



Miter Gears

Spur Gears

Helical Gears

Internal Gears

Racks

CP Racks & Pinions

Miter Gears

Bevel Gears

Screw Gears

Worm Gear Pairs

Bevel Gearboxes

Other Products

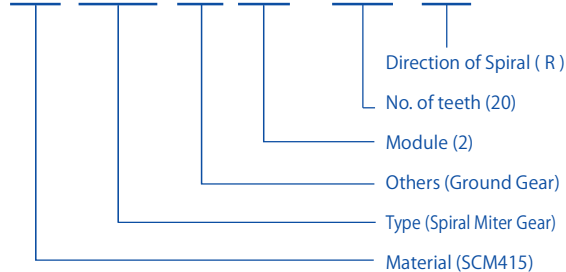
MMSG Ground Spiral Miter Gears Precision: 1 Material: SCM415 Heat Treatment: Tooth area carburized m2 ~ 4 Page 276	SMSG Ground Spiral Miter Gears Precision: 2 Material: S45C Heat Treatment: Gear teeth induction hardened m1 ~ 5 Page 278	MMSA/MMSB Finished Bore Spiral Miter Gears Precision: 4 Material: SCM415 Heat Treatment: Carburized m1 ~ 10 Page 280	MMS Spiral Miter Gears Precision: 4 Material: SCM415 Heat Treatment: Tooth area carburized m2 ~ 5 Page 282	SMS Spiral Miter Gears Precision: 4 Material: S45C Heat Treatment: Gear teeth induction hardened m1 ~ 8 Page 284	SMZG Ground Zerol Miter Gears Precision: 2 Material: S45C Heat Treatment: Gear teeth induction hardened m2 ~ 3 Page 286
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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

MMSG 2-20R



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
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Characteristics



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

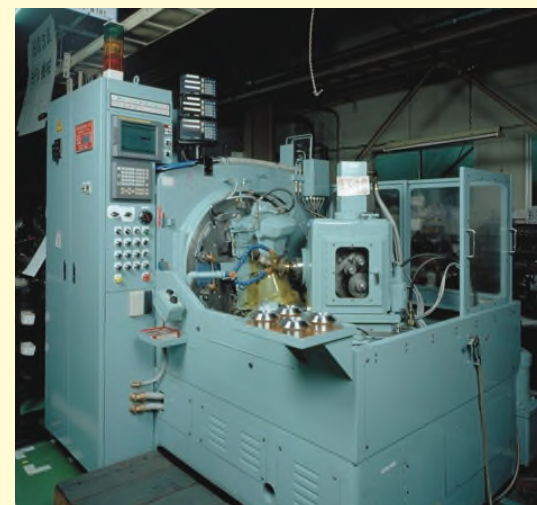
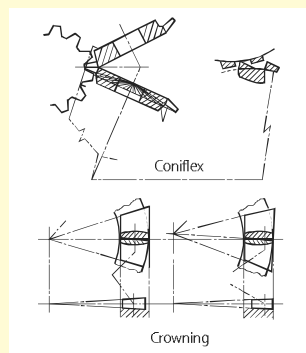
Type	Catalog No.	Module	No. of Teeth () Shaft Angle	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704 : 1978	Secondary Operations	Features
Spiral Miter Gears	MMSG	2 ~ 4	20, 25, 30	SCM415	Carburized Note 1	Ground	1	△	High strength, abrasion-resistant and compact for high speed & torque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

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

○ Possible △ Partly Possible × Not possible

We use the Crowning method for gear cutting

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



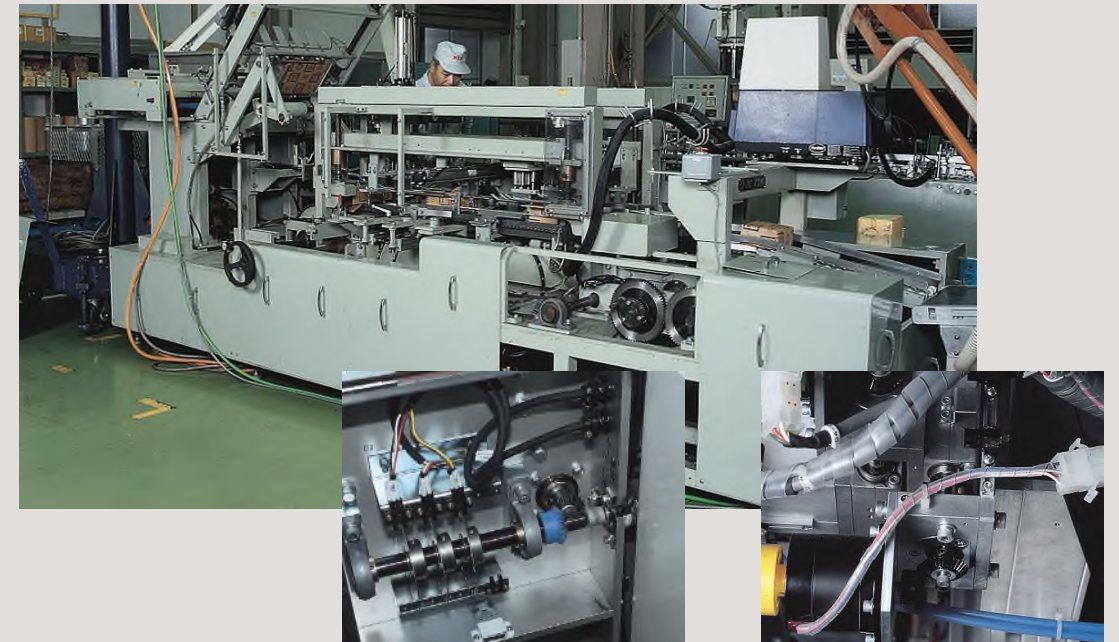
Gleason Coniflex No.104

Application Examples



KHK stock bevel gears (miter gears) are adopted in driving devices for all kinds of intersecting axes, including transport devices.

Automatic packaging machine



SM miter gears and PM plastic miter gears used for control devices

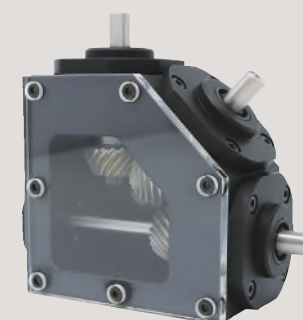
SM miter gears used for transport devices

Masdac Dorayaki Machine

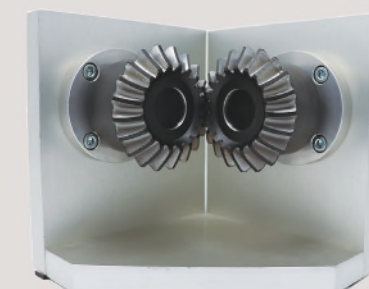


SM miter gears used for reversing fabrics

Angular Miter Gear Box



Zerol Miter Gear Set



Spiral Miter Gear Set



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 92.

■ Calculation assumptions for Bending Strength of Gears

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

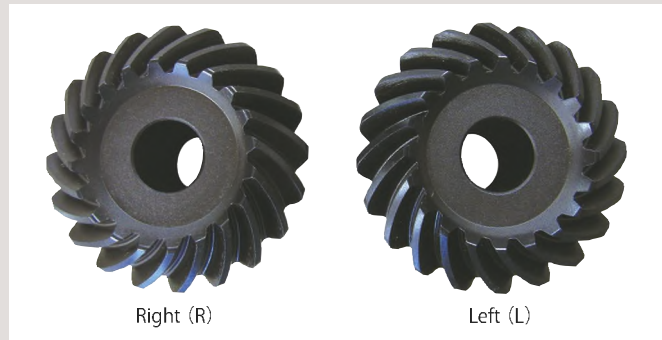
■ Calculation assumptions for Surface Durability (Except those in common with bending strength)

Formula NOTE 1	Formula of bevel gears on bending strength (JGMA404-01)			
Kinematic viscosity of lubricant	100cSt (50°C)			
Gear support	Shafts & gear box have normal stiffness, and gears are supported on one end			
Allowable Hertz stress σ_{Hlim} (kgf/mm ²)	166	90	49	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 Polyplenco Limited and "Duracon Gear Data" by Polyplastic Co. The units for the number of rotations (rpm) and the stress (kgf/mm²) are adjusted to the units needed in the formula.

[NOTE 2] The allowable bending stress at the root σ_{Fim} 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 gears 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.

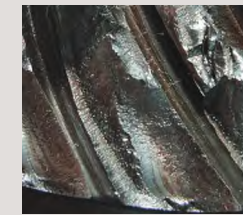
The most important factor in selecting gears is the gear strength.

Step 1

Determine the actual load torque applied to the gear and the gear type suitable for the purpose.

■ Definition of Bending Strength of Gears

The allowable bending strength of a gear is defined as the allowable tangential force at the pitch circle based on the mutually allowable root stress of two meshing gears under load.



Example of failure due to insufficient bending strength

■ Definition of Surface Durability

The surface durability of a gear is defined as the allowable tangential force at the pitch circle, which permits the force to be transmitted safely without incurring surface failure. The allowable gear tooth load of a gear is defined as the allowable tangential force at the pitch circle based on the mutual gear tooth strength of two meshing gears under load



Example of wear due to insufficient surface durability

Step 2

Select provisionally from the allowable torque table of the Master Catalog based on the load torque.

■ For provisional selection from the Master Catalog

Catalog No.	Number of teeth	A	B	C	D	E	F	G	H	I	J	K	Allowable torque (kgm)	Surface durability	Surface durability	Surface durability
MMSG2-20R	20	12	35	40	42.7	35	21.98	16.35	12.5	20	9	24.54	17.0	23.5	1.73	2.40
MMSG2-20L		14	42	50	53.2	45	28.63	21.6	16	26	11	30.89	32.7	46.1	3.33	4.70
MMSG3-20R	20	16	52	60	63.99	50	30.78	21.99	16	27	14	34.4	58.5	83.7	5.97	8.54
MMSG3-20L		20	50	70	74.53	55	32.45	22.26	14	29	16	42.75	91.8	133	9.36	13.6
MMSG4-20R	20	20	55	80	84.99	65	39.13	27.5	17	35	18	49.08	136	199	13.8	20.3
MMSG4-20L		12	38	50	52.5	40	23.43	16.25	11	21	11	30.89	27.5	47.0	2.80	4.79
MMSG5-20R	20	16	45	62.5	65.34	50	29.57	20.27	14	26	14	37.4	54.3	94.5	5.54	9.64
MMSG5-20L		20	55	75	78.78	60	35.6	24.39	17	31	17	43.97	94.5	167	9.64	17.0
MMSG6-20R	20	25	65	87.5	91.81	70	41.65	28.41	19	37	20	52.43	151	270	15.4	27.5
MMSG6-20L		28	75	100	104.7	80	47.8	32.35	22	42	23	58.95	216	392	22.1	40.0

Step 3

We recommend that each user computes their own values by applying the actual usage conditions to determine the suitability of the gear strength.

Calculate the strength formally using the various gear strength formulas. Please see Page 87 of our technical reference book for more details.

Strength confirmation is simple when using the website.

(2) Bending Strength Equations

The tangential force, F_{tm} , acting at the central pitch circle should be less than the allowable tangential force, F_{tlim} , which is based upon the allowable bending stress at the root σ_{Fim} .

That is:

$$F_{tm} \leq F_{tlim} \quad (10.30)$$

The bending stress at the root, σ_F , which is derived from F_{tm} should not exceed the allowable bending stress σ_{Fim} .

$$\sigma_F \leq \sigma_{Fim} \quad (10.31)$$

The tangential force at the central pitch circle, F_{tm} (kgf) is obtained from Equation (10.32).

$$F_{tlim} = 0.85 \cos \beta_m \sigma_{Fim} m b \left\{ \frac{R_a - 0.5b}{R_a} \right\} \quad (10.32)$$

MMSG2-20R Strength calculation of gears

Rotating Speed	600 rpm
Number of repetitions	Above 10,000,000
Dimension Factor of Root Stress	1.00
Impact from Prime Mover	Impact from Load Side of Machine
	Uniform Load Medium impact Heavy impact
Uniform Load	1.00 1.25 1.75
Light impact	1.25 1.50 2.00
Medium impact	1.50 1.75 2.25
Kinematic Viscosity of Lubricant	ISO VG 100
Safety Factor	1.2
Method of Gear shaft Support	<input type="radio"/> Bearing on One End <input type="radio"/> Bearing on Both Ends
Direction of Load	<input type="radio"/> Unidirectional <input type="radio"/> Bidirectional
Unit	<input type="radio"/> kgf <input type="radio"/> N

Calculation result display

When selecting KHK standard gears, glance over the Cautions on Product Characteristics and Cautions on Performing Secondary Operations in the respective dimension tables.

- Products not listed in this catalog or materials, modules, number of teeth and the like not listed in the dimensional tables can be manufactured as custom items. Please see Page 16 for more details about custom-made orders.
- The color and shape of the product images listed on the dimension table page of each product may differ from the actual product. Be sure to confirm the shape in the dimension table before selection.
- The details (specifications, dimensions, prices, etc.) listed in the catalog may be changed without prior notice. Changes are announced on the KHK website.

Website URL: <https://khkgears.net/>

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

Application Hints

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

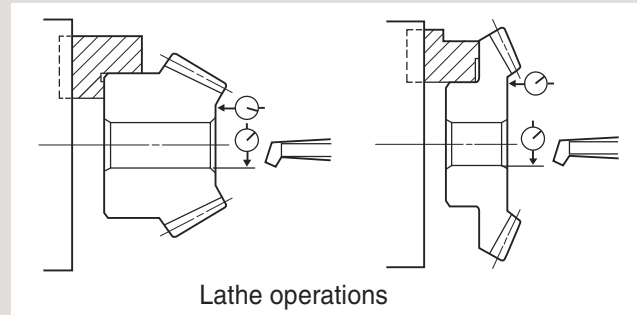
TEL: 81-48-254-1744 FAX: 81-48-254-1765 E-mail: info@khkgears.net

1. Cautions on Handling

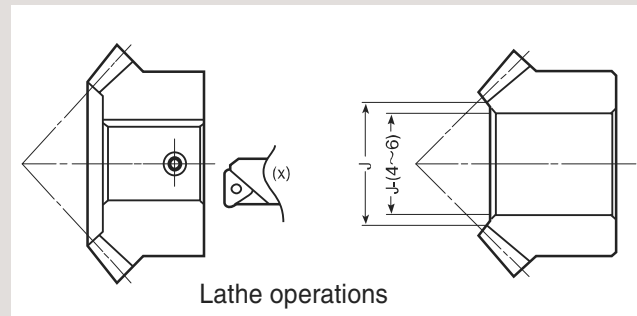
- ① KHK products are packaged one by one to prevent scratches and dents, but if you find issues such as rust, scratches, or dents when the product is removed from the box after purchase, please contact the supplier.
- ② Depending on the handling method, the product may become deformed or damaged. Resin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

2. Caution on Performing Secondary Operations

- ① If you are 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.



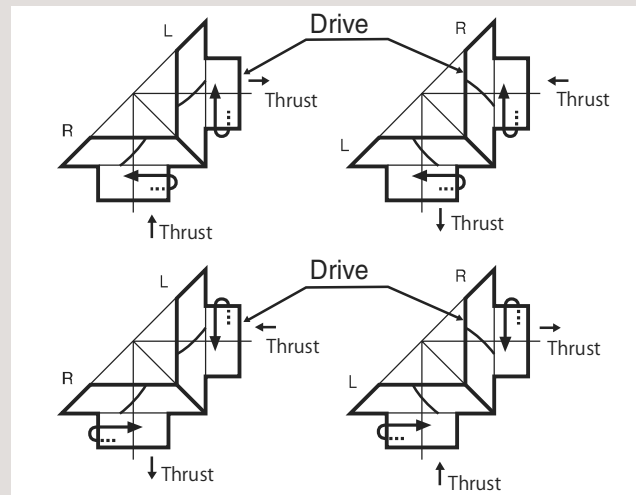
- ④ For items with induction hardened teeth, such as SMSG and SMS series, the hardness is high near the tooth root. When machining the front face, the machined area should be 4 to 6mm smaller than the dimension, J.



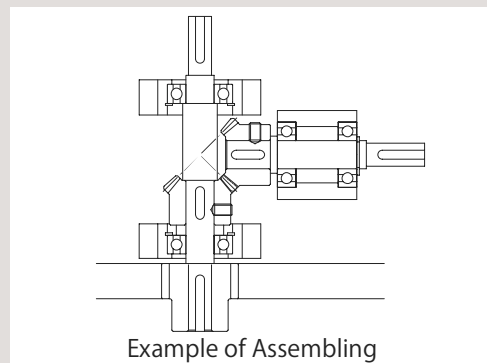
- ⑤ For tapping and keyway operations, see the examples given in "1. Caution on Performing Secondary Operations" in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentrations, always leave radii on corners.
- ⑥ PM plastic miter gears are susceptible to changes due to temperature and humidity. Dimensions may change between, during, and after re-machining operations.
- ⑦ When heat-treating S45C products, it is possible to get thermal stress cracks. It is best to subject them to penetrant inspection afterwards. 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.

3. Points of Caution in Assembling

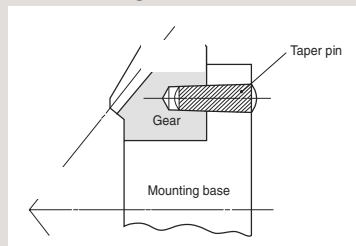
- ① Since miter gears are cone shaped, they produce axial thrust forces. Specifically with regard to spiral miter gears, the directions of thrust change with the hand of spiral and the direction of rotation. This is illustrated below. The bearings must be selected properly to be able to handle these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

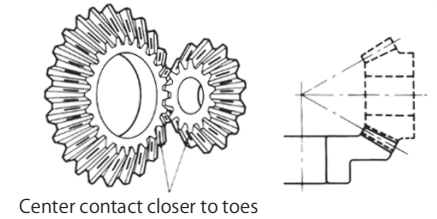


- ⑤ KHK stock miter gears are designed such that, when assembled according to the specified mounting distance with a tolerance of H7 to H8, the normal direction backlash shown in the table is obtained. Mounting distance error, offset error and shaft angle error must be minimized to avoid excessive noise and wear. Inaccurate assembly will lead to irregular noises and uneven wear. Various conditions of tooth contact are shown below. Also, when changing the normal direction backlash, adjust the mounting distance according to the amount of axial movement shown in the table below so as not to change the tooth contact.

Shaft Angle (°)	Normal direction backlash	Travel in axial direction	
		Drive gear	Driven gear
90	j_n	$1.03 \times j_n$	$1.03 \times j_n$
60		$1.46 \times j_n$	$1.46 \times j_n$
120		$0.84 \times j_n$	$0.84 \times j_n$

Correct Tooth Contact

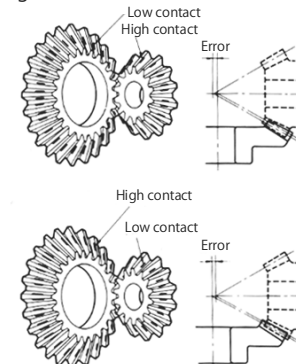
- When assembled correctly, the contact will occur on both gears in the middle of the flank and center of face width but somewhat closer to the toe.



Incorrect Tooth Contact

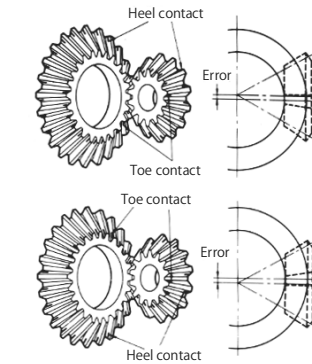
Mounting Distance Error

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



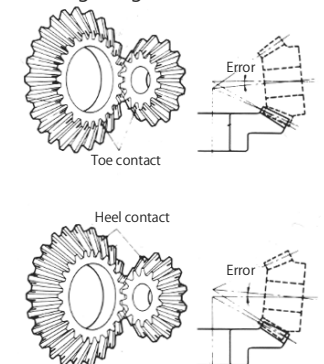
Offset Error

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



Shaft Angle Error

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



4. Cautions on Starting

- ① Check the following items before starting.
 - Are the gears installed securely?
 - Is there uneven tooth contact?
 - Is there adequate backlash? Be sure to avoid zero-backlash.
 - Has proper lubrication been supplied?
- ② If gears are exposed, be sure to attach a safety cover to ensure safety. Also, be careful not to touch rotating gears.
- ③ Gears can be lubricated with the "grease lubrication method", "splash lubrication method (oil bath method)," or "forced lubrication method (circulation lubrication method)". For initial operation, the lubricant may dete-

riorate markedly, so check the condition of the lubricant after starting. For more technical information, please see the section "Gear Lubrication" (Page 112) of our technical reference book.

- ④ If there is any abnormality such as noise or vibration during startup, check the gears and assembly condition. "High gear accuracy", "smooth gear teeth surface" and "correct tooth contact" are some of the measures against gear noise. For more technical information, please see the section "Gear Noise and Countermeasures" (Page 119) of our technical reference book.

KHK considers safety a priority in the use of our products.

When handling, adding secondary operations, assembling, and operating KHK products, please be aware of the following issues in order to prevent accidents.

Warning: Precautions for preventing physical and property damage

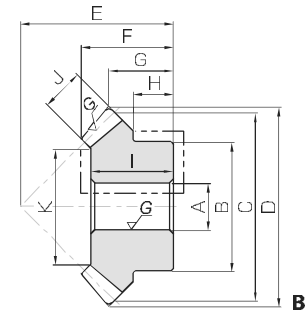
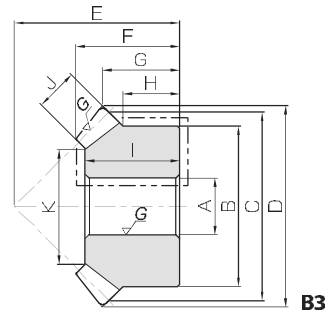
1. When using KHK products, follow relevant safety regulations (Occupational Safety and Health Regulations, etc.).
2. Pay attention to the following items when installing, removing, or performing maintenance and inspection of the product.
 - ① Turn off the power switch.
 - ② Do not reach or crawl under the product.
 - ③ Wear appropriate clothing and protective equipment for the work.

Cautions in Preventing Accidents

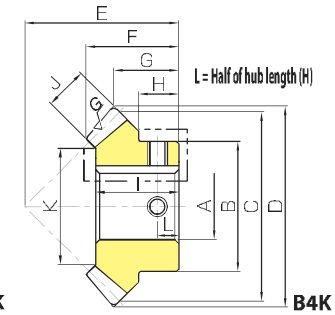
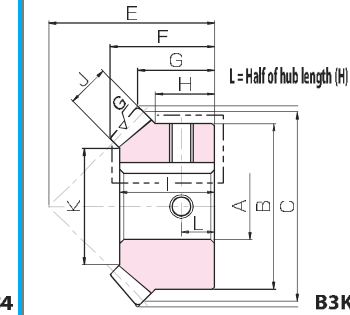
1. Before using a KHK product, read the precautions in the catalog carefully in order to use it correctly.
2. Avoid use in environments that may adversely affect the product.
3. Our products are manufactured under a superior quality control system based on the ISO9000 quality management system; if you notice any malfunctions upon purchasing a product, please contact the supplier.



Specifications		A _{H7}	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
* The precision grade of J Series products is equivalent to the value shown in the table.			
		I	Length of bore
		J	Face width
		K	Holding surface dia.



J Series



Ground Spiral Miter Gears



Catalog No.	Gear ratio	No. of teeth	Shape	A _{H7}	B	C	D	E	F	G	H	I	J	K	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)			
															Bending strength	Surface durability	Bending strength	Surface durability					
MMSG2-20R MMSG2-20L	1	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				1	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	0.21
MMSG2.5-25R MMSG2.5-25L	16	45	62.5				65.54	50	29.57	20.27	14	26	14	37.4	54.3	94.5	5.54	9.64	0.05~0.11	0.37			
MMSG3-25R MMSG3-25L	20	55	75				78.78	60	35.6	24.39	17	31	17	43.92	94.5	167	9.64	17.0	0.06~0.12	0.65			
MMSG3.5-25R MMSG3.5-25L	25	65	87.5				91.81	70	41.65	28.41	19	37	20	52.43	151	270	15.4	27.5	0.07~0.13	1.04			
MMSG4-25R MMSG4-25L	28	75	100				104.7	80	47.8	32.35	22	42	23	58.95	216	392	22.1	40.0	0.09~0.15	1.57			
MMSG2-30R MMSG2-30L	1	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	0.36
MMSG2.5-30R MMSG2.5-30L							16	55	75	78.04	60	34.08	24.02	16	30	15	47.57	75.3	156	7.68	16.0	0.05~0.11	0.66
MMSG3-30R MMSG3-30L							20	65	90	93.61	70	40.25	26.8	18	36	20	55.43	139	294	14.2	30.0	0.06~0.12	1.11
MMSG3.5-30R MMSG3.5-30L							25	80	105	109.21	80	44.4	29.6	20	40	22	67.77	204	436	20.8	44.5	0.07~0.13	1.75
MMSG4-30R MMSG4-30L							28	90	120	124.7	90	49.27	32.35	22	44	25	77.29	303	657	30.9	67.0	0.09~0.15	2.49

- [Caution on Product Characteristics]
- A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
 - The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 for more details.
 - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
 - These gears produce axial thrust forces. See page 274 for more details.
- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 274) 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.
 - 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).

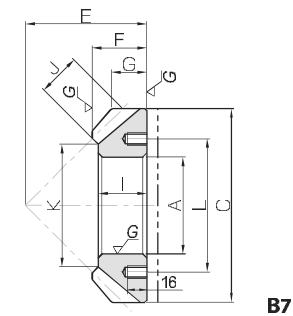
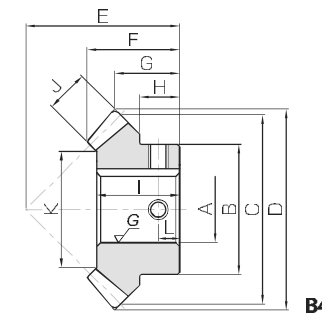
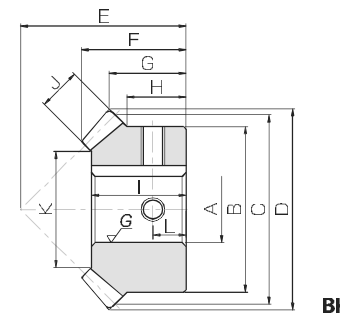
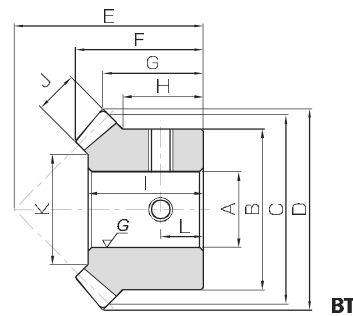
To order J Series products, please specify; **Catalog No. + J + BORE**

Bore H7	* The product shapes of J Series items are identified by background color.																			
	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50			
Keyway Js9	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	
Screw size	M4				M5				M6				M8				M10			
Catalog No.	B3K		B3K		B3K		B3K		B3K		B3K		B3K		B3K		B3K			
MMSG2-20R J BORE	B3K	B3K	B3K	B3K	B3K	B3K														
MMSG2-20L J BORE	B3K	B3K	B3K	B3K	B3K	B3K														
MMSG2.5-20R J BORE		B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K											
MMSG2.5-20L J BORE		B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K											
MMSG3-20R J BORE				B3K	B3K	B3K	B3K	B3K	B3K	B3K										
MMSG3-20L J BORE				B3K	B3K	B3K	B3K	B3K	B3K	B3K										
MMSG3.5-20R J BORE										B4K	B4K	B4K	B4K							
MMSG3.5-20L J BORE										B4K	B4K	B4K	B4K	B4K						
MMSG4-20R J BORE										B4K	B4K	B4K	B4K	B4K	B4K					
MMSG4-20L J BORE										B4K	B4K	B4K	B4K	B4K	B4K					
MMSG2-25R J BORE	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K											
MMSG2-25L J BORE	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K											
MMSG2.5-25R J BORE				B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K									
MMSG2.5-25L J BORE				B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K									
MMSG3-25R J BORE										B4K	B4K	B4K	B4K	B4K						
MMSG3-25L J BORE										B4K	B4K	B4K	B4K	B4K						
MMSG3.5-25R J BORE											B4K	B4K	B4K	B4K	B4K	B4K				
MMSG3.5-25L J BORE											B4K	B4K	B4K	B4K	B4K	B4K				
MMSG4-25R J BORE												B4K	B4K	B4K	B4K	B4K	B4K			
MMSG4-25L J BORE												B4K	B4K	B4K	B4K	B4K	B4K			
MMSG2-30R J BORE		B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K									
MMSG2-30L J BORE		B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K									
MMSG2.5-30R J BORE				B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K							
MMSG2.5-30L J BORE				B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K							
MMSG3-30R J BORE										B4K	B4K	B4K	B4K	B4K	B4K					
MMSG3-30L J BORE										B4K	B4K	B4K	B4K	B4K	B4K	B4K				
MMSG3.5-30R J BORE												B4K	B4K	B4K	B4K	B4K	B4K	B4K		
MMSG3.5-30L J BORE												B4K	B4K	B4K	B4K	B4K	B4K	B4K		
MMSG4-30R J BORE													B4K	B4K	B4K	B4K	B4K	B4K	B4K	
MMSG4-30L J BORE													B4K	B4K	B4K	B4K	B4K	B4K	B4K	

- [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 counterbored to reduce the length of the tap. (Products marked with "*" are tap size).
 - For products having a tapped hole, a set screw is included.



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



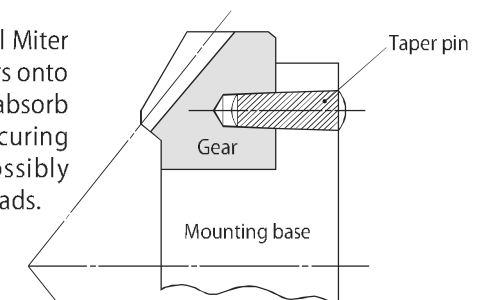
Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore
						A/H7	B								
MMSA1-20R MMSB1-20R MMSA1-20L MMSB1-20L	1	m1	20	R	BT	8	17	20	21.29	20	13.53	10.64	8.5	12.2	
L				BT	10										
MMSA1.5-20R MMSB1.5-20R MMSA1.5-20L MMSB1.5-20L	1	m1.5	20	R	BT	10	25	30	31.9	28	18.48	13.95	10.5	16.5	
L				BT	12										
MMSA2-20R MMSB2-20R MMSA2-20L MMSB2-20L	1	m2	20	R	BK	14	35	40	42.52	35	22.09	16.26	12.5	20	
L				BK	16										
MMSA2.5-20R MMSB2.5-20R MMSA2.5-20L MMSB2.5-20L	1	m2.5	20	R	BK	18	42	50	53.2	45	28.63	21.6	16	26	
L				BK	20										
MMSA3-20R MMSB3-20R MMSA3-20L MMSB3-20L	1	m3	20	R	BK	20	52	60	63.99	50	30.78	21.99	16	27	
L				BK	22										
MMSA3.5-20R MMSB3.5-20R MMSA3.5-20L MMSB3.5-20L	1	m3.5	20	R	B4	25	50	70	74.53	55	32.45	22.26	14	29	
L				B4	28										
MMSA4-20R MMSB4-20R MMSA4-20L MMSB4-20L	1	m4	20	R	B4	28	55	80	84.99	65	39.13	27.5	17	35	
L				B4	30										
MMSA5-20R MMSB5-20R MMSA5-20L MMSB5-20L	1	m5	20	R	B4	30	70	100	106.25	75	42.99	28.13	17	38	
L				B4	35										
MMSA6-20R MMSB6-20R MMSA6-20L MMSB6-20L	1	m6	20	R	B4	40	80	120	127.59	90	51.13	33.8	20	45	
L				B4	45										
MMSA8-20R MMSA8-20L	1	m8	20	R	B7	80	—	160	—	100	45	29.16	—	40	
L				B7	80										
MMSA10-20R MMSA10-20L	1	m10	20	R	B7	100	—	200	—	125	58	36.48	—	50	
L				B7	100										

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

- [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 The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 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 274 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.

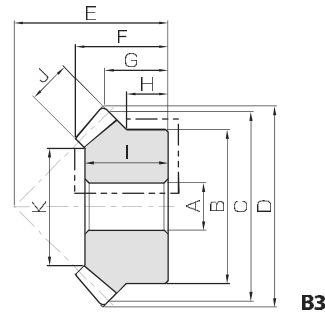
- [Caution on Secondary Operations]
- ① These products which are hardened by carburizing allow no secondary machining. However, for B7 type gears, the area surrounded with ----- line (in the illustration) is masked during the carburization process and can be modified. Care should be exercised since the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

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





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



Catalog No.	Gear ratio	Module	No. of teeth	Direction of spiral	Shape	Bore		Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A _{H7}	B						
MMS2-20R MMS2-20L	1	m2	20	R L	B3	12	34	40	42.31	35	22.14	16.15	
MMS2.5-20R MMS2.5-20L		m2.5	20	R L	B3	15	42	50	53.2	45	28.63	21.6	
MMS3-20R MMS3-20L		m3	20	R L	B3	16	52	60	63.99	50	30.78	21.99	
MMS4-20R MMS4-20L		m4	20	R L	B3	20	65	80	84.99	65	39.13	27.5	
MMS5-20R MMS5-20L		m5	20	R L	B3	25	85	100	106.25	75	42.99	28.13	
MMS2-25R MMS2-25L	1	m2	25	R L	B3	12	45	50	52.4	40	24.19	16.2	
MMS2.5-25R MMS2.5-25L		m2.5	25	R L	B3	16	55	62.5	65.54	50	30.24	20.27	
MMS3-25R MMS3-25L		m3	25	R L	B3	20	65	75	78.77	60	37.57	24.39	
MMS4-25R MMS4-25L		m4	25	R L	B3	25	85	100	104.7	80	49.14	32.35	
MMS5-25R MMS5-25L		m5	25	R L	B3	28	100	125	130.86	100	60.59	40.43	
MMS2-30R MMS2-30L	1	m2	30	R L	B3	12	45	60	62.42	50	29.27	21.21	
MMS2.5-30R MMS2.5-30L		m2.5	30	R L	B3	16	60	75	78.04	62	36.08	26.02	
MMS3-30R MMS3-30L		m3	30	R L	B3	20	70	90	93.61	75	45.25	31.8	
MMS4-30R MMS4-30L		m4	30	R L	B3	28	100	120	124.71	95	54.28	37.35	
MMS5-30R MMS5-30L		m5	30	R L	B3	28	130	150	155.9	120	68.2	47.95	

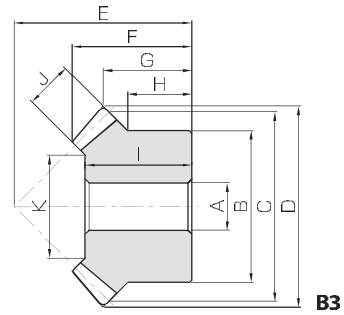
Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
12	20	9	24.54	17.0	17.3	1.73	1.76	0.06~0.16	0.13	MMS2-20R MMS2-20L
16	26	11	30.89	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 Product Characteristics]
- ① A set 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 272 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 274 for more details.

- [Caution on Secondary Operations]
- ① Please read "Caution on Performing Secondary Operations" (Page 274) 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).



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



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	

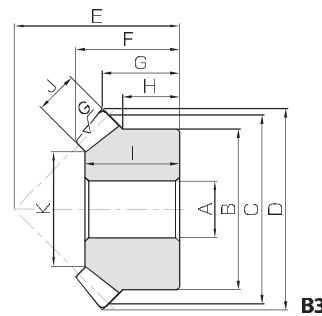
- [Caution on Product Characteristics]
- ① A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
 - ② The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 for more details.
 - ③ 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 274 for more details.
 - ⑤ Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.

Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (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 274) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
 - ② Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).



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



Catalog No.	Gear ratio	Module	No. of teeth	Helix angle	Direction of spiral	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
							A	B					
SMZG2-20R SMZG2-20L	1	m2	20	5°	R L	B3	12	34	40	43.32	37	24.69	18.66
SMZG2.5-20R SMZG2.5-20L		m2.5	20	5°	R L	B3	14	42	50	54.16	48	32.34	25.08
SMZG3-20R SMZG3-20L		m3	20	5°	R L	B3	16	50	60	64.89	58	39.52	30.45

- [Caution on Product Characteristics]
- A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
 - Allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 for more details.
 - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
 - These gears produce an axial thrust force, which is the same as straight bevel gears. For details, see our technical reference book (Page 108).

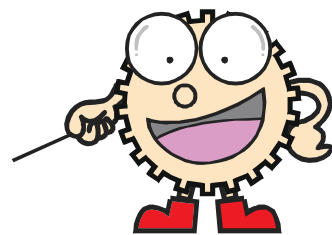
Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
H	I	J	K							
14	22	10	21.72	7.76	4.10	0.79	0.42	0.05~0.11	0.15	SMZG2-20R SMZG2-20L
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]
- Please read "Caution on Performing Secondary Operations" (Page 274) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
 - Due to gear teeth induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2to 3 mm).

■ Features of Zerol Miter Gears

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

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



■ Performance Comparison

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

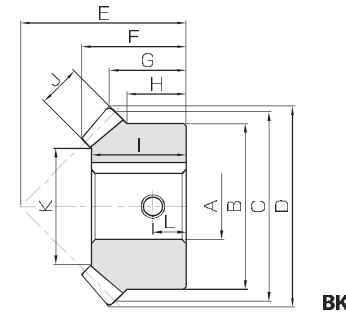
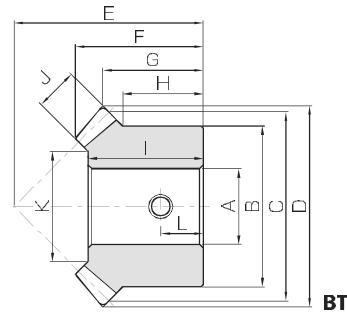
NOTE: The above evaluations were based on a comparison of 3 products.

■ Zerol Miter Gear Set Example





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
Surface treatment	Black oxide coating



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-H7	B								
SMA1-20 SMB1-20	1	m1	20	BT BT	8	16	20	21.41	20	13.95	10.71	8	12	
10					12	12.07								
SMA1.5-20 SMB1.5-20		m1.5	20	BT BK	10	26	30	32.12	30	21.24	16.06	13	19	
12					19									
SMA2-20 SMB2-20		m2	20	BK BK	14	34	40	42.83	37	24.89	18.41	14	22	
15					22									
SMA2.5-20 SMB2.5-20		m2.5	20	BK BK	18	42	50	53.54	48	32.54	24.77	19	29	
20					29									
SMA3-20 SMB3-20 SMC3-20		m3	20	BK BK BK	22	50	60	64.24	58	39.84	30.12	23	35	
25					35									
SMA3.5-20 SMB3.5-20		m3.5	20	BK BK	28	60	70	74.95	65	44.13	32.47	25	40	
30					40									
SMA4-20 SMB4-20 SMC4-20		m4	20	BK BK BK	30	64	80	85.65	75	50.78	37.83	27	45	
32					45									
SMA5-20 SMB5-20 SMC5-20		m5	20	BK BK BK	40	80	100	107.07	90	60.38	43.54	30	54	
30					54									
SMA6-20 SMB6-20 SMC6-20		m6	20	BK BK BK	45	100	120	128.48	104	67.67	48.24	34	60	
50					60									
SMA8-20		m8	20	BK	60	130	160	171.31	125	73.33	50.66	30	62	
SMA1-25		1	m1	25	BT BK	10	20	25	26.41	23	15.16	11.21	8	14
12						19								
SMA1.5-25			m1.5	25	BK BK	18	40	50	52.83	40	24.33	16.41	10	20
15						20								
SMA2-25 SMB2-25			m2	25	BK BK	20	50	62.5	66.04	50	30.41	20.52	12.5	26
18	26													
SMA2.5-25 SMB2.5-25	m2.5		25	BK BK	25	60	75	79.24	60	37.81	24.62	15	32	
30					32									
SMA3-25 SMB3-25	m3		25	BK BK	30	70	87.5	92.45	70	43.23	28.72	17.5	37	
35					37									
SMA3.5-25 SMB3.5-25	m3.5		25	BK BK	32	80	100	105.66	80	49.32	32.83	20	43	
35					43									
SMA4-25 SMB4-25	m4		25	BK BK	40	100	125	132.07	100	60.82	41.04	25	50	
50					50									
SMA5-25	m5		25	BK	55	120	150	158.48	120	72.32	49.24	30	61	
61					61									
SMA6-25	1		m6	30	BK BK	12	24	30	31.41	28	17.71	13.71	10	16
15						16								
SMA1-30			m1	30	BK BK	15	36	45	47.12	43	28.24	21.56	16	25
25						25								
SMA1.5-30			m1.5	30	BK BK	20	45	60	62.83	50	29.42	21.41	12.5	25
25						25								
SMA2-30 SMB2-30			m2	30	BK BK	25	60	75	78.54	62	36.28	26.27	17	32
30						32								
SMA2.5-30 SMB2.5-30		m2.5	30	BK BK	30	70	90	94.24	75	45.47	32.12	20	40	
35					40									
SMA3-30 SMB3-30		m3	30	BK BK	35	90	105	109.95	85	49.66	34.97	25	45	
40					45									
SMA3.5-30 SMB3.5-30		m3.5	30	BK BK	40	100	120	125.66	95	54.52	37.83	25	50	
50					50									
SMA4-30 SMB4-30		m4	30	BK BK	55	130	150	157.07	120	68.56	48.54	35	62	
62					62									

- [Caution on Product Characteristics]
- 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.
 - The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 for more details.
 - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
 - The keyway dimensions of items with "*" mark do not conform to JIS Standards.

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

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 274) when performing modification and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.
 - Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).



MM Carburized & Hardened Miter Gears

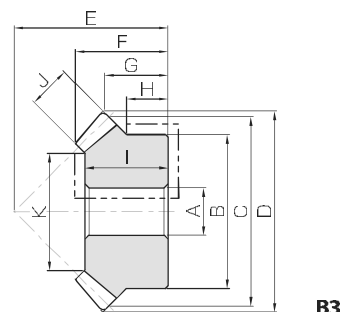
Module 2 ~ 5

MM

Carburized & Hardened Miter Gears



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



B3

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Hub dia.		Pitch dia.		Outside dia.		Mounting distance	Total length	Crown to back length		Hub width
					A _{H7}	B	C	D	E	F	G	H					
MM2-20	1	m2	20	B3	12	34	40	42.83	35	22.24	16.41	12		22.24	16.41		12
MM2.5-20		m2.5	20	B3	15	42	50	53.54	45	28.89	21.77	16					
MM3-20		m3	20	B3	16	52	60	64.24	50	31.19	22.12	16					
MM4-20		m4	20	B3	20	65	80	85.66	65	39.49	27.83	17.5					
MM5-20		m5	20	B3	25	80	100	107.07	90	60.38	43.54	30					
MM2-25	1	m2	25	B3	12	45	50	52.83	40	24.33	16.41	12.5		24.33	16.41		12.5
MM2.5-25		m2.5	25	B3	16	55	62.5	66.03	50	30.41	20.52	15					
MM3-25		m3	25	B3	20	65	75	79.24	60	37.81	24.62	17.5					
MM4-25		m4	25	B3	25	85	100	105.66	80	49.32	32.83	22.5					
MM5-25		m5	25	B3	28	100	125	132.07	100	60.82	41.04	25					
MM2-30	1	m2	30	B3	12	45	60	62.83	50	29.43	21.41	12.5		29.43	21.41		12.5
MM2.5-30		m2.5	30	B3	16	60	75	78.54	62	36.28	26.27	17					
MM3-30		m3	30	B3	20	70	90	94.24	75	45.47	32.12	20					
MM4-30		m4	30	B3	28	100	120	125.66	95	54.52	37.83	25					
MM5-30		m5	30	B3	28	130	150	157.07	120	68.56	48.54	35					

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			
I	J	K							
20	9	24.54	15.1	9.74	1.54	0.99	0.06~0.16	0.13	MM2-20
26	11	30.89	29.0	19.0	2.96	1.94	0.07~0.17	0.27	MM2.5-20
27	14	34.4	52.0	34.5	5.30	3.52	0.08~0.18	0.43	MM3-20
35	18	49.09	121	81.2	12.3	8.28	0.12~0.27	0.93	MM4-20
54	26	54.46	256	175	26.1	17.8	0.14~0.34	2.15	MM5-20
21	12	28.06	26.4	20.1	2.70	2.05	0.06~0.16	0.25	MM2-25
27	15	36.57	51.6	39.7	5.27	4.05	0.07~0.17	0.47	MM2.5-25
33	20	39.43	94.7	73.5	9.66	7.49	0.08~0.18	0.81	MM3-25
44	25	57.29	217	171	22.1	17.4	0.12~0.27	1.89	MM4-25
50	30	65.15	413	329	42.1	33.6	0.14~0.34	3.41	MM5-25
25	12	36.06	35.7	31.1	3.64	3.17	0.06~0.16	0.37	MM2-30
32	15	47.57	69.7	61.5	7.11	6.27	0.07~0.17	0.76	MM2.5-30
40	20	53.43	129	115	13.2	11.7	0.08~0.18	1.32	MM3-30
50	25	79.29	293	266	29.9	27.1	0.12~0.27	3.09	MM4-30
62	30	99.15	558	513	56.9	52.3	0.14~0.34	6.47	MM5-30

[Caution on Product Characteristics] ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 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.

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 274) 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).



LM Sintered Metal Miter Gears

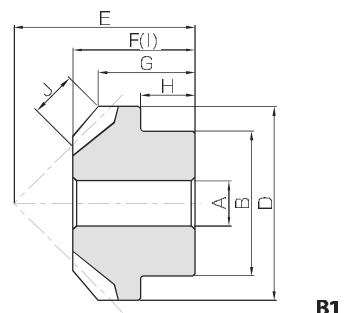
Module 0.8 ~ 1.5

LM

Sintered Metal Miter Gears



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 _{H7}	B	C	D	E	F	G	H					
LM0.8-20	1	m0.8	20	B1	4	12	16	17.13	16	11	8.57	5.5		11	8.57		5.5
LM1-20		m1	20	B1	5	16	20	21.41	20	13.5	10.71	6					
LM1.25-20		m1.25	20	B1	6	22	25	26.77	23	15	11.38	6					
LM1.5-20		m1.5	20	B1	6	26	30	32.12	30	21	16.06	9					

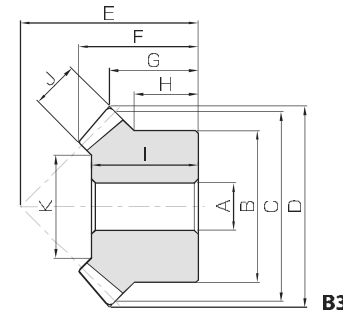
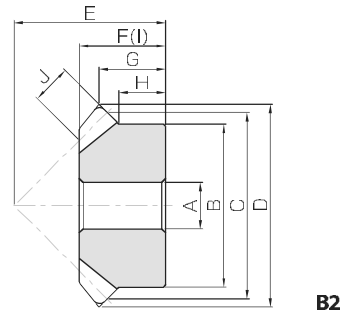
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (g)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
I	J	K							
11	4.24	—	0.22	0.027	0.022	0.0027	0~0.16	9.67	LM0.8-20
13.5	4.95	—	0.41	0.050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

[Caution on Product Characteristics] ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 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.

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 274) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.



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



Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width
					AH7	B					C	D	
SM2-16	1	m2	16	B2	10	27	32	34.83	30	19	15.41	11.5	
SM2.5-16		m2.5	16	B2	12	34	40	43.53	35	21	16.77	12	
SM3-16		m3	16	B2	14	42	48	52.24	40	23	18.12	13	
SM4-16		m4	16	B2	16	55	64	69.66	50	28	20.83	13.5	
SM5-16		m5	16	B2	20	70	80	87.07	65	37	28.54	20	
SM1-20	1	m1	20	B3	6	16	20	21.41	20	13.94	10.71	8	
SM1.25-20		m1.25	20	B3	8	22	25	26.77	23	15.27	11.38	9	
SM1.5-20		m1.5	20	B3	8	26	30	32.12	30	21.24	16.06	13	
SM2-20		m2	20	B3	12	34	40	42.83	37	24.89	18.41	14	
SM2.5-20		m2.5	20	B3	14	42	50	53.54	48	32.54	24.77	19	
SM3-20	1	m3	20	B3	16	50	60	64.24	58	39.84	30.12	23	
SM3.5-20		m3.5	20	B3	20	60	70	74.95	65	44.13	32.47	25	
SM4-20		m4	20	B3	20	64	80	85.65	75	50.78	37.83	27	
SM5-20		m5	20	B3	25	80	100	107.07	90	60.38	43.54	30	
SM6-20		m6	20	B3	28	100	120	128.48	104	67.67	48.24	34	
SM8-20	m8	20	B3	30	130	160	171.31	125	73.33	50.66	30		
SM1-25	1	m1	25	B3	6	20	25	26.41	23	15.16	11.21	8	
SM1.25-25		m1.25	25	B3	8	25	31.25	33.02	28	17.88	13.26	9.25	
SM1.5-25		m1.5	25	B3	10	30	37.5	39.62	34	22.25	16.31	11.5	
SM2-25		m2	25	B3	12	40	50	52.83	40	24.33	16.41	10	
SM2.5-25		m2.5	25	B3	16	50	62.5	66.04	50	30.41	20.52	12.5	
SM3-25	1	m3	25	B3	20	60	75	79.24	60	37.81	24.62	15	
SM3.5-25		m3.5	25	B3	25	70	87.5	92.45	70	43.23	28.72	17.5	
SM4-25		m4	25	B3	28	80	100	105.66	80	49.32	32.83	20	
SM5-25		m5	25	B3	28	100	125	132.07	100	60.82	41.04	25	
SM6-25		m6	25	B3	28	120	150	158.48	120	72.32	49.24	30	
SM1-30	1	m1	30	B3	8	24	30	31.41	28	17.71	13.71	10	
SM1.25-30		m1.25	30	B3	10	30	37.5	39.27	36	23.47	18.13	13.5	
SM1.5-30		m1.5	30	B3	10	36	45	47.12	43	28.24	21.56	16	
SM2-30		m2	30	B3	12	45	60	62.83	50	29.42	21.41	12.5	
SM2.5-30		m2.5	30	B3	16	60	75	78.54	62	36.28	26.27	17	
SM3-30	1	m3	30	B3	20	70	90	94.24	75	45.47	32.12	20	
SM3.5-30		m3.5	30	B3	25	90	105	109.95	85	49.66	34.97	25	
SM4-30		m4	30	B3	28	100	120	125.66	95	54.52	37.83	25	
SM5-30		m5	30	B3	28	130	150	157.07	120	68.56	48.54	35	

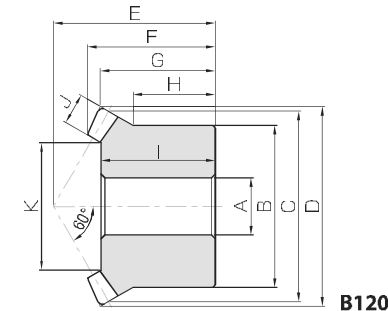
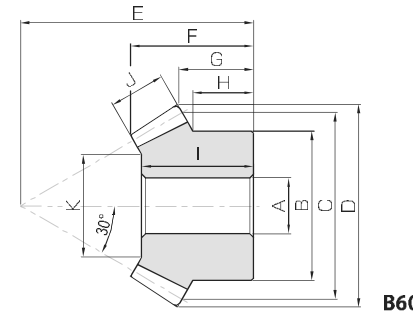
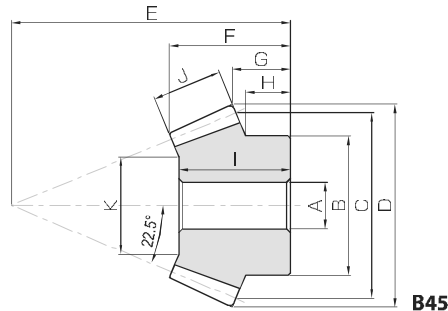
Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
19	7	—	3.84	0.33	0.39	0.034	0.06~0.16	0.076	SM2-16
21	9	—	7.63	0.68	0.78	0.069	0.07~0.17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

[Caution on Product Characteristics] ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 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.

[Caution on Secondary Operations] ① Please read "Caution on Performing Secondary Operations" (Page 274) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.



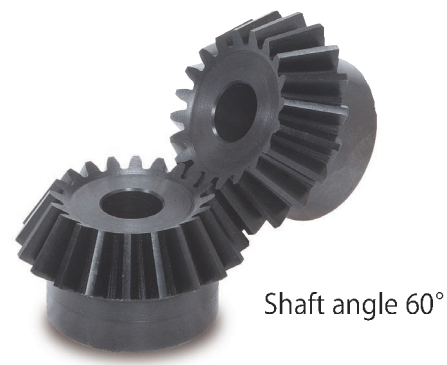
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



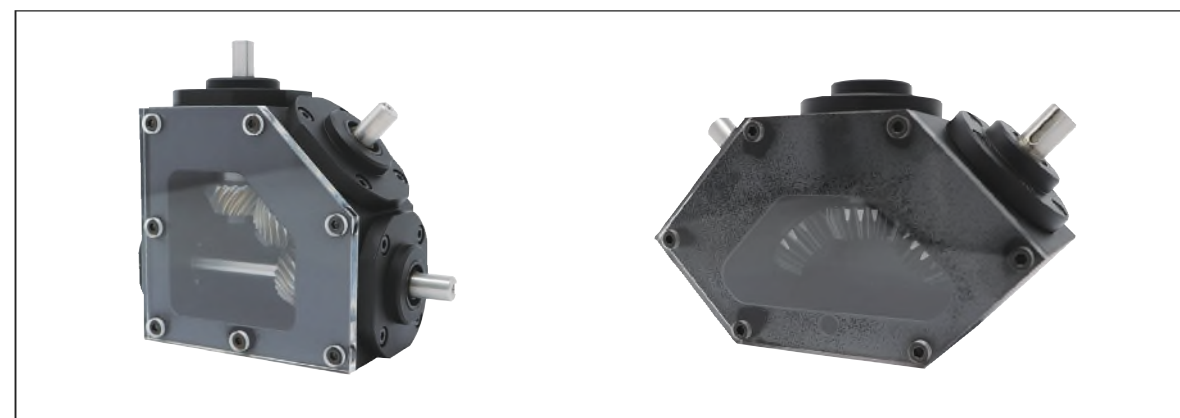
Example of a pair of gears with a shaft angle of 45°

Catalog No.	Gear ratio	Module	No. of teeth	Shaft angle	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length
						A _{H7}	B					
SAM1.5-20045	1	m1.5	20	45°	B45	8	25	30	32.77	45	19.33	9.36
SAM2-20045		m2	20	45°	B45	10	30	40	43.69	60	26.08	12.48
SAM2.5-20045		m2.5	20	45°	B45	12	40	50	54.62	75	31.92	15.6
SAM3-20045		m3	20	45°	B45	14	50	60	65.54	90	38.66	18.72
SAM1.5-20060	1	m1.5	20	60°	B60	8	25	30	32.59	40	22.3	14.77
SAM2-20060		m2	20	60°	B60	12	32	40	43.46	50	26.39	16.36
SAM2.5-20060		m2.5	20	60°	B60	14	40	50	54.33	60	30.49	17.94
SAM3-20060		m3	20	60°	B60	16	50	60	65.19	70	34.59	19.54
SAM1.5-20120	1	m1.5	20	120°	B120	8	26	30	31.5	26	20.69	18.64
SAM2-20120		m2	20	120°	B120	12	34	40	42	34	26.86	24.18
SAM2.5-20120		m2.5	20	120°	B120	14	42	50	52.5	42	33.22	29.73
SAM3-20120		m3	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 272 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.



■ Angular Miter Gear Box Example

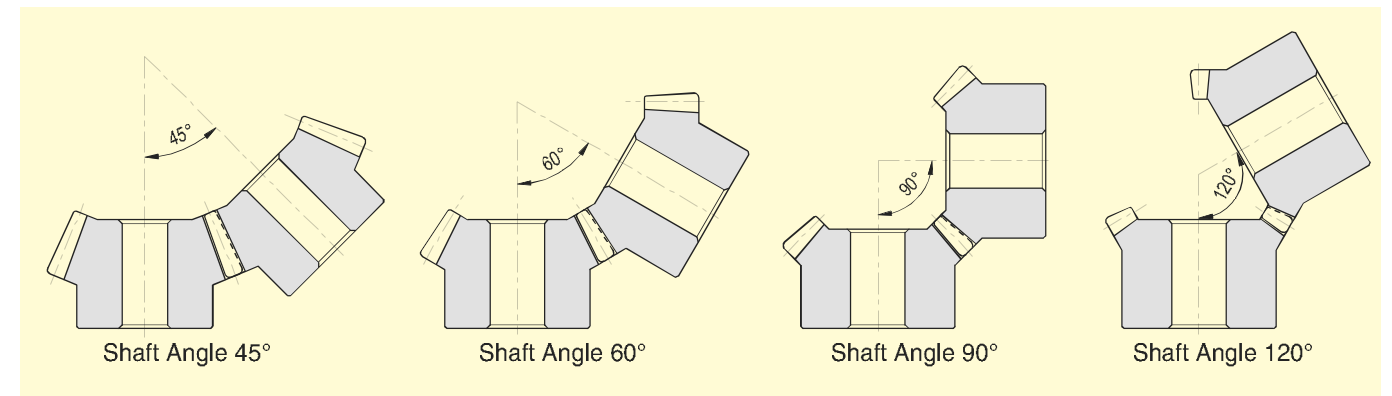


Hub width	Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
H	I	J	K							
7.75	18	11	17	4.30	0.38	0.44	0.039	0.05~0.15	0.067	SAM1.5-20045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

- [Caution on Secondary Operations]
- ① Please read "Caution on Performing Secondary Operations" (Page 274) 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 positioned at 90°, Miter Gears with other angles are called Angular Miter Gears. The SAM series of KHK standard Angular Miter Gears are available with 45°, 60°, and 120° shaft angles. We recommended the 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 Pairs

Bevel Gearboxes

Other Products



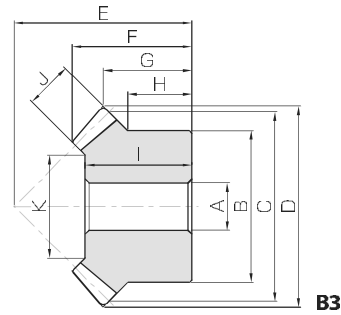
SUM Stainless Steel Miter Gears

Module 1 ~ 4

SUM



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		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width
					A _{H7}	B					G	H	
SUM1-20	1	m1	20	B3	6	16	20	21.41	20	13.95	10.71	8	
SUM1.5-20		m1.5	20	B3	8	26	30	32.12	30	21.24	16.06	13	
SUM2-20		m2	20	B3	12	34	40	42.83	37	24.89	18.41	14	
SUM2.5-20		m2.5	20	B3	14	42	50	53.54	48	32.54	24.77	19	
SUM3-20		m3	20	B3	16	50	60	64.24	58	39.84	30.12	23	
SUM4-20	m4	20	B3	20	64	80	85.65	75	50.78	37.83	27		
SUM1-25	1	m1	25	B3	6	20	25	26.41	23	15.16	11.21	8	
SUM1.5-25		m1.5	25	B3	10	30	37.5	39.62	34	22.25	16.31	11.5	
SUM2-25		m2	25	B3	12	45	50	52.83	40	24.33	16.41	12.5	
SUM2.5-25		m2.5	25	B3	16	55	62.5	66.04	50	30.41	20.52	15	
SUM3-25		m3	25	B3	20	65	75	79.24	60	37.81	24.62	17.5	
SUM4-25	m4	25	B3	28	80	100	105.66	80	49.32	32.83	20		
SUM1-30	1	m1	30	B3	8	24	30	31.41	28	17.71	13.71	10	
SUM1.5-30		m1.5			10	36	45	47.12	43	28.24	21.56	16	
SUM2-30		m2			12	45	60	62.83	50	29.43	21.41	12.5	
SUM2.5-30		m2.5			16	60	75	78.54	62	36.28	26.27	17	
SUM3-30		m3			20	70	90	94.24	75	45.47	32.12	20	

- [Caution on Product Characteristics]
- The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 for more details.
 - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

Stainless Steel Miter Gears
Additional Products

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	0.49	0.060	0.050	0.0061	0.03~0.13	0.019	SUM1-20
19	8	15.37	1.72	0.22	0.18	0.022	0.05~0.15	0.074	SUM1.5-20
22	10	21.72	3.94	0.51	0.40	0.052	0.06~0.16	0.15	SUM2-20
29	12	28.06	7.52	1.00	0.77	0.10	0.07~0.17	0.30	SUM2.5-20
35	15	31.57	13.3	1.80	1.36	0.18	0.08~0.18	0.52	SUM3-20
45	20	43.43	31.5	4.39	3.22	0.45	0.12~0.27	1.15	SUM4-20
14	6	15.03	0.81	0.12	0.083	0.012	0.03~0.13	0.035	SUM1-25
19	9	19.54	2.74	0.41	0.28	0.042	0.05~0.15	0.11	SUM1.5-25
20	12	26.06	6.50	1.00	0.66	0.10	0.06~0.16	0.24	SUM2-25
26	15	34.57	12.7	2.00	1.29	0.20	0.07~0.17	0.46	SUM2.5-25
32	20	37.43	23.3	3.73	2.37	0.38	0.08~0.18	0.80	SUM3-25
43	25	55.29	53.2	8.79	5.43	0.90	0.12~0.27	1.72	SUM4-25
16	6	19.03	1.10	0.18	0.11	0.02	0.03~0.13	0.057	SUM1-30
25	10	25.72	3.96	0.68	0.40	0.07	0.05~0.15	0.21	SUM1.5-30
25	12	36.06	8.77	1.55	0.89	0.16	0.06~0.16	0.37	SUM2-30
32	15	47.57	17.1	3.10	1.75	0.32	0.07~0.17	0.76	SUM2.5-30
40	20	53.43	31.7	5.86	3.23	0.60	0.08~0.18	1.32	SUM3-30

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 274) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK's system for quick modification of KHK stock gears is also available.



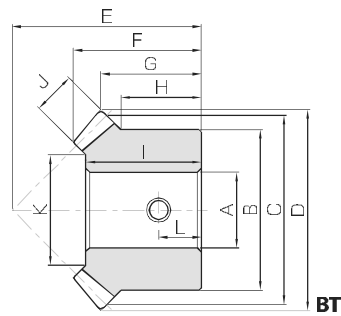
SUMA Finished Bore Stainless Steel Miter Gears

Module 1 ~ 4

SUMA

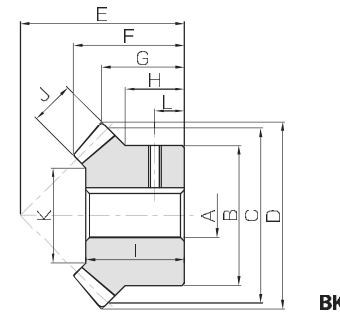


Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	SUS303
Heat treatment	—
Tooth hardness	(less than 187HB)



Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width	Length of bore
					A _{H7}	B					G	H		
SUMA1-20	1	m1	20	BT	6	16	20	21.41	20	13.95	10.71	8	12	
SUMA1.5-20		m1.5	20	BT	8	26	30	32.12	30	21.24	16.06	13	19	
SUMA2-20		m2	20	BK	12	34	40	42.83	37	24.89	18.41	14	22	
SUMA2.5-20		m2.5	20	BK	14	42	50	53.54	48	32.54	24.77	19	29	
SUMA3-20		m3	20	BK	16	50	60	64.24	58	39.84	30.12	23	35	
SUMA4-20	m4	20	BK	20	64	80	85.65	75	50.78	37.83	27	45		
SUMA1-25	1	m1	25	BT	6	20	25	26.41	23	15.16	11.21	8	14	
SUMA1.5-25		m1.5	25	BT	10	30	37.5	39.62	34	22.25	16.31	11.5	19	
SUMA2-25		m2	25	BK	12	45	50	52.83	40	24.33	16.41	12.5	20	
SUMA2.5-25		m2.5	25	BK	16	55	62.5	66.04	50	30.41	20.52	15	26	
SUMA3-25		m3	25	BK	20	65	75	79.24	60	37.81	24.62	17.5	32	
SUMA4-25	m4	25	BK	30	80	100	105.66	80	49.32	32.83	20	43		

- [Caution on Product Characteristics]
- 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.
 - The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 for more details.
 - Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.



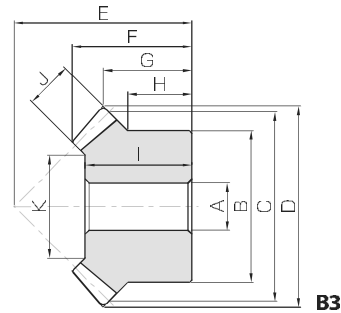
Face width	Holding surface dia.	Keyway	Set Screw	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog No.
				Bending strength	Surface durability	Bending strength	Surface durability			
5	9.86	—	M4	4	0.49	0.060	0.050	0.0061	0.018	SUMA1-20
8	15.37	—	M4	6.5	1.72	0.22	0.18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

- [Caution on Secondary Operations]
- Please read "Caution on Performing Secondary Operations" (Page 274) 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.



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.



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

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length		Hub width
					A	B					C	D	
PM1-20	1	m1	20	B3	6	16	20	21.41	20	13.95	10.71	8	
PM1.25-20		m1.25	20	B3	8	22	25	26.77	23	15.27	11.38	9	
PM1.5-20		m1.5	20	B3	8	26	30	32.12	30	21.24	16.06	13	
PM2-20		m2	20	B3	10	34	40	42.83	37	24.89	18.41	14	
PM2.5-20		m2.5	20	B3	12	42	50	53.54	48	32.54	24.77	19	
PM3-20		m3	20	B3	14	50	60	64.24	58	39.84	30.12	23	
PM3.5-20		m3.5	20	B3	20	60	70	74.95	65	44.13	32.47	25	
PM4-20		m4	20	B3	20	64	80	85.66	75	50.78	37.83	27	
PM1-25	1	m1	25	B3	6	20	25	26.41	23	15.16	11.21	8	
PM1.25-25		m1.25	25	B3	8	25	31.25	33.02	28	17.88	13.26	9.25	
PM1.5-25		m1.5	25	B3	8	30	37.5	39.62	34	22.25	16.31	11.5	
PM2-25		m2	25	B3	10	40	50	52.83	40	24.33	16.41	10	
PM2.5-25		m2.5	25	B3	14	50	62.5	66.04	50	30.41	20.52	12.5	
PM3-25	m3	25	B3	15	60	75	79.24	60	37.81	24.62	15		
PM1-30	1	m1	30	B3	8	24	30	31.41	28	17.71	13.71	10	
PM1.5-30		m1.5			10	36	45	47.12	43	28.24	21.56	16	
PM2-30		m2			12	45	60	62.83	50	29.43	21.41	12.5	
PM2.5-30		m2.5			16	60	75	78.54	62	36.28	26.27	17	
PM3-30		m3			20	70	90	94.24	75	45.47	32.12	20	

Length of bore	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (g)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
I	J	K							
12	5	9.86	0.22	—	0.022	—	0~0.23	2.77	PM1-20
13	6	13.03	0.42	—	0.043	—	0~0.24	5.31	PM1.25-20
19	8	15.37	0.76	—	0.077	—	0~0.25	11.0	PM1.5-20
22	10	21.72	1.74	—	0.18	—	0~0.26	22.5	PM2-20
29	12	28.06	3.34	—	0.34	—	0~0.27	45.9	PM2.5-20
35	15	31.57	5.89	—	0.60	—	0~0.28	79.8	PM3-20
40	18	39.09	9.47	—	0.97	—	0~0.30	121	PM3.5-20
45	20	43.43	14.0	—	1.42	—	0~0.32	170	PM4-20
14	6	15.03	0.36	—	0.036	—	0~0.23	5.13	PM1-25
16	7	18.7	0.67	—	0.068	—	0~0.24	9.27	PM1.25-25
19	9	19.54	1.20	—	0.12	—	0~0.25	17.0	PM1.5-25
20	12	26.06	2.84	—	0.29	—	0~0.26	32.7	PM2-25
26	15	34.57	5.55	—	0.57	—	0~0.27	63.9	PM2.5-25
32	20	37.43	10.0	—	1.02	—	0~0.28	115	PM3-25
16	6	19.03	0.48	—	0.049	—	0.13~0.23	8.44	PM1-30
25	10	25.72	1.74	—	0.18	—	0.15~0.25	30.9	PM1.5-30
25	12	36.06	3.88	—	0.40	—	0.16~0.26	54.5	PM2-30
32	15	47.57	7.57	—	0.77	—	0.17~0.27	113	PM2.5-30
40	20	53.43	13.9	—	1.42	—	0.18~0.28	196	PM3-30

- [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 our 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 272 for more details.
 - ③ Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
 - ④ Without lubrication, using plastic gears in pairs may generate heat and dilation. It is recommended to mate them with steel gears.

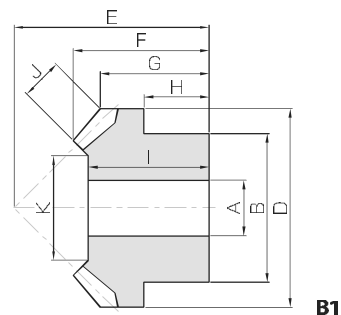
- [Caution on Secondary Operations]
- ① Please read “Caution on Performing Secondary Operations” (Page 274) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK’s system for quick modification of KHK stock gears is also available.
 - ② Plastic gears are susceptible to the effects of temperature and moisture. Dimensional changes may occur while performing secondary operations and during post-machining operations.

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)



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. For details on bushings, please see Page 300.

Injection Molded Miter Gears

■ 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

Catalog No.	Gear ratio	Module	No. of teeth	Shape	Bore		Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	
					A	B					C	D
DM0.5-20	1	m0.5	20	B1	3	8	10	10.71	11	7.97	6.35	
DM0.8-20		m0.8	20	B1	5	12	16	17.13	16	10.83	8.56	
DM1-20		m1	20	B1	6	16	20	21.41	21	14.62	11.71	
DM1.5-20		m1.5	20	B1	8	20	30	32.12	30	20.59	16.06	

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

- [Caution on Product Characteristics]
- ① The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 272 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 tolerances of these gears, please see the Dimensional Tolerance Table.

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

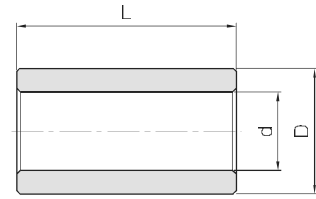


BB Sintered Metal Bushings

Sintered Metal Bushings



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



T8

Catalog No.	I.D. of bushing	O.D. of bushing	Total Length	Products that can use the bushing
	$d \begin{smallmatrix} +0,02 \\ 0 \end{smallmatrix}$	$D \begin{smallmatrix} +0,02 \\ -0,01 \end{smallmatrix}$	$L \begin{smallmatrix} 0 \\ -0,3 \end{smallmatrix}$	
BB30507	3	5	7	DM0.8
BB30608	3	6	8	DM1
BB40609	4	6	9	DM1
BB50814	5	8	14	DM1.5

Material : Oil impregnated sintered bronze.



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



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