**	30	B4	10	30	60	61.17	31	21.6	17.17	10
SB2-1530			15	B3	8	22	30	34.81	40	20.59	11.2	8
SB2.5-3015		***m*2.5**	30	B4	15	40	75	76.46	40	28.75	22.71	15
SB2.5-1530			15	B3	12	30	37.5	43.51	55	31.81	19	15.63
SB3-3015		***m*3**	30	B4	16	50	90	91.76	50	37.31	29.26	18
SB3-1530			15	B3	12	35	45	52.22	70	43.88	26.8	22.5
SB4-3015		***m*4**	30	B4	20	60	120	122.34	60	42.4	32.34	20
SB4-1530			15	B3	16	50	60	69.62	85	48.74	27.41	22.5
SB5-3015		***m*5**	30	B5	20	70	150	152.93	75	52.5	40.43	25
SB5-1530			15	B3	20	60	75	87.03	110	63.61	38.01	31.25
SB6-3015		***m*6**	30	B5	25	80	180	183.5	90	62.56	48.49	28
SB6-1530			15	B3	25	70	90	104.44	125	68.48	38.6	30
SB2.5-3618	2	***m*2.5**	36	B4	15	55	90	91.46	43	28.52	21.96	13
SB2.5-1836			18	B3	12	38	45	51.01	64	34.27	20.5	17.25
SB3-3618		***m*3**	36	B4	20	60	108	109.76	52	34.95	26.76	17
SB3-1836			18	B3	16	46	54	61.22	75	40.01	22.8	19
SB4-3618		***m*4**	36	B4	20	70	144	146.34	72	49	38.34	25
SB4-1836			18	B3	20	60	72	81.62	100	52.77	30.41	25
SB1-4020	2	***m*1**	40	B4	8	25	40	40.59	22	15.07	12.59	8
SB1-2040			20	B3	6	16	20	22.41	28	13.78	8.6	7
SB1.25-4020		***m*1.25**	40	B4	10	32	50	50.73	27	18.54	15.23	10
SB1.25-2040			20	B3	8	22	25	28.01	36	18.66	11.75	10.25
SB1.5-4020		***m*1.5**	40	B4	10	38	60	60.88	35	25.01	20.88	15
SB1.5-2040			20	B3	8	25	30	33.61	46	25.54	16.9	14.75
SB2-4020		***m*2**	40	B4	12	40	80	81.17	45	32.37	26.17	18
SB2-2040			20	B3	12	32	40	44.81	60	34.16	21.2	18
SB2.5-4020		***m*2.5**	40	B4	15	50	100	101.46	55	39.73	31.46	20
SB2.5-2040			20	B3	12	40	50	56.01	75	43.78	26.5	22.5
SB3-4020		***m*3**	40	B4	20	60	120	121.76	65	45.85	36.76	24
SB3-2040			20	B3	16	50	60	67.22	90	50.81	31.8	27.5
SB4-4020		***m*4**	40	B4	20	70	160	162.34	80	53.92	42.34	28
SB4-2040			20	B3	20	60	80	89.62	120	66.59	42.41	35
SB5-4020		***m*5**	40	B5	25	100	200	202.93	90	55.33	42.93	26
SB5-2040			20	B3	20	80	100	112.03	140	68.92	43.01	35
SB6-4020		***m*6**	40	B5	25	85	240	243.52	105	65.05	48.52	28
SB6-2040			20	B3	25	90	120	134.44	160	78.16	43.6	32.5
SBY8-4020		***m*8**	40	BT	35	180	320	324.69	130	75.36	54.69	25
SBY8-2040			20	B3	30	120	160	179.25	210	98	54.81	40

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	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**
50	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**

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

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



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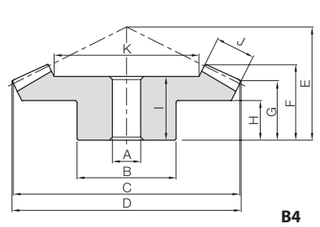

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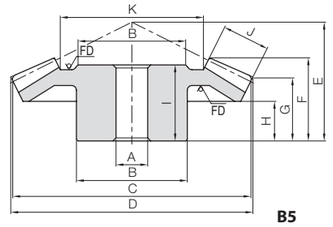

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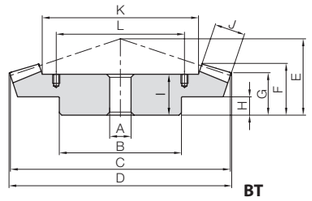

BT

* FD has a forged finish surface.

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	2.5	***m*1**	45	B4	8	30	45	45.46	23	16.95	14.57	10
SB1-1845			18	B3	6	15	18	20.57	32	16.34	10.02	8.9
SB1.25-4518		***m*1.25**	45	B4	10	34	56.25	56.82	26	18.53	15.46	10
SB1.25-1845			18	B3	8	19	22.5	25.72	40	20.66	12.52	11.17
SB1.5-4518		***m*1.5**	45	B4	10	36	67.5	68.18	30	21.1	17.35	10
SB1.5-1845			18	B3	8	23	27	30.86	45	21.97	12.02	10.45
SB2-4518		***m*2**	45	B4	12	48	90	90.91	40	27.91	23.14	15
SB2-1845			18	B3	10	32	36	41.15	60	28.69	16.03	14.2
SB2.5-4518		***m*2.5**	45	B4	15	55	112.5	113.64	50	35.06	28.92	18
SB2.5-1845			18	B3	12	40	45	51.44	72	33.31	17.04	14.75
SB3-4518		***m*3**	45	B4	20	65	135	136.37	60	41.86	34.71	22
SB3-1845			18	B3	16	48	54	61.72	85	38.04	19.05	16.3
SB4-4518		***m*4**	45	B4	20	80	180	181.82	75	51.16	41.28	24
SB4-1845			18	B3	20	62	72	82.3	110	48.28	22.06	18
SB5-4518		***m*5**	45	B4	25	100	225	227.28	90	59.43	47.85	28
SB5-1845			18	B3	20	80	90	102.87	135	55.82	25.07	20.5
SB1-4515	3	***m*1**	45	B4	8	30	45	45.37	17	11.77	10.06	5
SB1-1545			15	B3	6	12	15	17.67	29	12.51	6.95	6
SB1.25-4515		***m*1.25**	45	B4	10	34	56.25	56.72	21	14.61	12.33	6
SB1.25-1545			15	B3	8	15	18.75	22.09	36	15.85	8.43	7.25
SB1.5-4515		***m*1.5**	45	B4	10	36	67.5	68.06	28	20.44	17.59	11
SB1.5-1545			15	B3	8	18	22.5	26.54	47	23.19	13.92	12.5
SB2-4515		***m*2**	45	B4	12	40	90	90.75	40	30.4	26.12	17
SB2-1545			15	B3	10	24	30	35.35	60	29.8	15.89	14
SB2.5-4515		***m*2.5**	45	B4	15	50	112.5	113.43	50	38.35	32.65	22
SB2.5-1545			15	B3	12	30	37.5	44.18	75	38.41	19.86	17.5
SB3-4515		***m*3**	45	B4	20	60	135	136.12	55	40.74	34.18	20
SB3-1545			15	B3	15	38	45	53.02	90	45.17	23.84	21.33
SB4-4515		***m*4**	45	B5	20	80	180	181.5	70	50.79	42.24	24
SB4-1545			15	B3	16	50	60	70.69	115	54.6	26.78	24
SB5-4515		***m*5**	45	B5	25	90	225	226.87	75	50.28	40.3	20
SB5-1545			15	B3	20	60	75	88.37	145	67.19	34.73	30
SB6-4515		***m*6**	45	BT	30	160	270	272.24	100	72.62	58.36	30
SB6-1545			15	B3	25	70	90	106.03	175	89.04	42.67	36.67
SBY8-4515		***m*8**	45	BT	35	200	360	362.99	125	83.74	69.49	30
SBY8-1545			15	B3	30	100	120	141.39	230	99.93	53.56	46.67

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			
15	7	30.73	3.35	0.35	0.34	0.04	0.03~0.13	0.11	**SB1-4518**
15.5		10.31	1.33	0.14	0.14	0.01		0.019	**SB1-1845**
16	9	37.86	6.67	0.72	0.68	0.07	0.04~0.14	0.17	**SB1.25-4518**
19.5		12.16	2.65	0.29	0.27	0.03		0.038	**SB1.25-1845**
18	11	45	11.7	1.29	1.19	0.13	0.05~0.15	0.28	**SB1.5-4518**
21		16.51	4.64	0.51	0.47	0.05		0.063	**SB1.5-1845**
25	14	62.24	26.8	3.05	2.74	0.31	0.06~0.16	0.65	**SB2-4518**
27.5		23.11	10.7	1.22	1.09	0.12		0.16	**SB2-1845**
31	18	76.53	53.4	6.20	5.44	0.63	0.07~0.17	1.23	**SB2.5-4518**
31.5		26.82	21.2	2.48	2.16	0.25		0.28	**SB2.5-1845**
37	21	92.96	90.5	10.7	9.23	1.09	0.08~0.18	2.05	**SB3-4518**
36		33.41	36.0	4.29	3.67	0.44		0.46	**SB3-1845**
45	29	122.33	220	26.8	22.4	2.73	0.12~0.27	4.69	**SB4-4518**
46		45.83	87.3	10.7	8.91	1.09		1.01	**SB4-1845**
51	34	156.56	411	51.8	41.9	5.28	0.14~0.34	8.31	**SB5-4518**
52.5		56.9	164	20.7	16.7	2.11		1.95	**SB5-1845**
9	6	32.02	2.84	0.27	0.29	0.027	0.03~0.13	0.078	**SB1-4515**
12		10.05	0.98	0.09	0.10	0.0091		0.095	**SB1-1545**
12	8	39.63	5.80	0.56	0.59	0.057	0.04~0.14	0.15	**SB1.25-4515**
15		10.9	2.00	0.19	0.20	0.019		0.018	**SB1.25-1545**
17	10	46.58	10.3	1.02	1.05	0.10	0.05~0.15	0.25	**SB1.5-4515**
22.5		14.75	3.56	0.34	0.36	0.035		0.041	**SB1.5-1545**
26	15	59.04	26.4	2.68	2.69	0.27	0.06~0.16	0.60	**SB2-4515**
29		19.13	9.10	0.89	0.93	0.091		0.096	**SB2-1545**
35	20	72.84	53.6	5.55	5.46	0.57	0.07~0.17	1.22	**SB2.5-4515**
37		20.51	18.5	1.85	1.89	0.19		0.19	**SB2.5-1545**
35	23	88.18	90.2	9.53	9.20	0.97	0.08~0.18	1.99	**SB3-4515**
43		22.53	31.2	3.18	3.18	0.32		0.34	**SB3-1545**
45	30	118.09	211	23.0	21.5	2.35	0.12~0.27	3.89	**SB4-4515**
52		32.26	72.8	7.67	7.43	0.78		0.77	**SB4-1545**
44	35	152.88	394	44.3	40.2	4.52	0.14~0.34	6.10	**SB5-4515**
65		48.64	136	14.8	13.9	1.51		1.46	**SB5-1545**
62	50	169.26	751	87.0	76.6	8.87	0.16~0.36	18.0	**SB6-4515**
86		49.77	259	39.9	26.4	4.06		2.61	**SB6-1545**
67	50	255.92	1470	179	150	18.3	0.20~0.45	36.4	**SBY8-4515**
93		61.77	506	59.7	51.6	6.09		5.80	**SBY8-1545**

Spur Gears
Helical Gears
Internal Gears
Racks
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Miter Gears
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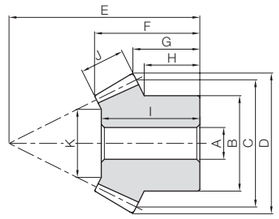
SB/SBY Module 1.5~6 Bevel Gears

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



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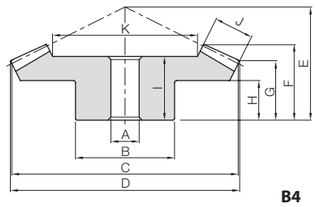

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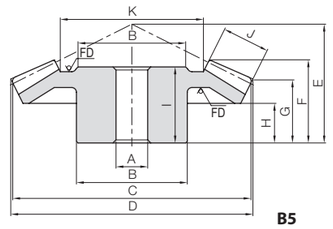

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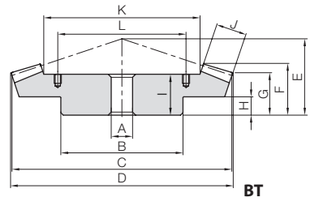


BT

* FD has a forged finish surface.

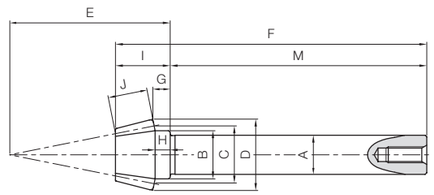
Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back G	Hub width H
SB1.5-6015	4	***m*1.5**	60	B4	12	50	90	90.41	32	24.2	21.58	12
SB1.5-1560			15	B3	8	18	22.5	26.66	56	23.01	11.52	10.43
SB2-6015		***m*2**	60	B4	15	60	120	120.55	42	31.6	28.1	16
SB2-1560			15	B3	10	24	30	35.55	75	31.01	15.69	14.25
SB2.5-6015		***m*2.5**	60	B4	20	70	150	150.69	53	40	35.63	20
SB2.5-1560			15	B3	12	30	37.5	44.44	94	39.02	19.87	18.06
SB3-6015		***m*3**	60	B4	20	80	180	180.83	64	47.97	43.15	25
SB3-1560			15	B3	15	38	45	53.33	112	44.1	23.04	21.12
SB4-6015		***m*4**	60	B5	25	85	240	241.1	80	59.2	52.2	36
SB4-1560			15	B3	16	50	60	71.1	150	62.03	31.4	28.75
SBY5-6015		***m*5**	60	BT	30	180	300	301.36	80	53.97	45.22	20
SBY5-1560			15	B3	25	60	75	88.9	185	75.03	36.74	33.13
SBY6-6015		***m*6**	60	BT	35	200	360	361.66	100	68.16	58.31	25
SBY6-1560			15	B3	25	75	90	106.66	220	85.17	42.08	38.13

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

SB Module 1.5~3 Steel Bevel Gears & Pinion Shafts

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.



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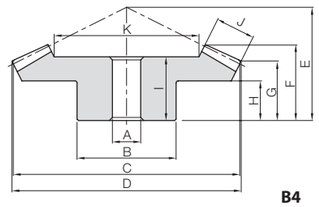


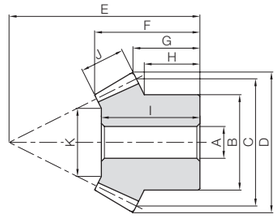
B4

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore/Shaft Dia. A_{H7} (bore) A_{h7} (shaft)	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back G	Hub width H	Length of bore and shaft I
SB1.5-6012	5	***m*1.5**	60	B4	12	50	90	90.33	30	23.89	21.82	12	21
SB1.5-1260			12	B8	12.2	15	18	22.24	50	97.06	5.42	4.7	17.06
SB2-6012		***m*2**	60	B4	15	60	120	120.43	40	31.85	29.09	16	27
SB2-1260			12	B8	15.2	20	24	29.65	66	117.08	6.56	5.6	22.08
SB2.5-6012		***m*2.5**	60	B4	20	70	150	150.54	50	39.81	36.36	20	34
SB2.5-1260			12	B8	20.2	25	30	37.06	83	143.1	8.7	7.5	28.1
SB3-6012		***m*3**	60	B4	20	80	180	180.65	60	47.43	43.64	25	41
SB3-1260			12	B8	25.25	30	36	44.48	100	172.19	10.85	9.4	32.19

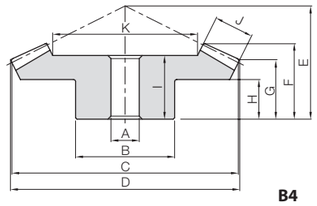
Face width J	Holding surface dia. K	Length of shaft M	Socket head screw Size	Allowable torque (N·m) Bending strength	Allowable torque (N·m) Surface durability	Allowable torque (kgf·m) Bending strength	Allowable torque (kgf·m) Surface durability	Backlash (mm)	Weight (kg)	Catalog Number
12	65.52	—	—	18.0	1.41	1.83	0.14	0.05~0.15	0.62	**SB1.5-6012**
	—	80	M5	4.01	0.46	0.41	0.047		0.097	**SB1.5-1260**
16	86.96	—	—	42.6	3.43	4.34	0.35	0.06~0.16	1.34	**SB2-6012**
	—	95	M6	9.50	1.12	0.97	0.11		0.19	**SB2-1260**
20	108.8	—	—	83.2	6.85	8.48	0.70	0.07~0.17	2.54	**SB2.5-6012**
	—	115	M8	18.5	2.23	1.89	0.23		0.40	**SB2.5-1260**
22	134.73	—	—	135	11.4	13.8	1.16	0.08~0.18	4.18	**SB3-6012**
	—	140	M8	30.1	3.70	3.07	0.38		0.74	**SB3-1260**

Product Precautions → Page 338

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	***m*1.5**	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		***m*2**	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		***m*2.5**	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		***m*3**	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	***m*1.5**	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		***m*2**	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		***m*2.5**	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		***m*3**	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	***m*1.5**	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		***m*2**	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		***m*2.5**	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		***m*3**	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	21.33

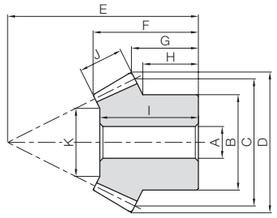
Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability			
16	9	27.37	3.22	0.46	0.33	0.047	0.05~0.15	0.12	**SUB1.5-3020**
17		17.05	2.23	0.31	0.23	0.032		0.064	**SUB1.5-2030**
23	11	37.56	7.22	1.08	0.74	0.11	0.06~0.16	0.27	**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	0.55	**SUB2.5-3020**
28		27.42	10.3	1.52	1.05	0.15		0.29	**SUB2.5-2030**
31	17	57.14	24.8	3.87	2.53	0.39	0.08~0.18	0.95	**SUB3-3020**
37		34.71	17.2	2.58	1.76	0.26		0.56	**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		0.090	**SUB1.5-2040**
27	15	48.46	13.4	2.07	1.36	0.21	0.06~0.16	0.62	**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	1.24	**SUB2.5-4020**
41		24.56	13.6	2.15	1.39	0.22		0.41	**SUB2.5-2040**
38	22	73.81	44.4	7.19	4.53	0.73	0.08~0.18	1.89	**SUB3-4020**
47		29.61	22.4	3.60	2.28	0.37		0.70	**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	0.82	**SUB2-4515**
29		19.13	5.03	0.63	0.51	0.065		0.097	**SUB2-1545**
35	20	72.84	29.6	3.94	3.02	0.40	0.07~0.17	1.38	**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	2.36	**SUB3-4515**
43		22.53	17.2	2.26	1.76	0.23		0.34	**SUB3-1545**

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

Plastic Bevel Gears

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.



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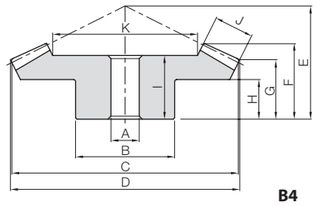


B4

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	B	C	D	E	F	G	H
PB1.5-3020	1.5	***m*1.5**	30	B4	10	30	45	46.24	28	18.53	13.93	8
PB1.5-2030			20	B3	8	25	30	33.13	33	18.63	11.54	8.83
PB2-3020		***m*2**	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		***m*2.5**	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		***m*3**	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	2	***m*1**	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		***m*1.25**	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		***m*1.5**	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		***m*2**	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		***m*2.5**	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		***m*3**	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	***m*1.5**	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		***m*2**	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		***m*2.5**	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		***m*3**	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

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**

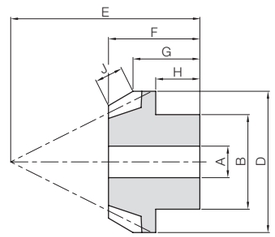
* In regard to MC Nylon gears, other materials are available for plastic gears, including Ultra High Molecular Weight Polyethylene (U-PE), which has excellent abrasion resistance and resin conforming to the Plastic Implementation Measure (PIM). A single piece order is acceptable and will be produced as a custom-made gear. Please see Page 26 for more details on quotations and orders.

Product Precautions → Page 338

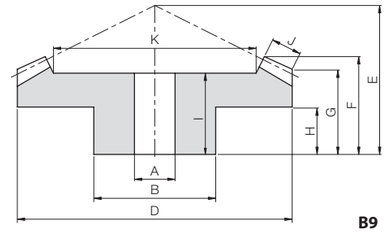
DB Module 0.5~1 Injection Molded Bevel Gears

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	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back
					A	B		D	E	F	G
DB0.5-4020	2	***m*0.5**	40	B9	4	12	20	20.29	12	8.33	7.29
DB0.5-2040			20	B1	3	8	10	11.2	16	8.46	6.3
DB0.8-4020		***m*0.8**	40	B9	5	15	32	32.47	18	11.91	10.47
DB0.8-2040			20	B1	4	12	16	17.92	24	11.5	8.48
DB1-4020		***m*1**	40	B9	6	18	40	40.59	22	14.45	12.59
DB1-2040			20	B1	5	15	20	22.4	30	14.49	10.6

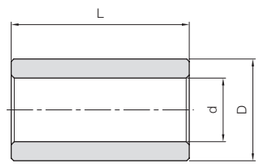
Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash (mm)	Weight (g)	Catalog Number
H	I	J	K	Bending strength	Bending strength			
4	7	2.5	14.41	0.24	0.025	0~0.30	2.00	**DB0.5-4020**
4	—		—	0.092	0.0094		0.54	**DB0.5-2040**
6	10	3.5	24.17	0.91	0.093	0~0.48	6.26	**DB0.8-4020**
5	—		—	0.34	0.035		1.87	**DB0.8-2040**
7.5	12.5	4.5	30.44	1.59	0.16	0~0.60	11.9	**DB1-4020**
7	—		—	0.60	0.061		3.54	**DB1-2040**

■ Dimensional tolerance of molded item (unit: mm)

Dimensional classification \ Grade	Rough grade
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

BB Sintered Metal Bushings

When using the injection molded bevel gear as an idler gear and a shaft diameter smaller than the inside diameter of the molded gear, please press fit one of the following standard bushings.



T8

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

Material: Oil-free copper alloy

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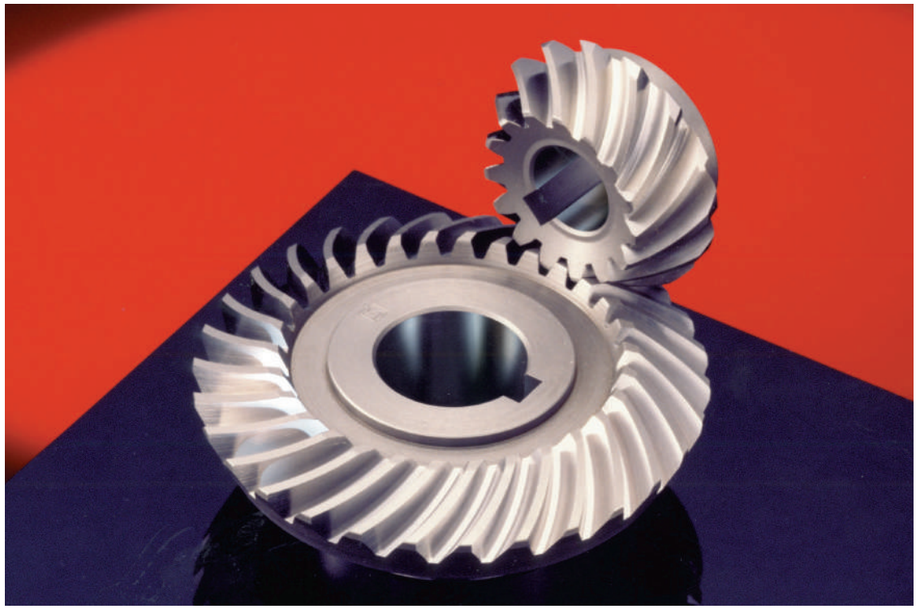


Catalog number

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

- L — Direction of spiral (left)
- U — Product shape (prevents carburizing)
- G — Tooth surface finish (ground)
- 001 — Gear Ratio (1)
- 031 — Gear outer diameter (31 mm)
- KSP — Type (Spiral Miter)

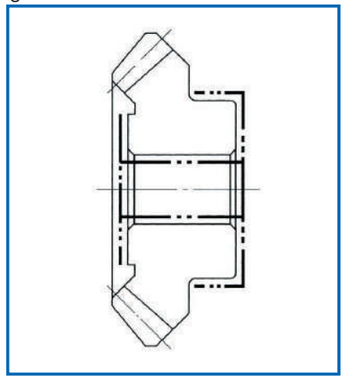
Features of KSP spiral bevel gears

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	678.6	628.6	589.4	562.9	542.3	510.9	466.8
KSP184001	5.31	10.2	28.3	52.8	75.5	96.8	136	206
	1010	976.7	901.2	841.4	801.2	770.8	722.8	656.1

Transmission 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

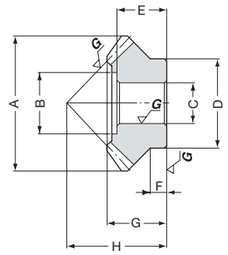
Transmission capacity table (speed ratio 1/2)

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

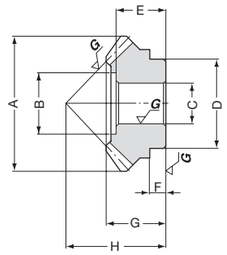
Figure number \ Rotational Speed of Pinion (rpm)	50	100	300	600	900	1200	1800	3000
KSP039002	0.025	0.049	0.142	0.275	0.404	0.528	0.770	1.23
	9.63	9.45	9.07	8.76	8.57	8.41	8.17	7.83
KSP056002	0.075	0.147	0.423	0.814	1.19	1.55	2.26	3.59
	28.8	28.1	27.0	26.0	25.3	24.8	23.9	22.8
KSP075002	0.185	0.361	1.03	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**

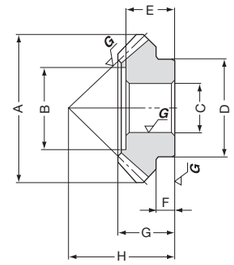
* The material of module 3.5 and above is SCM420.
** Modules 1.5 and 2 have the tooth hardness of 80 to 83 HRA.



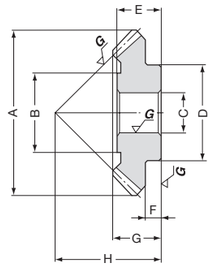
A



A'



B



C

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Pitch dia.	Face width	Shape	Outside dia. A	Holding surface dia. B	Bore C^{H7}	Hub dia. D	Hole length E	Hub width F	Total length G	Mounting distance H	Machinable MAX bore	Allowable torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog Number
KSP031001GU L **KSP031001GU R**	1	***m*1.5**	20	L R	30	7	A	30.5	16.5	10	22	13	6	15	25	12	0.61	0 ~0.05	0.04	**KSP031001GU L** **KSP031001GU R**
KSP040001GU L **KSP040001GU R**		***m*2**	20	L R	40	9	B	40	22.5	12	31	14	7	16.5	30	16	1.59	0 ~0.05	0.09	**KSP040001GU L** **KSP040001GU R**
KSP078001GU L **KSP078001GU R**		***m*3.5**	22	L R	77	18	B	78	43	20	54	27	12	32	57	32	9.74	0.05~0.10	0.59	**KSP078001GU L** **KSP078001GU R**
KSP105001GU L **KSP105001GU R**		***m*4.5**	23	L R	103.5	25	C	105	50	26	70	35	14	39	72	40	23.9	0.05~0.10	1.33	**KSP105001GU L** **KSP105001GU R**
KSP132001GU L **KSP132001GU R**		***m*5**	26	L R	130	29	C	132	64	30	82	41	14	45	88	48	38.4	0.05~0.10	2.49	**KSP132001GU L** **KSP132001GU R**
KSP157001GU L **KSP157001GU R**		***m*5.5**	28	L R	154	34	C	157	76	32	92	47	20	53.5	105	55	60.1	0.05~0.10	3.90	**KSP157001GU L** **KSP157001GU R**
KSP184001GU L **KSP184001GU R**		***m*6**	30	L R	180	38	C	184	84	40	101	51	17	56.5	118	62	85.8	0.05~0.10	5.79	**KSP184001GU L** **KSP184001GU R**
KSP0481.5GU P **KSP0481.5GU G**	1.5	***m*2**	16 24	L R	32 48	9	A' B	34 48	17.5 30	10 12	24 30	13 17	4.5 7	14.5 19	31 30	— 20	2.02	0 ~0.05	0.05 0.14	**KSP0481.5GU P** **KSP0481.5GU G**
KSP0741.5GU P **KSP0741.5GU G**		***m*2.75**	18 27	L R	49.5 74.25	15	A' B	52 74	27 44.5	14 20	40 50	20 25	6 12	22 29	46 45	20 35	7.15	0.05~0.10	0.20 0.49	**KSP0741.5GU P** **KSP0741.5GU G**
KSP075002GU P **KSP075002GU G**	2	***m*2.5**	15 30	L R	37.5 75	14	A' C	40 75	20 36	12 16	30 44	17 24	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**
KSP096002GU P **KSP096002GU G**		***m*3**	16 32	L R	48 96	18	B C	53 96	23.5 46	12 20	36 56	19 29	2.5 12	21.5 31	53 47	19 32	12.5	0.05~0.10	0.20 0.91	**KSP096002GU P** **KSP096002GU G**
KSP119002GU P **KSP119002GU G**		***m*3.5**	17 34	L R	59.5 119	22	A C	65 119	34 54	16 26	44 63	25 34	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**

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■ Adjustment of tooth contact

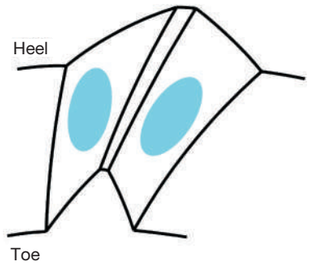
<Center of tooth contact>

(1) Near the center of the tooth length for the length direction

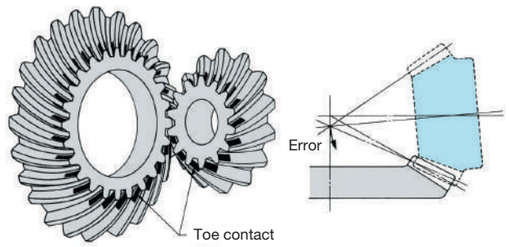
(2) Ideally, the tooth width direction should be at the center of the width or slightly closer to the toe.

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.

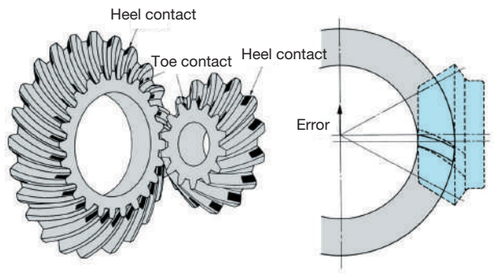
Deviation of the tooth contact from the normal position may adversely affect the strength and quietness.



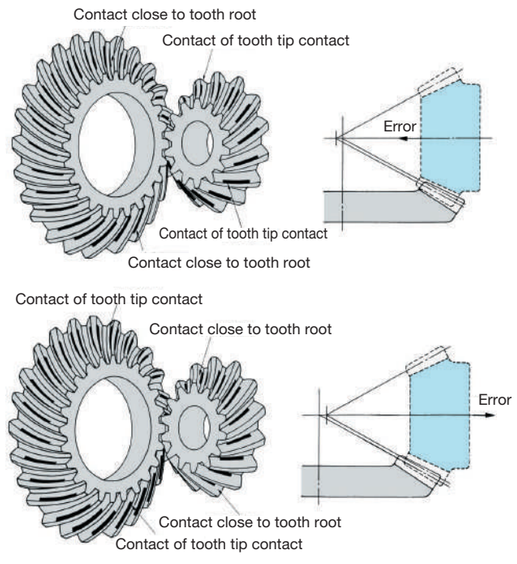
(1) Tooth contact in case of a shaft-angle error



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



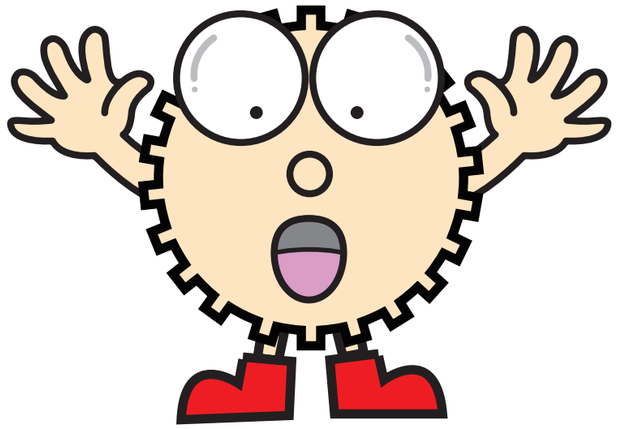
(3) Tooth contact in case of a pinion set position error



Screw Gears

SN-H Hardened Screw Gears	SN Screw Gears	SUN Stainless Steel Screw Gears	AN Screw Gears	PN Plastic Screw Gears
NEW (J)(H)	(J)	(J)	(J)(M)	(J)
Material: S45C	Material: S45C	Material: SUS303	Material: CAC702 (A ℓ BC2)	Material: MC901
*m*1~4 Page 380	*m*1~4 Page 380	*m*1~3 Page 384	*m*1~3 Page 386	*m*1~3 Page 388

(M) Includes Made to Order



Catalog Number of KHK Stock Gears

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

(Example) Screw Gears

S N 1 - 13 R

- R — Direction of Helix (Right)
- 13 — No. of Teeth (13)
- 1 — Module (1)
- N — Type (Screw Gears)
- S — Material (S45C)

Material		Type	
S	S45C	N	Screw Gears
SU	Stainless Steel		
A	CAC702		
P	MC901		