1.Select by Image

PICTORIAL INDEX OF MITER AND BEVEL GEARS

Intersecting Axes Gears

MITER GEARS

MMSG Ground Spiral Miter Gears — J Series — Newly added

*m*2 ～ 4 Page 256

SMSG Ground Spiral Miter Gears — J Series — Newly added

*m*1 ～ 5 Page 258

MMSA・MMSB Finished Bore Spiral Miter Gears

*m*1 ～ 10 Page 260

MMS Spiral Miter Gears

*m*2 ～ 5 Page 262

SMS Spiral Miter Gears

*m*1 ～ 8 Page 264

SMZG Ground Zerol Miter Gears

*m*2 ～ 3 Page 266

SMA・SMB・SMC Finished Bore Miter Gears

*m*1 ～ 8 Page 268

MM Carburized & Hardened Miter Gears

*m*2 ～ 5 Page 270

LM Sintered Metal Miter Gears

*m*0.8 ～ 1.5 Page 270

SM Steel Miter Gears

*m*1 ～ 8 Page 272

SAM Angular Miter Gears

*m*1.5 ～ 3 Page 274

SUM Stainless Steel Miter Gears

*m*1 ～ 4 Page 276

SUMA Finished Bore Stainless Steel Miter Gears

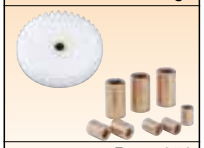
*m*1 ～ 4 Page 276

PM Plastic Miter Gears

*m*1 ～ 4 Page 278

DM Injection Molded Miter Gears

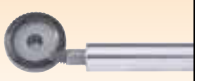
*m*0.5 ～ 1.5 Page 278

BB Sintered Metal Bushings

φ5 ～ 8 Page 279

Nissei KSP Ground Spiral Miter Gears

*m*1.5 ～ 6 Page 318

BEVEL GEARS

MHP High-Ratio Hypoid Gears
Gear Ratio 15 ～ 200

*m*1, 1.5 Page 288

MBSG Ground Spiral Bevel Gears
Gear Ratio 2

*m*2 ～ 4 Page 290

SBSG Ground Spiral Bevel Gears
Gear Ratio 1.5 ～ 3

*m*2 ～ 4 Page 292

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

*m*2 ～ 6 Page 294

SBS Spiral Bevel Gears
Gear Ratio 1.5 ～ 4

*m*1 ～ 5 Page 298

SBZG Ground Zerol Bevel Gears
Gear Ratio 1.5, 2

*m*2 ～ 3 Page 302

SB Steel Bevel Gears
Gear Ratio 1.5 ～ 4

*m*1.5 ～ 6 Page 304

SBY Steel Bevel Gears
Gear Ratio 2 ～ 4

*m*5 ～ 8 Page 304

SB Steel Bevel Gears & Pinion Shafts
Gear Ratio 5

*m*1.5 ～ 3 Page 308

SUB Stainless Steel Bevel Gears
Gear Ratio 1.5 ～ 3

*m*1.5 ～ 3 Page 310

PB Plastic Bevel Gears
Gear Ratio 1.5 ～ 3

*m*1 ～ 3 Page 312

DB Injection Molded Bevel ears
Gear Ratio 2

*m*0.5 ～ 1 Page 314

BB Sintered Metal Bushings

φ5 ～ 8 Page 314

Nissei KSP Ground Spiral Bevel Gears
Gear Ratio 1.5 ～ 2

*m*2 ～ 5 Page 320

■ Feature Icons

- RoHS Compliant Product
- Finished Product
- Ground Gear
- Resin Product
- Injection Molded Product
- Re-machinable Product
- Heat Treated Product
- Stainless Product
- Copper Alloy Product
- Black Oxide coated Product

Miter Gears

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) Miter Gears

M MS G 2 - 20 R

- R — Direction of Spiral (R)
- 20 — No. of teeth (20)
- 2 — Module (2)
- G — Others (Ground Gear)
- MS — Type (Spiral Miter Gear)
- M — Material (SCM415)

Material

S	S45C
M	SCM415
SU	SUS303
L	SMF5040
P	MC901
D	DURACON

Type

M	Straight Miter Gears
MS	Spiral Miter Gears
AM	Angular Miter Gears

Other Information

G	Ground Gears

■ Feature Icons

- RoHS Compliant Product
- Finished Product
- Ground Gear
- Resin Product
- Injection Molded Product
- Re-machinable Product
- Heat Treated Product
- Stainless Product
- Copper Alloy Product
- Black Oxide coated Product

Miter Gears

Characteristics

Miter gears are a special class of bevel gears where the shafts intersect at 90° and the gear ratio is 1:1.
KHK stock miter gears are available in two types, spiral and straight tooth, with high precision grade for demanding torques and speeds, and commercial grade for economical applications. The following table lists the main features for easy selection.

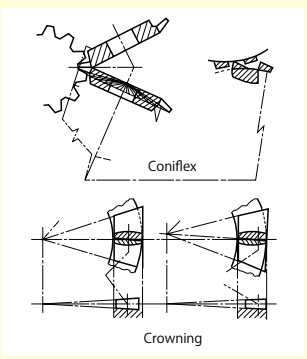
Type	Catalog No.	Module	No. of Teeth ( ) Shaft Angle	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704 : 1978	Secondary Operations	Features
Spiral Miter Gears	**MMSG**	2～4	20、25、30	SCM415	Carburized Note 1	Ground	1	△	High strength, abrasion-resistant and compact for high speed & torque use.
	SMSG	2～5	20、25、30	S45C	Gear teeth induction hardened	Ground	2	△	Reasonably priced ground gear, yet remachinable except for the gear teeth.
	KSP F type	1.5～6	20～30	SCM415	Carburized	Ground	0	×	Superior performance with regard to high speed, low noise, and low vibration.
	KSP U type				Carburized NOTE 1			△	
	MMSA・MMSB	1～10	20	SCM415	Carburized	Cut	4	×	Ready to use without performing secondary operations. Strong and abrasion resistant.
	MMS	2～5	20、25、30	SCM415	Carburized Note 1	Cut	4	△	Only teeth are induction hardened, allowing user to perform secondary operations elsewhere.
	SMS	1～8	20、25、30	S45C	Gear teeth induction hardened	Cut	4	△	Large numbers of teeth and modules are offered in these affordable spiral miter gears.
Zerol miter gears	**SMZG**	2～3	20	S45C	Gear teeth induction hardened	Ground	2	△	A spiral miter gear with a helix angle less than 10° . Receives forces from the same direction as straight miter gears receive and have excellent precision properties..
Straight Miter Gears	**SMA・SMB・SMC**	1～8	20、25、30	S45C	Gear teeth induction hardened	Cut	4	△	Usable without remachining, offered in 3 bore sizes.
	MM	2～5	20、25、30	SCM415	Carburized Note 1	Cut	4	△	Compared to SM miters, these are stronger and less abrasive, and allow secondary operations.
	LM	0.8～1.5	20	SMF5040 (Equiv. to S45C)	—	Sintered	5	○	Mass-produced, low cost sintered products. Small and light weight.
	SM	1～8	16、20、25、30	S45C	—	Cut	3	○	Popular straight miter for many uses.
	SAM	1.5～3	20 (45°、60°、120°)	S45C	—	Cut	3	○	3 types are available for shafts at 45° , 60° and 120° .
	SUM	1～4	20、25	SUS303	—	Cut	3	○	Suitable for food machinery due to SUS303's rust-resistant quality.
	SUMA	1～4	20、25	SUS303	—	Cut	3	△	Stainless steel products, usable without remachining.
	PM	1～4	20、25	MC901	—	Cut	4	○	MC nylon products are light and can be used without lubricant.
	DM	0.5～1.5	20	DURACON (M90-44)	—	Injection Molded	6	△	Injection molded, mass-produced products, suitable for office machines.

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

○ Possible △ Partly Possible
× Not possible

We use Crowning method for gear cutting

KHK utilizes Gleason Coniflex No.104, 102 and 114 bevel gear generating machinery, also equipped for mass production of straight miter gears. You can count on a stable supply of economically priced straight miter gears from KHK



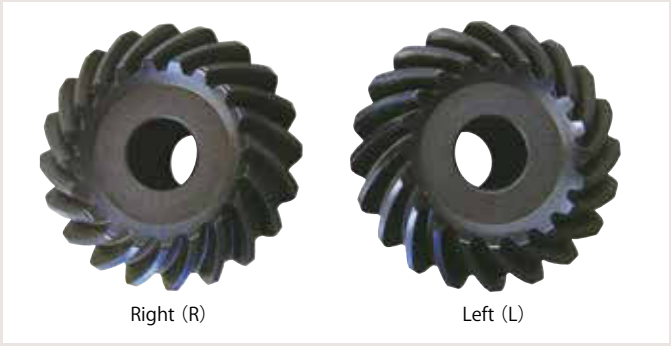
Gleason Coniflex No.104

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

Among KHK stock miter gears, there are products which are not interchangeable even when the module and the number of teeth are the same. Also, spiral miter gears require additional consideration since the right-hand mates with the left-hand spiral as shown in the table below.



Right (R) Left (L)

■ Straight Miter (○ Allowable × Not allowable)

Catalog No.	SMA SMB SMC	MM	SM	SUM	SUMA	PM	DM	LM	SAM
SMA・SMB・SMC	○	○	○	○	○	○	×	×	×
MM	○	○	○	○	○	○	×	×	×
SM	○	○	○	○	○	○	×	×	×
SUM	○	○	○	○	○	○	×	×	×
SUMA	○	○	○	○	○	○	×	×	×
PM	○	○	○	○	○	○	×	×	×
DM	×	×	×	×	×	×	○	×	×
LM	×	×	×	×	×	×	×	○	×
SAM	×	×	×	×	×	×	×	×	○

■ Zerol Miter Gears

SMZG products are not interchangeable with products in other series.

■ Spiral Miter (○ Allowable △ Allowable in certain cases × Not allowable)

Catalog No.	Series	MMSG	SMSG	MMSA MMSB	MMS	SMS
Series	Spiral hand	R	R	R	R	R
MMSG	L	○	×	×	×	×
SMSG	L	×	○	×	×	×
MMSA・MMSB	L	×	×	○	△	×
MMS	L	×	×	△	○	×
SMS	L	×	×	×	△	○

〔CAUTION〕 For selecting items in the " △ " category, please reconfirm with your nearest KHK dealer that the pair can work.

2. Caution in Selecting Gears Based on Gear Strength

The gear strength values shown in the product pages were computed by assuming a certain application environment. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. To learn more about the strength calculations, please refer to the technical information contained in the "Bending Strength of Bevel Gears" section on Page 87, and the "Surface Durability of Bevel Gears" section on Page 93.

■ Calculation assumptions for Bending Strength of Gears

Item \ Catalog No.	MMSG MMSA・MMSB MMS・MM	SMSG・SMZG SMS SMA・SMB・SMC	SM SAM	SUM SUMA LM NOTE 3	PM	DM
Formula NOTE 1	Formula of bevel gears on bending strength (JGMA403-01)				The Lewis formula	
No. of teeth of mating gear	Same number of teeth				——	
Rotation	100rpm (600rpm for MMSG, SMSG and SMZG)				100rpm	
Durability	Over 10^7 cycles				——	
Impact from motor	Uniform load				Allowable bending stress (kgf/mm²)	
Impact from load	Uniform load				1.15 (40℃ with No Lubrication)	*m* 0.5 4.0 *m* 0.8 4.0 *m* 1.0 3.5 *m* 1.5 1.8 NOTE 3 (40℃ with Grease Lubrication)
Direction of load	Bidirectional					
Allowable bending stresss at root σ_{Flim} (kgf/mm²) NOTE 2	47	21	19	10.5		
Safety factor K_R	1.2					

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

Formula NOTE 1	Formula of bevel gears on bending strength (JGMA404-01)			
Kinematic viscosity of lubricant	100cSt (50℃)			
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	41.3
Safety factor C_R	1.15			

〔NOTE 1〕 The gear strength formula is based on JGMA (Japanese Gear Manufacturers Association) specifications, "MC Nylon Technical Data" by Nippon Polypenco Limited and"Duracon Gear Data" by Polyplastic Co. The units for the number of rotations (rpm) and the the stress (kgf/mm²) are adjusted to the units needed in the formula.

〔NOTE 2〕 The allowable bending stress at the root σ_{Flim} is calculated from JGMA403-01, and set to 2/3 of the value in the consideration of the use of planetary-, idler-, or other gear systems, loaded in both directions

〔NOTE 3〕 The values of the allowable bending stresses for DM m1.5 and the allowable root bending stress for LM gears are our own estimates.

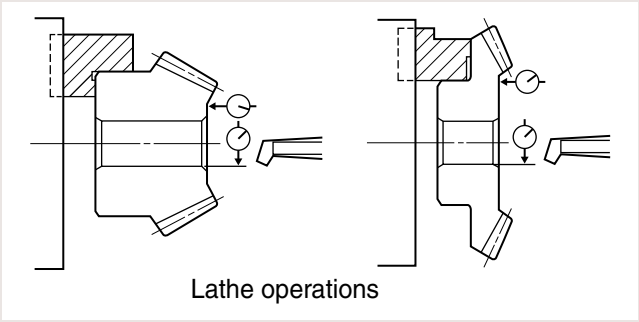
Application Hints

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

KHK Co., Ltd.
PHONE: 81-48-254-1744 FAX: 81-48-254-1765
E-mail export@khkgears.co.jp

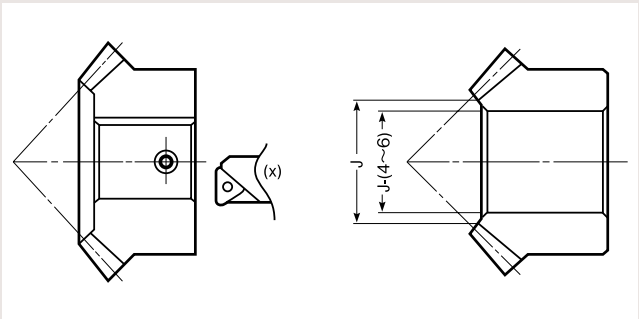
1. Caution on Performing Secondary Operations

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



Lathe operations

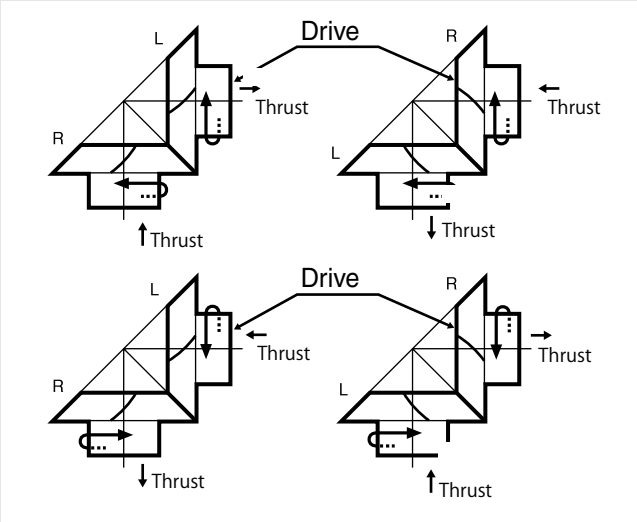
④For items with induction hardened teeth, such as SMSG and SMS series, the hardness is high near the tooth root. When machining the front face, the machined area should be 4 to 6mm smaller than the dimension, J.



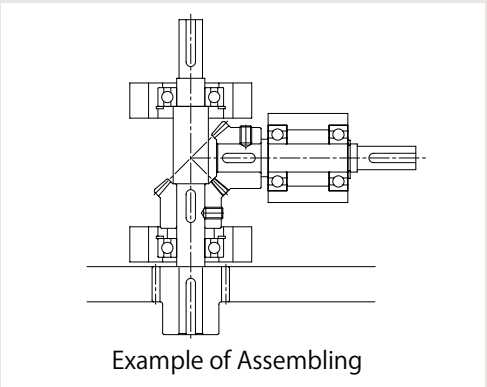
⑤ For tapping and keyway operations, see the examples given in "1. Caution on Performing Secondary Operations" in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentration, always leave radii on corners.
⑥ PM plastic miter gears are susceptible to changes due to temperature and humidity. Dimensions may change between during and after remachining operations.
⑦When heat-treating S45C products, it is possible to get thermal stress cracks. It is best to subject them to penetrant inspection afterwards. If tooth strength is not sufficient, it can be increased approximately four times by heat-treating. On the other hand, the precision of the gear will drop about one grade.

2. Points of Caution in Assembling

① Since miter gears are cone shaped, they produce axial thrust forces. Specifically with regard to spiral miter gears, the directions of thrust change with the hand of spiral and the direction of rotation. This is illustrated below. The bearings must be selected properly to be able to handle these thrust forces. For more technical information, please see the section "Gear Forces" (Page 107) of separate technical reference book.

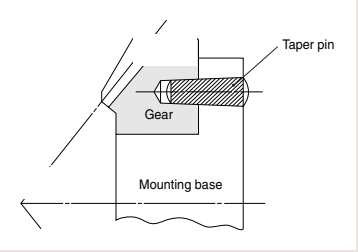


② If a miter gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend mounting bevel gears as close to the bearings as possible. This is especially important since most miter gears are supported on one end. The bending of shafts will cause abnormal noise and wear, and may even cause fatigue failure of the shafts. Both shafts and bearings must be designed with sufficient strength.



Example of Assembling

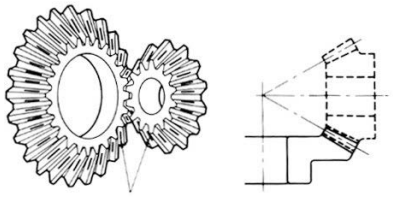
③ Due to the thrust load of miter gears, the gears, shafts and bearings have the tendency to loosen up during operation. Miter gears should be fastened to the shaft with keys and set screws, taper pins, step shafts, etc.
④ When installing MMSA or MMSB finished bore spiral miter gears in B7 style (ring type), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only.



⑤ KHK stock miter gears are designed such that, when assembled according to the specified mounting distance with a tolerance of H7 to H8, the backlash shown in the table are obtained. 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 teeth contact are shown below.

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.

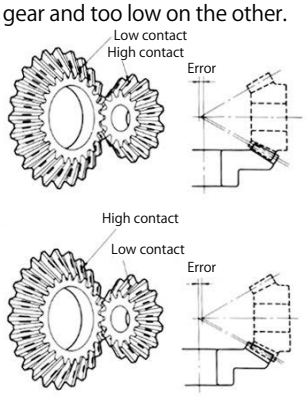


Center contact closer to toes

Incorrect Tooth Contact

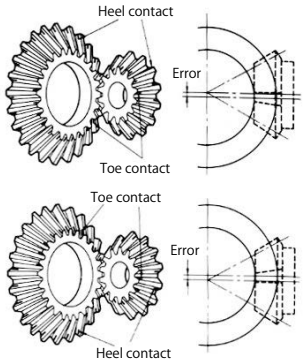
■ Mounting Distance Error

● 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.



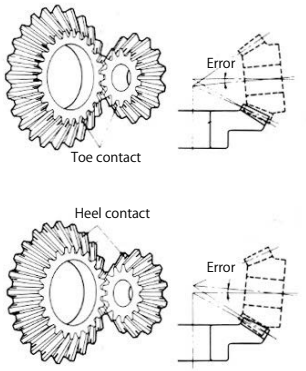
■ Offset Error

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



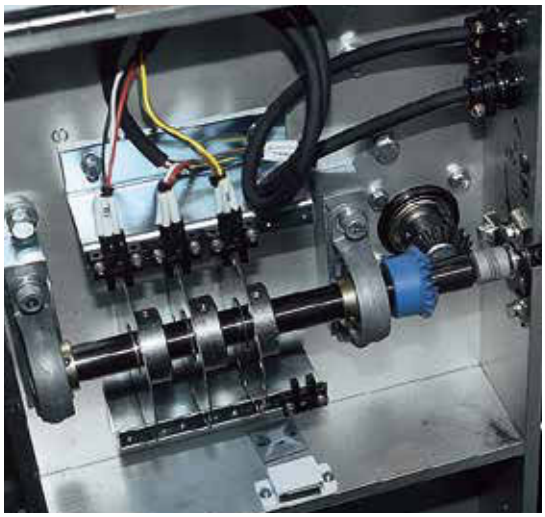
■ Shaft Angle Error

● 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° .



Application Examples

Automatic packaging machine (Miter gears - inset)

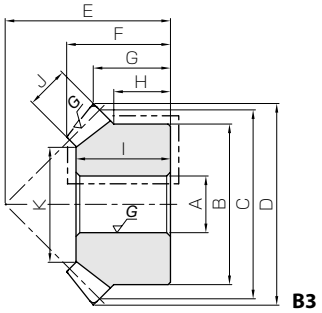


Electric components assembly line (Miter gears <SM and PM>)

Specifications	
Precision grade	JIS B 1704 : 1978 grade 1
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Carburizing
Tooth hardness	55 ~ 60HRC
Gear ratio	1
Screw offset (L)	Half of hub width (H)

* The precision grade of J Series products is equivalent to the value shown in the table.

A_{H7}	Bore
B	Hub dia.
C	Pitch dia.
D	Outside dia.
E	Mounting distance
F	Total length
G	Crown to back
H	Hub width
I	Length of bore
J	Face width
K	Holding surface dia.



B3

Catalog No.	No. of teeth	Shape	A_{H7}	B	C	D	E	F	G	H	I	J	K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)
														Bending strength	Surface durability	Bending strength	Surface durability		
MMSG2-20R MMSG2-20L	20	B3	12	35	40	42.7	35	21.98	16.35	12.5	20	9	24.54	17.0	23.5	1.73	2.40	0.04~0.10	0.14
MMSG2.5-20R MMSG2.5-20L			14	42	50	53.2	45	28.63	21.6	16	26	11	30.89	32.7	46.1	3.33	4.70	0.05~0.11	0.27
MMSG3-20R MMSG3-20L			16	52	60	63.99	50	30.78	21.99	16	27	14	34.4	58.5	83.7	5.97	8.54	0.06~0.12	0.43
MMSG3.5-20R MMSG3.5-20L		B4	20	50	70	74.53	55	32.45	22.26	14	29	16	42.75	91.8	133	9.36	13.6	0.07~0.13	0.51
MMSG4-20R MMSG4-20L			20	55	80	84.99	65	39.13	27.5	17	35	18	49.08	136	199	13.8	20.3	0.09~0.15	0.80
MMSG2-25R MMSG2-25L	25		12	38	50	52.5	40	23.43	16.25	11	21	11	30.89	27.5	47.0	2.80	4.79	0.04~0.10	0.21
MMSG2.5-25R MMSG2.5-25L			16	45	62.5	65.54	50	29.57	20.27	14	26	14	37.4	54.3	94.5	5.54	9.64	0.05~0.11	0.37
MMSG3-25R MMSG3-25L			20	55	75	78.78	60	35.6	24.39	17	31	17	43.92	94.5	167	9.64	17.0	0.06~0.12	0.65
MMSG3.5-25R MMSG3.5-25L			25	65	87.5	91.81	70	41.65	28.41	19	37	20	52.43	151	270	15.4	27.5	0.07~0.13	1.04
MMSG4-25R MMSG4-25L			28	75	100	104.7	80	47.8	32.35	22	42	23	58.95	216	392	22.1	40.0	0.09~0.15	1.57
MMSG2-30R MMSG2-30L	30		14	45	60	62.42	50	29.27	21.21	15	26	12	38.06	38.5	78.6	3.93	8.02	0.04~0.10	0.36
MMSG2.5-30R MMSG2.5-30L			16	55	75	78.04	60	34.08	24.02	16	30	15	47.57	75.3	156	7.68	16.0	0.05~0.11	0.66
MMSG3-30R MMSG3-30L			20	65	90	93.61	70	40.25	26.8	18	36	20	55.43	139	294	14.2	30.0	0.06~0.12	1.11
MMSG3.5-30R MMSG3.5-30L			25	80	105	109.21	80	44.4	29.6	20	40	22	67.77	204	436	20.8	44.5	0.07~0.13	1.75
MMSG4-30R MMSG4-30L			28	90	120	124.7	90	49.27	32.35	22	44	25	77.29	303	657	30.9	67.0	0.09~0.15	2.49

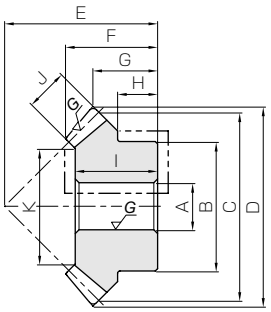
[Caution on Product Characteristics]
① A sets of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
②The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. See page 254 for more details.

[Caution on Secondary Operations]
①Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
②In the illustration, the area surrounded with ----line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

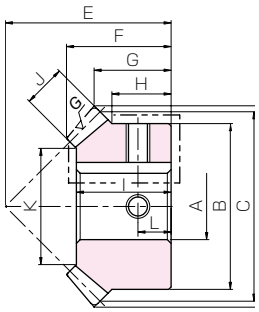
J Series

Ground Spiral Miter Gears

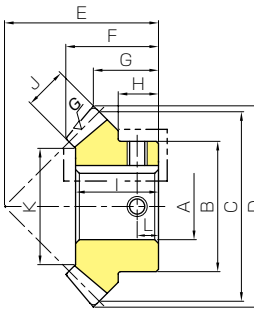
Newly added



B4



B3K



B4K

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

Bore H7	＊ The product shapes of J Series items are identified by background color.																	
Keyway Js9	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50
Screw size	4 × 1.8	5 × 2.3				6 × 2.8				8 × 3.3			10 × 3.3		12 × 3.3	14 × 3.8	
Catalog No.	M4					M5				M6			M8			M10	
MMSG2-20R J BORE MMSG2-20L J BORE																	
MMSG2.5-20R J BORE MMSG2.5-20L J BORE																	
MMSG3-20R J BORE MMSG3-20L J BORE																	
MMSG3.5-20R J BORE MMSG3.5-20L J BORE																	
MMSG4-20R J BORE MMSG4-20L J BORE																	
MMSG2-25R J BORE MMSG2-25L J BORE																	
MMSG2.5-25R J BORE MMSG2.5-25L J BORE																	
MMSG3-25R J BORE MMSG3-25L J BORE																	
MMSG3.5-25R J BORE MMSG3.5-25L J BORE																	
MMSG4-25R J BORE MMSG4-25L J BORE																	
MMSG2-30R J BORE MMSG2-30L J BORE																	
MMSG2.5-30R J BORE MMSG2.5-30L J BORE																	
MMSG3-30R J BORE MMSG3-30L J BORE																	
MMSG3.5-30R J BORE MMSG3.5-30L J BORE																	
MMSG4-30R J BORE MMSG4-30L J BORE																	

[Caution on J series]

① As available-on-request products, requires a lead-time for shipping within 2 working-days (excludes the day ordered), after placing an order. Please allow additional shipping time to get to your local distributor.
② Number of products we can process for one order is 1 to 20 units. For quantities of 21 or more pieces, we need to quote price and lead time.
③ Keyways are made according to JIS B1301 standards, Js 9 tolerance.
④ Certain products which would otherwise have a very long tapped hole are conterbored to reduce the length of the tap. (Products marked with " * " are tap size).
⑤ For products having a tapped hole, a set screw is included.

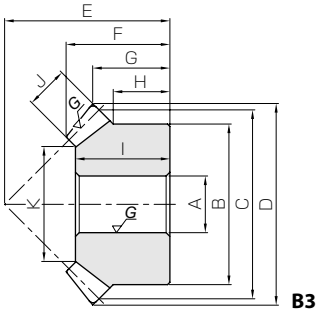
Ground Spiral Miter Gears

Module 1 ～ 5

Specifications	
Precision grade	JIS B 1704 : 1978 grade 2
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ～ 60HRC
Gear ratio	1
Screw offset (L)	Half of hub width (H)

＊ The precision grade of J Series products is equivalent to the value shown in the table.

A_{H7}	Bore
B	Hub dia.
C	Pitch dia.
D	Outside dia.
E	Mounting distance
F	Total length
G	Crown to back
H	Hub width
I	Length of bore
J	Face width
K	Holding surface dia.



B3

Standardized ground spiral miter gears available in Module 1!

Catalog No.	No. of teeth	Shape	A_{H7}	B	C	D	E	F	G	H	I	J	K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)
														Bending strength	Surface durability	Bending strength	Surface durability		
SMSG1-20R SMSG1-20L	20	B3	6	16	20	21.30	20	13.84	10.65	8	12	5	9.86	1.17	0.97	0.12	0.099	0.02~0.08	0.019
SMSG1.5-20R SMSG1.5-20L			8	26	30	31.74	30	21.18	15.87	13	19	8	15.37	4.10	3.47	0.42	0.35	0.04~0.10	0.074
SMSG2-20R SMSG2-20L			12	34	40	42.4	37	24.75	18.2	14	22	10	21.72	7.83	6.79	0.80	0.69	0.05~0.11	0.15
SMSG2.5-20R SMSG2.5-20L			14	42	50	52.94	48	32.42	24.47	19	29	12	28.06	14.9	13.2	1.52	1.35	0.06~0.12	0.30
SMSG3-20R SMSG3-20L			16	50	60	63.72	58	39.6	29.86	23	35	15	31.57	26.4	23.7	2.69	2.42	0.07~0.13	0.52
SMSG3.5-20R SMSG3.5-20L			20	60	70	74.47	65	43.81	32.23	25	40	18	39.09	42.6	38.8	4.35	3.96	0.08~0.14	0.82
SMSG4-20R SMSG4-20L			20	64	80	84.88	75	50.51	37.44	27	45	20	43.43	62.6	57.8	6.39	5.90	0.10~0.16	1.15
SMSG5-20R SMSG5-20L			25	80	100	105.9	90	60.16	42.95	30	54	26	54.46	115	109	11.8	11.1	0.12~0.18	2.13
SMSG1-25R SMSG1-25L	25		6	20	25	26.22	23	15.08	11.11	8	14	6	15.03	1.88	1.91	0.19	0.19	0.02~0.08	0.035
SMSG1.5-25R SMSG1.5-25L			10	30	37.5	39.31	34	22.14	16.16	11.5	19	9	19.54	5.29	5.52	0.54	0.56	0.04~0.10	0.11
SMSG2-25R SMSG2-25L			12	40	50	52.4	40	24.19	16.2	10	20	12	26.06	12.6	13.5	1.28	1.37	0.05~0.11	0.21
SMSG2.5-25R SMSG2.5-25L			16	50	62.5	65.54	50	30.24	20.27	12.5	26	15	34.57	24.5	26.8	2.50	2.74	0.06~0.12	0.42
SMSG3-25R SMSG3-25L			20	60	75	78.77	60	37.57	24.39	15	32	20	37.43	45.0	50.0	4.59	5.10	0.07~0.13	0.74
SMSG3.5-25R SMSG3.5-25L			25	70	87.5	91.81	70	42.98	28.41	17.5	37	22	46.77	69.2	78.1	7.05	7.97	0.08~0.14	1.14
SMSG4-25R SMSG4-25L			28	80	100	104.7	80	49.14	32.35	20	43	25	55.29	95.0	109	9.68	11.1	0.10~0.16	1.71
SMSG5-25R SMSG5-25L			28	100	125	130.86	100	60.59	40.43	25	50	30	65.15	181	213	18.5	21.7	0.12~0.18	3.39
SMSG1-30R SMSG1-30L	30		8	24	30	31.26	28	17.61	13.63	10	16	6	19.03	2.50	3.02	0.25	0.31	0.02~0.08	0.057
SMSG1.5-30R SMSG1.5-30L			10	36	45	46.84	43	28.11	21.42	16	25	10	25.72	7.53	9.35	0.77	0.95	0.04~0.10	0.21
SMSG2-30R SMSG2-30L			12	45	60	62.42	50	29.27	21.21	12.5	25	12	36.06	16.7	21.4	1.70	2.18	0.05~0.11	0.37
SMSG2.5-30R SMSG2.5-30L			16	60	75	78.04	62	36.08	26.02	17	32	15	47.57	32.6	42.7	3.32	4.36	0.06~0.12	0.76
SMSG3-30R SMSG3-30L			20	70	90	93.61	75	45.25	31.8	20	40	20	53.43	60.3	80.4	6.15	8.20	0.07~0.13	1.32
SMSG3.5-30R SMSG3.5-30L			25	90	105	109.21	85	49.4	34.6	25	45	22	67.77	85.1	115	8.68	11.8	0.08~0.14	2.19
SMSG4-30R SMSG4-30L			28	100	120	124.71	95	54.28	37.35	25	50	25	79.29	127	174	12.9	17.8	0.10~0.16	3.07
SMSG5-30R SMSG5-30L			28	130	150	155.90	120	68.20	47.95	35	62	30	99.15	240	332	24.5	33.9	0.12~0.18	6.44

[Caution on Product Characteristics]

① A sets of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
②The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. See page 254 for more details.

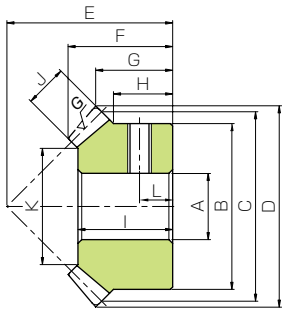
[Caution on Secondary Operations]

①Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
② Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 1 to 2 mm).

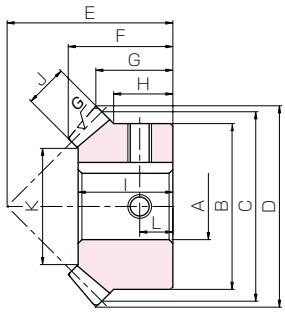
J Series

Ground Spiral Miter Gears

Newly added



B3T



B3K

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

Bore H7	＊ The product shapes of J Series items are identified by background color.																			
Keyway Js9	6	8	10	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50
Screw size	—		4 × 1.8		5 × 2.3				6 × 2.8				8 × 3.3			10 × 3.3		12 × 3.3	14 × 3.8	
Catalog No.	M4	M5	M4						M5				M6			M8			M10	
SMSG1-20R J BORE SMSG1-20L J BORE																				
SMSG1.5-20R J BORE SMSG1.5-20L J BORE																				
SMSG2-20R J BORE SMSG2-20L J BORE																				
SMSG2.5-20R J BORE SMSG2.5-20L J BORE																				
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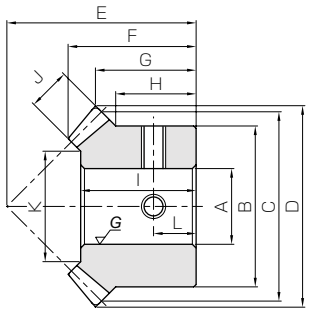
SMSG4-30R J BORE SMSG4-30L J BORE																				
SMSG5-30R J BORE SMSG5-30L J BORE																				

[Caution on J series]

① As available-on-request products, requires a lead-time for shipping within 2 working-days (excludes the day ordered), after placing an order. Please allow additional shipping time to get to your local distributor.
② Number of products we can process for one order is 1 to 20 units. For quantities of 21 or more pieces, we need to quote price and lead time.
③ Keyways are made according to JIS B1301 standards, Js 9 tolerance.
④ Certain products which would otherwise have a very long tapped hole are conterbored to reduce the length of the tap. (Products marked with " * " are tap size).
⑤ Areas of products which have been re-worked will not be black oxide coated.
⑥ For products having a tapped hole, a set screw is included.

Finished Bore Spiral Miter Gears

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



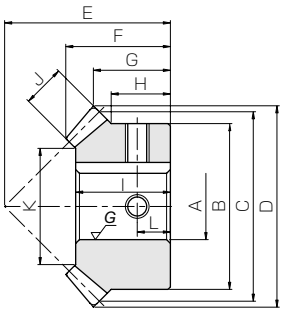
BT

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G	Hub width H	Length of bore I
MMSA1-20R **MMSB1-20R**	1	***m*1**	20	R	BT	8 10	17	20	21.29	20	13.53	10.64	8.5	12.2
MMSA1-20L **MMSB1-20L**				L	BT	8 10								
MMSA1.5-20R **MMSB1.5-20R**		***m*1.5**	20	R	BT BK	10 12	25	30	31.9	28	18.48	13.95	10.5	16.5
MMSA1.5-20L **MMSB1.5-20L**				L	BT BK	10 12								
MMSA2-20R **MMSB2-20R**		***m*2**	20	R	BK	14 16	35	40	42.52	35	22.09	16.26	12.5	20
MMSA2-20L **MMSB2-20L**				L	BK	14 16								
MMSA2.5-20R **MMSB2.5-20R**		***m*2.5**	20	R	BK	18 20	42	50	53.2	45	28.63	21.6	16	26
MMSA2.5-20L **MMSB2.5-20L**				L	BK	18 20								
MMSA3-20R **MMSB3-20R**		***m*3**	20	R	BK	20 22	52	60	63.99	50	30.78	21.99	16	27
MMSA3-20L **MMSB3-20L**				L	BK	20 22								
MMSA3.5-20R **MMSB3.5-20R**		***m*3.5**	20	R	B4	25 28	50	70	74.53	55	32.45	22.26	14	29
MMSA3.5-20L **MMSB3.5-20L**				L	B4	25 28								
MMSA4-20R **MMSB4-20R**		***m*4**	20	R	B4	28 30	55	80	84.99	65	39.13	27.5	17	35
MMSA4-20L **MMSB4-20L**				L	B4	28 30								
MMSA5-20R **MMSB5-20R**		***m*5**	20	R	B4	30 35	70	100	106.25	75	42.99	28.13	17	38
MMSA5-20L **MMSB5-20L**				L	B4	30 35								
MMSA6-20R **MMSB6-20R**		***m*6**	20	R	B4	40 45	80	120	127.59	90	51.13	33.8	20	45
MMSA6-20L **MMSB6-20L**				L	B4	40 45								
MMSA8-20R **MMSA8-20L**		***m*8**	20	R L	B7	80 80	—	160	—	100	45	29.16	—	40
MMSA10-20R **MMSA10-20L**		***m*10**	20	R L	B7	100 100	—	200	—	125	58	36.48	—	50

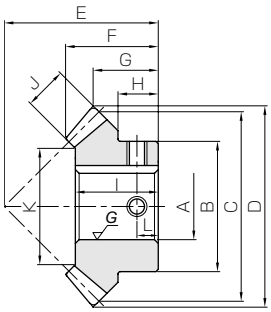
[Caution on Product Characteristics]

① A sets of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
②The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. See page 254 for more details.
⑤ Although the dimensions of the keyway are made to the JIS (Js9) tolerance, there may be some deviations due to the effects of heat treatment.
⑥ For products having a tapped hole (Except for B7-shaped products), a tapping screw is attached as an accessory.

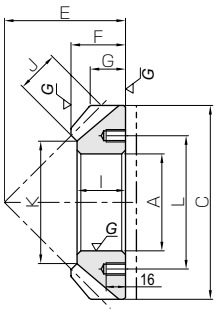
Finished Bore Spiral Miter Gears



BK



B4

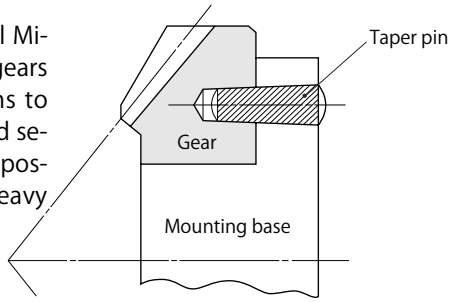


B7

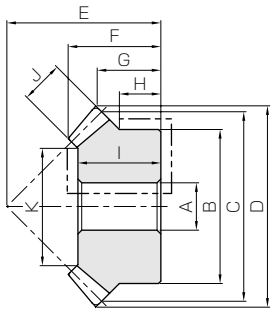
Face width	Holding surface dia.	Keyway	Set Screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
J	K	Width×Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
4.5	11.67	— —	2–M4 2–M4	4.5	2.24	2.09	0.23	0.21	0.03~0.13	0.018 0.015	**MMSA1-20R** **MMSB1-20R**
		— —	2–M4 2–M4	4.5						0.018 0.015	**MMSA1-20L** **MMSB1-20L**
7	17.2	— 4 x 1.8	2–M4 2–M4	6	7.74	7.34	0.79	0.75	0.05~0.15	0.057 0.052	**MMSA1.5-20R** **MMSB1.5-20R**
		— 4 x 1.8	2–M4 2–M4	6						0.057 0.052	**MMSA1.5-20L** **MMSB1.5-20L**
9	24.54	5 x 2.3 5 x 2.3	2–M4 2–M4	7	18.0	17.3	1.83	1.76	0.06~0.16	0.13 0.12	**MMSA2-20R** **MMSB2-20R**
		5 x 2.3 5 x 2.3	2–M4 2–M4	7						0.13 0.12	**MMSA2-20L** **MMSB2-20L**
11	30.89	6 x 2.8 6 x 2.8	2–M5 2–M5	8	34.6	33.7	3.52	3.44	0.07~0.17	0.24 0.23	**MMSA2.5-20R** **MMSB2.5-20R**
		6 x 2.8 6 x 2.8	2–M5 2–M5	8						0.24 0.23	**MMSA2.5-20L** **MMSB2.5-20L**
14	34.4	6 x 2.8 6 x 2.8	2–M5 2–M5	8	61.9	61.1	6.32	6.23	0.08~0.18	0.40 0.39	**MMSA3-20R** **MMSB3-20R**
		6 x 2.8 6 x 2.8	2–M5 2–M5	8						0.40 0.39	**MMSA3-20L** **MMSB3-20L**
16	42.75	8 x 3.3 8 x 3.3	2–M6 2–M6	8	97.1	96.7	9.90	9.86	0.10~0.25	0.46 0.43	**MMSA3.5-20R** **MMSB3.5-20R**
		8 x 3.3 8 x 3.3	2–M6 2–M6	8						0.46 0.43	**MMSA3.5-20L** **MMSB3.5-20L**
18	49.08	8 x 3.3 8 x 3.3	2–M6 2–M6	9	144	144	14.6	14.7	0.12~0.27	0.70 0.68	**MMSA4-20R** **MMSB4-20R**
		8 x 3.3 8 x 3.3	2–M6 2–M6	9						0.70 0.68	**MMSA4-20L** **MMSB4-20L**
23	60.95	8 x 3.3 10 x 3.3	2–M6 2–M8	9	284	288	29.0	29.4	0.14~0.34	1.32 1.25	**MMSA5-20R** **MMSB5-20R**
		8 x 3.3 10 x 3.3	2–M6 2–M8	9						1.32 1.25	**MMSA5-20L** **MMSB5-20L**
27	73.63	12 x 3.3 14 x 3.8	2–M8 2-M10	10	475	496	48.4	50.6	0.16~0.36	2.11 1.99	**MMSA6-20R** **MMSB6-20R**
		12 x 3.3 14 x 3.8	2–M8 2-M10	10						2.11 1.99	**MMSA6-20L** **MMSB6-20L**
35	101	— —	6-M10 6-M10	110	1080	1170	111	119	0.20~0.45	3.98 3.98	**MMSA8-20R** **MMSA8-20L**
45	122.72	— —	6-M10 6-M10	130	1660	1840	169	188	0.25~0.50	7.88 7.88	**MMSA10-20R** **MMSA10-20L**

[Caution on Secondary Operations] ①These products which are hardened by carburizing allow no secondary machining. However, for B7 type gear, the area surrounded with – – – – line (in the illustration) is masked during the carburization process and can be modified. Care should be exercised since the hardness is high (approx. HRC40, maximum).

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



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



B3

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A_{H7}	B	C	D	E	F	G
MMS2-20R MMS2-20L	1	***m*2**	20	R L	B3	12	34	40	42.31	35	22.14	16.15
MMS2.5-20R MMS2.5-20L		***m*2.5**	20	R L	B3	15	42	50	53.2	45	28.63	21.6
MMS3-20R MMS3-20L		***m*3**	20	R L	B3	16	52	60	63.99	50	30.78	21.99
MMS4-20R MMS4-20L		***m*4**	20	R L	B3	20	65	80	84.99	65	39.13	27.5
MMS5-20R MMS5-20L		***m*5**	20	R L	B3	25	85	100	106.25	75	42.99	28.13
MMS2-25R MMS2-25L	1	***m*2**	25	R L	B3	12	45	50	52.4	40	24.19	16.2
MMS2.5-25R MMS2.5-25L		***m*2.5**	25	R L	B3	16	55	62.5	65.54	50	30.24	20.27
MMS3-25R MMS3-25L		***m*3**	25	R L	B3	20	65	75	78.77	60	37.57	24.39
MMS4-25R MMS4-25L		***m*4**	25	R L	B3	25	85	100	104.7	80	49.14	32.35
MMS5-25R MMS5-25L		***m*5**	25	R L	B3	28	100	125	130.86	100	60.59	40.43
MMS2-30R MMS2-30L	1	***m*2**	30	R L	B3	12	45	60	62.42	50	29.27	21.21
MMS2.5-30R MMS2.5-30L		***m*2.5**	30	R L	B3	16	60	75	78.04	62	36.08	26.02
MMS3-30R MMS3-30L		***m*3**	30	R L	B3	20	70	90	93.61	75	45.25	31.8
MMS4-30R MMS4-30L		***m*4**	30	R L	B3	28	100	120	124.71	95	54.28	37.35
MMS5-30R MMS5-30L		***m*5**	30	R L	B3	28	130	150	155.9	120	68.2	47.95

[Caution on Product Characteristics]

① A sets of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
②The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. See page 254 for more details.

* For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see page 8.

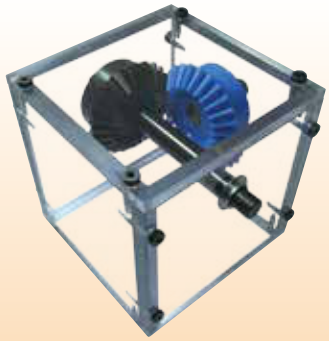
Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
12	20	9	24.54	17.0	17.3	1.73	1.76	0.06~0.16	0.13	**MMS2-20R MMS2-20L**
16	26	11	30.89	32.7	33.7	3.34	3.44	0.07~0.17	0.26	**MMS2.5-20R MMS2.5-20L**
16	27	14	34.4	58.7	61.1	5.98	6.23	0.08~0.18	0.43	**MMS3-20R MMS3-20L**
17.5	35	18	49.08	136	144	13.9	14.7	0.12~0.27	0.92	**MMS4-20R MMS4-20L**
17.5	38	23	60.95	269	288	27.5	29.4	0.14~0.34	1.65	**MMS5-20R MMS5-20L**
12.5	21	12	28.06	29.1	36.3	2.96	3.70	0.06~0.16	0.25	**MMS2-25R MMS2-25L**
15	27	15	36.57	56.7	71.8	5.79	7.32	0.07~0.17	0.47	**MMS2.5-25R MMS2.5-25L**
17.5	33	20	39.43	104	133	10.6	13.6	0.08~0.18	0.81	**MMS3-25R MMS3-25L**
22.5	44	25	57.29	238	309	24.3	31.5	0.12~0.27	1.88	**MMS4-25R MMS4-25L**
25	50	30	65.15	454	595	46.3	60.7	0.14~0.34	3.39	**MMS5-25R MMS5-25L**
12.5	25	12	36.06	42.4	57.1	4.32	5.82	0.06~0.16	0.37	**MMS2-30R MMS2-30L**
17	32	15	47.57	82.8	113	8.44	11.5	0.07~0.17	0.76	**MMS2.5-30R MMS2.5-30L**
20	40	20	53.43	153	211	15.6	21.5	0.08~0.18	1.32	**MMS3-30R MMS3-30L**
25	50	25	79.29	348	488	35.5	49.8	0.12~0.27	3.07	**MMS4-30R MMS4-30L**
35	62	30	99.15	662	941	67.5	96.0	0.14~0.34	6.44	**MMS5-30R MMS5-30L**

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

② In the illustration, the area surrounded with ——— line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

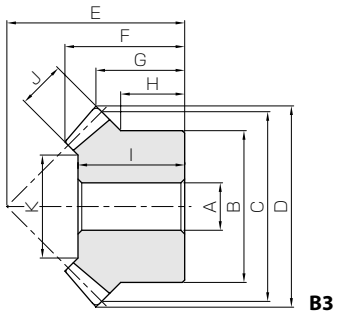
GCU-M Miter Gear Kit



Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

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



B3

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G
SMS1-20R **SMS1-20L**	1	***m*1**	20	R L	B3	6	16	20	21.3	20	13.84	10.65
SMS1.5-20R **SMS1.5-20L**		***m*1.5**	20	R L	B3	8	26	30	31.74	30	21.18	15.87
SMS2-20R **SMS2-20L**		***m*2**	20	R L	B3	12	34	40	42.4	37	24.75	18.2
SMS2.5-20R **SMS2.5-20L**		***m*2.5**	20	R L	B3	14	42	50	52.94	48	32.42	24.47
SMS3-20R **SMS3-20L**		***m*3**	20	R L	B3	16	50	60	63.72	58	39.6	29.86
SMS3.5-20R **SMS3.5-20L**		***m*3.5**	20	R L	B3	20	60	70	74.47	65	43.81	32.23
SMS4-20R **SMS4-20L**		***m*4**	20	R L	B3	20	64	80	84.88	75	50.51	37.44
SMS5-20R **SMS5-20L**		***m*5**	20	R L	B3	25	80	100	105.9	90	60.16	42.95
SMS6-20R **SMS6-20L**		***m*6**	20	R L	B3	28	100	120	127.16	104	67.35	47.58
SMS8-20R **SMS8-20L**		***m*8**	20	R L	B3	30	130	160	169.94	125	72.6	49.97
SMS1-25R **SMS1-25L**	1	***m*1**	25	R L	B3	6	20	25	26.22	23	15.08	11.11
SMS1.5-25R **SMS1.5-25L**		***m*1.5**	25	R L	B3	10	30	37.5	39.31	34	22.14	16.16
SMS2-25R **SMS2-25L**		***m*2**	25	R L	B3	12	40	50	52.38	40	24.2	16.19
SMS2.5-25R **SMS2.5-25L**		***m*2.5**	25	R L	B3	16	50	62.5	65.54	50	30.24	20.27
SMS3-25R **SMS3-25L**		***m*3**	25	R L	B3	20	60	75	78.77	60	37.57	24.39
SMS3.5-25R **SMS3.5-25L**		***m*3.5**	25	R L	B3	25	70	87.5	91.81	70	42.98	28.41
SMS4-25R **SMS4-25L**		***m*4**	25	R L	B3	28	80	100	104.7	80	49.14	32.35
SMS5-25R **SMS5-25L**		***m*5**	25	R L	B3	28	100	125	130.86	100	60.59	40.43
SMS6-25R **SMS6-25L**		***m*6**	25	R L	B3	28	120	150	157.17	120	71.97	48.58
SMS1-30R **SMS1-30L**	1	***m*1**	30	R L	B3	8	24	30	31.26	28	17.61	13.63
SMS1.5-30R **SMS1.5-30L**		***m*1.5**	30	R L	B3	10	36	45	46.84	43	28.11	21.42
SMS2-30R **SMS2-30L**		***m*2**	30	R L	B3	12	45	60	62.42	50	29.27	21.21
SMS2.5-30R **SMS2.5-30L**		***m*2.5**	30	R L	B3	16	60	75	78.04	62	36.08	26.02
SMS3-30R **SMS3-30L**		***m*3**	30	R L	B3	20	70	90	93.61	75	45.25	31.8
SMS3.5-30R **SMS3.5-30L**		***m*3.5**	30	R L	B3	25	90	105	109.21	85	49.4	34.6
SMS4-30R **SMS4-30L**		***m*4**	30	R L	B3	28	100	120	124.71	95	54.28	37.35
SMS5-30R **SMS5-30L**		***m*5**	30	R L	B3	28	130	150	155.90	120	68.2	47.95

[Caution on Product Characteristics]
① A sets of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
② The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. See page 254 for more details.
⑤ Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
8	12	5	9.86	1.07	0.65	0.11	0.067	0.03~0.13	0.019	**SMS1-20R SMS1-20L**
13	19	8	15.37	3.73	2.33	0.38	0.24	0.05~0.15	0.074	**SMS1.5-20R SMS1.5-20L**
14	22	10	21.72	8.54	5.40	0.87	0.55	0.06~0.16	0.15	**SMS2-20R SMS2-20L**
19	29	12	28.06	16.3	10.5	1.66	1.07	0.07~0.17	0.30	**SMS2.5-20R SMS2.5-20L**
23	35	15	31.57	28.8	18.7	2.94	1.91	0.08~0.18	0.52	**SMS3-20R SMS3-20L**
25	40	18	39.09	46.5	30.4	4.74	3.10	0.10~0.25	0.82	**SMS3.5-20R SMS3.5-20L**
27	45	20	43.43	68.3	45.0	6.97	4.59	0.12~0.27	1.15	**SMS4-20R SMS4-20L**
30	54	26	54.46	136	90.9	13.9	9.27	0.14~0.34	2.13	**SMS5-20R SMS5-20L**
34	60	30	67.15	226	155	23.0	15.8	0.16~0.36	3.65	**SMS6-20R SMS6-20L**
30	62	35	95	484	344	49.4	35.1	0.20~0.45	7.00	**SMS8-20R SMS8-20L**
8	14	6	15.03	1.71	1.28	0.17	0.13	0.03~0.13	0.035	**SMS1-25R SMS1-25L**
11.5	19	9	19.54	5.78	4.42	0.59	0.45	0.05~0.15	0.11	**SMS1.5-25R SMS1.5-25L**
10	20	12	26.06	13.7	10.7	1.40	1.09	0.06~0.16	0.21	**SMS2-25R SMS2-25L**
12.5	26	15	34.57	26.8	21.1	2.73	2.15	0.07~0.17	0.42	**SMS2.5-25R SMS2.5-25L**
15	32	20	37.43	49.1	39.1	5.00	3.98	0.08~0.18	0.74	**SMS3-25R SMS3-25L**
17.5	37	22	46.77	75.4	60.6	7.69	6.18	0.10~0.25	1.14	**SMS3.5-25R SMS3.5-25L**
20	43	25	55.29	112	90.7	11.5	9.25	0.12~0.27	1.71	**SMS4-25R SMS4-25L**
25	50	30	65.15	214	175	21.8	17.8	0.14~0.34	3.39	**SMS5-25R SMS5-25L**
30	61	35	83	357	300	36.4	30.6	0.16~0.36	5.99	**SMS6-25R SMS6-25L**
10	16	6	19.03	2.28	2.03	0.23	0.21	0.03~0.13	0.057	**SMS1-30R SMS1-30L**
16	25	10	25.72	8.22	7.48	0.84	0.76	0.05~0.15	0.21	**SMS1.5-30R SMS1.5-30L**
12.5	25	12	36.06	18.2	16.9	1.86	1.72	0.06~0.16	0.37	**SMS2-30R SMS2-30L**
17	32	15	47.57	35.6	33.4	3.63	3.40	0.07~0.17	0.76	**SMS2.5-30R SMS2.5-30L**
20	40	20	53.43	65.8	62.3	6.71	6.35	0.08~0.18	1.32	**SMS3-30R SMS3-30L**
25	45	22	67.77	101	96.0	10.3	9.79	0.10~0.25	2.19	**SMS3.5-30R SMS3.5-30L**
25	50	25	79.29	150	144	15.3	14.7	0.12~0.27	3.07	**SMS4-30R SMS4-30L**
35	62	30	99.15	284	276	29.0	28.1	0.14~0.34	6.44	**SMS5-30R SMS5-30L**

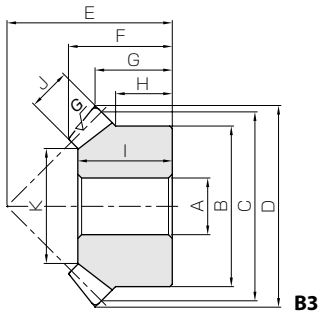
[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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).

Ground Zerol Miter Gears

Specifications	
Precision grade	JIS B 1704 : 1978 grade 2
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ~ 60HRC



B3

Catalog No.	Gear ratio	Module	No. of teeth	Helix angle	Direction of spiral	Shape	Bore A	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G
SMZG2-20R **SMZG2-20L**	1	***m*2**	20	5°	R L	B3	12	34	40	43.32	37	24.69	18.66
SMZG2.5-20R **SMZG2.5-20L**		***m*2.5**	20	5°	R L	B3	14	42	50	54.16	48	32.34	25.08
SMZG3-20R **SMZG3-20L**		***m*3**	20	5°	R L	B3	16	50	60	64.89	58	39.52	30.45

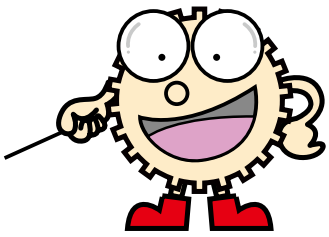
[Caution on Product Characteristics]

① A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
② Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ It produces an axial thrust force, which has the same direction as straight bevel gears. For details, see separate technical reference book (Page 108).

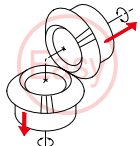
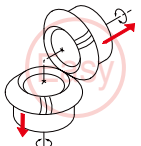
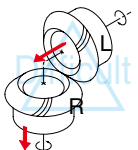
■ Features of Zerol Miter Gears

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

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



■ Performance Comparison

Gear Type	Bearing Design ＊	Interchangeability Mounting Distance	Precision JIS B 1704	Strength Bending Strength	Durability Surface Durability	Noise/Vibration Surface Roughness/Total Contact Ratio	Price for single item
Miter Gears  **SM2-20**	 No thrust force produced inward	Many SUM、PM、SMZG	Normal grade 3	Normal 7.13N・m	Bad 0.72N・m	Normal 3.2a/1.62	Low
Ground Zerol Miter Gears  **SMZG2-20R/L**	 No thrust force produced inward	Many SM、SUM、PM	Good grade 2	Normal 7.76N・m	Good 4.40N・m	Low 0.4a/1.74	Normal
Ground Spiral Miter Gears  **MMSG2-20R/L**	 Thrust force produced inward	None —	Good grade 2	Strong 15.6N・m	Good 21.7N・m	Low 0.4a/2.49	Normal

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

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
14	22	10	21.72	7.76	4.10	0.79	0.42	0.05~0.11	0.15	**SMZG2-20R SMZG2-20L**
19	29	12	28.06	14.8	7.92	1.51	0.81	0.06~0.12	0.30	**SMZG2.5-20R SMZG2.5-20L**
23	35	15	31.57	26.2	14.3	2.67	1.45	0.07~0.13	0.53	**SMZG3-20R SMZG3-20L**

[Caution on Secondary Operations]
① Care must be exercised when performing modification and/or secondary operations of miter gears. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
② Due to gear teeth induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2to 3 mm).

* For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see page 8.

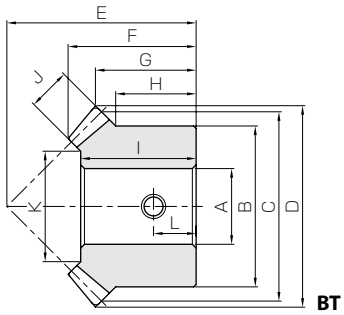
GCU-M Miter Gear Kit

Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

Finished Bore Miter Gears

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



Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore
					A_{H7}	B	C	D	E	F	G	H	I
SMA1-20 **SMB1-20**	1	***m*1**	20	BT BT	8 10	16	20	21.41	20	13.95	10.71	8	12 12.07
SMA1.5-20 **SMB1.5-20**		***m*1.5**	20	BT BK	10 12	26	30	32.12	30	21.24	16.06	13	19 19
SMA2-20 **SMB2-20**		***m*2**	20	BK BK	14 15	34	40	42.83	37	24.89	18.41	14	22 22
SMA2.5-20 **SMB2.5-20**		***m*2.5**	20	BK BK	18 20	42	50	53.54	48	32.54	24.77	19	29 29
SMA3-20 **SMB3-20** **SMC3-20**		***m*3**	20	BK BK BK	22 25 20	50	60	64.24	58	39.84	30.12	23	35 35 35
SMA3.5-20 **SMB3.5-20**		***m*3.5**	20	BK BK	28 30	60	70	74.95	65	44.13	32.47	25	40 40
SMA4-20 **SMB4-20** **SMC4-20**		***m*4**	20	BK BK BK	30 32 25	64	80	85.65	75	50.78	37.83	27	45 45 45
SMA5-20 **SMB5-20** **SMC5-20**		***m*5**	20	BK BK BK	40 30 35	80	100	107.07	90	60.38	43.54	30	54 54 54
SMA6-20 **SMB6-20** **SMC6-20**		***m*6**	20	BK BK BK	45 50 40	100	120	128.48	104	67.67	48.24	34	60 60 60
SMA8-20		***m*8**	20	BK	60	130	160	171.31	125	73.33	50.66	30	62
SMA1-25	1	***m*1**	25	BT	10	20	25	26.41	23	15.16	11.21	8	14
SMA1.5-25		***m*1.5**	25	BK	12	30	37.5	39.62	34	22.25	16.31	11.5	19
SMA2-25 **SMB2-25**		***m*2**	25	BK BK	18 15	40	50	52.83	40	24.33	16.41	10	20
SMA2.5-25 **SMB2.5-25**		***m*2.5**	25	BK BK	20 18	50	62.5	66.04	50	30.41	20.52	12.5	26
SMA3-25 **SMB3-25**		***m*3**	25	BK BK	30 25	60	75	79.24	60	37.81	24.62	15	32
SMA3.5-25 **SMB3.5-25**		***m*3.5**	25	BK BK	32 28	70	87.5	92.45	70	43.23	28.72	17.5	37
SMA4-25 **SMB4-25**		***m*4**	25	BK BK	35 30	80	100	105.66	80	49.32	32.83	20	43
SMA5-25		***m*5**	25	BK	50	100	125	132.07	100	60.82	41.04	25	50
SMA6-25		***m*6**	25	BK	55	120	150	158.48	120	72.32	49.24	30	61
SMA1-30	1	***m*1**	30	BK	12	24	30	31.41	28	17.71	13.71	10	16
SMA1.5-30		***m*1.5**	30	BK	15	36	45	47.12	43	28.24	21.56	16	25
SMA2-30 **SMB2-30**		***m*2**	30	BK BK	20 15	45	60	62.83	50	29.42	21.41	12.5	25
SMA2.5-30 **SMB2.5-30**		***m*2.5**	30	BK BK	25 20	60	75	78.54	62	36.28	26.27	17	32
SMA3-30 **SMB3-30**		***m*3**	30	BK BK	32 25	70	90	94.24	75	45.47	32.12	20	40
SMA3.5-30 **SMB3.5-30**		***m*3.5**	30	BK BK	35 30	90	105	109.95	85	49.66	34.97	25	45
SMA4-30 **SMB4-30**		***m*4**	30	BK BK	40 30	100	120	125.66	95	54.52	37.83	25	50
SMA5-30		***m*5**	30	BK	55	130	150	157.07	120	68.56	48.54	35	62

[Caution on Product Characteristics]

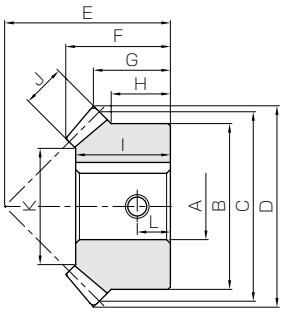
① Keyways are made according to JIS B1301 standards and Js 9 tolerances. For products with a tapped hole, a set screw is included as an accessory.

②The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.

③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

④ The keyway dimensions of items with " ※ "marks do not conform to JIS Standards.

Finished Bore Miter Gear



BK

Face width	Holding surface dia.	Keyway	Set Screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
J	K	Width×Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
5	9.86	—	M4	4	0.90	0.37	0.091	0.038	0.03~0.13	0.016	**SMA1-20**
	10	—	M4							0.014	**SMB1-20**
8	15.37	—	M4	6.5	3.13	1.31	0.32	0.13	0.05~0.15	0.069	**SMA1.5-20**
	15.37	4 x 1.8	M5							0.06	**SMB1.5-20**
10	21.72	5 x 2.3	M5	7	7.17	3.05	0.73	0.31	0.06~0.16	0.14	**SMA2-20**
	21.72	5 x 2.3	M5							0.13	**SMB2-20**
12	28.06	5 x 2.3*	M6	9.5	13.7	5.90	1.39	0.60	0.07~0.17	0.27	**SMA2.5-20**
	28.06	6 x 2.8	M6							0.26	**SMB2.5-20**
15	31.57	7 x 3*	M6	11.5	24.2	10.5	2.47	1.08	0.08~0.18	0.47	**SMA3-20**
	31.57	7 x 3*	M8							0.44	**SMB3-20**
	31.57	6 x 2.8	M6							0.49	**SMC3-20**
18	39.09	7 x 3*	M8	12.5	39.0	17.2	3.98	1.75	0.10~0.25	0.71	**SMA3.5-20**
	39.09	8 x 3.3	M8							0.68	**SMB3.5-20**
20	43.43	7 x 3*	M8	13.5	57.3	25.4	5.85	2.59	0.12~0.27	1.00	**SMA4-20**
	43.43	10 x 3.3	M8							0.96	**SMB4-20**
	43.43	8 x 3.3	M8							1.07	**SMC4-20**
26	54.46	10 x 3.3*	M8	15	114	51.3	11.7	5.23	0.14~0.34	1.80	**SMA5-20**
	54.46	8 x 3.3	M8							2.04	**SMB5-20**
	54.46	10 x 3.3	M8							1.93	**SMC5-20**
30	67.15	12 x 3.3*	M8	17	190	87.5	19.3	8.92	0.16~0.36	3.19	**SMA6-20**
	67.15	14 x 3.8	M8							3.01	**SMB6-20**
	67.15	12 x 3.3	M8							3.35	**SMC6-20**
35	95	18 x 4.4	M10	15	406	194	41.4	19.8	0.20~0.45	5.96	**SMA8-20**
6	15.03	—	M4	4	1.48	0.71	0.15	0.072	0.03~0.13	0.029	**SMA1-25**
9	19.54	4 x 1.8	M5	5.75	4.98	2.44	0.51	0.25	0.05~0.15	0.10	**SMA1.5-25**
12	26.06	6 x 2.8	M6	5	11.8	5.90	1.20	0.60	0.06~0.16	0.19	**SMA2-25**
		5 x 2.3	M5							0.20	**SMB2-25**
15	34.57	5 x 2.3*	M6	6	23.1	11.7	2.35	1.19	0.07~0.17	0.39	**SMA2.5-25**
		6 x 2.8	M6							0.40	**SMB2.5-25**
20	37.43	7 x 3*	M8	7.5	42.3	21.6	4.31	2.20	0.08~0.18	0.63	**SMA3-25**
		8 x 3.3	M8							0.69	**SMB3-25**
22	46.77	10 x 3.3	M8	8.5	65.0	33.5	6.63	3.42	0.10~0.25	1.04	**SMA3.5-25**
		8 x 3.3	M8							1.09	**SMB3.5-25**
25	55.29	10 x 3.3	M8	10	96.8	50.2	9.87	5.12	0.12~0.27	1.59	**SMA4-25**
		8 x 3.3	M8							1.68	**SMB4-25**
30	65.15	12 x 3.3*	M8	12.5	185	96.8	18.8	9.87	0.14~0.34	2.86	**SMA5-25**
35	83	16 x 4.3	M10	15	307	166	31.3	16.9	0.16~0.36	5.13	**SMA6-25**
6	19.03	4 x 1.8	M5	5	2.00	1.11	0.20	0.11	0.03~0.13	0.047	**SMA1-30**
10	25.71	5 x 2.3	M5	8	7.22	4.08	0.74	0.42	0.05~0.15	0.19	**SMA1.5-30**
12	36.06	6 x 2.8	M6	6.25	16.0	9.20	1.63	0.94	0.06~0.16	0.32	**SMA2-30**
		5 x 2.3	M5							0.35	**SMB2-30**
15	47.57	8 x 3.3	M8	8.5	31.2	18.2	3.19	1.86	0.07~0.17	0.68	**SMA2.5-30**
		6 x 2.8	M6							0.73	**SMB2.5-30**
20	53.43	10 x 3.3	M8	10	57.8	34.0	5.89	3.46	0.08~0.18	1.15	**SMA3-30**
		8 x 3.3	M8							1.25	**SMB3-30**
22	67.77	10 x 3.3	M8	12.5	88.4	52.3	9.01	5.34	0.10~0.25	2.01	**SMA3.5-30**
		8 x 3.3	M8							2.10	**SMB3.5-30**
25	79.29	12 x 3.3	M8	12.5	131	78.3	13.4	7.99	0.12~0.27	2.81	**SMA4-30**
		8 x 3.3	M8							3.03	**SMB4-30**
30	99.15	16 x 4.3	M10	17.5	250	150	25.5	15.3	0.14~0.34	5.56	**SMA5-30**

[Caution on Secondary Operations]

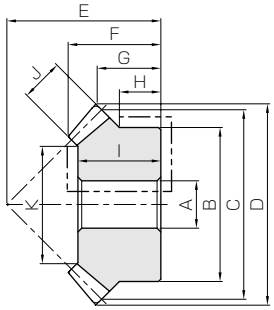
① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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).

MM
Carburized & Hardened Miter Gears

Module 2 ～ 5

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



B3

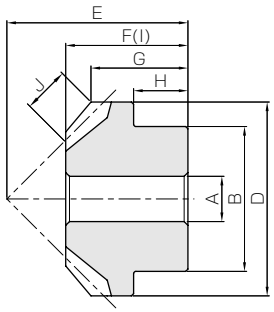
Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{H7}	B	C	D	E	F	G	H
MM2-20	1	***m*2**	20	B3	12	34	40	42.83	35	22.24	16.41	12
MM2.5-20		***m*2.5**	20	B3	15	42	50	53.54	45	28.89	21.77	16
MM3-20		***m*3**	20	B3	16	52	60	64.24	50	31.19	22.12	16
MM4-20		***m*4**	20	B3	20	65	80	85.66	65	39.49	27.83	17.5
MM5-20		***m*5**	20	B3	25	80	100	107.07	90	60.38	43.54	30
MM2-25	1	***m*2**	25	B3	12	45	50	52.83	40	24.33	16.41	12.5
MM2.5-25		***m*2.5**	25	B3	16	55	62.5	66.03	50	30.41	20.52	15
MM3-25		***m*3**	25	B3	20	65	75	79.24	60	37.81	24.62	17.5
MM4-25		***m*4**	25	B3	25	85	100	105.66	80	49.32	32.83	22.5
MM5-25		***m*5**	25	B3	28	100	125	132.07	100	60.82	41.04	25
MM2-30	1	***m*2**	30	B3	12	45	60	62.83	50	29.43	21.41	12.5
MM2.5-30		***m*2.5**	30	B3	16	60	75	78.54	62	36.28	26.27	17
MM3-30		***m*3**	30	B3	20	70	90	94.24	75	45.47	32.12	20
MM4-30		***m*4**	30	B3	28	100	120	125.66	95	54.52	37.83	25
MM5-30		***m*5**	30	B3	28	130	150	157.07	120	68.56	48.54	35

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

LM
Sintered Metal Miter Gears

Module 0.8 ～ 1.5

Specifications	
Precision grade	JIS B 1704 : 1978 grade 5
Gear teeth	Gleason
Pressure angle	20°
Material	SMF5040
Heat treatment	—
Tooth hardness	(70 ～ 95HRB)



B1

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{H8}	B	C	D	E	F	G	H
LM0.8-20	1	***m*0.8**	20	B1	4	12	16	17.13	16	11	8.57	5.5
LM1-20		***m*1**	20	B1	5	16	20	21.41	20	13.5	10.71	6
LM1.25-20		***m*1.25**	20	B1	6	22	25	26.77	23	15	11.38	6
LM1.5-20		***m*1.5**	20	B1	6	26	30	32.12	30	21	16.06	9

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
② Steam treatment (an effect creating surface oxidation) provides rust prevention; however, it is not a complete solution.
③ Although the sintering process allows for the inclusion of oil to maintain lubrication, these gears have not been oil impregnated.

Carburized & Hardened Miter Gears

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
l	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
20	9	24.54	15.1	9.74	1.54	0.99	0.06~0.16	0.13	**MM2-20**
26	11	30.89	29.0	19.0	2.96	1.94	0.07~0.17	0.27	**MM2.5-20**
27	14	34.4	52.0	34.5	5.30	3.52	0.08~0.18	0.43	**MM3-20**
35	18	49.09	121	81.2	12.3	8.28	0.12~0.27	0.93	**MM4-20**
54	26	54.46	256	175	26.1	17.8	0.14~0.34	2.15	**MM5-20**
21	12	28.06	26.4	20.1	2.70	2.05	0.06~0.16	0.25	**MM2-25**
27	15	36.57	51.6	39.7	5.27	4.05	0.07~0.17	0.47	**MM2.5-25**
33	20	39.43	94.7	73.5	9.66	7.49	0.08~0.18	0.81	**MM3-25**
44	25	57.29	217	171	22.1	17.4	0.12~0.27	1.89	**MM4-25**
50	30	65.15	413	329	42.1	33.6	0.14~0.34	3.41	**MM5-25**
25	12	36.06	35.7	31.1	3.64	3.17	0.06~0.16	0.37	**MM2-30**
32	15	47.57	69.7	61.5	7.11	6.27	0.07~0.17	0.76	**MM2.5-30**
40	20	53.43	129	115	13.2	11.7	0.08~0.18	1.32	**MM3-30**
50	25	79.29	293	266	29.9	27.1	0.12~0.27	3.09	**MM4-30**
62	30	99.15	558	513	56.9	52.3	0.14~0.34	6.47	**MM5-30**

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

② In the illustration, the area surrounded with — - - - — line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

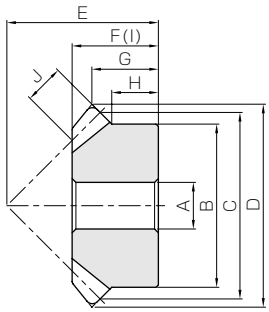
Sintered Metal Miter Gears

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
l	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(g)	
11	4.24	—	0.22	0.027	0.022	0.0027	0~0.16	9.67	**LM0.8-20**
13.5	4.95	—	0.41	0.050	0.042	0.0051	0~0.18	20.7	**LM1-20**
15	6.36	—	0.81	0.099	0.083	0.010	0~0.20	38.8	**LM1.25-20**
21	8.48	—	1.48	0.19	0.15	0.019	0~0.22	78.6	**LM1.5-20**

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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

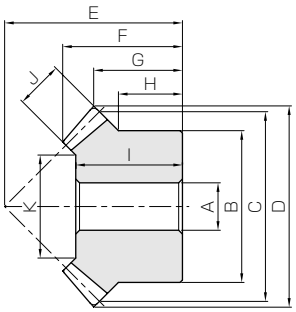


B2

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{H7}	B	C	D	E	F	G	H
SM2-16	1	***m*2**	16	B2	10	27	32	34.83	30	19	15.41	11.5
SM2.5-16		***m*2.5**	16	B2	12	34	40	43.53	35	21	16.77	12
SM3-16		***m*3**	16	B2	14	42	48	52.24	40	23	18.12	13
SM4-16		***m*4**	16	B2	16	55	64	69.66	50	28	20.83	13.5
SM5-16		***m*5**	16	B2	20	70	80	87.07	65	37	28.54	20
SM1-20	1	***m*1**	20	B3	6	16	20	21.41	20	13.94	10.71	8
SM1.25-20		***m*1.25**	20	B3	8	22	25	26.77	23	15.27	11.38	9
SM1.5-20		***m*1.5**	20	B3	8	26	30	32.12	30	21.24	16.06	13
SM2-20		***m*2**	20	B3	12	34	40	42.83	37	24.89	18.41	14
SM2.5-20		***m*2.5**	20	B3	14	42	50	53.54	48	32.54	24.77	19
SM3-20		***m*3**	20	B3	16	50	60	64.24	58	39.84	30.12	23
SM3.5-20		***m*3.5**	20	B3	20	60	70	74.95	65	44.13	32.47	25
SM4-20		***m*4**	20	B3	20	64	80	85.65	75	50.78	37.83	27
SM5-20		***m*5**	20	B3	25	80	100	107.07	90	60.38	43.54	30
SM6-20		***m*6**	20	B3	28	100	120	128.48	104	67.67	48.24	34
SM8-20		***m*8**	20	B3	30	130	160	171.31	125	73.33	50.66	30
SM1-25	1	***m*1**	25	B3	6	20	25	26.41	23	15.16	11.21	8
SM1.25-25		***m*1.25**	25	B3	8	25	31.25	33.02	28	17.88	13.26	9.25
SM1.5-25		***m*1.5**	25	B3	10	30	37.5	39.62	34	22.25	16.31	11.5
SM2-25		***m*2**	25	B3	12	40	50	52.83	40	24.33	16.41	10
SM2.5-25		***m*2.5**	25	B3	16	50	62.5	66.04	50	30.41	20.52	12.5
SM3-25		***m*3**	25	B3	20	60	75	79.24	60	37.81	24.62	15
SM3.5-25		***m*3.5**	25	B3	25	70	87.5	92.45	70	43.23	28.72	17.5
SM4-25		***m*4**	25	B3	28	80	100	105.66	80	49.32	32.83	20
SM5-25		***m*5**	25	B3	28	100	125	132.07	100	60.82	41.04	25
SM6-25		***m*6**	25	B3	28	120	150	158.48	120	72.32	49.24	30
SM1-30	1	***m*1**	30	B3	8	24	30	31.41	28	17.71	13.71	10
SM1.25-30		***m*1.25**	30	B3	10	30	37.5	39.27	36	23.47	18.13	13.5
SM1.5-30		***m*1.5**	30	B3	10	36	45	47.12	43	28.24	21.56	16
SM2-30		***m*2**	30	B3	12	45	60	62.83	50	29.42	21.41	12.5
SM2.5-30		***m*2.5**	30	B3	16	60	75	78.54	62	36.28	26.27	17
SM3-30		***m*3**	30	B3	20	70	90	94.24	75	45.47	32.12	20
SM3.5-30		***m*3.5**	30	B3	25	90	105	109.95	85	49.66	34.97	25
SM4-30		***m*4**	30	B3	28	100	120	125.66	95	54.52	37.83	25
SM5-30		***m*5**	30	B3	28	130	150	157.07	120	68.56	48.54	35

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see page 8.

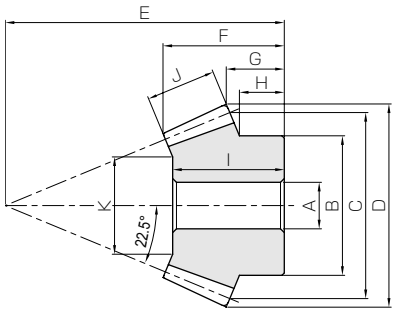


B3

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
19	7	—	3.84	0.33	0.39	0.034	0.06~0.16	0.076	**SM2-16**
21	9	—	7.63	0.68	0.78	0.069	0.07~0.17	0.14	**SM2.5-16**
23	11	—	13.3	1.21	1.36	0.12	0.08~0.18	0.22	**SM3-16**
28	14	—	30.7	2.87	3.13	0.29	0.12~0.27	0.49	**SM4-16**
37	17	—	58.9	5.62	6.00	0.57	0.14~0.34	1.03	**SM5-16**
12	5	9.86	0.89	0.084	0.091	0.0086	0.03~0.13	0.019	**SM1-20**
13	6	13.03	1.70	0.16	0.17	0.017	0.04~0.14	0.036	**SM1.25-20**
19	8	15.37	3.12	0.30	0.32	0.031	0.05~0.15	0.074	**SM1.5-20**
22	10	21.72	7.13	0.72	0.73	0.073	0.06~0.16	0.15	**SM2-20**
29	12	28.06	13.6	1.41	1.39	0.14	0.07~0.17	0.30	**SM2.5-20**
35	15	31.57	24.1	2.54	2.45	0.26	0.08~0.18	0.53	**SM3-20**
40	18	39.09	38.8	4.15	3.96	0.42	0.10~0.25	0.82	**SM3.5-20**
45	20	43.43	57.0	6.19	5.82	0.63	0.12~0.27	1.15	**SM4-20**
54	26	54.46	114	12.6	11.6	1.29	0.14~0.34	2.15	**SM5-20**
60	30	67.15	191	21.8	19.4	2.22	0.16~0.36	3.68	**SM6-20**
62	35	95	413	49.6	42.1	5.06	0.20~0.45	7.05	**SM8-20**
14	6	15.03	1.47	0.16	0.15	0.017	0.03~0.13	0.035	**SM1-25**
16	7	18.7	2.75	0.31	0.28	0.032	0.04~0.14	0.063	**SM1.25-25**
19	9	19.54	4.96	0.57	0.51	0.059	0.05~0.15	0.11	**SM1.5-25**
20	12	26.06	11.8	1.41	1.20	0.14	0.06~0.16	0.22	**SM2-25**
26	15	34.57	23.0	2.81	2.34	0.29	0.07~0.17	0.42	**SM2.5-25**
32	20	37.43	42.1	5.24	4.29	0.53	0.08~0.18	0.74	**SM3-25**
37	22	46.77	64.7	8.19	6.60	0.83	0.10~0.25	1.15	**SM3.5-25**
43	25	55.29	96.3	12.4	9.82	1.26	0.12~0.27	1.73	**SM4-25**
50	30	65.15	184	24.2	18.7	2.47	0.14~0.34	3.41	**SM5-25**
61	35	83	309	42.1	31.5	4.29	0.16~0.36	6.03	**SM6-25**
16	6	19.03	1.99	0.26	0.20	0.026	0.03~0.13	0.057	**SM1-30**
21	8	22.37	4.05	0.54	0.41	0.055	0.04~0.14	0.12	**SM1.25-30**
25	10	25.71	7.19	0.97	0.73	0.099	0.05~0.15	0.21	**SM1.5-30**
25	12	36.06	15.9	2.22	1.62	0.23	0.06~0.16	0.37	**SM2-30**
32	15	47.57	31.1	4.43	3.17	0.45	0.07~0.17	0.76	**SM2.5-30**
40	20	53.43	57.5	8.33	5.87	0.85	0.08~0.18	1.32	**SM3-30**
45	22	67.77	88.0	13.0	8.97	1.32	0.10~0.25	2.20	**SM3.5-30**
50	25	79.29	131	19.6	13.3	2.00	0.12~0.27	3.09	**SM4-30**
62	30	99.15	249	38.3	25.4	3.91	0.14~0.34	6.47	**SM5-30**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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



B45

Example of a pair Shaft angle 45°

Catalog No.	Gear ratio	Module	No. of teeth	Shaft angle	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A_{H7}	B	C	D	E	F	G
SAM1.5-20045	1	***m*1.5**	20	45°	B45	8	25	30	32.77	45	19.33	9.36
SAM2-20045		***m*2**	20	45°	B45	10	30	40	43.69	60	26.08	12.48
SAM2.5-20045		***m*2.5**	20	45°	B45	12	40	50	54.62	75	31.92	15.6
SAM3-20045		***m*3**	20	45°	B45	14	50	60	65.54	90	38.66	18.72
SAM1.5-20060	1	***m*1.5**	20	60°	B60	8	25	30	32.59	40	22.3	14.77
SAM2-20060		***m*2**	20	60°	B60	12	32	40	43.46	50	26.39	16.36
SAM2.5-20060		***m*2.5**	20	60°	B60	14	40	50	54.33	60	30.49	17.94
SAM3-20060		***m*3**	20	60°	B60	16	50	60	65.19	70	34.59	19.54
SAM1.5-20120	1	***m*1.5**	20	120°	B120	8	26	30	31.5	26	20.69	18.64
SAM2-20120		***m*2**	20	120°	B120	12	34	40	42	34	26.86	24.18
SAM2.5-20120		***m*2.5**	20	120°	B120	14	42	50	52.5	42	33.22	29.73
SAM3-20120		***m*3**	20	120°	B120	16	50	60	63	50	39.39	35.28

[Caution on Product Characteristics]

① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.

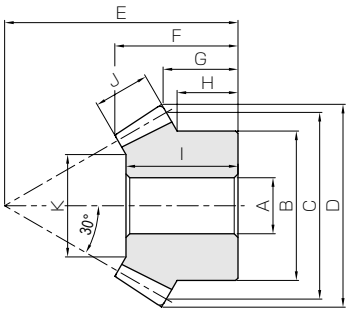
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

③ The shaft angle of each product is the degree obtained when two of the same products are installed as a pair. Pairing two different products cannot change the shaft angle.

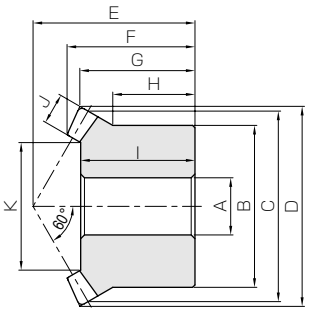
Shaft angle 60°

Shaft angle 120°

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see page 8.



B60



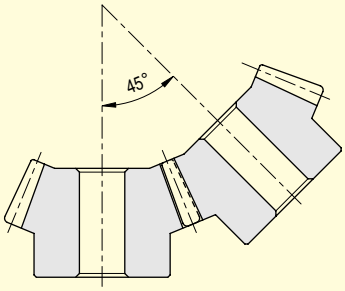
B120

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
7.75	18	11	17	4.30	0.38	0.44	0.039	0.05~0.15	0.067	**SAM1.5-20045**
9.65	24	15	20.92	10.3	0.95	1.05	0.097	0.06~0.16	0.15	**SAM2-20045**
12.58	30	18	30.07	19.6	1.85	2.00	0.19	0.07~0.17	0.31	**SAM2.5-20045**
15.51	36	22	34	34.4	3.30	3.51	0.34	0.08~0.18	0.55	**SAM3-20045**
12.58	21	9	18.18	3.54	0.32	0.36	0.033	0.05~0.15	0.077	**SAM1.5-20060**
13.05	24	12	21.93	8.39	0.78	0.86	0.080	0.06~0.16	0.15	**SAM2-20060**
13.82	28	15	29.15	16.4	1.56	1.67	0.16	0.07~0.17	0.27	**SAM2.5-20060**
15.16	32	18	36.36	28.3	2.74	2.89	0.28	0.08~0.18	0.47	**SAM3-20060**
13.88	18	5	19.22	2.43	0.29	0.25	0.030	0.05~0.15	0.073	**SAM1.5-20120**
17.26	24	6.5	26.78	5.66	0.70	0.58	0.072	0.06~0.16	0.16	**SAM2-20120**
20.64	29	8.5	32.03	11.4	1.45	1.16	0.15	0.07~0.17	0.31	**SAM2.5-20120**
24.02	35	10	39.59	19.4	2.53	1.98	0.26	0.08~0.18	0.53	**SAM3-20120**

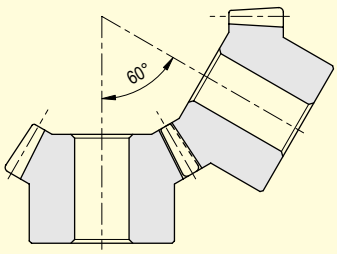
[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

■ Angular Miter Gears

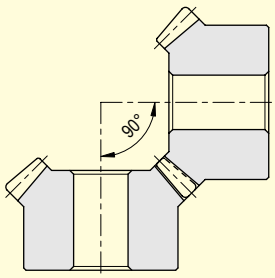
The shafts of standard Miter Gears are at 90° , Miter Gears with other angles are called Angular Miter Gears. SAM series of KHK standard Angular Miter Gears are available with 45° , 60° , 90° and 120° shaft angles. Recommended use of a pair of identical gears in mesh. Other shaft angles may be ordered as custom gears. However, because of the limitations of our manufacturing equipment, we may not be able to produce your specific design.



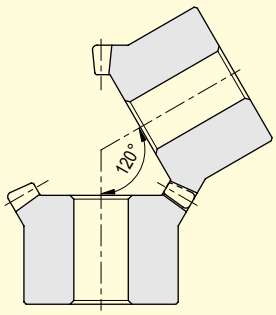
Shaft Angle 45°



Shaft Angle 60°



Shaft Angle 90°

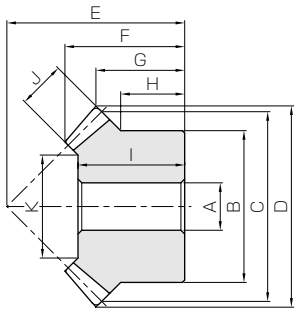


Shaft Angle 120°

SUM
Stainless Steel Miter Gears

Module 1 ~ 4

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

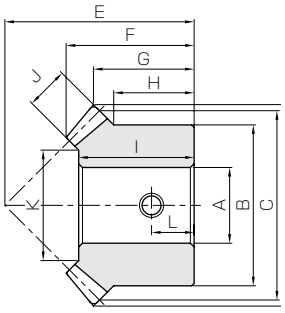
Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{H7}	B	C	D	E	F	G	H
SUM1-20	1	***m*1**	20	B3	6	16	20	21.41	20	13.95	10.71	8
SUM1.5-20		***m*1.5**	20	B3	8	26	30	32.12	30	21.24	16.06	13
SUM2-20		***m*2**	20	B3	12	34	40	42.83	37	24.89	18.41	14
SUM2.5-20		***m*2.5**	20	B3	14	42	50	53.54	48	32.54	24.77	19
SUM3-20		***m*3**	20	B3	16	50	60	64.24	58	39.84	30.12	23
SUM4-20		***m*4**	20	B3	20	64	80	85.65	75	50.78	37.83	27
SUM1-25	1	***m*1**	25	B3	6	20	25	26.41	23	15.16	11.21	8
SUM1.5-25		***m*1.5**	25	B3	10	30	37.5	39.62	34	22.25	16.31	11.5
SUM2-25		***m*2**	25	B3	12	45	50	52.83	40	24.33	16.41	12.5
SUM2.5-25		***m*2.5**	25	B3	16	55	62.5	66.04	50	30.41	20.52	15
SUM3-25		***m*3**	25	B3	20	65	75	79.24	60	37.81	24.62	17.5
SUM4-25		***m*4**	25	B3	28	80	100	105.66	80	49.32	32.83	20

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

SUMA
Finished Bore Stainless Steel Miter Gears

Module 1 ~ 4

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



BT

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore
					A_{H7}	B	C	D	E	F	G	H	I
SUMA1-20	1	***m*1**	20	BT	6	16	20	21.41	20	13.95	10.71	8	12
SUMA1.5-20		***m*1.5**	20	BT	8	26	30	32.12	30	21.24	16.06	13	19
SUMA2-20		***m*2**	20	BK	12	34	40	42.83	37	24.89	18.41	14	22
SUMA2.5-20		***m*2.5**	20	BK	14	42	50	53.54	48	32.54	24.77	19	29
SUMA3-20		***m*3**	20	BK	16	50	60	64.24	58	39.84	30.12	23	35
SUMA4-20		***m*4**	20	BK	20	64	80	85.65	75	50.78	37.83	27	45
SUMA1-25	1	***m*1**	25	BT	6	20	25	26.41	23	15.16	11.21	8	14
SUMA1.5-25		***m*1.5**	25	BT	10	30	37.5	39.62	34	22.25	16.31	11.5	19
SUMA2-25		***m*2**	25	BK	12	45	50	52.83	40	24.33	16.41	12.5	20
SUMA2.5-25		***m*2.5**	25	BK	16	55	62.5	66.04	50	30.41	20.52	15	26
SUMA3-25		***m*3**	25	BK	20	65	75	79.24	60	37.81	24.62	17.5	32
SUMA4-25		***m*4**	25	BK	30	80	100	105.66	80	49.32	32.83	20	43

[Caution on Product Characteristics]
① Keyways are made according to JIS B1301 standards and Js 9 tolerances. For products with a tapped hole, a set screw is included as an accessory.
② The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

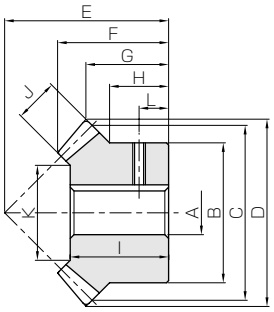
Stainless Steel Miter Gears

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
l	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
12	5	9.86	0.49	0.060	0.050	0.0061	0.03~0.13	0.019	**SUM1-20**
19	8	15.37	1.72	0.22	0.18	0.022	0.05~0.15	0.074	**SUM1.5-20**
22	10	21.72	3.94	0.51	0.40	0.052	0.06~0.16	0.15	**SUM2-20**
29	12	28.06	7.52	1.00	0.77	0.10	0.07~0.17	0.30	**SUM2.5-20**
35	15	31.57	13.3	1.80	1.36	0.18	0.08~0.18	0.52	**SUM3-20**
45	20	43.43	31.5	4.39	3.22	0.45	0.12~0.27	1.15	**SUM4-20**
14	6	15.03	0.81	0.12	0.083	0.012	0.03~0.13	0.035	**SUM1-25**
19	9	19.54	2.74	0.41	0.28	0.042	0.05~0.15	0.11	**SUM1.5-25**
20	12	26.06	6.50	1.00	0.66	0.10	0.06~0.16	0.24	**SUM2-25**
26	15	34.57	12.7	2.00	1.29	0.20	0.07~0.17	0.46	**SUM2.5-25**
32	20	37.43	23.3	3.73	2.37	0.38	0.08~0.18	0.80	**SUM3-25**
43	25	55.29	53.2	8.79	5.43	0.90	0.12~0.27	1.72	**SUM4-25**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

SUMA

Finished Bore Stainless Steel Miter Gears



BK

Face width	Holding surface dia.	Keyway	Set Screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
J	K	Width×Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
5	9.86	—	M4	4	0.49	0.060	0.050	0.0061	0.03~0.13	0.018	**SUMA1-20**
8	15.37	—	M4	6.5	1.72	0.22	0.18	0.022	0.05~0.15	0.073	**SUMA1.5-20**
10	21.72	4 x 1.8	M4	7	3.94	0.51	0.40	0.052	0.06~0.16	0.14	**SUMA2-20**
12	28.06	5 x 2.3	M5	9.5	7.52	1.00	0.77	0.10	0.07~0.17	0.29	**SUMA2.5-20**
15	31.57	5 x 2.3	M5	11.5	13.3	1.80	1.36	0.18	0.08~0.18	0.52	**SUMA3-20**
20	43.43	6 x 2.8	M5	13.5	31.5	4.39	3.22	0.45	0.12~0.27	1.14	**SUMA4-20**
6	15.03	—	M4	4	0.81	0.12	0.083	0.012	0.03~0.13	0.034	**SUMA1-25**
9	19.54	—	M4	6	2.74	0.41	0.28	0.042	0.05~0.15	0.11	**SUMA1.5-25**
12	26.06	4 x 1.8	M4	6.5	6.50	1.00	0.66	0.10	0.06~0.16	0.24	**SUMA2-25**
15	34.57	5 x 2.3	M5	7.5	12.7	2.00	1.29	0.20	0.07~0.17	0.46	**SUMA2.5-25**
20	37.43	6 x 2.8	M5	9	23.3	3.73	2.37	0.38	0.08~0.18	0.79	**SUMA3-25**
25	55.29	8 x 3.3	M6	10	53.2	8.79	5.43	0.90	0.12~0.27	1.67	**SUMA4-25**

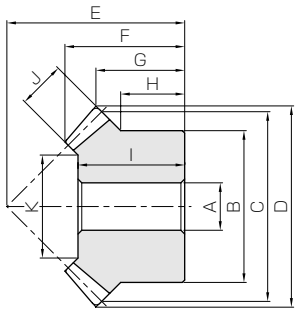
[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

PM
Plastic Miter Gears

Module 1 ～ 4

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

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



B3

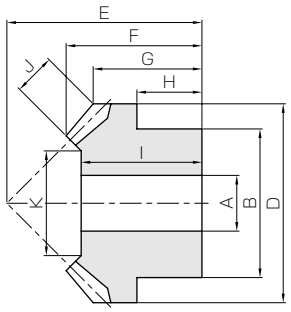
Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A	B	C	D	E	F	G	H
PM1-20	1	***m*1**	20	B3	6	16	20	21.41	20	13.95	10.71	8
PM1.25-20		***m*1.25**	20	B3	8	22	25	26.77	23	15.27	11.38	9
PM1.5-20		***m*1.5**	20	B3	8	26	30	32.12	30	21.24	16.06	13
PM2-20		***m*2**	20	B3	10	34	40	42.83	37	24.89	18.41	14
PM2.5-20		***m*2.5**	20	B3	12	42	50	53.54	48	32.54	24.77	19
PM3-20		***m*3**	20	B3	14	50	60	64.24	58	39.84	30.12	23
PM3.5-20		***m*3.5**	20	B3	20	60	70	74.95	65	44.13	32.47	25
PM4-20		***m*4**	20	B3	20	64	80	85.66	75	50.78	37.83	27
PM1-25	1	***m*1**	25	B3	6	20	25	26.41	23	15.16	11.21	8
PM1.25-25		***m*1.25**	25	B3	8	25	31.25	33.02	28	17.88	13.26	9.25
PM1.5-25		***m*1.5**	25	B3	8	30	37.5	39.62	34	22.25	16.31	11.5
PM2-25		***m*2**	25	B3	10	40	50	52.83	40	24.33	16.41	10
PM2.5-25		***m*2.5**	25	B3	14	50	62.5	66.04	50	30.41	20.52	12.5
PM3-25		***m*3**	25	B3	15	60	75	79.24	60	37.81	24.62	15

[Caution on Product Characteristics]
① Significant variations in temperature or humidity can cause dimensional changes in plastic gears (MC Nylon gears), including bore size (H8 when produced), tooth diameter, and backlash. Please see the section "Design of Plastic Gears" in separate technical reference book (Page 101).
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see page 253 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ Without lubrication, using plastic gears in pairs may generate heat and dilation. It is recommended to mate with steel gears.

DM
Injection Molded Miter Gears

Module 0.5 ～ 1.5

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



B1

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
					A	B	C	D	E	F	G
DM0.5-20	1	***m*0.5**	20	B1	3	8	10	10.71	11	7.97	6.35
DM0.8-20		***m*0.8**	20	B1	5	12	16	17.13	16	10.83	8.56
DM1-20		***m*1**	20	B1	6	16	20	21.41	21	14.62	11.71
DM1.5-20		***m*1.5**	20	B1	8	20	30	32.12	30	20.59	16.06

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Bending strength	(mm)	(g)	
4	7	2.5	4.93	0.082	0.0083	0 ~ 0.30	0.57	**DM0.5-20**
5	10	3.5	10.1	0.31	0.032	0 ~ 0.48	1.93	**DM0.8-20**
7	13	4.5	11.27	0.54	0.055	0 ~ 0.60	4.28	**DM1-20**
10	19	7	18.2	0.96	0.098	0 ~ 0.60	11.8	**DM1.5-20**

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 253 for more details.
② The bore tolerance is generally -0.05 to -0.3 but may be + values at the central portion of the hole.
③ To find the dimensional tolerance of these gears, please see the Dimensional Tolerance Table.

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

■ **Dimensional tolerance table（Unit : mm）**

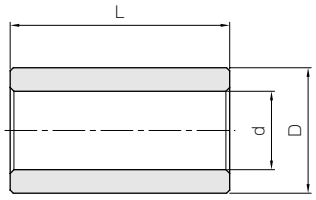
Range	Tolerance
below 3 mm	± 0.20
3 up to 6 mm	± 0.25
6 up to 10 mm	± 0.30
10 up to 18 mm	± 0.35
18 up to 30 mm	± 0.40
30 mm up	± 0.50

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
l	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
12	5	9.86	0.22	—	0.022	—	0~0.23	0.0028	**PM1-20**
13	6	13.03	0.42	—	0.043	—	0~0.24	0.0053	**PM1.25-20**
19	8	15.37	0.76	—	0.077	—	0~0.25	0.011	**PM1.5-20**
22	10	21.72	1.74	—	0.18	—	0~0.26	0.023	**PM2-20**
29	12	28.06	3.34	—	0.34	—	0~0.27	0.046	**PM2.5-20**
35	15	31.57	5.89	—	0.60	—	0~0.28	0.080	**PM3-20**
40	18	39.09	9.47	—	0.97	—	0~0.30	0.12	**PM3.5-20**
45	20	43.43	14.0	—	1.42	—	0~0.32	0.17	**PM4-20**
14	6	15.03	0.36	—	0.036	—	0~0.23	0.0051	**PM1-25**
16	7	18.7	0.67	—	0.068	—	0~0.24	0.0093	**PM1.25-25**
19	9	19.54	1.20	—	0.12	—	0~0.25	0.017	**PM1.5-25**
20	12	26.06	2.84	—	0.29	—	0~0.26	0.033	**PM2-25**
26	15	34.57	5.55	—	0.57	—	0~0.27	0.064	**PM2.5-25**
32	20	37.43	10.0	—	1.02	—	0~0.28	0.11	**PM3-25**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 254) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
② Plastic gears are susceptible to the effects of temperature and moisture. Dimensional changes may occur while performing secondary operations and during post-machining operations.

BB Sintered Metal Bushings

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



T8

Catalog No.	I.D. of bushing	O.D. of bushing	Length	Products that can use the bushing
	d $^{+0.02}_{0}$	D $^{+0.02}_{-0.01}$	L $^{0}_{-0.3}$	
BB30507	3	5	7	DM0.8
BB30608	3	6	8	DM1
BB40609	4	6	9	DM1
BB50814	5	8	14	DM1.5

Material : Oil impregnated sintered bronze.

Ground Spiral Miter Gears

Fine-pitch ground spiral miter gears are available as standardized products!

In producing SMSG Ground Spiral Miter Gears in module 1, it is extremely difficult to obtain accuracy, as advanced skills and technologies are required for production. We are proud to offer this ground spiral miter gear, industry's first ever product as a stock gear. Try them now.

For details, see page 258.

※ For products not categorized in KHK Stock Gear Series, custom gear production services is available. For details, see page 8.

Ground Zerol Gears

First ever as Stock Gears!

SMZG Ground Zerol Miter Gears and SBZG Ground Zerol Bevel Gears

SMZG
Ground Zerol Miter Gears

SBZG
Ground Zerol Bevel Gears

Zerol Gears are spiral bevel gears, that have a spiral angle less than 10 degrees, and featuring characteristics of both straight bevel gears and spiral bevel gears.

Specifications	
Precision grade	JIS B 1704: 1978 grade 2
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	55 ～ 60HRC

≪ Features ≫

- Zerol Gears allows you to design a compact gear system that produces no inward thrust force, which is a problem for spiral bevel gearing.
- Being able to apply gear grinding, which cannot be done to straight bevel gears, Zerol Gears provide excellent precision, wear resistance and are quiet in operation, compared to straight bevel gears with hardened teeth.
- Since the mounting distance is the same as the SB Bevel Gears, replacements can easily be found. As with spiral bevel gears, remember to mate a right-helix gear with a left-helix gear, in combination.

RoHS Compliant !

For details, see page 266 and 302.

Bevel Gears

MHP
High-Ratio Hypoid Gears
Gear Ratio 15 ~ 200

*m*1, 1.5 Page 288

MBSG
Ground Spiral Bevel Gears
Gear Ratio 2

*m*2 ~ 4 Page 290

SBSG
Ground Spiral Bevel Gears
Gear Ratio 1.5 ~ 3

*m*2 ~ 4 Page 292

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

*m*2 ~ 6 Page 294

SBS
Spiral Bevel Gears
Gear Ratio 1.5 ~ 4

*m*1 ~ 5 Page 298

SBZG
Ground Zerol Bevel Gears
Gear Ratio 1.5, 2

*m*2 ~ 3 Page 302

SB
Steel Bevel Gears
Gear Ratio 1.5 ~ 4

*m*1.5 ~ 6 Page 304

SBY
Steel Bevel Gears
Gear Ratio 2 ~ 4

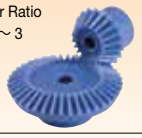
*m*5 ~ 8 Page 304

SB
Steel Bevel Gears & Pinion Shafts
Gear Ratio 5

*m*1.5 ~ 3 Page 308

SUB
Stainless Steel Bevel Gears
Gear Ratio 1.5 ~ 3

*m*1.5 ~ 3 Page 310

PB
Plastic Bevel Gears
Gear Ratio 1.5 ~ 3

*m*1 ~ 3 Page 312

DB
Injection Molded Bevel ears
Gear Ratio 2

*m*0.5 ~ 1 Page 314

BB
Sintered Metal Bushings

φ5 ~ 8 Page 314

Nissei KSP
Ground Spiral Bevel Gears
Gear Ratio 1.5 ~ 2

*m*2 ~ 5 Page 320

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 Spiral (R)
- 20 — No. of teeth of mating gear (20)
- 40 — No. of teeth (40)
- 2 — Module (2)
- G — Others (Ground Gear)
- BS — Type (Spiral Bevel Gear)
- M — Material (SCM415)

Material

S	S45C
M	SCM415
SU	SUS303
P	MC901
D	DURACON

Type

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

Other Information

G	Ground Gears

■ Feature Icons

- RoHS Compliant Product
- Re-machinable Product
- Finished Product
- Heat Treated Product
- Ground Gear
- Stainless Product
- Resin Product
- Copper Alloy Product
- Injection Molded Product
- Black Oxide coated Product

Characteristics

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

Type	Catalog No.	Module	Gear Ratio	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704 : 1978	Secondary Operations	Features
Hypoid Gear	**MHP**	1 ~ 1.5	15 ~ 200	SCM415	Carburized Note 1	Cut	3	△	High speed reduction ratio, high efficiency, high rigidity and compact gear assembly.
Spiral bevel gears	**MBSG**	2 ~ 4	2	SCM415	Carburized Note 1	Ground	1	△	High strength, abrasion-resistant and compact for high-speed & torque use.
	SBSG	2 ~ 4	1.5 ~ 3	S45C	Gear teeth induction hardened	Ground	2	△	Reasonably priced ground gear, yet remachinable except for the gear teeth.
	KSP F type	1.5 ~ 5	20 ~ 30	SCM415	Carburized	Ground	0	×	Superior performance with regard to high speed, low noise, and low vibration.
	KSP U type				Carburized Note 1			△	
	MBSA・MBSB	2 ~ 6	1.5 ~ 3	SCM415	Carburized	Cut	4	×	Ready to use without performing secondary operations. Strong and abrasion resistant.
	SBS	1 ~ 5	1.5 ~ 4	S45C	Gear teeth induction hardened	Cut	4	△	Large nos. of teeth and modules are offered in these affordable spiral bevel gears.
Zerol Bevel Gears	**SBZG**	2 ~ 3	1.5 ~ 2	S45C	Gear teeth induction hardened	Ground	2	△	A spiral bevel gears with a helix angle less than 10° . Receives forces from the same directions straight bevel gears receive and have excellent precision.
Straight bevel gears	**SB・SBY**	1 ~ 8	1.5 ~ 5	S45C	—	Cut	3	○	Popular series of straight bevel gears for many uses.
	SUB	1.5 ~ 3	1.5 ~ 3	SUS303	—	Cut	3	○	Suitable for food machinery due to SUS303's rust-resistant quality.
	PB	1 ~ 3	1.5 ~ 3	MC901	—	Cut	4	○	MC nylon products are light and can be used without lubricant.
	DB	0.5 ~ 1	2	Duracon (M90-44)	—	Injection Molded	6	△	Injection molded, mass-produced productions, suitable for office machines.

○ Possible △ Partly possible
× Not possible

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

● **For safe handling and to prevent damage such as deformation, KHK stock bevel gears have round chamfering at the corners, on the top surface plane of a gear tooth.**

■ The chamfering of the corner gear tips for bevel gear

Module	Outside edge R	Inside edge R
0.5 up to 1	0.5	All burrs removed
1 up to 2.5	1	0.5
2.5 up to 5	2	1
Over 5	3	1.5

Integrated combination of cutting-edge technologies and know-how.

The popularity in our large selection of product lineups is established by a production system integrated with advanced manufacturing technology and know-how, achieving quality products.

Gear cutting of Straight Bevel Gears

Bevel Gear Grinding Machine (Gleason PH-275HG)

Gear cutting of Spiral Bevel Gears

Bevel Gear Cutting Machine Equipments

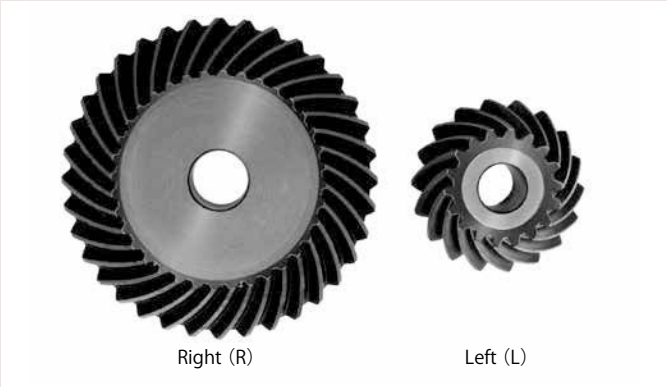
Inspection Equipment

Selection Hints

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

1. Caution in Selecting the Mating Gears

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



Right (R) Left (L)

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

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

■ Zerol Bevel Gears

SBZG products are not interchangeable with products in other series.

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

Pinion \ Gear	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 a certain application environment. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. To learn more about strength calculation, please refer to the technical information contained in the "Bending Strength of Bevel Gears" section on Page 87, and the "Surface Durability of Bevel Gears" section on Page 93.

■ Calculation assumptions for Bending Strength of Gears

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

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

Formula NOTE 1	Formula of bevel gears on surface durability (JGMA404-01)			
Kinematic viscosity of lubricant	100cSt (50℃)			
Gear support	Shafts & gear box have normal stiffness, and gears are supported on one end			
Allowable Hertz stress σ_{Hlim}(kgf/mm^2)	166	90	49 (62.5)	41.3
Safety factor C_R	1.15			

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

〔**NOTE 2**〕 The allowable bending stress at the root σ_{Flim} is calculated from JGMA403-01, and set to 2/3 of the value in the consideration of the use of planetary-, idler-, or other gear systems, loaded in both directions.

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

Application Hints

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

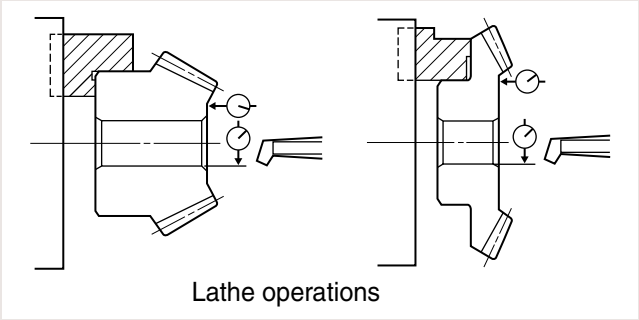
KHK Co., Ltd.
PHONE: 81-48-254-1744 FAX: 81-48-254-1765
E-mail export@khkgears.co.jp

1. Caution on Performing Secondary Operations

① If you are reboring, it is important to pay special attention to locating the center in order to avoid runout.

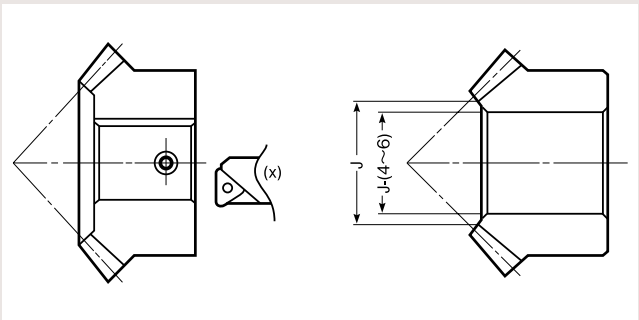
② The reference datum for gear cutting is the bore. Therefore, it is best to use the bore for locating the center. If it is too difficult to do for small bores, the alternative is to use one spot on the bore and the runout of the side surface.

③ If reworking using scroll chucks, we recommend the use of new or rebored jaws for improved precision. Please exercise caution not to crush the teeth by applying too much pressure. Any scarring will cause noise during operation.



Lathe operations

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

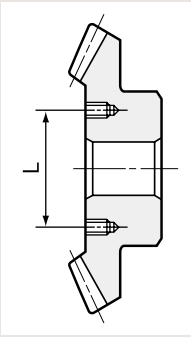


⑤ For tapping and keyway operations, see the examples given in "1. Caution on Performing Secondary Operations" in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentration, always leave radii on corners.

⑥ PB plastic bevel gears are susceptible to changes due to temperature and humidity. Dimensions may change between during and after remachining operations.

⑦ When heat treating S45C products, it is possible to get thermal stress cracks. It is best to subject them to penetrant inspection afterwards. While the teeth strength may increase four fold, the precision of the gear will drop approximately one grade.

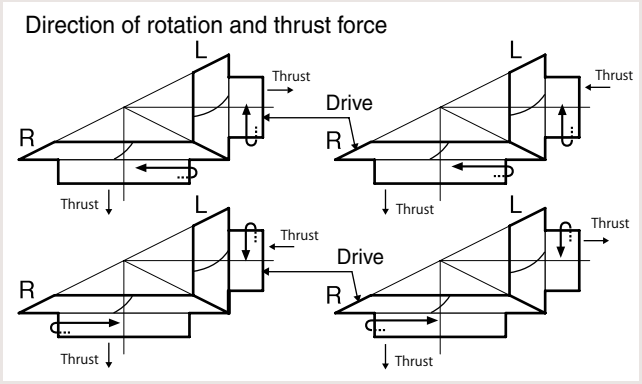
⑧ For the handling conveniences, the SB and SBY series listed below has the tapped holes (180° apart, 2 places) on the holding surface.



Catalog No.	L (mm)	Tap Size
SB6-4515	130	M10 deep 15
SBY8-4020	160	M10 deep 15
SBY8-4515	210	M10 deep 15
SBY5-6015	160	M10 deep 15
SBY6-6015	220	M10 deep 15

2. Points of Caution in Assembling

① Since bevel gears are cone shaped, they produce axial thrust forces. Especially for spiral bevel gears, the directions of thrust changes with the hand of spiral and the direction of rotation. This is illustrated below. The bearings must be selected properly to be able to handle these thrust forces. For details, please refer to separate technical reference book, section of "Gear Forces" (Page 108).

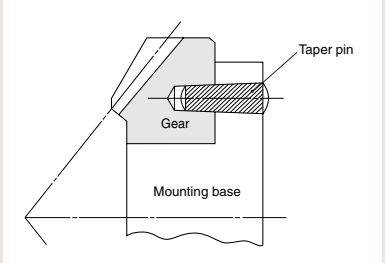


[NOTE] Bevel gears with the gear ratio 1.57 or less, produce a thrust force which has the same direction as miter gears. For details, see page 254.

② If a bevel gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend mounting bevel gears as close to the bearings as possible. This is especially important since most bevel gears are supported on one end. The bending of shafts will cause abnormal noise and wear, and may even cause fatigue failure of the shafts. Both shafts and bearings must be designed with sufficient strength.

③ Due to the thrust load of bevel gears, the gears, shafts and bearings have the tendency to loosen up during operation. Bevel gears should be fastened to the shaft with keys and set screws, taper pins, step shafts, etc.

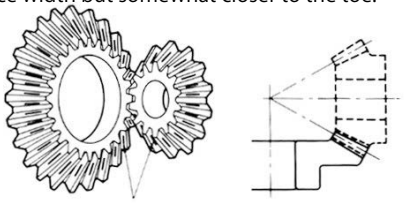
④ When installing MBSA or MBSB spiral bevel gears in B7 style (ring type), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only.



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

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.

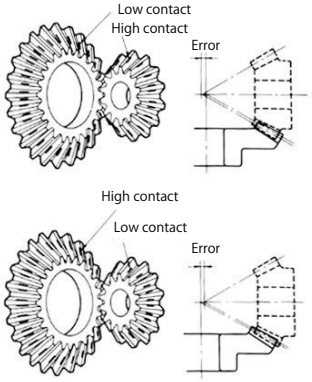


Center contact closer to toes

Incorrect Tooth Contact

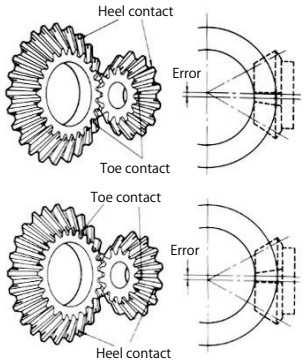
■ Mounting Distance Error

● 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.



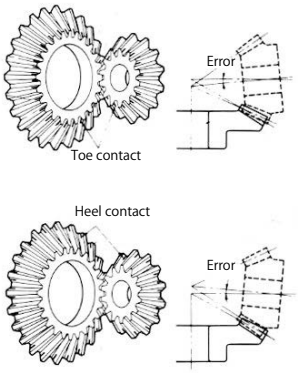
■ Offset Error

● 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°.



Application Examples

SB Bevel Gears are used in the automatic line-feeding of a machine part processing machine.

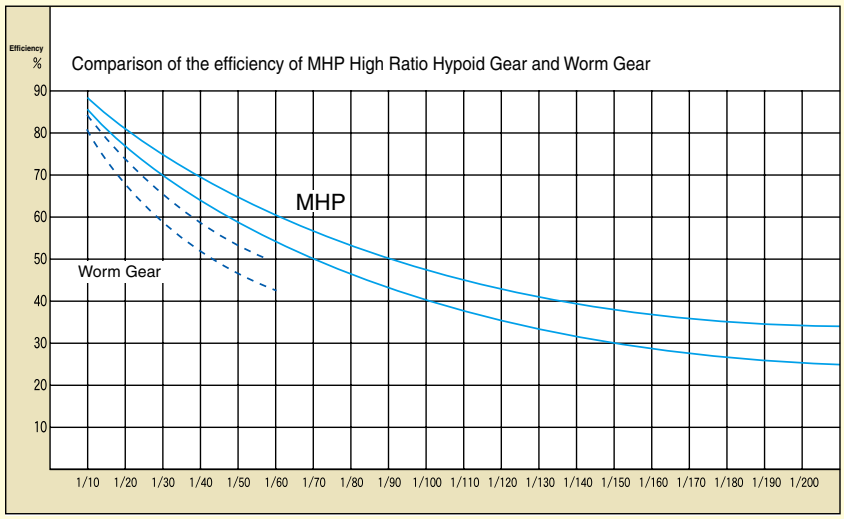
2WD Bicycle by SHESCO

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

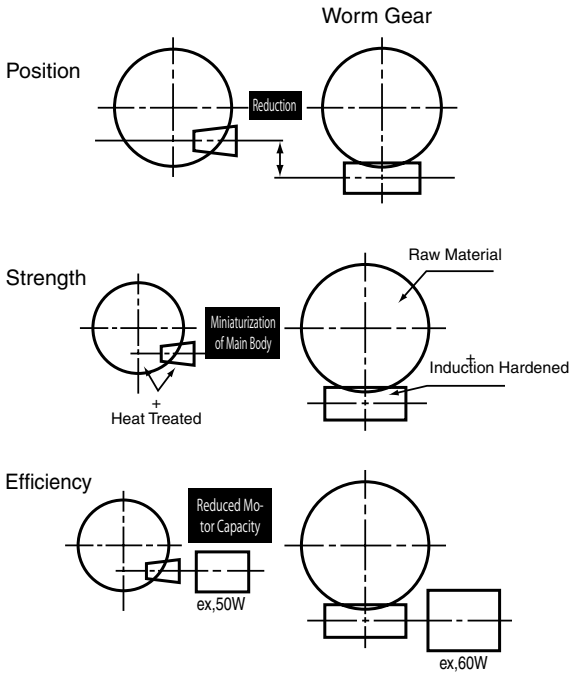
■ Features of MHP High Ratio Hypoid Gears

A pair of MHP high-ratio hypoid gears are able to produce an amazing reduction of speed of 200:1 in one stage.

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



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 calculation

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)

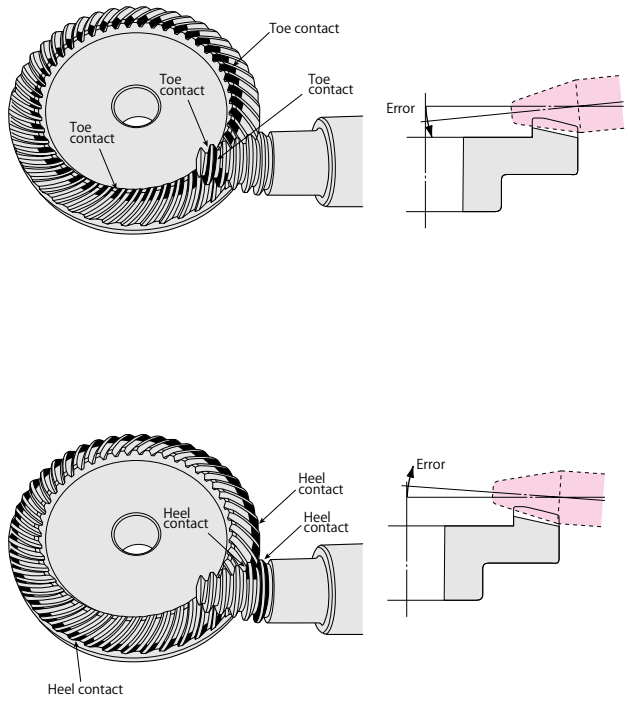
$$W_{XG} = W_{NG} \times T_G$$

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

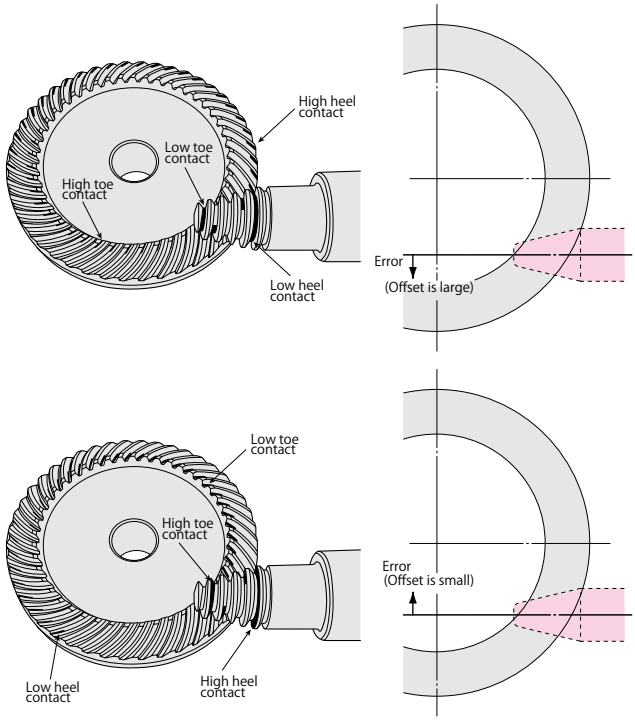
■ Variations in tooth contact due to poor alignment of gears

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

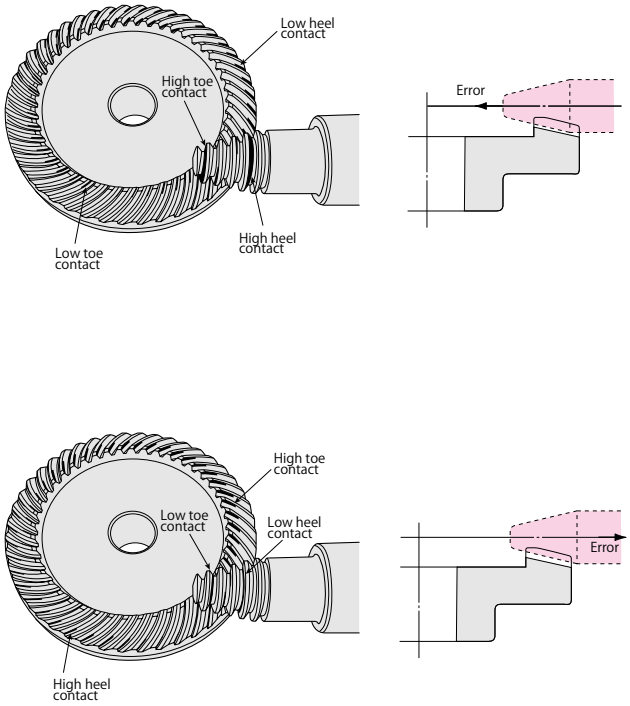
(1) Tooth contact in case of a shaft-angle error



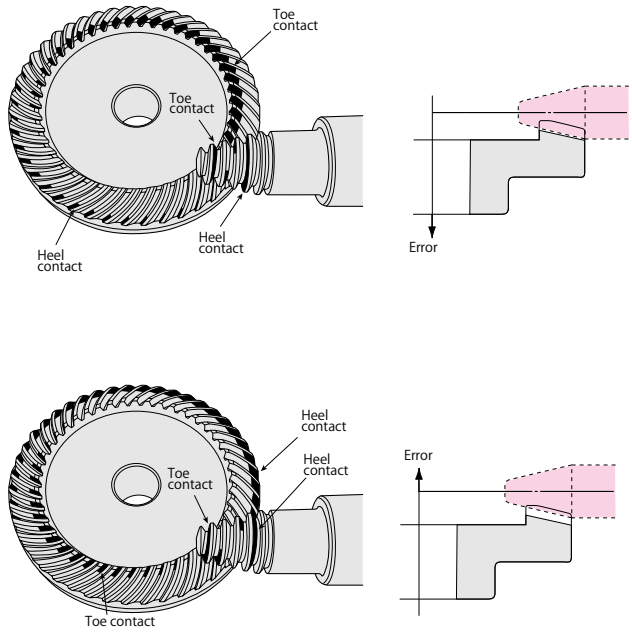
(2) Tooth contact in case of a shaft-offset error



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

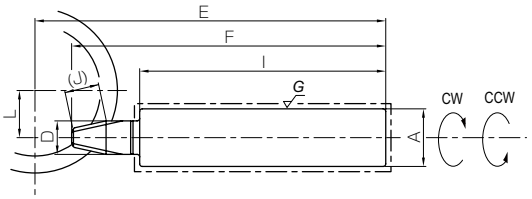


(4) Tooth contact in case of a gear set position error



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

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



B8

Catalog No.	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	15	***m*1**	1.067	45	R	B9	12	30	48	48	19	16.3	7	14
MHP1-3045L				3	L	B8	22.1	—	10.3	10.3	127	113	—	94
MHP1.5-0453R	15	***m*1.5**	1.733	45	R	B9	14	40	78	78	28	23.7	10	20
MHP1.5-3045L				3	L	B8	31.1	—	17.6	17.6	170	148	—	116
MHP1.5-0603R	20	***m*1.5**	1.633	60	R	B9	20	50	98	98	33	28.7	13	25
MHP1.5-3060L				3	L	B8	36.1	—	15.7	15.7	199	168	—	135
MHP1-0602R	30	***m*1**	1.05	60	R	B9	12	34	63	63	21	17.8	8	16
MHP1-2060L				2	L	B8	22.1	—	12.8	12.8	134	120	—	94
MHP1-0451R	45	***m*1**	1.067	45	R	B9	12	30	48	48	19	16.5	7	14
MHP1-1045L				1	L	B8	20.1	—	10.1	10.1	115	104	—	85
MHP1.5-0451R	45	***m*1.5**	1.733	45	R	B9	14	40	78	78	28	23.9	10	20
MHP1.5-1045L				1	L	B8	26.1	—	18.3	18.3	152	138	—	102
MHP1-0601R	60	***m*1**	1.05	60	R	B9	12	34	63	63	21	17.9	8	16
MHP1-1060L				1	L	B8	22.1	—	12.9	12.9	134	122	—	94
MHP1.5-0601R	60	***m*1.5**	1.633	60	R	B9	20	50	98	98	33	28.2	13	25
MHP1.5-1060L				1	L	B8	31.1	—	17.7	17.7	175	151	—	116

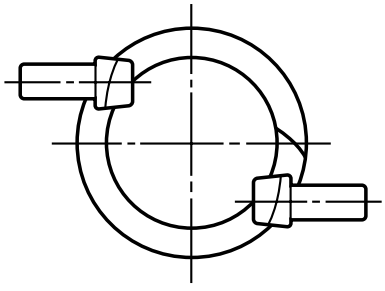
[Caution on Product Characteristics]

① The allowable torques are obtained from the results of experimentation with the pinion at 600 rpm, lubricated with Kingstar SG-O (NIHON GREASE).

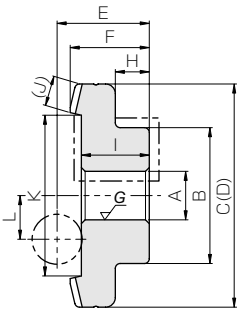
② Radial and thrust load coefficients are the factors used for calculation of those loads. As shown in the figure B8 Shape, CW and CCW stand for clockwise and counterclockwise rotation. A plus sign means that the two gears in a set move away each other when load is applied. A minus sign means that two gears in a set approach each other when load is applied. For more details, see the section "How to determine the radial and thrust loads" on Page 286.

■ 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.



High-Ratio Hypoid Gears



B9

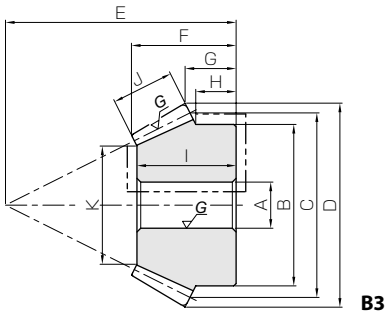
Face width	Holding surface dia.	Offset	Radial load coefficient		Thrust load coefficient		Allowable transmission torque (N·m)	Allowable transmission torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
(J)	K	L	CW	CCW	CW	CCW					
(6)	35.1 —	10	48.48 147.3	−37.67 523.74	13 969.92	31.74 −831.16	10.3	1.05	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	41.2	4.20	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	82.4	8.40	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	24.1	2.46	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	11.3	1.15	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	46.6	4.75	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	25.3	2.58	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	94.0	9.58	0.10~0.20	0.94 0.77	**MHP1.5-0601R** **MHP1.5-1060L**

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

② In the illustration, the area surrounded with—---— line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

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



B3

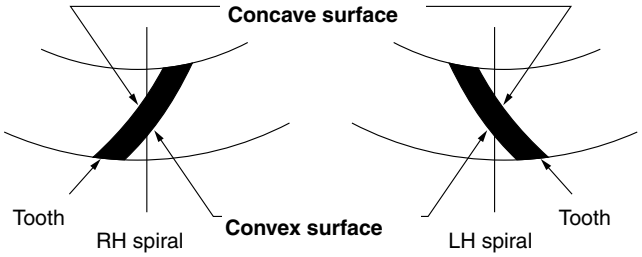
Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A_{H7}	B	C	D	E	F	G
MBSG2-4020R	2	***m*2**	40	R	B4	15	45	80	81.1	45	31.78	26.1
MBSG2-2040L			20	L	B3	12	35	40	44.1	55	28.16	16.02
MBSG2.5-4020R		***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

[Caution on Product Characteristics]
① Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ These gears produce axial thrust forces. Please see Page 284 for more details.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.

■ Contact Surface of Spiral Bevel Gears

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



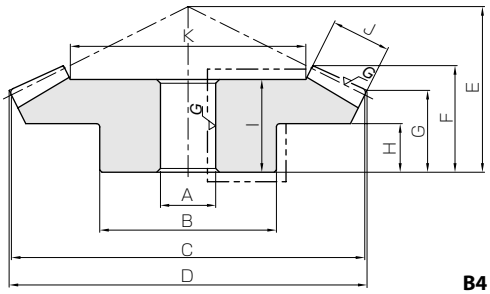
RH Spiral as a driving gear

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

LH Spiral as a driving gear

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

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



B4

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
18 13.75	29 27	14	52.7 25.39	56.5 28.2	94.2 47.1	5.76 2.88	9.61 4.80	0.04~0.10	0.57 0.18	**MBSG2-4020R** **MBSG2-2040L**
16 13.25	30 29	17	66.99 29.97	108 54.1	184 91.8	11.0 5.52	18.7 9.37	0.05~0.11	1.01 0.31	**MBSG2.5-4020R** **MBSG2.5-2040L**
20 18	35 36.5	20	80.28 36.56	185 92.4	318 159	18.8 9.42	32.4 16.2	0.06~0.12	1.64 0.56	**MBSG3-4020R** **MBSG3-2040L**
22 17.5	42 43	27	106.63 51.25	441 221	778 389	45.0 22.5	79.3 39.7	0.09~0.15	3.55 1.20	**MBSG4-4020R** **MBSG4-2040L**

[Caution on Secondary Operations] ①Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
②In the illustration, the area surrounded with ----- line is masked during the carburization process and can be modified. However, care should be exercised since the hardness is high (approx. HRC40, maximum).

■ Forces Acting on Spiral Bevel Gear Teeth

For a spiral bevel gear with shaft angle Σ=90° , pressure angle α_n=20° , and spiral angle β_m=35° , the tables below show the axial thrust force F_x and the radial force F_r when a tangential force F_t of 100 units is applied at the center of face width. For details, please refer to the section "Features of Tooth Surface Contact" in separate technical reference book.

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

(1) Forces acting upon pinion

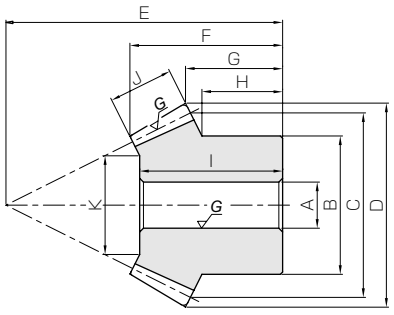
Contact Surface	Gear Ratio z_2/z_1						
	1.0	1.5	2.0	2.5	3.0	4.0	5.0
Concave Surface	80.9 − 18.1	82.9 − 1.9	82.5 8.4	81.5 15.2	80.5 20.0	78.7 26.1	77.4 29.8
Convex Surface	− 18.1 80.9	− 33.6 75.8	− 42.8 71.1	− 48.5 67.3	− 52.4 64.3	− 57.2 60.1	− 59.9 57.3

(2) Forces acting upon gear

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

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	Teeth induction hardened
Tooth hardness	50 ～ 60HRC



B3

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A_{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	44.10	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	26.30
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	88.50	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	15.80
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

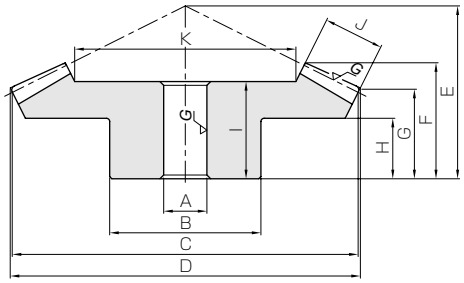
[Caution on Product Characteristics]

① Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.

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

③ These gears produce axial thrust forces. Please see Page 284 for more details.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.



B4

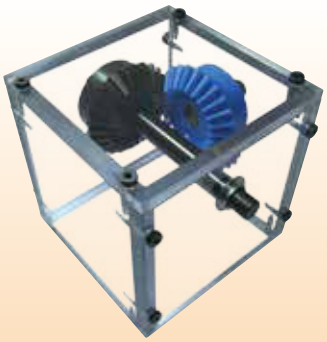
Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
15 11.67	23 22	11	37.56 21.34	14.1 9.61	14.2 9.44	1.44 0.98	1.44 0.96	0.05~0.11	0.26 0.13	**SBSG2-3020R** **SBSG2-2030L**
18 14.17	30 28	15	45.61 27.42	29.0 19.8	29.7 19.8	2.96 2.02	3.03 2.02	0.06~0.12	0.55 0.28	**SBSG2.5-3020R** **SBSG2.5-2030L**
17 20	31 37	17	57.14 34.71	48.4 33.1	50.4 33.6	4.94 3.37	5.14 3.42	0.07~0.13	0.82 0.49	**SBSG3-3020R** **SBSG3-2030L**
25 23.33	40 43	20	78.59 46.89	106 72.2	113 75.3	10.8 7.36	11.5 7.68	0.10~0.16	1.90 1.05	**SBSG4-3020R** **SBSG4-2030L**
18 18	27 32	15	48.46 20.92	25.5 12.8	26.7 13.4	2.60 1.30	2.73 1.36	0.05~0.11	0.51 0.19	**SBSG2-4020R** **SBSG2-2040L**
20 22.5	34 40	20	59.28 20.56	51.7 25.9	55.1 27.6	5.27 2.64	5.62 2.81	0.06~0.12	1.06 0.42	**SBSG2.5-4020R** **SBSG2.5-2040L**
24 27.5	38 47	22	73.81 29.61	84.8 42.5	91.9 46.0	8.65 4.33	9.38 4.69	0.07~0.13	1.67 0.69	**SBSG3-4020R** **SBSG3-2040L**
28 35	45 62	28	102.39 42.78	195 97.9	217 109	19.9 9.98	22.2 11.1	0.10~0.16	3.33 1.53	**SBSG4-4020R** **SBSG4-2040L**
17 14	26 29	15	59.04 19.13	34.8 11.2	28.1 9.38	3.55 1.14	2.87 0.96	0.05~0.11	0.60 0.095	**SBSG2-4515R** **SBSG2-1545L**
22 17.5	35 37	20	72.84 20.51	59.0 18.9		6.01 1.93	4.93 1.64	0.06~0.12	1.21 0.19	**SBSG2.5-4515R** **SBSG2.5-1545L**
20 21.33	35 44	23	88.18 28.54	99.3 31.8	82.5 27.5	10.1 3.24	8.41 2.80	0.07~0.13	1.99 0.34	**SBSG3-4515R** **SBSG3-1545L**

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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

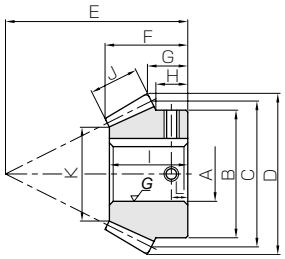
GCU-M Miter Gear Kit



Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

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



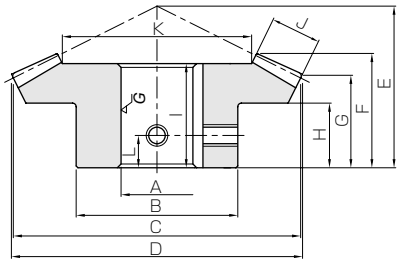
BK

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

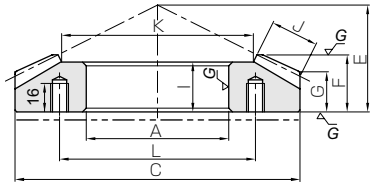
[Caution on Product Characteristics]

①The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ These gears produce axial thrust forces. See Page 284 for more details.
④ Although the dimensions of the keyway are made to the JIS (Js9) tolerance, there may be some deviations due to the effects of heat treatment.
⑤ For products having a tapped hole (Except for B7-shaped products), set screw is attached as an accessory.

Finished Bore Spiral Bevel Gears



B4

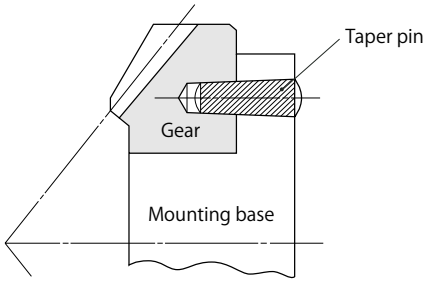


B7

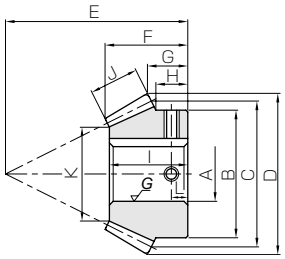
Face width	Holding surface dia.	Keyway	Set Screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
J	K	Width×Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
11	37.56	6 x 2.8 6 x 2.8	2–M5 2–M5	7	34.4	38.4	3.51	3.91	0.06~0.16	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**

[Caution on Secondary Operations] ① These products which are hardened by carburizing allow no secondary machining. However, for B7 type gear, the area surrounded with – – – – line (in the illustration) is masked during the carburization process and can be modified. Care should be exercised since the hardness is high (approx. HRC40, maximum).

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



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



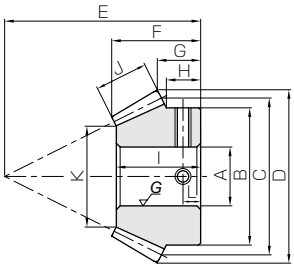
BK

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G	Hub width H	Length of bore I
MBSA2-4518R **MBSB2-4518R**	2.5	***m2***	45	R	B4	20 25	48	90	90.79	40	27.67	22.98	15	25
MBSA2-1845L **MBSB2-1845L**		***m2***	18	L	BK	12 16	32	36	40.42	60	28.54	15.88	14.2	27.5
MBSA2.5-4518R **MBSB2.5-4518R**		***m2.5***	45	R	B4	25 30	55	112.5	113.49	50	34.94	28.74	19	31
MBSA2.5-1845L **MBSB2.5-1845L**		***m2.5***	18	L	BK	15 20	40	45	50.35	72	33.19	16.82	14.75	31.5
MBSA3-4518R **MBSB3-4518R**		***m3***	45	R	B4	30 35	65	135	136.24	60	41.65	34.55	22	37
MBSA3-1845L **MBSB3-1845L**		***m3***	18	L	BK	20 25	48	54	60.69	85	37.82	18.84	16.3	36
MBSA4-4518R		***m4***	45	R	B7	80	—	180	—	55	29.77	21.25	—	25
MBSA4-1845L **MBSB4-1845L**		***m4***	18	L	BK	28 32	63	72	80.86	110	48.03	21.77	18.2	46
MBSA5-4518R		***m5***	45	R	B7	100	—	225	—	65	33.37	22.82	—	28
MBSA5-1845L **MBSB5-1845L**		***m5***	18	L	BK	35 42	80	90	101.07	135	57.3	24.71	20.5	54.5
MBSA6-4518R		***m6***	45	R	B7	110	—	270	—	75	36.97	24.19	—	30
MBSA6-1845L **MBSB6-1845L**		***m6***	18	L	BK	45 50	95	108	120.55	160	66.73	27.51	22.4	63
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

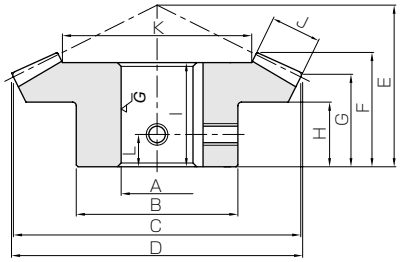
[Caution on Product Characteristics]

① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ These gears produce axial thrust forces. See Page 284 for more details.
④ Although the dimensions of the keyway are made to the JIS (Js9) tolerance, there may be some deviations due to the effects of heat treatment.
⑤ For products having a tapped hole (Except for B7-shaped products), set screw is attached as an accessory.

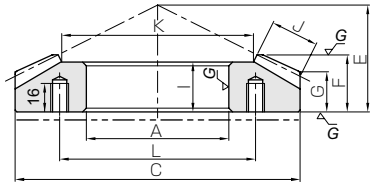
Finished Bore Spiral Bevel Gears



BT



B4

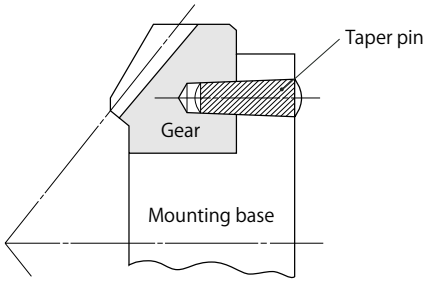


B7

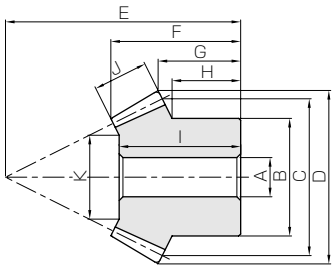
Face width	Holding surface dia.	Keyway	Set Screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
J	K	Width×Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
14	62.24	6 x 2.8 8 x 3.3	2–M5 2–M6	8	69.3	74.3	7.06	7.58	0.06~0.16	0.60 0.56	**MBSA2-4518R** **MBSB2-4518R**
14	23.11	4 x 1.8 5 x 2.3	2–M4 2–M4	7	27.2	29.7	2.77	3.03		0.14 0.12	**MBSA2-1845L** **MBSB2-1845L**
18	76.53	8 x 3.3 8 x 3.3	2–M6 2–M6	10	138	150	14.1	15.3	0.07~0.17	1.09 1.04	**MBSA2.5-4518R** **MBSB2.5-4518R**
18	26.82	5 x 2.3 6 x 2.8	2–M4 2–M5	8	54.1	59.9	5.52	6.11		0.26 0.22	**MBSA2.5-1845L** **MBSB2.5-1845L**
21	92.96	8 x 3.3 10 x 3.3	2–M6 2–M8	11	234	256	23.8	26.1	0.08~0.18	1.92 1.84	**MBSA3-4518R** **MBSB3-4518R**
21	33.41	6 x 2.8 8 x 3.3	2–M5 2–M6	9	91.8	103	9.36	10.5		0.41 0.36	**MBSA3-1845L** **MBSB3-1845L**
29	122.33	—	6-M10	110	567	630	57.8	64.3	0.12~0.27	3.92	**MBSA4-4518R**
29	45.83	8 x 3.3 10 x 3.3	2–M6 2–M8	10	223	252	22.7	25.7		0.89 0.82	**MBSA4-1845L** **MBSB4-1845L**
36	153.85	—	6-M10	130	1100	1240	112	126	0.14~0.34	6.82	**MBSA5-4518R**
36	56.13	10 x 3.3 12 x 3.3	2–M8 2–M8	11	433	495	44.2	50.5		1.68 1.50	**MBSA5-1845L** **MBSB5-1845L**
43	184.57	—	6-M10	140	1860	2150	190	219	0.16~0.36	11.1	**MBSA6-4518R**
43	66.44	14 x 3.8 14 x 3.8	2-M10 2-M10	12	731	859	74.6	87.6		2.66 2.48	**MBSA6-1845L** **MBSB6-1845L**
14	61.82	6 x 2.8 6 x 2.8	2–M5 2–M5	9	67.8	61.3	6.91	6.25	0.06~0.16	0.61 0.60	**MBSA2-4515R** **MBSB2-4515R**
14	16.46	— 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**

[Caution on Secondary Operations] ① These products which are hardened by carburizing allow no secondary machining. However, for B7 type gear, the area surrounded with – – – – line (in the illustration) is masked during the carburization. process and can be modified. Care should be exercised since the hardness is high (approx. HRC40, maximum).

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



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



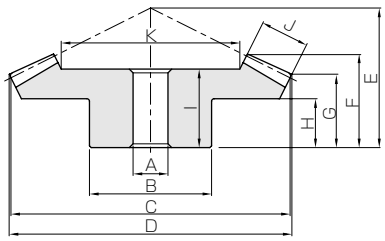
B3

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G
SBS2-3020R	1.5	***m2***	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		***m2.5***	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		***m3***	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		***m4***	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		***m5***	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	***m1***	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		***m1.5***	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		***m2***	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		***m2.5***	40	R	B4	15	50	100	101.27	55	39.65	31.27
SBS2.5-2040L			20	L	B3	12	40	50	55.21	75	43.61	26.30
SBS3-4020R		***m3***	40	R	B4	20	60	120	121.48	65	45.76	36.48
SBS3-2040L			20	L	B3	16	50	60	66.06	90	50.63	31.52
SBS4-4020R		***m4***	40	R	B4	20	70	160	162.07	80	53.69	42.07
SBS4-2040L			20	L	B3	20	60	80	88.50	120	66.24	42.12
SBS5-4020R		***m5***	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	***m2.5***	36	R	B4	15	55	90	91.29	43	28.38	21.79
SBS2.5-1836L			18	L	B3	12	38	45	50.30	64	34.06	20.32
SBS3-3618R		***m3***	36	R	B4	20	60	108	109.53	52	34.82	26.53
SBS3-1836L			18	L	B3	16	46	54	60.28	75	39.79	22.57
SBS4-3618R		***m4***	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	***m2***	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		***m2.5***	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		***m3***	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		***m4***	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		***m5***	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

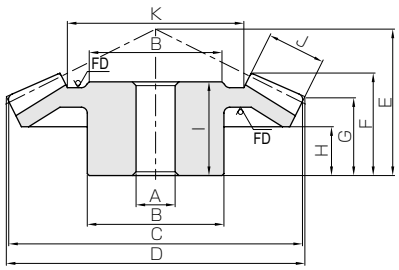
[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ These gears produce axial thrust forces. See Page 284 for more details.
④ Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.

Spiral Bevel Gears



B4



B5

∗ FD has die-forged finish.

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

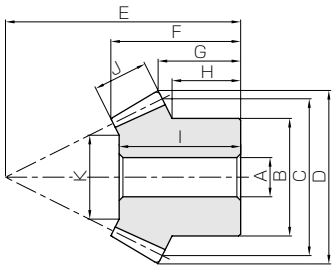
[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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

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

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



B3

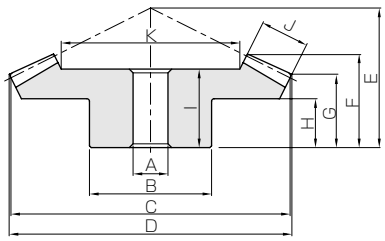
Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G
SBS2-4515R	3	***m*2**	45	R	B4	12	40	90	90.67	40	30.29	26.01
SBS2-1545L			15	L	B3	10	24	30	34.78	60	29.66	15.80
SBS2.5-4515R		***m*2.5**	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	69.30	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

[Caution on Product Characteristics]

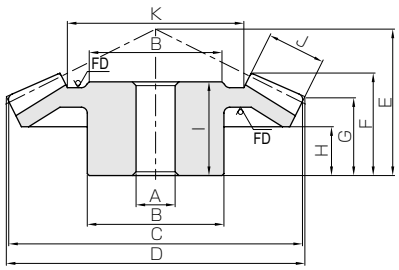
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ These gears produce axial thrust forces. See Page 284 for more details.
④ Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.

* For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.

Spiral Bevel Gears



B4



B5

∗ FD has die-forged finish.

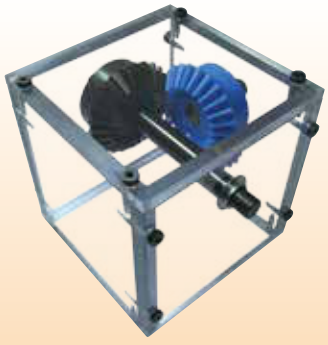
Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
17 14	26 29	15	59.04 19.13	31.7 10.1	18.8 6.27	3.23 1.03	1.92 0.64	0.06~0.16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

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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).

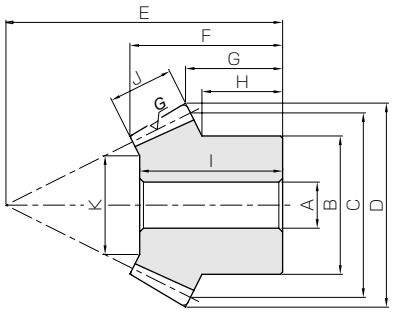
GCU-M Miter Gear Kit



Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

Specifications	
Precision grade	JIS B 1704 : 1978 grade 2
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	Teeth induction hardened
Tooth hardness	50 ~ 60HRC



B3

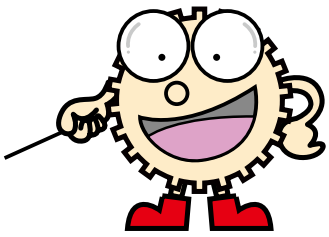
Catalog No.	Gear ratio	Module	No. of teeth	Helix angle	Direction of spiral	Shape	Bore A	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G
SBZG2-3020R	1.5	***m*2**	30	7°	R	B4	10	35	60	62.16	40	26.48	21.62
SBZG2-2030L			20		L	B3	10	30	40	44.18	45	25.05	16.39
SBZG2.5-3020R		***m*2.5**	30	7°	R	B4	15	45	75	77.77	50	33.69	27.08
SBZG2.5-2030L			20		L	B3	12	35	50	55.23	55	31.05	19.24
SBZG3-3020R		***m*3**	30	7°	R	B4	15	50	90	93.27	55	35.01	27.45
SBZG3-2030L			20		L	B3	15	45	60	66.32	70	40.50	27.11
SBZG2-4020R	2	***m*2**	40	9°	R	B4	12	40	80	81.58	45	31.91	26.58
SBZG2-2040L			20		L	B3	12	32	40	44.76	60	34.15	21.19
SBZG2.5-4020R		***m*2.5**	40	9°	R	B4	15	50	100	102.01	55	39.16	32.01
SBZG2.5-2040L			20		L	B3	12	40	50	55.99	75	43.77	26.50
SBZG3-4020R		***m*3**	40	9°	R	B4	20	60	120	122.31	65	45.30	37.31
SBZG3-2040L			20		L	B3	16	50	60	67.21	90	50.81	31.80

[Caution on Product Characteristics]
① Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ It produces an axial thrust force, which has the same direction as straight bevel gears. For details, see separate technical reference book (Page 108).

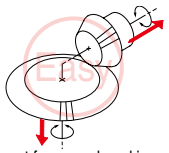
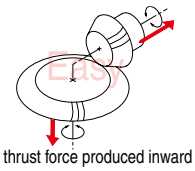
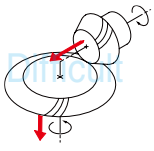
■ Features of Zerol Bevel Gears

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

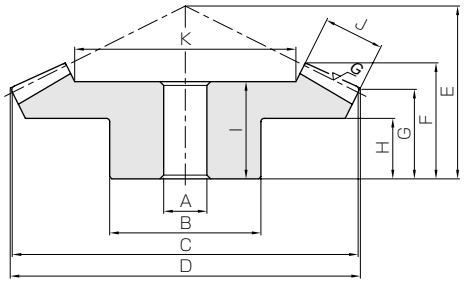
- Allows compact design as no inward thrust force (＊ Reference to the figure) is produced, which causes problems when using spiral Bevel gears.
- Unlike straight Bevel gears, Zerol Bevel Gears can be ground finished, allowing higher precision, wear-resistance and are quieter, compared with straight Bevel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



■ Performance Comparison

Gear Type	Bearing Design ＊	Interchangeability Mounting Distance	Precision JIS B 1704 : 1978	Strength Bending Strength	Durability Surface Durability	Noise/Vibration Surface Roughness/Total Contact Ratio	Price for single item
Bevel Gears  SB2-4020/2040	 No thrust force produced inward	Many SUB、PB、SBZG	Normal grade 3	Normal 24.2N・m /12.2N・m	Bad 2.92N・m /1.46N・m	Normal 3.2a/1.63	Low
Ground Zerol Bevel Gears  SBZG2-4020R/2040L	 No thrust force produced inward	Many SB、SUB、PB	Good grade 2	Normal 26.0N・m /13.1N・m	Good 18.4N・m /9.18N・m	Low 0.4a/1.84	Normal
Ground Spiral Bevel Gears  MBSG2-4020R/2040L	 Thrust force produced inward	None —	Good grade 2	Strong 56.5N・m /28.2N・m	Good 94.2N・m /47.1N・m	Low 0.4a/3.13	Normal

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



B4

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
15	23	11	37.56	14.3	8.88	1.46	0.91	0.05~0.11	0.27	**SBZG2-3020R**
11.67	22	11	21.34	9.89	5.92	1.01	0.60		0.14	**SBZG2-2030L**
18	30	15	45.61	29.4	18.8	3.00	1.92	0.06~0.12	0.55	**SBZG2.5-3020R**
12.5	28	15	27.42	20.4	12.5	2.08	1.28		0.25	**SBZG2.5-2030L**
17	31	17	57.14	51.7	31.6	5.27	3.22	0.07~0.13	0.84	**SBZG3-3020R**
20	37	17	34.71	35.8	21.1	3.65	2.15		0.50	**SBZG3-2030L**
18	27	15	48.46	26.0	18.4	2.66	1.87	0.05~0.11	0.52	**SBZG2-4020R**
18	32	15	20.92	13.1	9.18	1.33	0.94		0.19	**SBZG2-2040L**
20	35	20	60.28	55.6	38.5	5.67	3.92	0.06~0.12	1.10	**SBZG2.5-4020R**
22.5	41	20	24.56	27.9	19.2	2.85	1.96		0.40	**SBZG2.5-2040L**
24	38	22	73.81	96.3	62.8	9.82	6.40	0.07~0.13	1.69	**SBZG3-4020R**
27.5	47	22	29.61	48.4	31.4	4.93	3.20		0.70	**SBZG3-2040L**

[Caution on Secondary Operations]

① Please read "Cautions on Performing Secondary Operations" (Page 284) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

② Due to gear teeth induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 1to 2 mm).

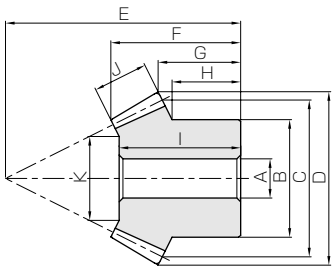
＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.

GCU-M Miter Gear Kit

Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

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

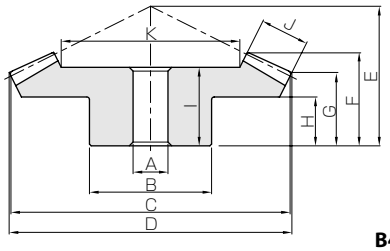


B3

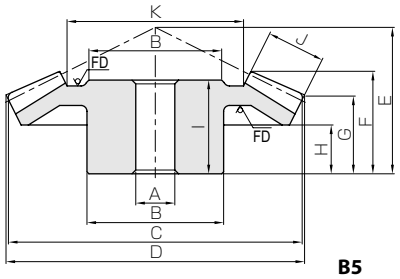
Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{H7}	B	C	D	E	F	G	H
SB1.5-3020	1.5	***m*1.5**	30	B4	10	30	45	46.24	28	18.53	13.93	8
SB1.5-2030			20	B3	8	25	30	33.13	33	18.63	11.54	8.83
SB2-3020		***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	183.49	90	62.56	48.49	28
SB6-1530			15	B3	25	70	90	104.44	125	68.48	38.61	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	61.23	75	40.01	22.81	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

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ For convenience in handling, BT Shaped Gears have tapped holes on their holding surface. To find the L dimensions and tap sizes, please refer to Page 284.

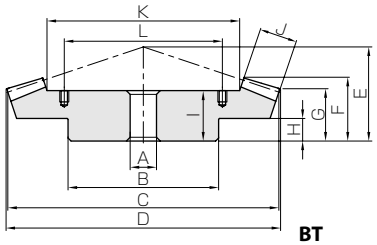
Steel Bevel Gears



B4



B5



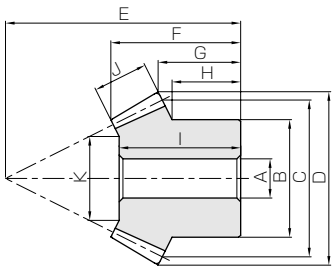
BT

∗ FD has die-forged finish.

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
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		45.48	174	18.5	17.7	1.88		1.94	**SB6-1530**
24	16	57.72	35.9	4.08	3.66	0.42	0.07~0.17	0.72	**SB2.5-3618**
32		25.44	18.1	2.04	1.84	0.21		0.27	**SB2.5-1836**
30	20	68.28	63.7	7.34	6.49	0.75	0.08~0.18	1.15	**SB3-3618**
37		28.56	32.0	3.67	3.27	0.37		0.44	**SB3-1836**
42	26	91.86	149	17.7	15.2	1.80	0.12~0.27	2.66	**SB4-3618**
49		39.72	74.8	8.85	7.62	0.90		1.04	**SB4-1836**
12	6	26.58	2.61	0.29	0.27	0.03	0.03~0.13	0.068	**SB1-4020**
12		9.17	1.32	0.15	0.13	0.02		0.019	**SB1-2040**
16	8	33.61	5.33	0.61	0.54	0.06	0.04~0.14	0.14	**SB1.25-4020**
17		13.22	2.69	0.31	0.27	0.03		0.046	**SB1.25-2040**
22	10	39.64	9.47	1.11	0.97	0.11	0.05~0.15	0.27	**SB1.5-4020**
24		17.28	4.77	0.56	0.49	0.06		0.089	**SB1.5-2040**
27	15	48.46	24.2	2.92	2.46	0.30	0.06~0.16	0.51	**SB2-4020**
32		20.92	12.2	1.46	1.24	0.15		0.19	**SB2-2040**
35	20	60.28	49.0	6.04	4.99	0.62	0.07~0.17	1.09	**SB2.5-4020**
41		24.56	24.7	3.02	2.52	0.31		0.40	**SB2.5-2040**
38	22	73.81	80.4	10.1	8.20	1.03	0.08~0.18	1.68	**SB3-4020**
47		29.61	40.5	5.06	4.13	0.52		0.70	**SB3-2040**
45	28	102.39	185	24.1	18.9	2.46	0.12~0.27	3.34	**SB4-4020**
62		42.78	93.3	12.0	9.51	1.23		1.47	**SB4-2040**
50	30	138.92	327	43.9	33.3	4.47	0.14~0.34	5.63	**SB5-4020**
63		57.84	165	21.9	16.8	2.24		2.67	**SB5-2040**
58	40	158.56	600	83.2	61.2	8.48	0.16~0.36	7.77	**SB6-4020**
70		61.11	302	41.6	30.8	4.24		4.08	**SB6-2040**
61	50	219.2	1350	196	138	20.0	0.20~0.45	25.75	**SBY8-4020**
90		96.39	679	98.1	69.3	10.0		9.41	**SBY8-2040**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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

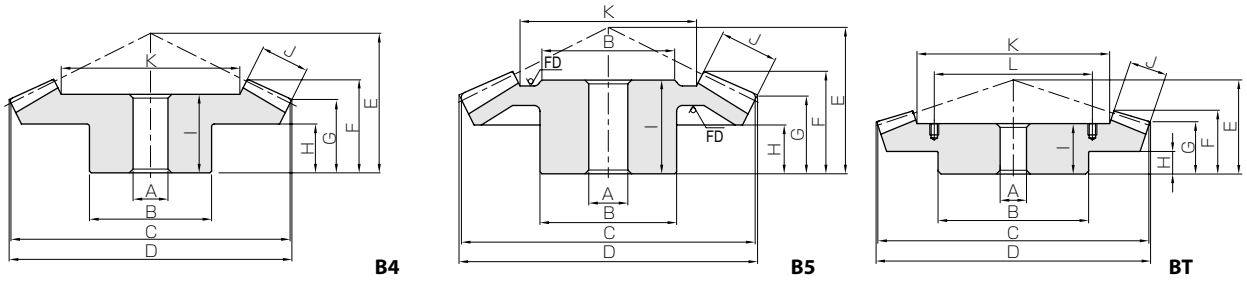


B3

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{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	23.33
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

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ For convenience in handling, BT Shaped Gears have tapped holes on their holding surface. To find the L dimensions and tap sizes, please refer to Page 284.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.



∗ FD has die-forged finish.

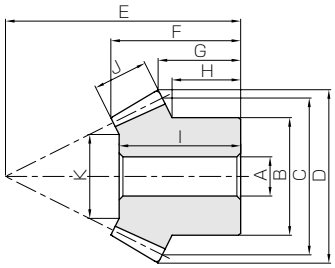
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
15	7	30.73	3.35	0.35	0.34	0.04	0.03~0.13	0.11	**SB1-4518**
15.5		10.31	1.33	0.14	0.14	0.01		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**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

SB・SBY Steel Bevel Gears

Module 1.5 ～ 6

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



B3

Catalog No.	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 length 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	71.10	150	62.03	31.39	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

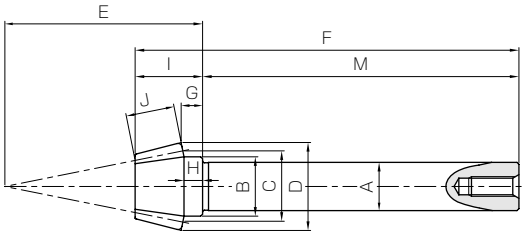
[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ For convenience in handling, BT Shaped Gears have tapped holes on their holding surface. To find the L dimensions and tap sizes, please refer to Page 284.

SB Steel Bevel Gears & Pinion Shafts

Module 1.5 ～ 3

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

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

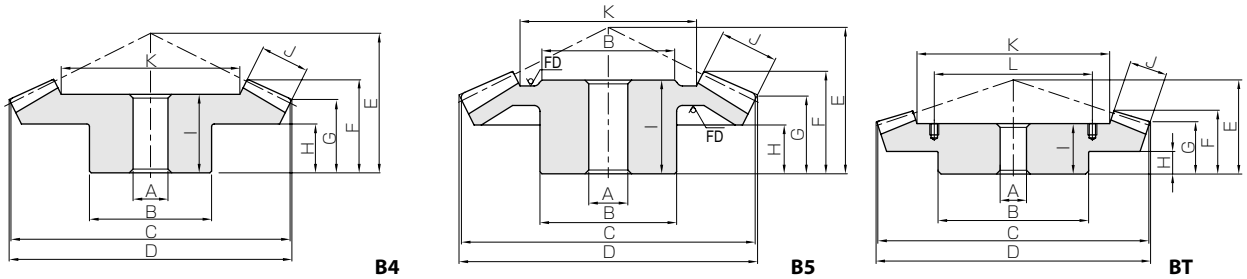


B8

Catalog No.	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 length G	Hub width H	Length of bore・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	24
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

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

Steel Bevel Gears



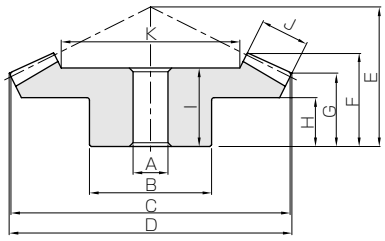
B4 B5 BT

∗ FD has die-forged finish.

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
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**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

Steel Bevel Gears & Pinion Shafts

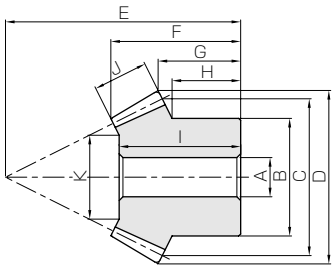


B4

Face width	Holding surface dia.	Shaft length	Screw size	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog No.
J	K	M		Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
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**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

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

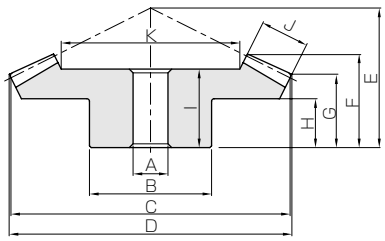


B3

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width
					A_{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	23.20	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

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.

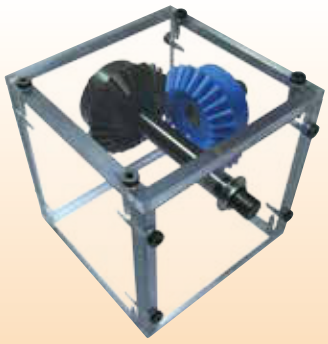


B4

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

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

GCU-M Miter Gear Kit

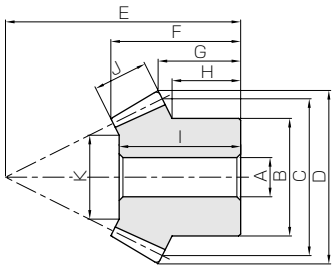


Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

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

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



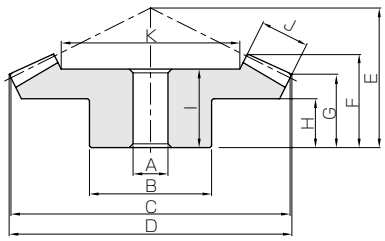
B3

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore A	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G	Hub width 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	23.20	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

[Caution on Product Characteristics]

① Significant variations in temperature or humidity can cause dimensional changes in plastic gears (MC Nylon gears), including bore size (H8 when produced), tooth diameter, and backlash. Please see the section "Design of Plastic Gears" in separate technical reference book. (Page 101).
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see page 283 for more details.
③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ Without lubrication, using plastic gears in pairs may generate heat and dilation. It is recommended to mate them with steel gears.

＊ For products not categorized in our KHK Stock Gear series, custom gear production services with short lead times is available. For details see Page 8.



B4

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

[Caution on Secondary Operations]

① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

② Plastic gears are susceptible to the effects of temperature and moisture. Dimensional changes may occur while performing secondary operations and during post-machining operations.

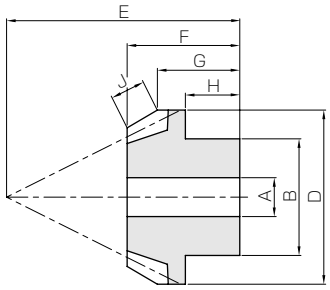
GCU-M Miter Gear Kit

Installment : Intersecting axes gears
Gear Type : Miter Gears
Gears : SM2-25
PM2-25
Gear Ratio : 1
Weight : Approx. 1kg

Use of bevel gears allows the changing of the shaft angle by 90 degrees. Applications include the changing of the direction of power.

DB Injection Molded Bevel Gears

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



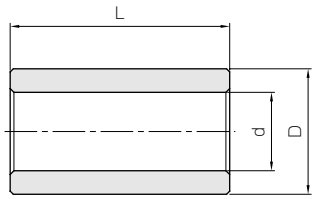
B1

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
					A	B	C	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

[Caution on Product Characteristics]
① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 283 for more details.
② The bore tolerance is generally -0.05 to -0.3 but may be + values at the central portion of the hole.
③ To find the dimensional tolerance of these gears, please see the Dimensional Tolerance Table.

BB Sintered Metal Bushings

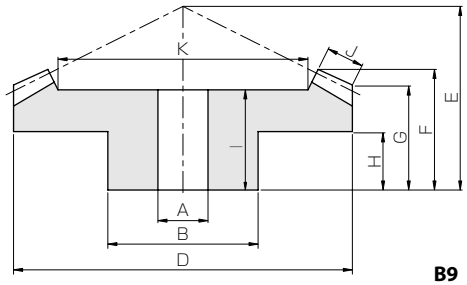
The table shows a series of standard metal bushings that can be pressed into standard Injection Molded Gears. They can be used as bearing metal on idler gears or to reduce the bore of the gears.



T8

Catalog No.	I.D. of bushing	O.D. of bushing	Length	Products that can use the bushing
	d $^{+0.02}_{0}$	D $^{+0.02}_{-0.01}$	L $^{0}_{-0.3}$	
BB30507	3	5	7	DB0.8
BB40612	4	6	12	DB1

Material : Oil impregnated sintered bronze.



B9

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash	Weight	Catalog No.
H	I	J	K	Bending strength	Bending strength	(mm)	(g)	
4 4	7 —	2.5	14.41 —	0.24 0.092	0.025 0.0094	0 ~ 0.30	2.00 0.54	**DB0.5-4020** **DB0.5-2040**
6 5	10 —	3.5	24.17 —	0.91 0.34	0.093 0.035	0 ~ 0.48	6.26 1.87	**DB0.8-4020** **DB0.8-2040**
7.5 7	12.5 —	4.5	30.44 —	1.59 0.60	0.16 0.061	0 ~ 0.60	11.9 3.54	**DB1-4020** **DB1-2040**

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

■ **Dimensional tolerance table (Unit : mm)**

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

Ground Spiral Bevel Gears

■ Catalog Number of NISSEI Spiral Bevel Gears

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

KSP 031 001 G F L

- L — Hand of Spiral (L)
- F — Products Shape (Finished Shape)
- G — Surface finish (Ground)
- 001 — Gear Ratio (1)
- 031 — OD of the Larger gear (31 mm)
- KSP — Type (Spiral Miter Gears)

■ The Characteristics of KSP Spiral Bevel Gears

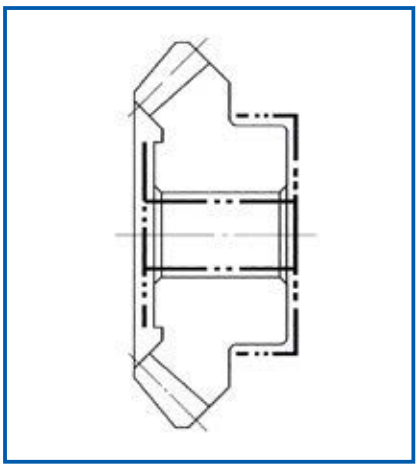
1. JIS Grade 0, high strength, high precision products
2. Superior performance with regard to high speed, low noise, and low vibration.
3. Module range from 1.5 to 6
4. Three gear ratios: 1, 1.5 and 2

■ Products Style

Type F - Finished Style

Type U - Hub masked to Allow Secondary Operations

※ The heavy lines in the figure below indicate the masked areas during carburizing.



■ Notes about the Transmission Capability Table

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

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

■ Service Factor *Sf*

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

■ Transmission Capability Table（Speed Ratio: 1）

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

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

■ Transmission Capability Table（Speed Ratio: 1.5）

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

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

■ Transmission Capability Table（Speed Ratio: 2）

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

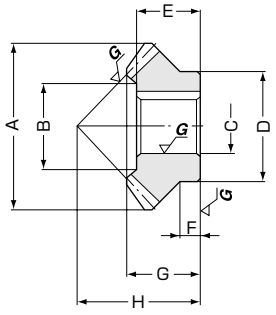
Model \ Pinion Rotation(rpm)	50	100	300	600	900	1200	1800	3000
KSP039002	0.025	0.049	0.142	0.275	0.404	0.528	0.770	1.23
	9.63	9.45	9.07	8.76	8.57	8.41	8.17	7.83
KSP056002	0.075	0.147	0.423	0.814	1.19	1.55	2.26	3.59
	28.8	28.1	27.0	26.0	25.3	24.8	23.9	22.8
KSP075002	0.185	0.361	1.03	1.98	2.89	3.76	5.45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

KSP
Nissei Ground Spiral Miter Gears

Module 1.5 ～ 6

Specifications	
Precision grade	JIS B 1704 : 1978 grade 0
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415＊
Heat treatment	Overall carburizing
Tooth hardness	60 ～ 63HRC ＊＊

＊ Module 3.5 and larger are made of SCM420.
＊＊ Tooth Hardness for module 2 and 2.5 is between 80 to 83 HRA.



A

Catalog No.	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	Length of bore E
KSP031001GF L **KSP031001GF R**	1	***m*1.5**	20	L R	30	7	A	30.5	16.2	12	22	13
KSP040001GF L **KSP040001GF R**		***m*2**	20	L R	40	9	B	40	22.5	14	31	14
KSP053001GF L **KSP053001GF R**		***m*2.5**	21	L R	52.5	12	B	53	31	19	38	20
KSP066001GF L **KSP066001GF R**		***m*3**	21	L R	63	15	B	65	33.6	23	47	25
KSP078001GF L **KSP078001GF R**		***m*3.5**	22	L R	77	18	B	78	43.1	27	54	27
KSP092001GF L **KSP092001GF R**		***m*4**	22	L R	88	21	B	91	48.6	30	63	32
KSP105001GF L **KSP105001GF R**		***m*4.5**	23	L R	103.5	25	C	105	50	32	70	35
KSP132001GF L **KSP132001GF R**		***m*5**	26	L R	130	29	C	132	64	36	82	41
KSP157001GF L **KSP157001GF R**		***m*5.5**	28	L R	154	34	C	157	76	40	92	47
KSP184001GF L **KSP184001GF R**		***m*6**	30	L R	180	38	C	184	84	48	101	51

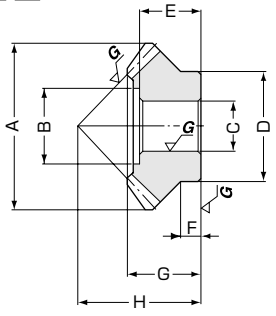
[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 317 to kgf/m, according to assumed usage conditions.
② These gears produce axial thrust forces. See Page 254 for more details.

KSP
Nissei Ground Spiral Miter Gears

Module 1.5 ～ 6

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

＊ Module 3.5 and larger are made of SCM420.
＊＊ Tooth Hardness for module 2 and 2.5 is between 80 to 83 HRA.

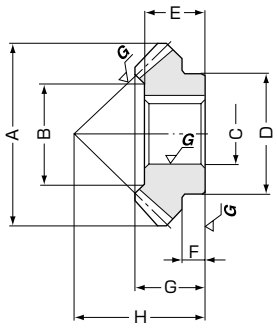


A

Catalog No.	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	Length of bore E
KSP031001GU L **KSP031001GU R**	1	***m*1.5**	20	L R	30	7	A	30.5	16.5	10	22	13
KSP040001GU L **KSP040001GU R**		***m*2**	20	L R	40	9	B	40	22.5	12	31	14
KSP053001GU L **KSP053001GU R**		***m*2.5**	21	L R	52.5	12	B	53	31	14	38	20
KSP066001GU L **KSP066001GU R**		***m*3**	21	L R	63	15	B	65	33.5	16	47	25
KSP078001GU L **KSP078001GU R**		***m*3.5**	22	L R	77	18	B	78	43	20	54	27
KSP092001GU L **KSP092001GU R**		***m*4**	22	L R	88	21	B	91	49	22	63	32
KSP105001GU L **KSP105001GU R**		***m*4.5**	23	L R	103.5	25	C	105	50	26	70	35
KSP132001GU L **KSP132001GU R**		***m*5**	26	L R	130	29	C	132	64	30	82	41
KSP157001GU L **KSP157001GU R**		***m*5.5**	28	L R	154	34	C	157	76	32	92	47
KSP184001GU L **KSP184001GU R**		***m*6**	30	L R	180	38	C	184	84	40	101	51

[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 317 to kgf/m, according to assumed usage conditions.
② These gears produce axial thrust forces. See Page 254 for more details.

Ground Spiral Miter Gears



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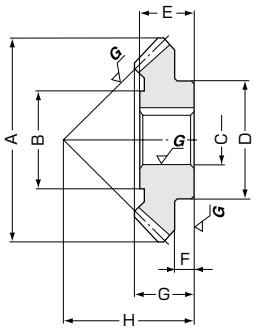


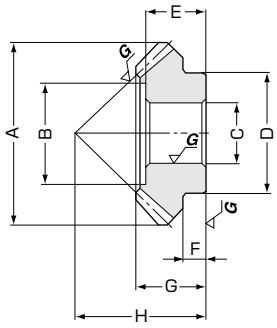
C

Hub width F	Total length G	Mounting distance H	Keyway	Allowable torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
6	15	25	4 x 1.8	0.61	0 ~0.05	0.04	**KSP031001GF L KSP031001GF R**
7	16.5	30	5 x 2.3	1.59	0 ~0.05	0.08	**KSP040001GF L KSP040001GF R**
8	22.8	40	6 x 2.8	3.63	0.05~0.10	0.18	**KSP053001GF L KSP053001GF R**
13	29.5	50	7 x 3	6.26	0.05~0.10	0.34	**KSP066001GF L KSP066001GF R**
12	32	57	8 x 3.3	9.74	0.05~0.10	0.54	**KSP078001GF L KSP078001GF R**
14	38	66	8 x 3.3	15.1	0.05~0.10	0.88	**KSP092001GF L KSP092001GF R**
14	39	72	10 x 3.3	23.9	0.05~0.10	1.25	**KSP105001GF L KSP105001GF R**
14	45	88	10 x 3.3	38.4	0.05~0.10	2.39	**KSP132001GF L KSP132001GF R**
20	53.5	105	12 x 3.3	60.1	0.05~0.10	3.71	**KSP157001GF L KSP157001GF R**
17	56.5	118	14 x 3.8	85.8	0.05~0.10	5.55	**KSP184001GF L KSP184001GF R**

[Caution on Secondary Operations] ① No secondary operations can be performed on these precision finished gears due to the applied carburizing process.

KSP

Ground Spiral Miter Gears



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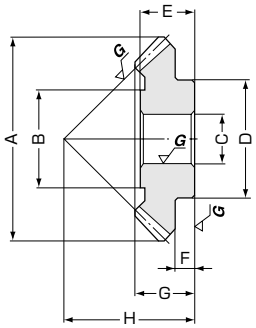


C

Hub width F	Total length G	Mounting distance H	Machinable max. bore	Allowable gear torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
6	15	25	12	0.61	0 ~0.05	0.04	**KSP031001GU L KSP031001GU R**
7	16.5	30	16	1.59	0 ~0.05	0.09	**KSP040001GU L KSP040001GU R**
8	22.8	40	22	3.63	0.05~0.10	0.21	**KSP053001GU L KSP053001GU R**
13	29.5	50	25	6.26	0.05~0.10	0.39	**KSP066001GU L KSP066001GU R**
12	32	57	32	9.74	0.05~0.10	0.59	**KSP078001GU L KSP078001GU R**
14	38	66	38	15.1	0.05~0.10	0.96	**KSP092001GU L KSP092001GU R**
14	39	72	40	23.9	0.05~0.10	1.33	**KSP105001GU L KSP105001GU R**
14	45	88	48	38.4	0.05~0.10	2.49	**KSP132001GU L KSP132001GU R**
20	53.5	105	55	60.1	0.05~0.10	3.90	**KSP157001GU L KSP157001GU R**
17	56.5	118	62	85.8	0.05~0.10	5.79	**KSP184001GU L KSP184001GU R**

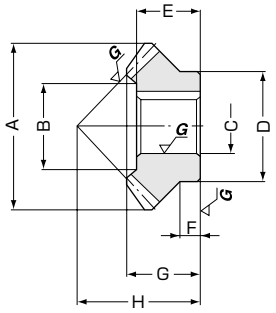
[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

KSP
Nissei Ground Spiral Bevel Gears

Module 2 ～ 5

Specifications	
Precision grade	JIS B 1704 : 1978 grade 0
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415＊
Heat treatment	Overall carburizing
Tooth hardness	60 ～ 63HRC ＊＊

＊ Module 3.5 and larger are made of SCM420.
＊＊ Tooth Hardness for module 2 and 2.5 is between 80 to 83 HRA.



A

Catalog No.	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	Length of bore E
KSP0481.5GF P **KSP0481.5GF G**	1.5	***m2***	16 24	L R	32 48	9	A B	34 48	17.5 30.4	12 15	24 30	13 17
KSP0611.5GF P **KSP0611.5GF G**		***m2.25***	18 27	L R	40.5 60.75	12	A B	42 61	22.4 36.3	15 20	30 40	17 20
KSP0741.5GF P **KSP0741.5GF G**		***m2.75***	18 27	L R	49.5 74.25	15	A B	52 74	28.8 44.5	20 25	40 50	20 25
KSP0901.5GF P **KSP0901.5GF G**		***m3***	20 30	L R	60 90	18	B B	63 90	34.1 54.7	22 27	44 56	24 29
KSP1051.5GF P **KSP1051.5GF G**		***m3.5***	20 30	L R	70 105	21	B C	74 105	37.8 53	25 30	50 63	25 32
KSP1241.5GF P **KSP1241.5GF G**		***m3.75***	22 33	L R	82.5 123.75	24	B C	87 124	46.6 64	27 33	56 69	29 35
KSP1411.5GF P **KSP1411.5GF G**		***m4.25***	22 33	L R	93.5 140.25	28	B C	99 141	52.9 68	30 36	63 73	32 41
KSP1631.5GF P **KSP1631.5GF G**		***m4.5***	24 36	L R	108 162	32	B C	113 163	64.6 76	33 40	69 82	35 47
KSP1811.5GF P **KSP1811.5GF G**		***m5***	24 36	L R	120 180	35	B C	126 181	71.8 86	36 45	73 90	41 48

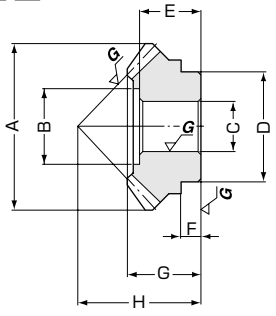
[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 317 to kgf/m, according to assumed usage conditions.
② These gears produce axial thrust forces. See Page 284 for more details.

KSP
Nissei Ground Spiral Bevel Gears

Module 2 ～ 5

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

＊ Module 3.5 and larger are made of SCM420.
＊＊ Tooth Hardness for module 2 and 2.5 is between 80 to 83 HRA.

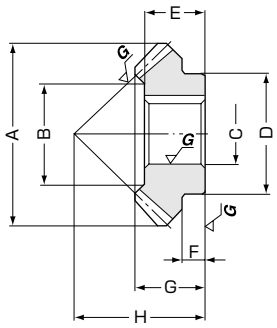


A'

Catalog No.	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	Length of bore E
KSP0481.5GU P **KSP0481.5GU G**	1.5	***m2***	16 24	L R	32 48	9	A' B	34 48	17.5 30	10 12	24 30	13 17
KSP0611.5GU P **KSP0611.5GU G**		***m2.25***	18 27	L R	40.5 60.75	12	A' B	42 61	22 36	12 14	30 40	17 20
KSP0741.5GU P **KSP0741.5GU G**		***m2.75***	18 27	L R	49.5 74.25	15	A' B	52 74	27 44.5	14 20	40 50	20 25
KSP0901.5GU P **KSP0901.5GU G**		***m3***	20 30	L R	60 90	18	B B	63 90	34 54.5	16 20	44 56	24 29
KSP1051.5GU P **KSP1051.5GU G**		***m3.5***	20 30	L R	70 105	21	B C	74 105	38 53	20 22	50 63	25 32
KSP1241.5GU P **KSP1241.5GU G**		***m3.75***	22 33	L R	82.5 123.75	24	B C	87 124	46.5 64	20 26	56 69	29 35
KSP1411.5GU P **KSP1411.5GU G**		***m4.25***	22 33	L R	93.5 140.25	28	B C	99 141	53 68	22 30	63 73	32 41
KSP1631.5GU P **KSP1631.5GU G**		***m4.5***	24 36	L R	108 162	32	B C	113 163	64.5 76	26 32	69 82	35 47
KSP1811.5GU P **KSP1811.5GU G**		***m5***	24 36	L R	120 180	35	B C	126 181	71.5 86	30 38	73 90	41 48

[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 317 to kgf/m, according to assumed usage conditions.
② These gears produce axial thrust forces. See Page 284 for more details.

Ground Spiral Bevel Gears



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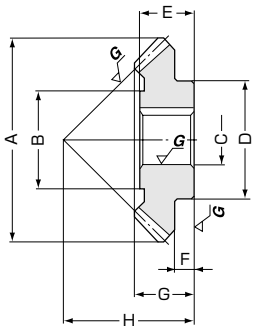
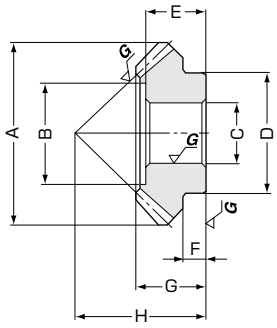


C

Hub width F	Total length G	Mounting distance H	Keyway	Allowable gear torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
4.3 7	14.5 19	31 30	4 x 1.8 5 x 2.3	2.02	0 ~0.05	0.05 0.13	**KSP0481.5GF P** **KSP0481.5GF G**
5.1 10	19 23.5	39 37	5 x 2.3 6 x 2.8	4.12	0.05~0.10	0.09 0.25	**KSP0611.5GF P** **KSP0611.5GF G**
5.7 12	22 29	46 45	6 x 2.8 7 x 3	7.15	0.05~0.10	0.17 0.45	**KSP0741.5GF P** **KSP0741.5GF G**
8 13	26.5 33	56 53	6 x 2.8 8 x 3.3	11.9	0.05~0.10	0.29 0.79	**KSP0901.5GF P** **KSP0901.5GF G**
7 13	28.5 34	63 57	7 x 3 8 x 3.3	17.8	0.05~0.10	0.43 1.09	**KSP1051.5GF P** **KSP1051.5GF G**
7 14	33 36.5	74 64	8 x 3.3 10 x 3.3	26.0	0.05~0.10	0.76 1.59	**KSP1241.5GF P** **KSP1241.5GF G**
7 17	36 43.5	82 74	8 x 3.3 10 x 3.3	39.2	0.05~0.10	1.07 2.35	**KSP1411.5GF P** **KSP1411.5GF G**
7 19	38.5 49.5	92 85	10 x 3.3 12 x 3.3	56.5	0.05~0.10	1.50 3.70	**KSP1631.5GF P** **KSP1631.5GF G**
10 19	45.5 50.5	105 90	10 x 3.3 14 x 3.8	72.4	0.05~0.10	2.12 4.65	**KSP1811.5GF P** **KSP1811.5GF G**

[Caution on Secondary Operations] ① No secondary operations can be performed on these precision finished gears due to the applied carburizing process.

Ground Spiral Bevel Gears



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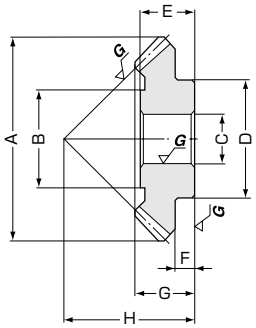


C

Hub width F	Total length G	Mounting distance H	Machinable max. bore	Allowable gear torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
4.5 7	14.5 19	31 30	10 20	2.02	0 ~0.05	0.05 0.14	**KSP0481.5GU P** **KSP0481.5GU G**
5.5 10	19 23.5	39 37	16 27	4.12	0.05~0.10	0.10 0.28	**KSP0611.5GU P** **KSP0611.5GU G**
5.6 12	22 29	46 45	20 35	7.15	0.05~0.10	0.20 0.49	**KSP0741.5GU P** **KSP0741.5GU G**
8 13	26.5 33	56 53	25 42	11.9	0.05~0.10	0.34 0.84	**KSP0901.5GU P** **KSP0901.5GU G**
7 13	28.5 34	63 57	28 42	17.8	0.05~0.10	0.47 1.18	**KSP1051.5GU P** **KSP1051.5GU G**
7 14	33 36.5	74 64	36 48	26.0	0.05~0.10	0.80 1.71	**KSP1241.5GU P** **KSP1241.5GU G**
7 17	36 43.5	82 74	42 50	39.2	0.05~0.10	1.15 2.46	**KSP1411.5GU P** **KSP1411.5GU G**
7 19	38.5 49.5	92 85	48 55	56.5	0.05~0.10	1.64 3.84	**KSP1631.5GU P** **KSP1631.5GU G**
10 19	45.5 50.5	105 90	55 60	72.4	0.05~0.10	2.21 4.85	**KSP1811.5GU P** **KSP1811.5GU G**

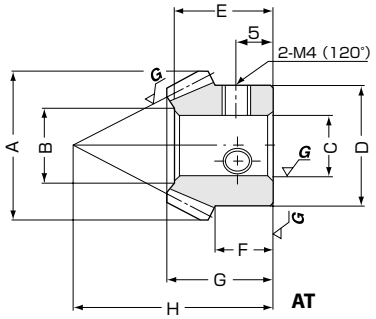
[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

KSP
Nissei Ground Spiral Bevel Gears

Module 1.5 ～ 4.5

Specifications	
Precision grade	JIS B 1704 : 1978 grade 0
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415＊
Heat treatment	Overall carburizing
Tooth hardness	60 ～ 63HRC ＊＊

＊ Module 3.5 and larger are made of SCM420.
＊＊ Tooth Hardness for module 2 and 2.5 is between 80 to 83 HRA.



Catalog No.	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	Length of bore E
KSP039002GC P **KSP039002GF G**	2	***m*1.5**	13 26	L R	19.5 39	7	AT B	21 38.5	10.2 24.1	8 12	16 24	14 13
KSP056002GF P **KSP056002GF G**		***m*2**	14 28	L R	28 56	10	B B	30 56	15.3 35.6	10 16	20 30	12 18
KSP075002GF P **KSP075002GF G**		***m*2.5**	15 30	L R	37.5 75	14	B C	40 75	16.9 36	14 22	30 44	17 24
KSP096002GF P **KSP096002GF G**		***m*3**	16 32	L R	48 96	18	B C	53 96	23.5 46	17 27	36 56	19 29
KSP119002GF P **KSP119002GF G**		***m*3.5**	17 34	L R	59.5 119	22	A C	65 119	31.1 54	22 33	44 63	25 34
KSP145002GF P **KSP145002GF G**		***m*4**	18 36	L R	72 144	27	A C	78 145	31.3 60	26 36	54 73	28 39
KSP172002GF P **KSP172002GF G**		***m*4.5**	19 38	L R	85.5 171	32	A C	93 172	44.4 70	33 42	69 79	34 46

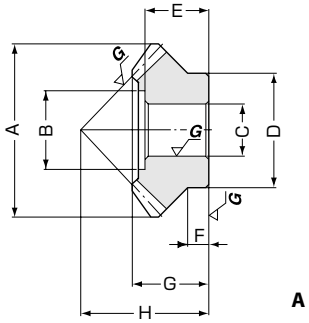
[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 317 to kgf/ m, according to assumed usage conditions.
② These gears produce axial thrust forces. See Page 284 for more details.

KSP
Nissei Ground Spiral Bevel Gears

Module 1.5 ～ 4.5

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

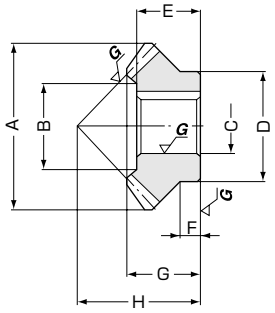
＊ Module 3.5 and larger are made of SCM420.
＊＊ Tooth Hardness for module 2 and 2.5 is between 80 to 83 HRA.



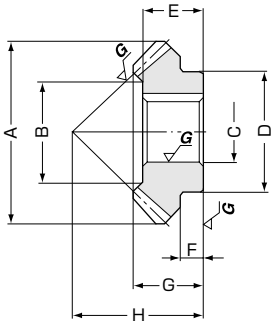
Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Pitch dia.	Face width	Shape	Outside dia. A	Holding surface dia. B	Bore C_{H7}	Hub dia. D	Length of bore E
KSP039002GU P **KSP039002GU G**	2	***m*1.5**	13 26	L R	19.5 39	7	A B	21 38.5	10.2 24	8 10	16 24	14 13
KSP056002GU P **KSP056002GU G**		***m*2**	14 28	L R	28 56	10	B B	30 56	15.3 35.5	8 12	20 30	12 18
KSP075002GU P **KSP075002GU G**		***m*2.5**	15 30	L R	37.5 75	14	A' C	40 75	20 36	12 16	30 44	17 24
KSP096002GU P **KSP096002GU G**		***m*3**	16 32	L R	48 96	18	B C	53 96	23.5 46	12 20	36 56	19 29
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
KSP145002GU P **KSP145002GU G**		***m*4**	18 36	L R	72 144	27	A C	78 145	38 60	20 30	54 73	28 39
KSP172002GU P **KSP172002GU G**		***m*4.5**	19 38	L R	85.5 171	32	A C	93 172	48 70	26 36	69 79	34 46

[Caution on Product Characteristics] ① The allowable torque is calculated by converting the output torque (600 rpm) on Page 317 to kgf/m, according to assumed usage conditions.
② These gears produce axial thrust forces. See Page 284 for more details.

Ground Spiral Bevel Gears



A



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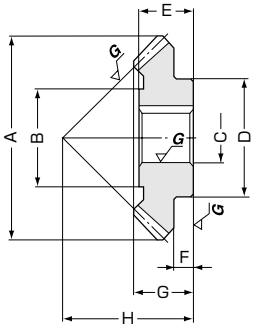
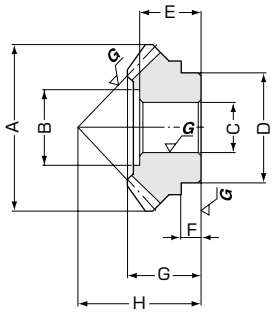


C

Hub width F	Total length G	Mounting distance H	Keyway	Allowable gear torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
7.6 7	14.5 15	28 22	– 4 x 1.8	0.89	0 ~0.05	0.02 0.06	**KSP039002GC P** **KSP039002GF G**
2.5 8	13 20.5	32 30	3 x 1.4 5 x 2.3	2.65	0 ~0.05	0.03 0.18	**KSP056002GF P** **KSP056002GF G**
4.6 11	19.5 25.5	44 38	5 x 2.3 6 x 2.8	6.43	0.05~0.10	0.09 0.41	**KSP075002GF P** **KSP075002GF G**
2.5 12	21.5 31	53 47	5 x 2.3 8 x 3.3	12.5	0.05~0.10	0.18 0.85	**KSP096002GF P** **KSP096002GF G**
3.6 15	27.5 35.5	67 55	6 x 2.8 10 x 3.3	22.2	0.05~0.10	0.33 1.37	**KSP119002GF P** **KSP119002GF G**
3.5 16	33 40.5	80 64	8 x 3.3 10 x 3.3	36.3	0.05~0.10	0.57 2.34	**KSP145002GF P** **KSP145002GF G**
4.4 20	38 47	94 75	10 x 3.3 12 x 3.3	59.9	0.05~0.10	0.91 3.60	**KSP172002GF P** **KSP172002GF G**

[Caution on Secondary Operations] ① No secondary operations can be performed on these precision finished gears due to the applied carburizing process.

Ground Spiral Bevel Gears



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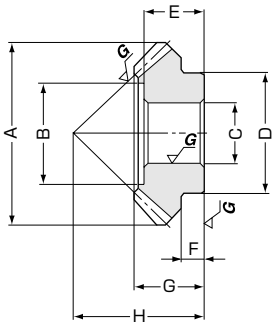

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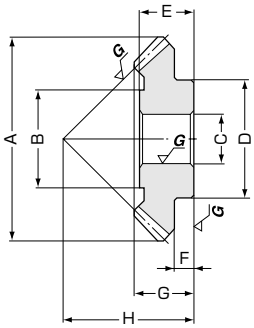


C

Hub width F	Total length G	Mounting distance H	Machinable max. bore	Allowable gear torque (kgf·m)	Backlash (mm)	Weight (kg)	Catalog No.
7.6 7	14.5 15	28 22	8 20	0.89	0 ~0.05	0.02 0.07	**KSP039002GU P** **KSP039002GU G**
2.5 8	13 20.5	32 30	10 20	2.65	0 ~0.05	0.04 0.19	**KSP056002GU P** **KSP056002GU G**
4.5 11	19.5 25.5	44 38	14 25	6.43	0.05~0.10	0.10 0.44	**KSP075002GU P** **KSP075002GU G**
2.5 12	21.5 31	53 47	19 32	12.5	0.05~0.10	0.20 0.91	**KSP096002GU P** **KSP096002GU G**
3.6 15	27.5 35.5	67 55	25 40	22.2	0.05~0.10	0.36 1.45	**KSP119002GU P** **KSP119002GU G**
3.5 16	33 40.5	80 64	30 42	36.3	0.05~0.10	0.65 2.44	**KSP145002GU P** **KSP145002GU G**
4.4 20	38 47	94 75	38 50	59.9	0.05~0.10	0.97 3.80	**KSP172002GU P** **KSP172002GU G**

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 284) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.

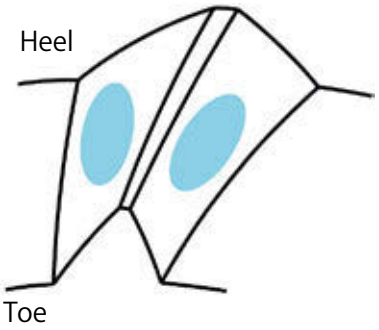
■ Adjusting Tooth Contact

＜ Centering tooth contact ＞

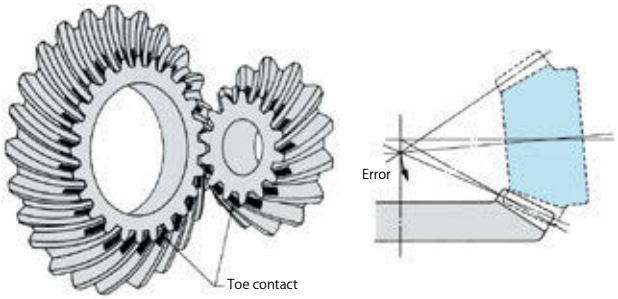
(1) When assembled correctly, the contact will occur in the middle of the tooth flank.

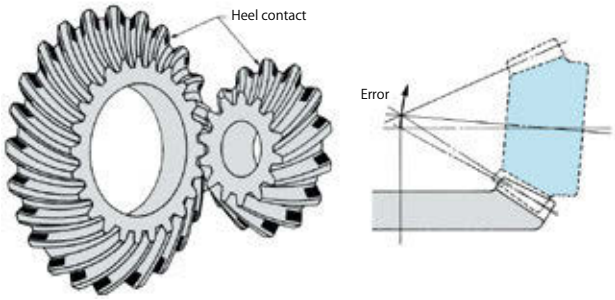
(2) The contact area along the tooth face should be in the center of the tooth, but somewhat closer to the toe is ideal.

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

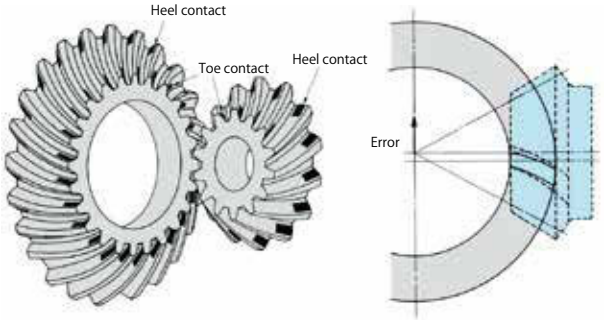


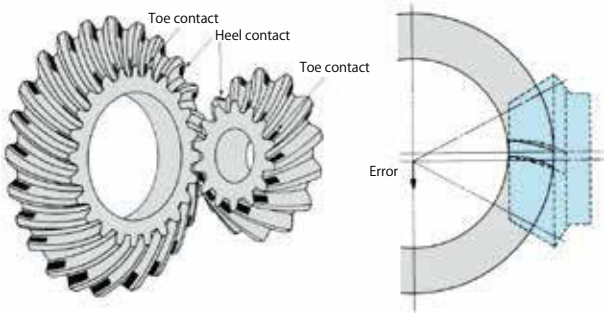
(1) When there is an angular error of the shafts



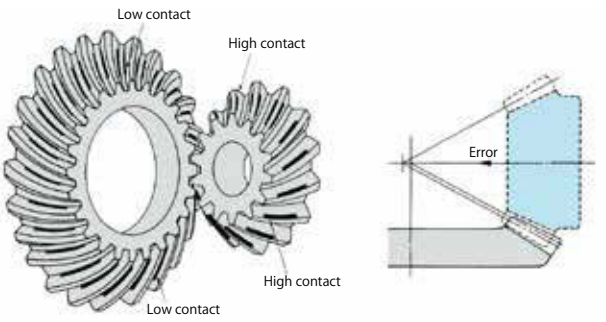


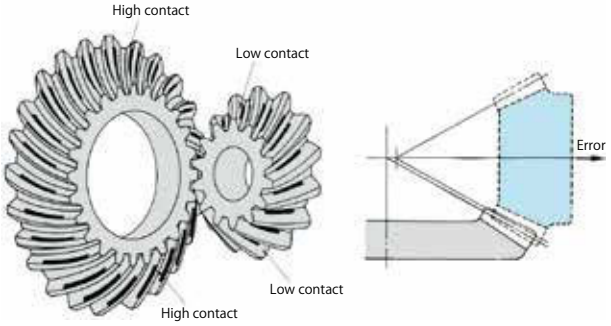
(2) When the pinion shaft is offset





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





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H. FRÖHLICH AG | INDUSTRIETECHNIK
Widenholzstrasse 1
CH-8304 Wallisellen
Tel. +41 44 527 20 00
Fax +41 44 527 20 19
info@hfag.ch I www.hfag.ch