



# Miter Gears

<b>MMSG</b> Ground Spiral Miter Gears <i>Newly added</i> m2 ~ 4 Page 256 RoHS, H, G, B	<b>SMSG</b> Ground Spiral Miter Gears <i>Newly added</i> m1 ~ 5 Page 258 RoHS, H, G, B	<b>MMSA · MMSB</b> Finished Bore Spiral Miter Gears m1 ~ 10 Page 260 RoHS, H, G, B	<b>MMS</b> Spiral Miter Gears m2 ~ 5 Page 262 RoHS, H, G, B	<b>SMS</b> Spiral Miter Gears m1 ~ 8 Page 264 RoHS, H, G, B	<b>SMZG</b> Ground Zero Miter Gears m2 ~ 3 Page 266 RoHS, H, G, B	<b>SMA · SMB · SMC</b> Finished Bore Miter Gears m1 ~ 8 Page 268 RoHS, H, G, B
<b>MM</b> Carburized & Hardened Miter Gears m2 ~ 5 Page 270 RoHS, H, G, B	<b>LM</b> Sintered Metal Miter Gears m0.8 ~ 1.5 Page 270 RoHS, H, G, B	<b>SM</b> Steel Miter Gears m1 ~ 8 Page 272 RoHS, H, G, B	<b>SAM</b> Angular Miter Gears m1.5 ~ 3 Page 274 RoHS, H, G, B	<b>SUM</b> Stainless Steel Miter Gears m1 ~ 4 Page 276 RoHS, H, G, B, SUS	<b>SUMA</b> Finished Bore Stainless Steel Miter Gears m1 ~ 4 Page 276 RoHS, H, G, B, SUS	<b>PM</b> Plastic Miter Gears m1 ~ 4 Page 278 RoHS, H, G, B, EP
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Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pair

Bevel Gearboxes

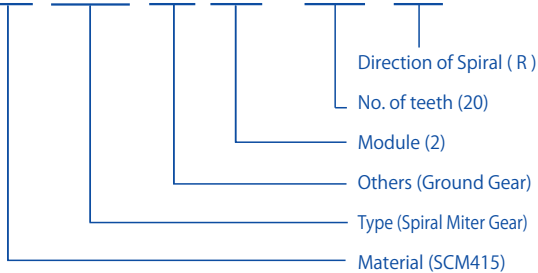
Other Products

## 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 M S G 2 - 20 R**



### 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
- Re-machinable Product
- Heat Treated Product
- Stainless Product
- Copper Alloy Product
- Injection Molded 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.

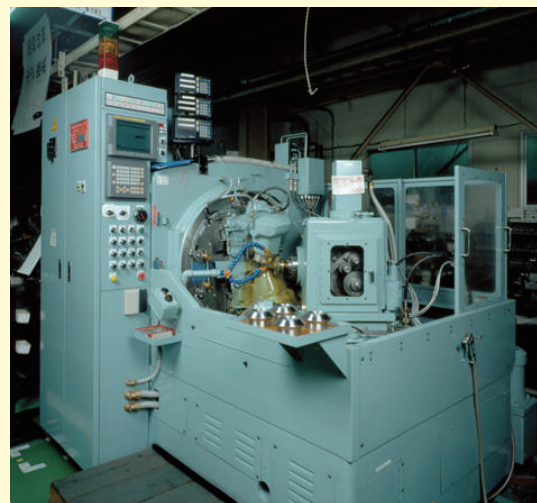
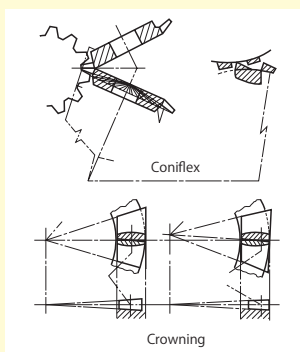
Type	Catalog No.	Module	No. of Teeth ( ) Shaft Angle	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704 : 1978	Secondary Operations	Features
Spiral Miter Gears	<b>MMSG</b>	2 ~ 4	20, 25, 30	SCM415	Carburized Note 1	Ground	1	△	High strength, abrasion-resistant and compact for high speed & torque use.
	<b>SMSG</b>	2 ~ 5	20, 25, 30	S45C	Gear teeth induction hardened	Ground	2	△	Reasonably priced ground gear, yet remachinable except for the gear teeth.
	<b>KSP F type</b>	1.5 ~ 6	20 ~ 30	SCM415	Carburized	Ground	0	×	Superior performance with regard to high speed, low noise, and low vibration.
	<b>KSP U type</b>				Carburized NOTE 1			△	
	<b>MMSA · MMSB</b>	1 ~ 10	20	SCM415	Carburized	Cut	4	×	Ready to use without performing secondary operations. Strong and abrasion resistant.
	<b>MMS</b>	2 ~ 5	20, 25, 30	SCM415	Carburized Note 1	Cut	4	△	Only teeth are induction hardened, allowing user to perform secondary operations elsewhere.
	<b>SMS</b>	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.
Zenith miter gears	<b>SMZG</b>	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	<b>SMA · SMB · SMC</b>	1 ~ 8	20, 25, 30	S45C	Gear teeth induction hardened	Cut	4	△	Usable without remachining, offered in 3 bore sizes.
	<b>MM</b>	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.
	<b>LM</b>	0.8 ~ 1.5	20	SMF5040 (Equiv. to S45C)	—	Sintered	5	○	Mass-produced, low cost sintered products. Small and light weight.
	<b>SM</b>	1 ~ 8	16, 20, 25, 30	S45C	—	Cut	3	○	Popular straight miter for many uses.
	<b>SAM</b>	1.5 ~ 3	20 (45°, 60°, 120°)	S45C	—	Cut	3	○	3 types are available for shafts at 45°, 60° and 120°.
	<b>SUM</b>	1 ~ 4	20, 25	SUS303	—	Cut	3	○	Suitable for food machinery due to SUS303's rust-resistant quality.
	<b>SUMA</b>	1 ~ 4	20, 25	SUS303	—	Cut	3	△	Stainless steel products, usable without remachining.
	<b>PM</b>	1 ~ 4	20, 25	MC901	—	Cut	4	○	MC nylon products are light and can be used without lubricant.
	<b>DM</b>	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.

#### ■ 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.

### 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

Catalog No.	MMSG MMSA · MMSB MMS · MM	SMSG · SMZG SMS SMA · SMB · SMC	SM SAM	SUM SUMA LM <small>NOTE 3</small>	PM	DM
Formula <small>NOTE 1</small>	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 <sup>7</sup> cycles				—	
Impact from motor	Uniform load				Allowable bending stress (kgf/mm <sup>2</sup> )	
Impact from load	Uniform load					
Direction of load	Bidirectional					
Allowable bending stresses at root $\sigma_{Hlim}$ (kgf/mm <sup>2</sup> ) <small>NOTE 2</small>	47	21	19	10.5	1.15 (40°C with No Lubrication)	m 0.5 4.0 m 0.8 4.0 m 1.0 3.5 m 1.5 1.8 <small>NOTE 3</small> (40°C with Grease Lubrication)
Safety factor $K_R$	1.2					

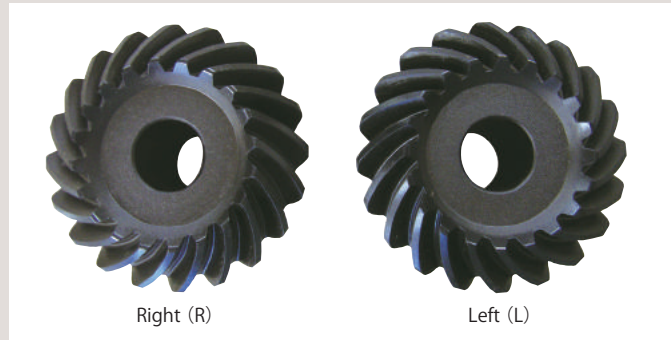
#### ■ Calculation assumptions for Surface Durability (Except those in common with bending strength)

Formula <small>NOTE 1</small>	Formula of bevel gears on bending strength (JGMA404-01)			
Kinematic viscosity of lubricant	100cSt (50°C)			
Gear support	Shafts & gear box have normal stiffness, and gears are supported on one end			
Allowable Hertz stress $\sigma_{Hlim}$ (kgf/mm <sup>2</sup> )	166	90	49	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 stress (kgf/mm<sup>2</sup>) are adjusted to the units needed in the formula.

**(NOTE 2)** The allowable bending stress at the root  $\sigma_{Hlim}$  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.



#### ■ 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.

# Miter Gears

## Application Hints

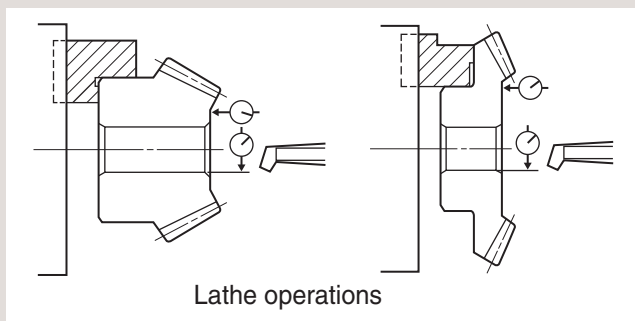


In order to use KHK stock gears safely, carefully read the Application Hints before proceeding. If there are questions or you require clarifications, please contact our technical department or your nearest distributor.

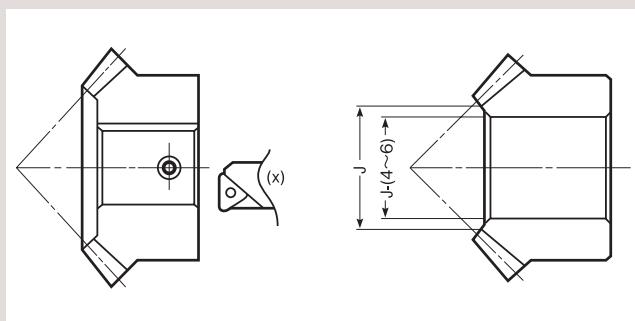
KHK USA Inc.  
 PHONE: 516-248-3850 FAX: 516-248-4385  
 E-mail info@khkgears.us

### 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.



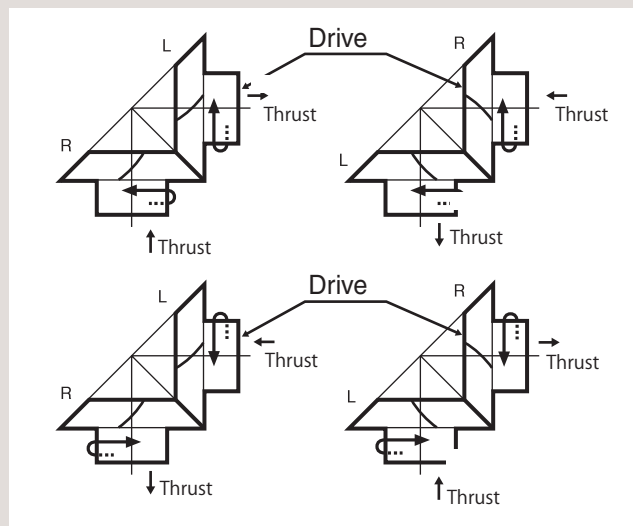
- ④ For items with induction hardened teeth, such as SMSG and SMS series, the hardness is high near the tooth root. When machining the front face, the machined area should be 4 to 6mm smaller than the dimension, J.



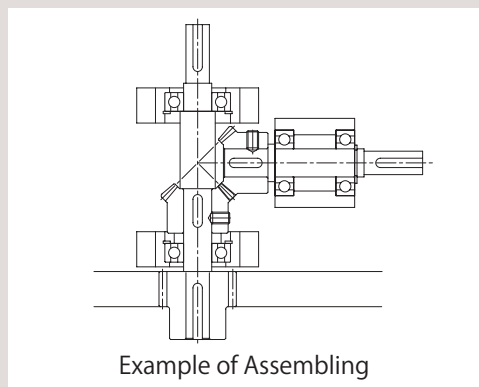
- ⑤ For tapping and keyway operations, see the examples given in "1. Caution on Performing Secondary Operations" in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentration, always leave radii on corners.
- ⑥ PM plastic miter gears are susceptible to changes due to temperature and humidity. Dimensions may change between during and after remachining operations.
- ⑦ When 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

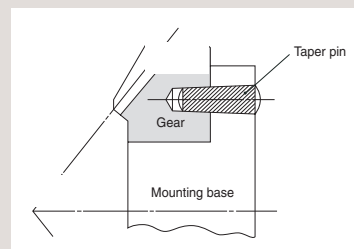
- ① Since miter gears are cone shaped, they produce axial thrust forces. Specifically with regard to spiral miter gears, the directions of thrust change with the hand of spiral and the direction of rotation. This is illustrated below. The bearings must be selected properly to be able to handle these 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.



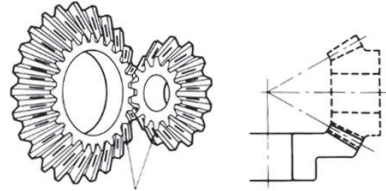
- ③ Due to the thrust load of miter gears, the gears, shafts and bearings have the tendency to loosen up during operation. Miter gears should be fastened to the shaft with keys and set screws, taper pins, step shafts, etc.
- ④ When installing MMSA or MMSB finished bore spiral miter gears in B7 style (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.

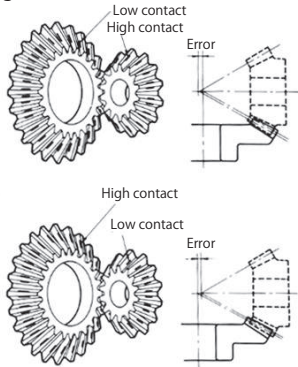


Center contact closer to toes

## Incorrect Tooth Contact

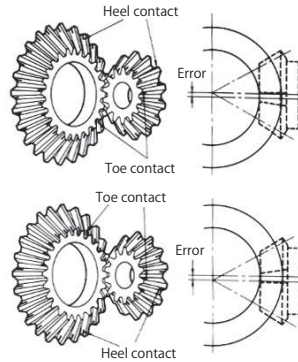
### ■ Mounting Distance Error

- 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.



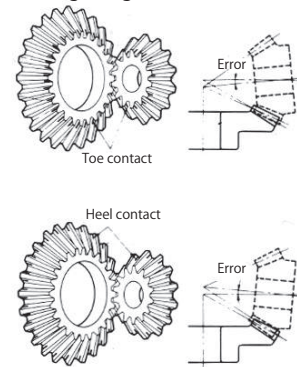
### ■ Offset Error

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

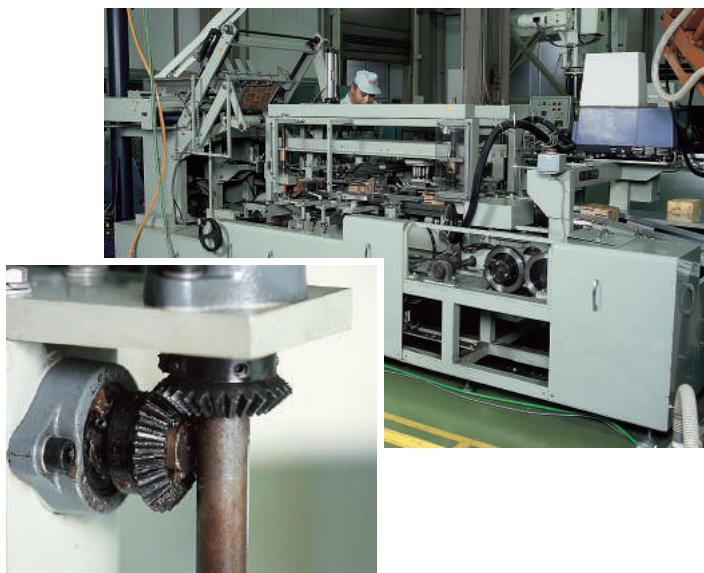


### ■ Shaft Angle Error

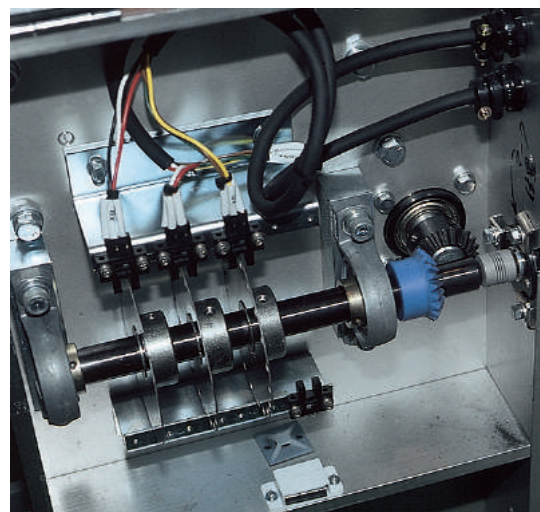
- When there is an angular error of shafts, the gears will contact at the toes or heels depending on whether the angle is greater or less than 90°.



## Application Examples



Automatic packaging machine (Miter gears - inset)



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



# MMSG Ground Spiral Miter Gears

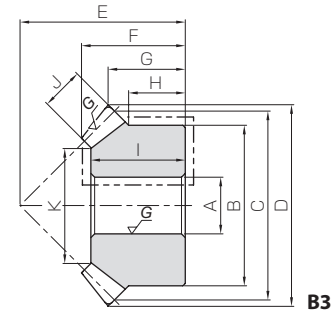


Module 2 ~ 4



Specifications		A <sub>H7</sub>	Bore
Precision grade	JIS B 1704 : 1978 grade 1	B	Hub dia.
Gear teeth	Gleason	C	Pitch dia.
Pressure angle	20°	D	Outside dia.
Helix angle	35°	E	Mounting distance
Material	SCM415	F	Total length
Heat treatment	Carburizing	G	Crown to back
Tooth hardness	55 ~ 60HRC	H	Hub width
Gear ratio	1	I	Length of bore
Screw offset (L)	Half of hub width (H)	J	Face width
		K	Holding surface dia.

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



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

Catalog No.	No. of teeth	Shape	A <sub>H7</sub>	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		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	B4	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
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		B4	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
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.
- 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.

[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).

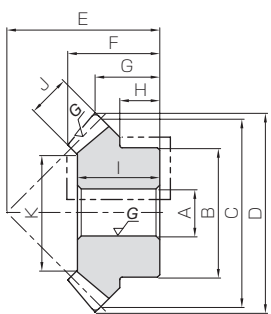
\* For products not categorized in our KHK Stock Gear series, custom gear production services with **short lead times** is available. For details see page 8.

J Series

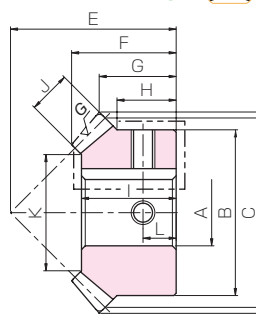


Ground Spiral Miter Gears

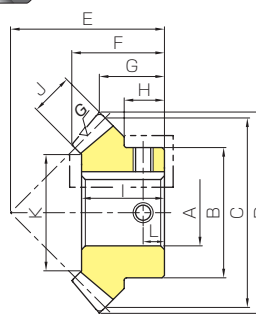
Newly added



B4



B3K



B4K



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

		* The product shapes of J Series items are identified by background color.																	
Bore H7	Keyway Js9	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50	
Screw size	4 x 1.8	5 x 2.3				6 x 2.8				8 x 3.3				10 x 3.3		12 x 3.3		14 x 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.

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pair

Bevel Gearboxes

Other Products



# SMSG Ground Spiral Miter Gears

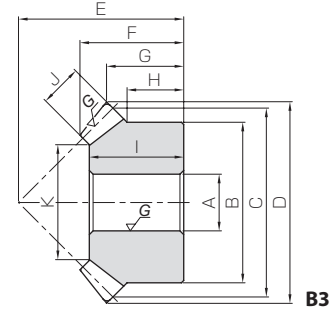


Module 1 ~ 5



Specifications		A <sub>H7</sub>	Bore
Precision grade	JIS B 1704 : 1978 grade 2	B	Hub dia.
Gear teeth	Gleason	C	Pitch dia.
Pressure angle	20°	D	Outside dia.
Helix angle	35°	E	Mounting distance
Material	S45C	F	Total length
Heat treatment	Teeth induction hardened	G	Crown to back
Tooth hardness	50 ~ 60HRC	H	Hub width
Gear ratio	1	I	Length of bore
Screw offset (L)	Half of hub width (H)	J	Face width
		K	Holding surface dia.

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



## Standardized ground spiral miter gears available in Module 1!

Catalog No.	No. of teeth	Shape	A <sub>H7</sub>	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	B3	6	20	25	26.22	23	15.08	11.11	8	14	6	15.03	1.88	1.91	0.19	0.19
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	B3			8	24	30	31.26	28	17.61	13.63	10	16	6	19.03	2.50	3.02	0.25	0.31
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

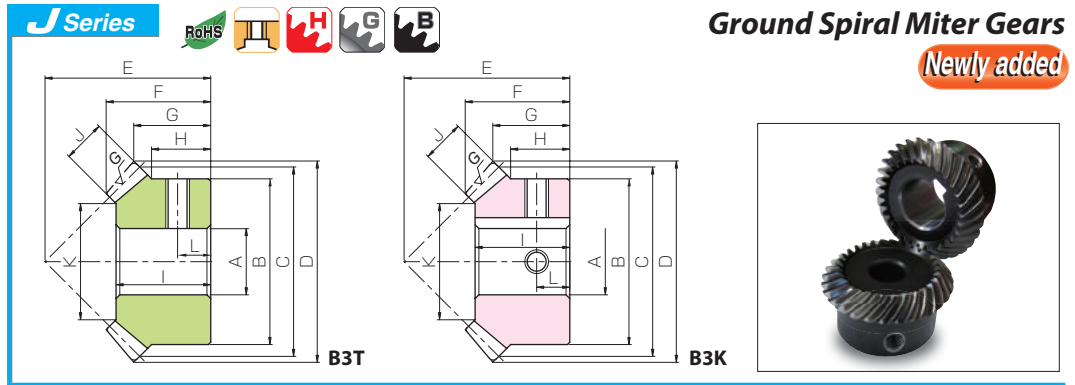
[Caution on Product Characteristics]

- ① A sets of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
- 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.

[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. 1 to 2 mm).





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	Green																			
SMSG1-20L J BORE																				
SMSG1.5-20R J BORE		Green	Pink																	
SMSG1.5-20L J BORE				Pink	Pink	Pink	Pink													
SMSG2-20R J BORE					Pink	Pink	Pink													
SMSG2-20L J BORE								Pink	Pink	Pink										
SMSG2.5-20R J BORE									Pink	Pink	Pink									
SMSG2.5-20L J BORE												Pink	Pink	Pink						
SMSG3-20R J BORE													Pink	Pink	Pink					
SMSG3-20L J BORE																Pink	Pink	Pink		
SMSG3.5-20R J BORE																	Pink	Pink	Pink	
SMSG3.5-20L J BORE																			Pink	Pink
SMSG4-20R J BORE																				Pink
SMSG4-20L J BORE																				
SMSG5-20R J BORE																				Pink
SMSG5-20L J BORE																				
SMSG1-25R J BORE	Green	Green																		
SMSG1-25L J BORE																				
SMSG1.5-25R J BORE				Pink	Pink	Pink														
SMSG1.5-25L J BORE							Pink	Pink	Pink											
SMSG2-25R J BORE					Pink	Pink	Pink													
SMSG2-25L J BORE								Pink	Pink	Pink										
SMSG2.5-25R J BORE									Pink	Pink	Pink									
SMSG2.5-25L J BORE												Pink	Pink	Pink						
SMSG3-25R J BORE													Pink	Pink	Pink					
SMSG3-25L J BORE																Pink	Pink	Pink		
SMSG3.5-25R J BORE																	Pink	Pink	Pink	
SMSG3.5-25L J BORE																			Pink	Pink
SMSG4-25R J BORE																				Pink
SMSG4-25L J BORE																				
SMSG5-25R J BORE																				Pink
SMSG5-25L J BORE																				
SMSG1-30R J BORE		Green	Pink	Pink																
SMSG1-30L J BORE																				
SMSG1.5-30R J BORE				Pink	Pink	Pink														
SMSG1.5-30L J BORE							Pink	Pink	Pink											
SMSG2-30R J BORE					Pink	Pink	Pink													
SMSG2-30L J BORE								Pink	Pink	Pink										
SMSG2.5-30R J BORE									Pink	Pink	Pink									
SMSG2.5-30L J BORE												Pink	Pink	Pink						
SMSG3-30R J BORE													Pink	Pink	Pink					
SMSG3-30L J BORE																Pink	Pink	Pink		
SMSG3.5-30R J BORE																	Pink	Pink	Pink	
SMSG3.5-30L J BORE																			Pink	Pink
SMSG4-30R J BORE																				Pink
SMSG4-30L J BORE																				
SMSG5-30R J BORE																				Pink
SMSG5-30L J BORE																				

- [Caution on J series]
- 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.
  - 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.
  - Keyways are made according to JIS B1301 standards, Js 9 tolerance.
  - 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).
  - Areas of products which have been re-worked will not be black oxide coated.
  - For products having a tapped hole, a set screw is included.



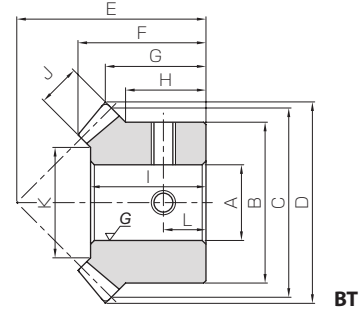
# MMSA · MMSB Finished Bore Spiral Miter Gears



Module 1 ~ 10



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

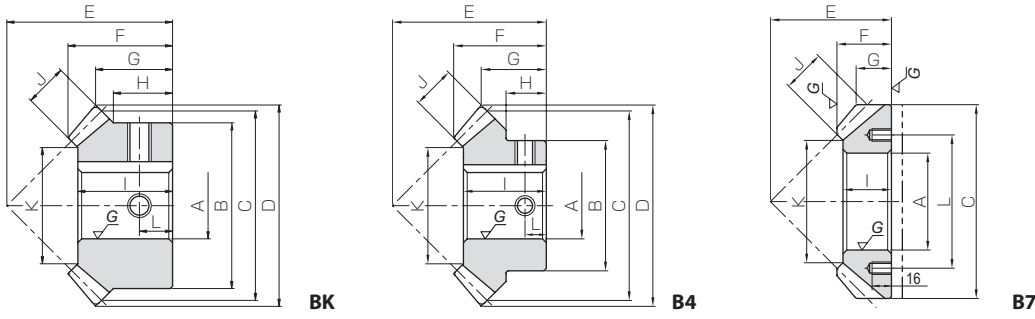


- Spur Gears
- Helical Gears
- Internal Gears
- Racks
- CP Racks & Pinions
- Miter Gears
- Bevel Gears
- Screw Gears
- Worm Gear Pair
- Bevel Gearboxes
- Other Products

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	Hub width	Length of bore
						A <sub>H7</sub>	B	C	D	E	F	G	H	I
MMSA1-20R MMSB1-20R MMSA1-20L MMSB1-20L	1	m1	20	R	BT	8 10	17	20	21.29	20	13.53	10.64	8.5	12.2
				L	BT	8 10								
MMSA1.5-20R MMSB1.5-20R MMSA1.5-20L MMSB1.5-20L	1	m1.5	20	R	BT BK	10 12	25	30	31.9	28	18.48	13.95	10.5	16.5
				L	BT BK	10 12								
MMSA2-20R MMSB2-20R MMSA2-20L MMSB2-20L	1	m2	20	R	BK	14 16	35	40	42.52	35	22.09	16.26	12.5	20
				L	BK	14 16								
MMSA2.5-20R MMSB2.5-20R MMSA2.5-20L MMSB2.5-20L	1	m2.5	20	R	BK	18 20	42	50	53.2	45	28.63	21.6	16	26
				L	BK	18 20								
MMSA3-20R MMSB3-20R MMSA3-20L MMSB3-20L	1	m3	20	R	BK	20 22	52	60	63.99	50	30.78	21.99	16	27
				L	BK	20 22								
MMSA3.5-20R MMSB3.5-20R MMSA3.5-20L MMSB3.5-20L	1	m3.5	20	R	B4	25 28	50	70	74.53	55	32.45	22.26	14	29
				L	B4	25 28								
MMSA4-20R MMSB4-20R MMSA4-20L MMSB4-20L	1	m4	20	R	B4	28 30	55	80	84.99	65	39.13	27.5	17	35
				L	B4	28 30								
MMSA5-20R MMSB5-20R MMSA5-20L MMSB5-20L	1	m5	20	R	B4	30 35	70	100	106.25	75	42.99	28.13	17	38
				L	B4	30 35								
MMSA6-20R MMSB6-20R MMSA6-20L MMSB6-20L	1	m6	20	R	B4	40 45	80	120	127.59	90	51.13	33.8	20	45
				L	B4	40 45								
MMSA8-20R MMSA8-20L	1	m8	20	R L	B7	80 80	—	160	—	100	45	29.16	—	40
MMSA10-20R MMSA10-20L	1	m10	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.
  - 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 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

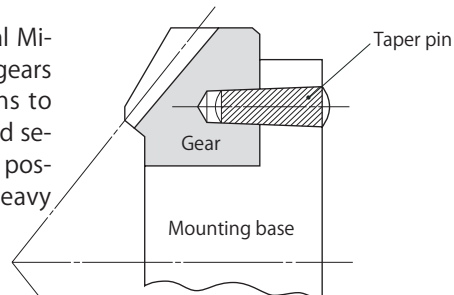


Face width J	Holding surface dia. K	Keyway WidthxDepth	Set Screw		Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog No.	
			Size	L	Bending strength	Surface durability	Bending strength	Surface durability				
4.5	11.67	—	2-M4	4.5	2.24	2.09	0.23	0.21	0.03~0.13	0.018 0.015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

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- Internal Gears
- Racks
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- Bevel Gears
- Screw Gears
- Worm Gear Pair
- Bevel Gearboxes
- Other Products

[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 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.



Inquiries are now being accepted on our website.



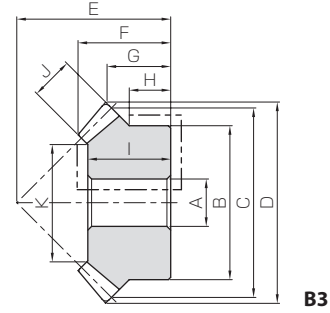
# MMS Spiral Miter Gears



Module 2 ~ 5



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



- Spur Gears
- Helical Gears
- Internal Gears
- Racks
- CP Racks & Pinions
- Miter Gears
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- Other Products

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 <sub>H7</sub>	B	C	D	E	F	G
MMS2-20R MMS2-20L	1	<b>m2</b>	20	R L	B3	12	34	40	42.31	35	22.14	16.15
MMS2.5-20R MMS2.5-20L		<b>m2.5</b>	20	R L	B3	15	42	50	53.2	45	28.63	21.6
MMS3-20R MMS3-20L		<b>m3</b>	20	R L	B3	16	52	60	63.99	50	30.78	21.99
MMS4-20R MMS4-20L		<b>m4</b>	20	R L	B3	20	65	80	84.99	65	39.13	27.5
MMS5-20R MMS5-20L		<b>m5</b>	20	R L	B3	25	85	100	106.25	75	42.99	28.13
MMS2-25R MMS2-25L	1	<b>m2</b>	25	R L	B3	12	45	50	52.4	40	24.19	16.2
MMS2.5-25R MMS2.5-25L		<b>m2.5</b>	25	R L	B3	16	55	62.5	65.54	50	30.24	20.27
MMS3-25R MMS3-25L		<b>m3</b>	25	R L	B3	20	65	75	78.77	60	37.57	24.39
MMS4-25R MMS4-25L		<b>m4</b>	25	R L	B3	25	85	100	104.7	80	49.14	32.35
MMS5-25R MMS5-25L		<b>m5</b>	25	R L	B3	28	100	125	130.86	100	60.59	40.43
MMS2-30R MMS2-30L	1	<b>m2</b>	30	R L	B3	12	45	60	62.42	50	29.27	21.21
MMS2.5-30R MMS2.5-30L		<b>m2.5</b>	30	R L	B3	16	60	75	78.04	62	36.08	26.02
MMS3-30R MMS3-30L		<b>m3</b>	30	R L	B3	20	70	90	93.61	75	45.25	31.8
MMS4-30R MMS4-30L		<b>m4</b>	30	R L	B3	28	100	120	124.71	95	54.28	37.35
MMS5-30R MMS5-30L		<b>m5</b>	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.
- 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.

\* 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 Miter Gears

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

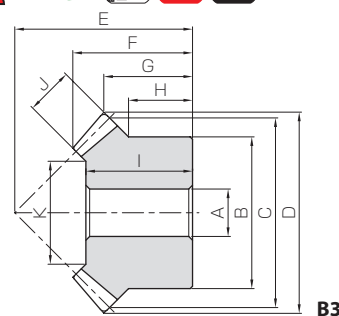
- Spur Gears
- Helical Gears
- Internal Gears
- Racks
- CP Racks & Pinions
- Miter Gears
- Bevel Gears
- Screw Gears
- Worm Gear Pair
- Bevel Gearboxes
- Other Products

# SMS Spiral Miter Gears

Module 1 ~ 8



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



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

Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	
						A	B						
SMS1-20R SMS1-20L	1	m1	20	R L	B3	6	16	20	21.3	20	13.84	10.65	
SMS1.5-20R SMS1.5-20L		m1.5	20	R L	B3	8	26	30	31.74	30	21.18	15.87	
SMS2-20R SMS2-20L		m2	20	R L	B3	12	34	40	42.4	37	24.75	18.2	
SMS2.5-20R SMS2.5-20L		m2.5	20	R L	B3	14	42	50	52.94	48	32.42	24.47	
SMS3-20R SMS3-20L		m3	20	R L	B3	16	50	60	63.72	58	39.6	29.86	
SMS3.5-20R SMS3.5-20L		m3.5	20	R L	B3	20	60	70	74.47	65	43.81	32.23	
SMS4-20R SMS4-20L		m4	20	R L	B3	20	64	80	84.88	75	50.51	37.44	
SMS5-20R SMS5-20L		m5	20	R L	B3	25	80	100	105.9	90	60.16	42.95	
SMS6-20R SMS6-20L		m6	20	R L	B3	28	100	120	127.16	104	67.35	47.58	
SMS8-20R SMS8-20L		m8	20	R L	B3	30	130	160	169.94	125	72.6	49.97	
SMS1-25R SMS1-25L		1	m1	25	R L	B3	6	20	25	26.22	23	15.08	11.11
SMS1.5-25R SMS1.5-25L			m1.5	25	R L	B3	10	30	37.5	39.31	34	22.14	16.16
SMS2-25R SMS2-25L			m2	25	R L	B3	12	40	50	52.38	40	24.2	16.19
SMS2.5-25R SMS2.5-25L			m2.5	25	R L	B3	16	50	62.5	65.54	50	30.24	20.27
SMS3-25R SMS3-25L	m3		25	R L	B3	20	60	75	78.77	60	37.57	24.39	
SMS3.5-25R SMS3.5-25L	m3.5		25	R L	B3	25	70	87.5	91.81	70	42.98	28.41	
SMS4-25R SMS4-25L	m4		25	R L	B3	28	80	100	104.7	80	49.14	32.35	
SMS5-25R SMS5-25L	m5		25	R L	B3	28	100	125	130.86	100	60.59	40.43	
SMS6-25R SMS6-25L	m6		25	R L	B3	28	120	150	157.17	120	71.97	48.58	
SMS1-30R SMS1-30L	1		m1	30	R L	B3	8	24	30	31.26	28	17.61	13.63
SMS1.5-30R SMS1.5-30L		m1.5	30	R L	B3	10	36	45	46.84	43	28.11	21.42	
SMS2-30R SMS2-30L		m2	30	R L	B3	12	45	60	62.42	50	29.27	21.21	
SMS2.5-30R SMS2.5-30L		m2.5	30	R L	B3	16	60	75	78.04	62	36.08	26.02	
SMS3-30R SMS3-30L		m3	30	R L	B3	20	70	90	93.61	75	45.25	31.8	
SMS3.5-30R SMS3.5-30L		m3.5	30	R L	B3	25	90	105	109.21	85	49.4	34.6	
SMS4-30R SMS4-30L		m4	30	R L	B3	28	100	120	124.71	95	54.28	37.35	
SMS5-30R SMS5-30L		m5	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.

## Spiral Miter Gears

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

Inquiries are now being accepted on our website.



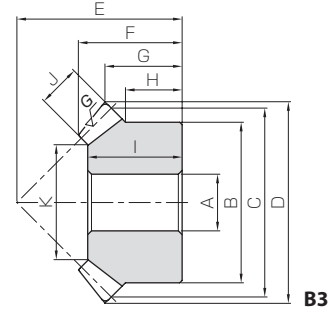
# SMZG Ground Zerol Miter Gears



Module 2 ~ 3



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



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

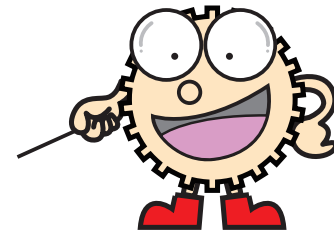
Catalog No.	Gear ratio	Module	No. of teeth	Helix angle	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
							A	B	C	D	E	F	G
SMZG2-20R SMZG2-20L	1	<b>m2</b>	20	5°	R L	B3	12	34	40	43.32	37	24.69	18.66
SMZG2.5-20R SMZG2.5-20L		<b>m2.5</b>	20	5°	R L	B3	14	42	50	54.16	48	32.34	25.08
SMZG3-20R SMZG3-20L		<b>m3</b>	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
 SM2-20	 No thrust force produced inward	 SUM, PM, SMZG	 grade 3	 7.13N · m	 0.72N · m	 3.2a/1.62	
 SMZG2-20R/L	 No thrust force produced inward	 SM, SUM, PM	 grade 2	 7.76N · m	 4.40N · m	 0.4a/1.74	
 MMSG2-20R/L	 Thrust force produced inward	 —	 grade 2	 15.6N · m	 21.7N · m	 0.4a/2.49	

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



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

Spur  
GearsHelical  
GearsInternal  
Gears

Racks

CP Racks  
& PinionsMiter  
GearsBevel  
GearsScrew  
GearsWorm  
Gear PairBevel  
GearboxesOther  
Products



SMA · SMB · SMC

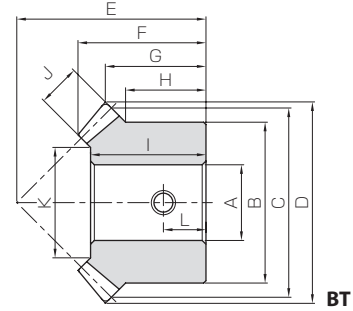
## Finished Bore Miter Gears



Module 1 ~ 8



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

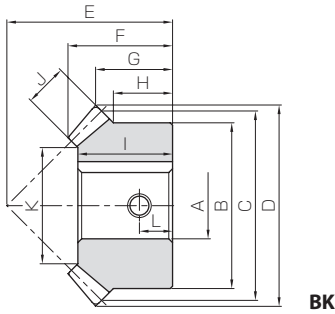


- Spur Gears
- Helical Gears
- Internal Gears
- Racks
- CP Racks & Pinions
- Miter Gears
- Bevel Gears
- Screw Gears
- Worm Gear Pair
- Bevel Gearboxes
- Other Products

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.		Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore
					A <sub>H7</sub>	B	C	D						
SMA1-20 SMB1-20	1	m1	20	BT	8	16	20	21.41	20	13.95	10.71	8	12	
				BT	10								12.07	
SMA1.5-20 SMB1.5-20		m1.5	20	BT	10	26	30	32.12	30	21.24	16.06	13	19	
				BK	12								19	
SMA2-20 SMB2-20		m2	20	BK	14	34	40	42.83	37	24.89	18.41	14	22	
				BK	15								22	
SMA2.5-20 SMB2.5-20		m2.5	20	BK	18	42	50	53.54	48	32.54	24.77	19	29	
				BK	20								29	
SMA3-20 SMB3-20 SMC3-20		m3	20	BK	22	50	60	64.24	58	39.84	30.12	23	35	
				BK	25								35	
				BK	20								35	
SMA3.5-20 SMB3.5-20		m3.5	20	BK	28	60	70	74.95	65	44.13	32.47	25	40	
				BK	30								40	
SMA4-20 SMB4-20 SMC4-20		m4	20	BK	30	64	80	85.65	75	50.78	37.83	27	45	
				BK	32								45	
				BK	25								45	
SMA5-20 SMB5-20 SMC5-20	m5	20	BK	40	80	100	107.07	90	60.38	43.54	30	54		
			BK	30								54		
			BK	35								54		
SMA6-20 SMB6-20 SMC6-20	m6	20	BK	45	100	120	128.48	104	67.67	48.24	34	60		
			BK	50								60		
			BK	40								60		
SMA8-20	m8	20	BK	60	130	160	171.31	125	73.33	50.66	30	62		
SMA1-25	1	m1	25	BT	10	20	25	26.41	23	15.16	11.21	8	14	
				BK	12								19	
SMA1.5-25		m1.5	25	BK	12	30	37.5	39.62	34	22.25	16.31	11.5	19	
				BK	15								19	
SMA2-25 SMB2-25		m2	25	BK	18	40	50	52.83	40	24.33	16.41	10	20	
				BK	15								20	
SMA2.5-25 SMB2.5-25		m2.5	25	BK	20	50	62.5	66.04	50	30.41	20.52	12.5	26	
				BK	18								26	
SMA3-25 SMB3-25		m3	25	BK	30	60	75	79.24	60	37.81	24.62	15	32	
				BK	25								32	
SMA3.5-25 SMB3.5-25		m3.5	25	BK	32	70	87.5	92.45	70	43.23	28.72	17.5	37	
				BK	28								37	
SMA4-25 SMB4-25		m4	25	BK	35	80	100	105.66	80	49.32	32.83	20	43	
				BK	30								43	
SMA5-25		m5	25	BK	50	100	125	132.07	100	60.82	41.04	25	50	
SMA6-25		m6	25	BK	55	120	150	158.48	120	72.32	49.24	30	61	
SMA1-30	1	m1	30	BK	12	24	30	31.41	28	17.71	13.71	10	16	
				BK	15								16	
SMA1.5-30		m1.5	30	BK	15	36	45	47.12	43	28.24	21.56	16	25	
				BK	20								25	
SMA2-30 SMB2-30		m2	30	BK	20	45	60	62.83	50	29.42	21.41	12.5	25	
				BK	15								25	
SMA2.5-30 SMB2.5-30		m2.5	30	BK	25	60	75	78.54	62	36.28	26.27	17	32	
				BK	20								32	
SMA3-30 SMB3-30		m3	30	BK	32	70	90	94.24	75	45.47	32.12	20	40	
				BK	25								40	
SMA3.5-30 SMB3.5-30		m3.5	30	BK	35	90	105	109.95	85	49.66	34.97	25	45	
				BK	30								45	
SMA4-30 SMB4-30		m4	30	BK	40	100	120	125.66	95	54.52	37.83	25	50	
				BK	30								50	
SMA5-30		m5	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.
  - 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 The keyway dimensions of items with "※" marks do not conform to JIS Standards.

Finished Bore Miter Gear



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

[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).



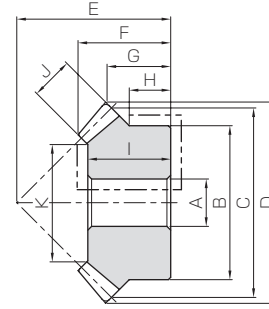
# MM Carburized & Hardened Miter Gears



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 <sub>H7</sub>	B	C	D	E	F	G	H
<b>MM2-20</b>	1	<b>m2</b>	20	B3	12	34	40	42.83	35	22.24	16.41	12
<b>MM2.5-20</b>		<b>m2.5</b>	20	B3	15	42	50	53.54	45	28.89	21.77	16
<b>MM3-20</b>		<b>m3</b>	20	B3	16	52	60	64.24	50	31.19	22.12	16
<b>MM4-20</b>		<b>m4</b>	20	B3	20	65	80	85.66	65	39.49	27.83	17.5
<b>MM5-20</b>		<b>m5</b>	20	B3	25	80	100	107.07	90	60.38	43.54	30
<b>MM2-25</b>	1	<b>m2</b>	25	B3	12	45	50	52.83	40	24.33	16.41	12.5
<b>MM2.5-25</b>		<b>m2.5</b>	25	B3	16	55	62.5	66.03	50	30.41	20.52	15
<b>MM3-25</b>		<b>m3</b>	25	B3	20	65	75	79.24	60	37.81	24.62	17.5
<b>MM4-25</b>		<b>m4</b>	25	B3	25	85	100	105.66	80	49.32	32.83	22.5
<b>MM5-25</b>		<b>m5</b>	25	B3	28	100	125	132.07	100	60.82	41.04	25
<b>MM2-30</b>	1	<b>m2</b>	30	B3	12	45	60	62.83	50	29.43	21.41	12.5
<b>MM2.5-30</b>		<b>m2.5</b>	30	B3	16	60	75	78.54	62	36.28	26.27	17
<b>MM3-30</b>		<b>m3</b>	30	B3	20	70	90	94.24	75	45.47	32.12	20
<b>MM4-30</b>		<b>m4</b>	30	B3	28	100	120	125.66	95	54.52	37.83	25
<b>MM5-30</b>		<b>m5</b>	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.



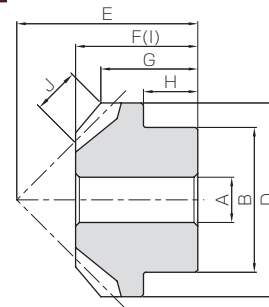
# LM Sintered Metal Miter Gears



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)

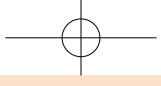


B1

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 <sub>H8</sub>	B	C	D	E	F	G	H
<b>LM0.8-20</b>	1	<b>m0.8</b>	20	B1	4	12	16	17.13	16	11	8.57	5.5
<b>LM1-20</b>		<b>m1</b>	20	B1	5	16	20	21.41	20	13.5	10.71	6
<b>LM1.25-20</b>		<b>m1.25</b>	20	B1	6	22	25	26.77	23	15	11.38	6
<b>LM1.5-20</b>		<b>m1.5</b>	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.



MM

### Carburized & Hardened Miter Gears

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

[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).

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pair

Bevel Gearboxes

Other Products

LM

### Sintered Metal Miter Gears

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

[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.



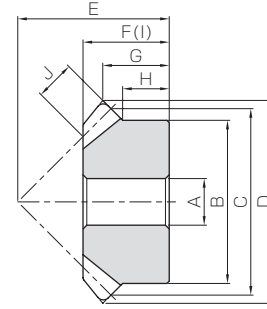
# SM Steel Miter Gears



Module 1 ~ 8



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



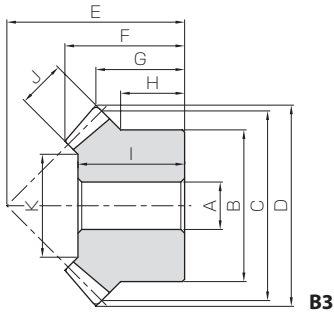
B2

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	
					AH7	B	C	D	E	F	G	H	
<b>SM2-16</b>	1	<b>m2</b>	16	B2	10	27	32	34.83	30	19	15.41	11.5	
<b>SM2.5-16</b>		<b>m2.5</b>	16	B2	12	34	40	43.53	35	21	16.77	12	
<b>SM3-16</b>		<b>m3</b>	16	B2	14	42	48	52.24	40	23	18.12	13	
<b>SM4-16</b>		<b>m4</b>	16	B2	16	55	64	69.66	50	28	20.83	13.5	
<b>SM5-16</b>		<b>m5</b>	16	B2	20	70	80	87.07	65	37	28.54	20	
<b>SM1-20</b>	1	<b>m1</b>	20	B3	6	16	20	21.41	20	13.94	10.71	8	
<b>SM1.25-20</b>		<b>m1.25</b>	20	B3	8	22	25	26.77	23	15.27	11.38	9	
<b>SM1.5-20</b>		<b>m1.5</b>	20	B3	8	26	30	32.12	30	21.24	16.06	13	
<b>SM2-20</b>		<b>m2</b>	20	B3	12	34	40	42.83	37	24.89	18.41	14	
<b>SM2.5-20</b>		<b>m2.5</b>	20	B3	14	42	50	53.54	48	32.54	24.77	19	
<b>SM3-20</b>		<b>m3</b>	20	B3	16	50	60	64.24	58	39.84	30.12	23	
<b>SM3.5-20</b>		<b>m3.5</b>	20	B3	20	60	70	74.95	65	44.13	32.47	25	
<b>SM4-20</b>		<b>m4</b>	20	B3	20	64	80	85.65	75	50.78	37.83	27	
<b>SM5-20</b>		<b>m5</b>	20	B3	25	80	100	107.07	90	60.38	43.54	30	
<b>SM6-20</b>		<b>m6</b>	20	B3	28	100	120	128.48	104	67.67	48.24	34	
<b>SM8-20</b>	<b>m8</b>	20	B3	30	130	160	171.31	125	73.33	50.66	30		
<b>SM1-25</b>	1	<b>m1</b>	25	B3	6	20	25	26.41	23	15.16	11.21	8	
<b>SM1.25-25</b>		<b>m1.25</b>	25	B3	8	25	31.25	33.02	28	17.88	13.26	9.25	
<b>SM1.5-25</b>		<b>m1.5</b>	25	B3	10	30	37.5	39.62	34	22.25	16.31	11.5	
<b>SM2-25</b>		<b>m2</b>	25	B3	12	40	50	52.83	40	24.33	16.41	10	
<b>SM2.5-25</b>		<b>m2.5</b>	25	B3	16	50	62.5	66.04	50	30.41	20.52	12.5	
<b>SM3-25</b>		<b>m3</b>	25	B3	20	60	75	79.24	60	37.81	24.62	15	
<b>SM3.5-25</b>		<b>m3.5</b>	25	B3	25	70	87.5	92.45	70	43.23	28.72	17.5	
<b>SM4-25</b>		<b>m4</b>	25	B3	28	80	100	105.66	80	49.32	32.83	20	
<b>SM5-25</b>		<b>m5</b>	25	B3	28	100	125	132.07	100	60.82	41.04	25	
<b>SM6-25</b>		<b>m6</b>	25	B3	28	120	150	158.48	120	72.32	49.24	30	
<b>SM1-30</b>		1	<b>m1</b>	30	B3	8	24	30	31.41	28	17.71	13.71	10
<b>SM1.25-30</b>			<b>m1.25</b>	30	B3	10	30	37.5	39.27	36	23.47	18.13	13.5
<b>SM1.5-30</b>	<b>m1.5</b>		30	B3	10	36	45	47.12	43	28.24	21.56	16	
<b>SM2-30</b>	<b>m2</b>		30	B3	12	45	60	62.83	50	29.42	21.41	12.5	
<b>SM2.5-30</b>	<b>m2.5</b>		30	B3	16	60	75	78.54	62	36.28	26.27	17	
<b>SM3-30</b>	<b>m3</b>		30	B3	20	70	90	94.24	75	45.47	32.12	20	
<b>SM3.5-30</b>	<b>m3.5</b>		30	B3	25	90	105	109.95	85	49.66	34.97	25	
<b>SM4-30</b>	<b>m4</b>		30	B3	28	100	120	125.66	95	54.52	37.83	25	
<b>SM5-30</b>	<b>m5</b>		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.



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

[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.

Spur  
GearsHelical  
GearsInternal  
Gears

Racks

CP Racks  
& PinionsMiter  
GearsBevel  
GearsScrew  
GearsWorm  
Gear PairBevel  
GearboxesOther  
Products



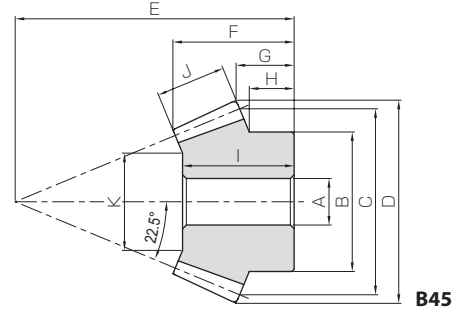
# SAM Angular Miter Gears



Module 1.5、2、2.5、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)



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 <sub>H7</sub>	B	C	D	E	F	G
<b>SAM1.5-20045</b>	1	<b>m1.5</b>	20	45°	B45	8	25	30	32.77	45	19.33	9.36
<b>SAM2-20045</b>		<b>m2</b>	20	45°	B45	10	30	40	43.69	60	26.08	12.48
<b>SAM2.5-20045</b>		<b>m2.5</b>	20	45°	B45	12	40	50	54.62	75	31.92	15.6
<b>SAM3-20045</b>		<b>m3</b>	20	45°	B45	14	50	60	65.54	90	38.66	18.72
<b>SAM1.5-20060</b>	1	<b>m1.5</b>	20	60°	B60	8	25	30	32.59	40	22.3	14.77
<b>SAM2-20060</b>		<b>m2</b>	20	60°	B60	12	32	40	43.46	50	26.39	16.36
<b>SAM2.5-20060</b>		<b>m2.5</b>	20	60°	B60	14	40	50	54.33	60	30.49	17.94
<b>SAM3-20060</b>		<b>m3</b>	20	60°	B60	16	50	60	65.19	70	34.59	19.54
<b>SAM1.5-20120</b>	1	<b>m1.5</b>	20	120°	B120	8	26	30	31.5	26	20.69	18.64
<b>SAM2-20120</b>		<b>m2</b>	20	120°	B120	12	34	40	42	34	26.86	24.18
<b>SAM2.5-20120</b>		<b>m2.5</b>	20	120°	B120	14	42	50	52.5	42	33.22	29.73
<b>SAM3-20120</b>		<b>m3</b>	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°

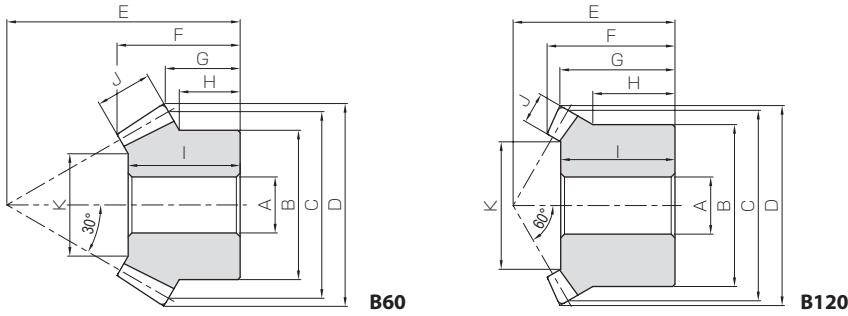


Shaft angle 120°

\* 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.



Angular Miter Gears

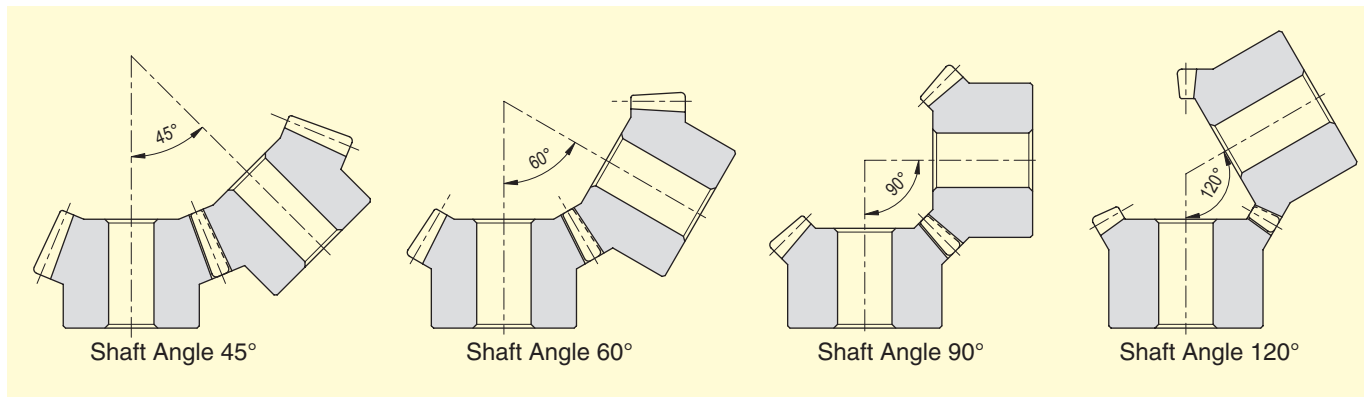


Hub width H	Length of bore I	Face width J	Holding surface dia. K	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
7.75	18	11	17	4.30	0.38	0.44	0.039	0.05~0.15	0.067	<b>SAM1.5-20045</b>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

[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.



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



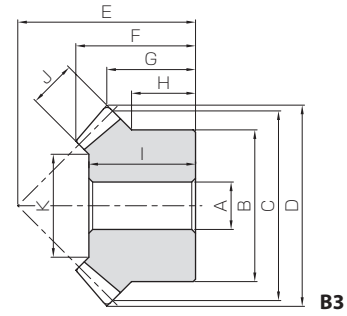
# SUM Stainless Steel Miter Gears



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)



Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pair

Bevel Gearboxes

Other Products

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
					AH7	B	C	D	E	F	G	H
<b>SUM1-20</b>	1	<b>m1</b>	20	B3	6	16	20	21.41	20	13.95	10.71	8
<b>SUM1.5-20</b>		<b>m1.5</b>	20	B3	8	26	30	32.12	30	21.24	16.06	13
<b>SUM2-20</b>		<b>m2</b>	20	B3	12	34	40	42.83	37	24.89	18.41	14
<b>SUM2.5-20</b>		<b>m2.5</b>	20	B3	14	42	50	53.54	48	32.54	24.77	19
<b>SUM3-20</b>		<b>m3</b>	20	B3	16	50	60	64.24	58	39.84	30.12	23
<b>SUM4-20</b>	<b>m4</b>	20	B3	20	64	80	85.65	75	50.78	37.83	27	
<b>SUM1-25</b>	1	<b>m1</b>	25	B3	6	20	25	26.41	23	15.16	11.21	8
<b>SUM1.5-25</b>		<b>m1.5</b>	25	B3	10	30	37.5	39.62	34	22.25	16.31	11.5
<b>SUM2-25</b>		<b>m2</b>	25	B3	12	45	50	52.83	40	24.33	16.41	12.5
<b>SUM2.5-25</b>		<b>m2.5</b>	25	B3	16	55	62.5	66.04	50	30.41	20.52	15
<b>SUM3-25</b>		<b>m3</b>	25	B3	20	65	75	79.24	60	37.81	24.62	17.5
<b>SUM4-25</b>	<b>m4</b>	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.



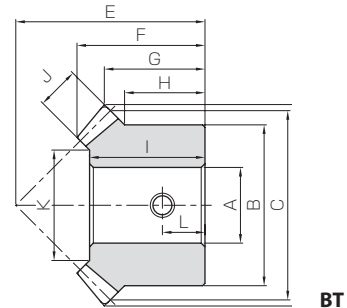
# SUMA Finished Bore Stainless Steel Miter Gears



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)



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
					AH7	B	C	D	E	F	G	H	I
<b>SUMA1-20</b>	1	<b>m1</b>	20	BT	6	16	20	21.41	20	13.95	10.71	8	12
<b>SUMA1.5-20</b>		<b>m1.5</b>	20	BT	8	26	30	32.12	30	21.24	16.06	13	19
<b>SUMA2-20</b>		<b>m2</b>	20	BK	12	34	40	42.83	37	24.89	18.41	14	22
<b>SUMA2.5-20</b>		<b>m2.5</b>	20	BK	14	42	50	53.54	48	32.54	24.77	19	29
<b>SUMA3-20</b>		<b>m3</b>	20	BK	16	50	60	64.24	58	39.84	30.12	23	35
<b>SUMA4-20</b>	<b>m4</b>	20	BK	20	64	80	85.65	75	50.78	37.83	27	45	
<b>SUMA1-25</b>	1	<b>m1</b>	25	BT	6	20	25	26.41	23	15.16	11.21	8	14
<b>SUMA1.5-25</b>		<b>m1.5</b>	25	BT	10	30	37.5	39.62	34	22.25	16.31	11.5	19
<b>SUMA2-25</b>		<b>m2</b>	25	BK	12	45	50	52.83	40	24.33	16.41	12.5	20
<b>SUMA2.5-25</b>		<b>m2.5</b>	25	BK	16	55	62.5	66.04	50	30.41	20.52	15	26
<b>SUMA3-25</b>		<b>m3</b>	25	BK	20	65	75	79.24	60	37.81	24.62	17.5	32
<b>SUMA4-25</b>	<b>m4</b>	25	BK	30	80	100	105.66	80	49.32	32.83	20	43	

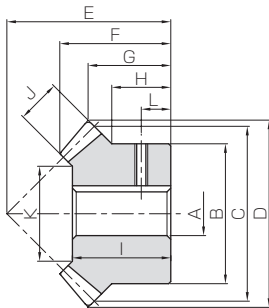
- [Caution on Product Characteristics]
- ① Keyways are made according to JIS B1301 standards and Js 9 tolerances. For products with a tapped hole, a set screw is included as an accessory.
  - ② The allowable torques shown in the table are the calculated values according to the assumed usage conditions. 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 I	Face width J	Holding surface dia. K	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
12	5	9.86	0.49	0.060	0.050	0.0061	0.03~0.13	0.019	<b>SUM1-20</b>
19	8	15.37	1.72	0.22	0.18	0.022	0.05~0.15	0.074	<b>SUM1.5-20</b>
22	10	21.72	3.94	0.51	0.40	0.052	0.06~0.16	0.15	<b>SUM2-20</b>
29	12	28.06	7.52	1.00	0.77	0.10	0.07~0.17	0.30	<b>SUM2.5-20</b>
35	15	31.57	13.3	1.80	1.36	0.18	0.08~0.18	0.52	<b>SUM3-20</b>
45	20	43.43	31.5	4.39	3.22	0.45	0.12~0.27	1.15	<b>SUM4-20</b>
14	6	15.03	0.81	0.12	0.083	0.012	0.03~0.13	0.035	<b>SUM1-25</b>
19	9	19.54	2.74	0.41	0.28	0.042	0.05~0.15	0.11	<b>SUM1.5-25</b>
20	12	26.06	6.50	1.00	0.66	0.10	0.06~0.16	0.24	<b>SUM2-25</b>
26	15	34.57	12.7	2.00	1.29	0.20	0.07~0.17	0.46	<b>SUM2.5-25</b>
32	20	37.43	23.3	3.73	2.37	0.38	0.08~0.18	0.80	<b>SUM3-25</b>
43	25	55.29	53.2	8.79	5.43	0.90	0.12~0.27	1.72	<b>SUM4-25</b>

[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.

**Finished Bore Stainless Steel Miter Gears**



BK

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

[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

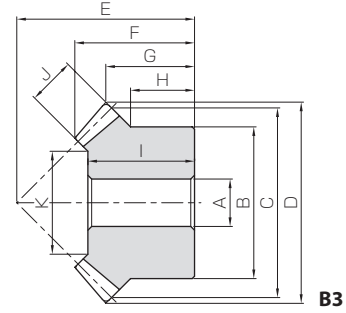


Module 1 ~ 4



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.



Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pair

Bevel Gearboxes

Other Products

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	<b>m1</b>	20	B3	6	16	20	21.41	20	13.95	10.71	8
PM1.25-20		<b>m1.25</b>	20	B3	8	22	25	26.77	23	15.27	11.38	9
PM1.5-20		<b>m1.5</b>	20	B3	8	26	30	32.12	30	21.24	16.06	13
PM2-20		<b>m2</b>	20	B3	10	34	40	42.83	37	24.89	18.41	14
PM2.5-20		<b>m2.5</b>	20	B3	12	42	50	53.54	48	32.54	24.77	19
PM3-20	1	<b>m3</b>	20	B3	14	50	60	64.24	58	39.84	30.12	23
PM3.5-20		<b>m3.5</b>	20	B3	20	60	70	74.95	65	44.13	32.47	25
PM4-20		<b>m4</b>	20	B3	20	64	80	85.66	75	50.78	37.83	27
PM1-25	1	<b>m1</b>	25	B3	6	20	25	26.41	23	15.16	11.21	8
PM1.25-25		<b>m1.25</b>	25	B3	8	25	31.25	33.02	28	17.88	13.26	9.25
PM1.5-25		<b>m1.5</b>	25	B3	8	30	37.5	39.62	34	22.25	16.31	11.5
PM2-25		<b>m2</b>	25	B3	10	40	50	52.83	40	24.33	16.41	10
PM2.5-25		<b>m2.5</b>	25	B3	14	50	62.5	66.04	50	30.41	20.52	12.5
PM3-25	<b>m3</b>	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.



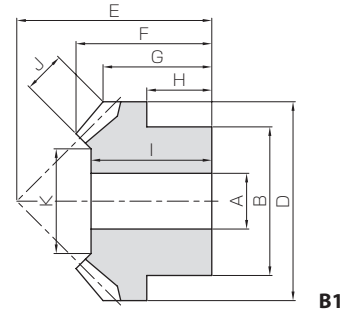
# DM Injection Molded Miter Gears



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)



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	<b>m0.5</b>	20	B1	3	8	10	10.71	11	7.97	6.35
DM0.8-20		<b>m0.8</b>	20	B1	5	12	16	17.13	16	10.83	8.56
DM1-20		<b>m1</b>	20	B1	6	16	20	21.41	21	14.62	11.71
DM1.5-20		<b>m1.5</b>	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 (mm)	Weight (g)	Catalog No.
H	I	J	K	Bending strength	Bending strength			
4	7	2.5	4.93	0.082	0.0083	0 ~ 0.30	0.57	<b>DM0.5-20</b>
5	10	3.5	10.1	0.31	0.032	0 ~ 0.48	1.93	<b>DM0.8-20</b>
7	13	4.5	11.27	0.54	0.055	0 ~ 0.60	4.28	<b>DM1-20</b>
10	19	7	18.2	0.96	0.098	0 ~ 0.60	11.8	<b>DM1.5-20</b>

- [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



PM

### Plastic Miter Gears

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

[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.

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pair

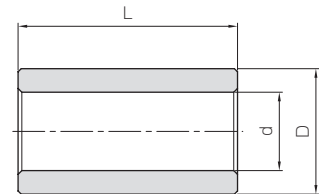
Bevel Gearboxes

Other Products

## 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 <sup>+0.02</sup> / <sub>0</sub>	D <sup>+0.02</sup> / <sub>-0.01</sub>	L <sub>-0.3</sub>	
<b>BB30507</b>	3	5	7	DM0.8
<b>BB30608</b>	3	6	8	DM1
<b>BB40609</b>	4	6	9	DM1
<b>BB50814</b>	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.

SMSG1-20R



Actual size

SMSG1-20L

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



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.