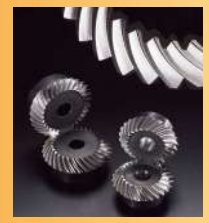
Miter Gears



Catalog Number of KHK Stock Gears

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

(Example) Miter Gears

M MS G 2 - 20 R

- R — Direction of Helix (Right)
- 20 — No. of Teeth (20)
- 2 — Module (2)
- G — Other Products (Ground Gears)
- MS — Type (Spiral Miter)
- M — Material (SCM415)

Material

S	S45C
M	SCM415
SU	Stainless Steel
L	Sintered Metal Alloy
P	MC901
D	Polyacetal

Type

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

Other Information

G,GQ	Ground Gears

Features

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, straight miter and spiral miter, 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.

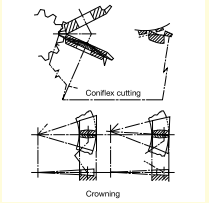
Type	Catalog Number	Module	No. of Teeth ( ) Shaft Angle	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704: 1978	Secondary Operations	Features
Spiral Miter Gears	**MMSGQ**	2~4	20, 30	SCM415	Carburized Note 1	Ground	0	△	Gears that have been hardened and ground that has grade-0 accuracy, strength, abrasion resistance and quietness. Secondary operations can be given except for the teeth.
	MMSG	2~4	20, 25, 30	SCM415	Carburized Note 1	Ground	1	△	Gears that have been hardened and ground that has excellent accuracy, strength and abrasion resistance. Secondary operations can be given except for the teeth.
	SMSG	1~5	20, 25, 30	S45C	Gear teeth induction hardened	Ground	2	△	Gears that have been hardened and ground that has excellent abrasion resistance. Secondary operations can be given except for the teeth.
	KSP	1.5~6	20~30	SCM415	Carburized Note 1	Ground	0	△	Gears that have been hardened and ground that has grade-0 accuracy, strength, abrasion resistance and quietness. Secondary operations can be given except for the teeth.
	MMSA/MMSB	1~10	20	SCM415	Carburized	Cut	4	×	Gears that have been fully hardened that have excellent strength and wear resistance. Can be used in the finished shape.
	MMS	2~5	20, 25, 30	SCM415	Carburized Note 1	Cut	4	△	Gears that have been hardened that have excellent strength and wear resistance. Secondary operations are possible except for the teeth.
	SMS	1~8	20, 25, 30	S45C	Gear teeth induction hardened	Cut	4	△	Gears that have been hardened with excellent wear resistance. Secondary operations are possible except for the teeth.
Straight Miter Gears	**SMA/SMB/ SMC**	1~8	20, 25, 30	S45C	Gear teeth induction hardened	Cut	4	△	Gears that have been hardened with excellent wear resistance. Can be used in the finished shape.
	MM	2~5	20, 25, 30	SCM415	Carburized Note 1	Cut	4	△	Gears that have been hardened that have excellent strength and wear resistance. Secondary operations are possible except for the teeth.
	LM	0.8~1.5	20	SMF5040 (S45C equivalent)	—	Sintered	5	○	Small gears made through sintering.
	SM	1~8	16, 20, 25, 30	S45C	—	Cut	3	○	Many lineups are available. The teeth can be additionally hardened.
	SAM	1.5~3	20 (45°, 60°, 120°)	S45C	—	Cut	3	○	3 types of angular miter are available for shafts at 45°, 60° and 120°.
	SUM	1~4	20, 25, 30	SUS303	—	Cut	3	○	Stainless steel gears with rust resistance.
	SUMA	1~4	20, 25	SUS303	—	Cut	3	△	Stainless steel gears with rust resistance. Keyways and tapping provided.
	PM	1~4	20, 25, 30	MC901	—	Cut	4	○	Nylon gears can be used with no lubrication.
	DM	0.5~1.5	20	Duracon (R) (M90-44) NOTE 2	—	Injection Molded	6	△	Low-priced gears made through injection molding. Suitable for light loads.

[NOTE 1] Although these are carburized products, secondary operations can be performed as the bore and the hub portions are masked during the carburization. However, note that high hardness (HRC40 at maximum) occurs in some cases.
[NOTE 2] "Duracon (R)" is a registered trademark of Polyplastics Co., Ltd. in Japan as well as other countries.

○ Possible △ Partly possible × Not possible

We use the Crowning method for gear cutting

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

■ Masdac Dorayaki Machine

SM miter gears used for reversing fabrics

■ Carton former

SM and SMB miters used to drive X/Y axes and transmit mechanical power

■ Fish processing machine manufactured by TOYO SUISAN KIKAI CO.,LTD.

SMB miter used for filleting fish

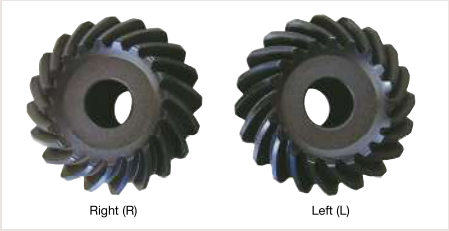
■ Angular Miter Gear Box

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 miters 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 Number	SMA SMB SMC	MM	SM	SUM	SUMA	PM	DM	LM	SAM
SMA/SMB/SMC	○	○	○	○	○	○	×	×	×
MM	○	○	○	○	○	○	×	×	×
SM	○	○	○	○	○	○	×	×	×
SUM	○	○	○	○	○	○	×	×	×
SUMA	○	○	○	○	○	○	×	×	×
PM	○	○	○	○	○	○	×	×	×
DM	×	×	×	×	×	×	○	×	×
LM	×	×	×	×	×	×	×	○	×
SAM	×	×	×	×	×	×	×	×	○

■ Spiral Miter (○ Allowable × Not allowable)

Catalog Number	Series	MMSGQ	MMSG	SMSG	MMSA MMSB	MMS	SMS
Series	Direction of spiral	R	R	R	R	R	R
MMSGQ	L	○	×	×	×	×	×
MMSG	L	×	○	×	×	×	×
SMSG	L	×	×	○	×	×	×
MMSA/MMSB	L	×	×	×	○	×	×
MMS	L	×	×	×	×	○	×
SMS	L	×	×	×	×	×	○

2. Caution in Selecting Gears Based on Gear Strength

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

■ Calculation of Bending Strength of Gears

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

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

Formula NOTE 1	Formula of bevel gears on surface durability (JGMA404-01)			
Kinematic viscosity of lubricant	100cSt (50°C)			
Gear support	Shafts & gear box have normal stiffness, and gears are supported on one end			
Allowable Hertz stress σ_{Hlim} (kgf/mm²)	166	90	49	41.3
Safety factor C_R	1.15			

[NOTE 1] The gear strength formula is based on JGMA (Japanese Gear Manufacturers Association) specifications, "MC Nylon Technical Data" by Mitsubishi Chemical Advanced Materials and "Duracon (R) Gear" by Polyplastics Co. The units for the rotational speed (rpm) and the stress (kgf/mm²) are adjusted to the units needed in the formula.

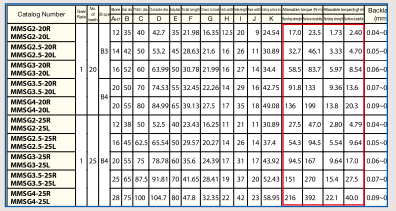
[NOTE 2] The values of the allowable bending stresses for DM *m*1.5 gears and the allowable root bending stress for LM gears are our own estimates.

Selecting the Gears

Step 1 Determine the calculated load torque applied to the gear and the gear type suitable for the purpose.

Step 2 Select provisionally from the allowable torque table of the Master Catalog or Web Catalog based on the load torque.

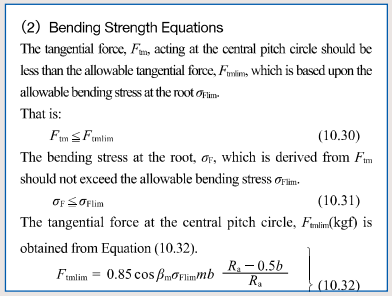
■ For provisional selection from the Master Catalog



Step 3 Calculate the strength under the actual usage conditions.

Calculate the strength formally using the various gear strength formulas. Please see our separate technical reference book for more details. We recommend using the Web Catalog that allows the strength to be easily calculated.

■ For strength calculation from the Master Catalog



(2) Bending Strength Equations

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

That is:

$$F_{tm} \leqq F_{tmlim} \quad (10.30)$$

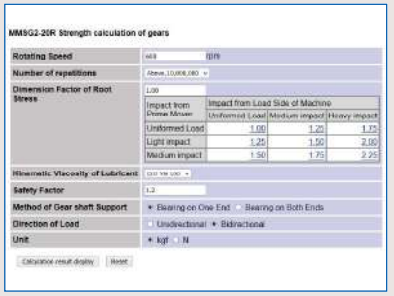
The bending stress at the root, σ_F, which is derived from F_{tm} should not exceed the allowable bending stress σ_{Flim}.

$$\sigma_F \leqq \sigma_{Flim} \quad (10.31)$$

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

$$F_{tmlim} = 0.85 \cos\beta_m \sigma_{Flim} mb \frac{R_a - 0.5b}{R_a} \quad (10.32)$$

■ For strength calculation from the Web Catalog



■ Bending strength

Calculated values of the strength at which the gear teeth do not break due to fatigue.

■ Surface durability;

Calculated values of the strength at which the gear teeth do not wear due to surface fatigue damage.

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

① 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 24 for more details about custom-made orders.

② 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.

③ The details (specifications, dimensions, etc.) listed in the catalog may be changed without prior notice. Changes are announced on the KHK website.

Website URL: https://khkgears.net/new/

Overseas Sales Department: Phone: +81-48-254-1744 Fax: +81-48-254-1765 E-mail: info@khkgears.net

Application Hints

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

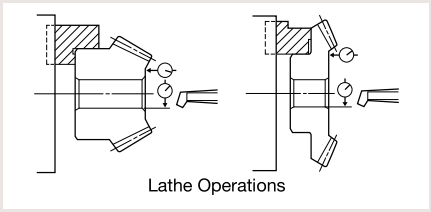
E-mail: info@khkgears.net

1. Cautions on Handling

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

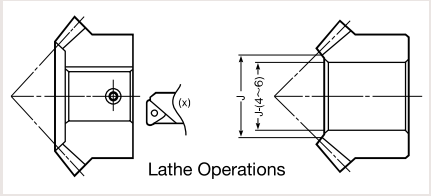
2. Caution on Performing Secondary Operations

① If reboring, it is important to pay special attention to locating the center in order to avoid runout.
② The reference datum for gear machining is the bore. Therefore, use the bore for locating the center. If it is too difficult to do for small bores, the alternative is to use one spot on the bore and the runout of the side surface.
③ If reworking using scroll chucks, we recommend the use of new or rebored jaws for improved precision. Please exercise caution not to crush the teeth.



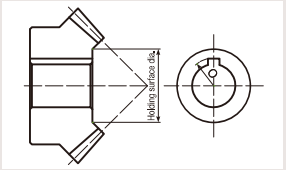
Lathe Operations

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



Lathe Operations

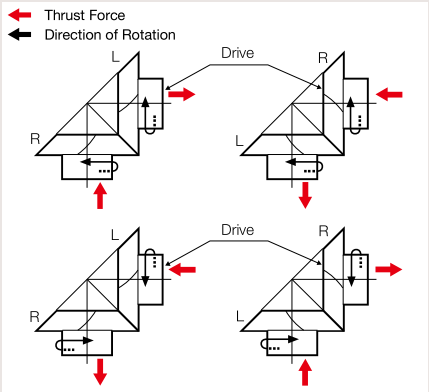
⑤ For tapping and keyway operations, see the examples given in “Caution on Performing Secondary Operations” in KHK Stock Spur Gear section. When providing keyway operations, to avoid stress concentration, always round the corners. Make sure that the diameter (O) of the keyway angle is smaller than the diameter of the holding surface.



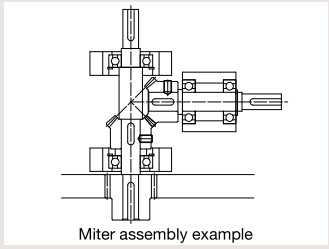
⑥ PM plastic miter gears are susceptible to changes due to temperature and humidity. Dimensions may change between, during, and after re-machining operations.
⑦ When induction-hardening S45C products, thermal stress cracks may appear. Also, note that the precision grade of the product declines by 1 or 2 grades, as deformation on material may occur. If you require tolerance for bore or other parts, machining is necessary after heat treatment.

3. Points of Caution during Assembly

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” in our separate technical reference book.

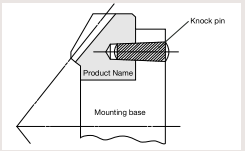


② If a gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend designing bevel gears to be as close to the bearings as possible. Design the gear box, shaft and bearing with high rigidity.



Miter assembly example

③ Be sure to fasten the miter to prevent the gears from moving, as thrust acts on it while rotating.
④ When installing MMSA or MMSB finished bore spiral miter gears produced as B7 style (ring gear), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only. (See the top of the right page for reference figure)

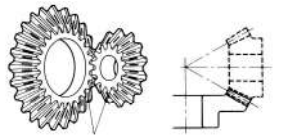


Shaft angle (°)	Normal direction Backlash	Travel in axial direction	
		Drive gear	Driven gear
90	j_n	$1.03 \times j_n$	$1.03 \times j_n$
60		$1.46 \times j_n$	$1.46 \times j_n$
120		$0.84 \times j_n$	$0.84 \times j_n$

⑤ The recommended assemble distance tolerance of KHK stock miters is H7 for ground gears and H8 for cut gears. Mounting distance error, offset error and shaft angle error must be minimized to avoid excessive noise and wear. Inaccurate assembly will lead to irregular noises and uneven wear. Various conditions of tooth contact are shown below. Also, when changing the normal direction backlash, adjust the mounting distance according to the amount of axial movement shown in the table on the right so as not to change the tooth contact.

Correct Tooth Contact

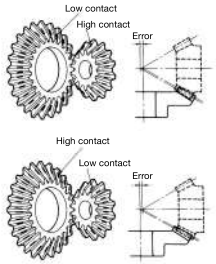
● When assembled correctly, the contact will occur on both gears in the middle of the flank and center of face width but somewhat closer to the toe.



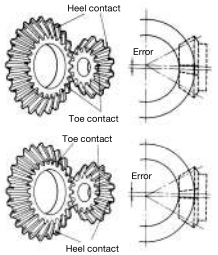
Center contact closer to toes

Incorrect Tooth Contact

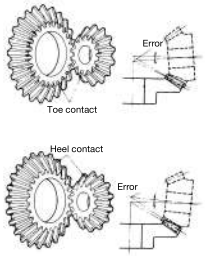
■ Mounting Distance Error
● When the mounting distance of the pinion is incorrect, the contact will occur too high on the flank on one gear and too low on the other.



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



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



4. Cautions on Starting

① Check the following items before starting.
- Are the gears fastened securely?
- Is there uneven tooth contact?
- Is there adequate backlash? (Be sure to avoid zero-backlash.)
- Has proper lubrication been supplied?

② If gears are exposed, be sure to attach a safety cover to ensure safety. Also, be careful not to touch rotating gears.
③ For more technical information on lubricating gears, please see the section “Gear Lubrication” in our separate technical reference book.
④ If there is any abnormality such as noise or vibration during startup, stop the operation immediately and check the assembly condition such as tooth contact, eccentricity and looseness. For more technical information, please see the section “Gear Noise and Countermeasures” in our separate technical reference book.

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.

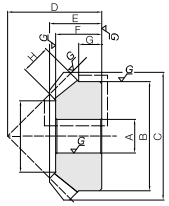
Warning: Precautions for preventing physical and property damage

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.

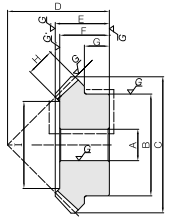
Caution: Cautions in Preventing Accidents

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	
Precision grade	JIS B 1704: 1978 grade 0
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Tooth area carburized
Tooth hardness	55 to 60HRC



B3



B4

All machining datum planes are cut and locating the center is made easy to maintain accuracy KHK's highest-grade spiral miter with excellent quietness

Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Pitch dia.	Shape	Bore	Hub dia.	Outside dia.	Mounting distance	Total length	Hole length
							A_{H7}	B	C	D	E	F
MMSGQ2-20R	1	m2	20	R	40	B3	12	35	40	35	21	20
MMSGQ2-20L				L								
MMSGQ2.5-20R		m2.5		R	50		14	42	51	45	28	26
MMSGQ2.5-20L				L								
MMSGQ3-20R		m3		R	60		16	52	61	50	30	27
MMSGQ3-20L				L								
MMSGQ3.5-20R		m3.5		R	70	B4	20	50	71	55	31.5	29
MMSGQ3.5-20L				L								
MMSGQ4-20R		m4		R	80		20	55	81	65	38	35
MMSGQ4-20L				L								
MMSGQ2-30R	1	m2	30	R	60	B4	14	45	60	50	28.5	26
MMSGQ2-30L				L								
MMSGQ2.5-30R		m2.5		R	75		16	55	76	60	33	30
MMSGQ2.5-30L				L								
MMSGQ3-30R		m3		R	90		20	65	91	70	39.5	36
MMSGQ3-30L				L								
MMSGQ3.5-30R		m3.5		R	105		25	80	106	80	43.5	40
MMSGQ3.5-30L				L								
MMSGQ4-30R		m4		R	120		28	90	121	90	48	44
MMSGQ4-30L				L								

[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 calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ These gears produce axial thrust forces. Please see Page 304 for more details.

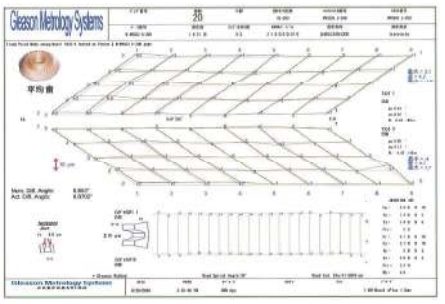
Hub width	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog Number
G	H	I	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
12.5	9	24.54	17.0	23.5	1.73	2.40	0~0.05	0.14	MMSGQ2-20R MMSGQ2-20L
16	11	30.89	32.7	46.1	3.33	4.70	0.05~0.10	0.27	MMSGQ2.5-20R MMSGQ2.5-20L
16	14	34.4	58.5	83.7	5.97	8.54		0.43	MMSGQ3-20R MMSGQ3-20L
14	16	42.75	91.8	133	9.36	13.6		0.51	MMSGQ3.5-20R MMSGQ3.5-20L
17	18	49.08	136	199	13.8	20.3		0.80	MMSGQ4-20R MMSGQ4-20L
15	12	38.06	38.5	78.6	3.93	8.02	0~0.05	0.36	MMSGQ2-30R MMSGQ2-30L
16	15	47.57	75.3	156	7.68	16.0	0.05~0.10	0.66	MMSGQ2.5-30R MMSGQ2.5-30L
18	20	55.43	139	294	14.2	30.0		1.11	MMSGQ3-30R MMSGQ3-30L
20	22	67.77	204	436	20.8	44.5		1.75	MMSGQ3.5-30R MMSGQ3.5-30L
22	25	77.29	303	657	30.9	67.0		2.49	MMSGQ4-30R MMSGQ4-30L

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns.
KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② In the illustration, the area surrounded with – – – – line is masked during the carburization process and can be modified. However, note that high hardness (HRC40 at maximum) occurs in some cases.

JIS grade 0 Ground bevel gears
Custom Gears are also available.

CNC Bevel Gear Grinding Machine (PH-280HG)

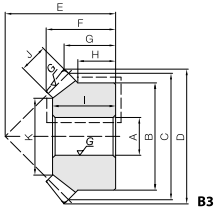
Gear Measuring System (350GMS)



Gear Measurement Data

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

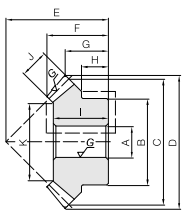
* The precision grade of J Series products is equivalent to the value shown in the table.



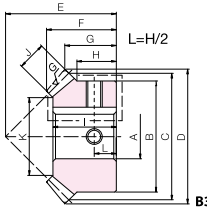
Catalog Number	Gear Ratio	No. of teeth	Shape	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Hub projection E	Total length F	Crown to back G	Hub width H	Hole length I	Face width J	Holding surface dia. K	Allowable torque (N-m) Bending strength	Allowable torque (N-m) Surface durability	Allowable torque (kgf-m) Bending strength	Allowable torque (kgf-m) Surface durability	Backlash (mm)	Weight (kg)
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**			B4	20	50	70	74.53	55	32.45	22.26	14	29	16	42.75	91.8	133	9.36	13.6	0.07~0.13	0.51
MMSG4-20R **MMSG4-20L**				20	55	80	84.99	65	39.13	27.5	17	35	18	49.08	136	199	13.8	20.3	0.09~0.15	0.80
MMSG2-25R **MMSG2-25L**	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

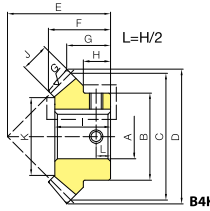
[Caution on Product Characteristics]
① A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. Please see Page 304 for more details.

[Caution on Secondary Operations]
① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns.
KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② In the illustration, the area surrounded with – – – – line is masked during the carburization process and can be modified. However, note that high hardness (HRC40 at maximum) occurs in some cases.



J Series





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

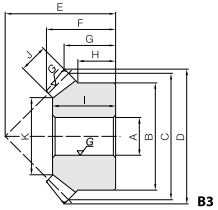
Bore $_{H7}$	* The product shapes of J Series items are identified by background color.																	
Keyway $_{Js9}$	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50	
Screw size	4 × 1.8	5 × 2.3				6 × 2.8				8 × 3.3			10 × 3.3		12 × 3.3	14 × 3.8		
Catalog Number	M4					M5				M6			M8			M10		
MMSG2-20R 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	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								
MMSG2.5-25L J BORE				B4K	B4K	B4K	B4K	B4K	B4K	B4K								
MMSG3-25R J BORE								B4K	B4K	B4K	B4K	B4K	B4K					
MMSG3-25L J BORE								B4K	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								
MMSG2-30L J BORE		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	B4K	B4K			
MMSG3-30L J BORE								B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K			
MMSG3.5-30R J BORE										B4K	B4K	B4K	B4K	B4K	B4K	B4K	B4K	
MMSG3.5-30L J BORE										B4K	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]
① As available-on-request products, these require a lead-time for shipping of 2 working days (excludes the day ordered), after placing an order. Because the machining starts immediately, we cannot accept cancellations. Please see Page 34 for more details.
② Number of pieces we can process for one order is 1 to 20 units. For larger quantities, please request price and delivery quotes.
③ Keyways are made according to JIS B1301 standards, Js9 tolerance.
④ Certain products which would otherwise have a very long tapped hole are counterbored to reduce the length of the tap. For details, please see the KHK Web Catalog.
⑤ For products having a tapped hole, a set screw is included.

Ground Spiral Miter Gears

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

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

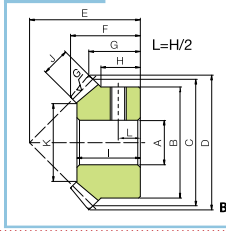


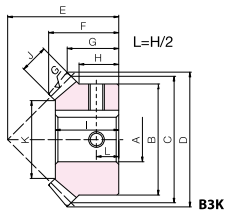
Catalog Number	Gear Ratio	No. of teeth	Shape	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Itertpiteto E	Total length F	Crown to back G	Hub width H	Hole length I	Face width J	Holding surface dia. K	Allowable torque (N-m) Bending strength	Allowable torque (N-m) Surface durability	Allowable torque (kgf-m) Bending strength	Allowable torque (kgf-m) Surface durability	Backlash (mm)	Weight (kg)
SMSG1-20R SMSG1-20L	1	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	1	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	0.02~0.08	0.035
SMSG1.5-25R SMSG1.5-25L				10	30	37.5	39.31	34	22.14	16.16	11.5	19	9	19.54	5.29	5.52	0.54	0.56	0.04~0.10	0.11
SMSG2-25R SMSG2-25L				12	40	50	52.4	40	24.19	16.2	10	20	12	26.06	12.6	13.5	1.28	1.37	0.05~0.11	0.21
SMSG2.5-25R SMSG2.5-25L				16	50	62.5	65.54	50	30.24	20.27	12.5	26	15	34.57	24.5	26.8	2.50	2.74	0.06~0.12	0.42
SMSG3-25R SMSG3-25L				20	60	75	78.77	60	37.57	24.39	15	32	20	37.43	45.0	50.0	4.59	5.10	0.07~0.13	0.74
SMSG3.5-25R SMSG3.5-25L				25	70	87.5	91.81	70	42.98	28.41	17.5	37	22	46.77	69.2	78.1	7.05	7.97	0.08~0.14	1.14
SMSG4-25R SMSG4-25L				28	80	100	104.7	80	49.14	32.35	20	43	25	55.29	95.0	109	9.68	11.1	0.10~0.16	1.71
SMSG5-25R SMSG5-25L				28	100	125	130.86	100	60.59	40.43	25	50	30	65.15	181	213	18.5	21.7	0.12~0.18	3.39
SMSG1-30R SMSG1-30L	1	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	0.02~0.08	0.057
SMSG1.5-30R SMSG1.5-30L				10	36	45	46.84	43	28.11	21.42	16	25	10	25.72	7.53	9.35	0.77	0.95	0.04~0.10	0.21
SMSG2-30R SMSG2-30L				12	45	60	62.42	50	29.27	21.21	12.5	25	12	36.06	16.7	21.4	1.70	2.18	0.05~0.11	0.37
SMSG2.5-30R SMSG2.5-30L				16	60	75	78.04	62	36.08	26.02	17	32	15	47.57	32.6	42.7	3.32	4.36	0.06~0.12	0.76
SMSG3-30R SMSG3-30L				20	70	90	93.61	75	45.25	31.8	20	40	20	53.43	60.3	80.4	6.15	8.20	0.07~0.13	1.32
SMSG3.5-30R SMSG3.5-30L				25	90	105	109.21	85	49.4	34.6	25	45	22	67.77	85.1	115	8.68	11.8	0.08~0.14	2.19
SMSG4-30R SMSG4-30L				28	100	120	124.71	95	54.28	37.35	25	50	25	79.29	127	174	12.9	17.8	0.10~0.16	3.07
SMSG5-30R SMSG5-30L				28	130	150	155.90	120	68.20	47.95	35	62	30	99.15	240	332	24.5	33.9	0.12~0.18	6.44

[Caution on Product Characteristics]
① A 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 calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. Please see Page 304 for more details.

[Caution on Secondary Operations]
① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).

J Series





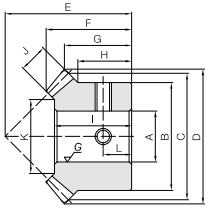
To order J Series products, please specify: Catalog No. + J + BORE.

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 Number	M4	M5	M4						M5				M6			M8			M10	
SMSG1-20R J BORE	B3T																			
SMSG1-20L J BORE	B3T																			
SMSG1.5-20R J BORE		B3T	B3K																	
SMSG1.5-20L J BORE		B3T	B3K																	
SMSG2-20R J BORE				B3K	B3K	B3K	B3K													
SMSG2-20L J BORE				B3K	B3K	B3K	B3K													
SMSG2.5-20R J BORE					B3K	B3K	B3K	B3K	B3K	B3K	B3K									
SMSG2.5-20L J BORE					B3K	B3K	B3K	B3K	B3K	B3K	B3K									
SMSG3-20R J BORE							B3K	B3K	B3K	B3K	B3K	B3K								
SMSG3-20L J BORE							B3K	B3K	B3K	B3K	B3K	B3K								
SMSG3.5-20R J BORE											B3K	B3K	B3K	B3K	B3K					
SMSG3.5-20L J BORE											B3K	B3K	B3K	B3K	B3K					
SMSG4-20R J BORE											B3K	B3K	B3K	B3K	B3K	B3K	B3K			
SMSG4-20L J BORE											B3K	B3K	B3K	B3K	B3K	B3K	B3K			
SMSG5-20R J BORE													B3K	B3K	B3K	B3K	B3K	B3K	B3K	
SMSG5-20L J BORE													B3K	B3K	B3K	B3K	B3K	B3K	B3K	
SMSG1-25R J BORE	B3T	B3T																		
SMSG1-25L J BORE	B3T	B3T																		
SMSG1.5-25R J BORE			B3K	B3K	B3K															
SMSG1.5-25L J BORE			B3K	B3K	B3K															
SMSG2-25R J BORE				B3K	B3K	B3K	B3K	B3K	B3K	B3K										
SMSG2-25L J BORE				B3K	B3K	B3K	B3K	B3K	B3K	B3K										
SMSG2.5-25R J BORE							B3K	B3K	B3K	B3K	B3K	B3K	B3K							
SMSG2.5-25L J BORE							B3K	B3K	B3K	B3K	B3K	B3K	B3K							
SMSG3-25R J BORE											B3K	B3K	B3K	B3K						
SMSG3-25L J BORE											B3K	B3K	B3K	B3K						
SMSG3.5-25R J BORE													B3K	B3K	B3K	B3K	B3K			
SMSG3.5-25L J BORE													B3K	B3K	B3K	B3K	B3K			
SMSG4-25R J BORE														B3K	B3K	B3K	B3K	B3K	B3K	
SMSG4-25L J BORE														B3K	B3K	B3K	B3K	B3K	B3K	
SMSG5-25R J BORE														B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG5-25L J BORE														B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG1-30R J BORE		B3T	B3K	B3K																
SMSG1-30L J BORE		B3T	B3K	B3K																
SMSG1.5-30R J BORE			B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K										
SMSG1.5-30L J BORE			B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K										
SMSG2-30R J BORE				B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K							
SMSG2-30L J BORE				B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K							
SMSG2.5-30R J BORE							B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K			
SMSG2.5-30L J BORE							B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K			
SMSG3-30R J BORE											B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K		
SMSG3-30L J BORE											B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K		
SMSG3.5-30R J BORE													B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG3.5-30L J BORE													B3K	B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG4-30R J BORE														B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG4-30L J BORE														B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG5-30R J BORE														B3K	B3K	B3K	B3K	B3K	B3K	B3K
SMSG5-30L J BORE														B3K	B3K	B3K	B3K	B3K	B3K	B3K

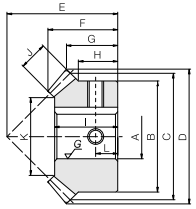
[Caution on J series]
① As available-on-request products, these require a lead-time for shipping of 2 working days (excludes the day ordered), after placing an order. Because the machining starts immediately, we cannot accept cancellations. Please see Page 34 for more details.
② Number of pieces we can process for one order is 1 to 20 units. For larger quantities, please request price and delivery quotes.
③ Keyways are made according to JIS B1301 standards, Js9 tolerance.
④ Certain products which would otherwise have a very long tapped hole are counterbored to reduce the length of the tap. For details, please see the KHK Web Catalog.
⑤ Areas of products which have been re-worked will not be black oxide coated.
⑥ For products having a tapped hole, a set screw is included.
⑦ When using B3T set screws for fastening gears to a shaft, only use this method for applications with light load usage. For secure fastening, please use dowel pins in combination.

Finished Bore Spiral Miter Gears

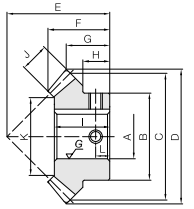
Specifications	
Precision grade	JIS B 1704: 1978 grade 4
Gear teeth	Gleason
Pressure angle	20°
Helix angle	35°
Material	SCM415
Heat treatment	Carburized
Tooth hardness	55 to 60HRC



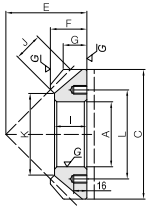
BT



BK



B4



B7

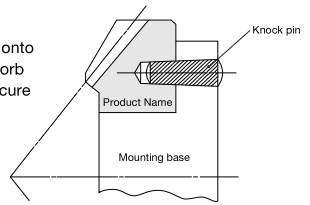
Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length
						A_{H7}	B	C	D	E	F	G	H	I
MMSA1-20R **MMSB1-20R**	1	***m*1**	20	R	BT	8 10	17	20	21.29	20	13.53	10.64	8.5	12.2
MMSA1-20L **MMSB1-20L**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

Face width	Holding surface dia.	Keyway	Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability			
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**
										0.018 0.015	**MMSA1-20L** **MMSB1-20L**
7	17.2	— 4 x 1.8		6	7.74	7.34	0.79	0.75	0.05~0.15	0.057 0.052	**MMSA1.5-20R** **MMSB1.5-20R**
		— 4 x 1.8								0.057 0.052	**MMSA1.5-20L** **MMSB1.5-20L**
9	24.54	5 x 2.3		7	18.0	17.3	1.83	1.76	0.06~0.16	0.13 0.12	**MMSA2-20R** **MMSB2-20R**
										0.13 0.12	**MMSA2-20L** **MMSB2-20L**
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**
										0.24 0.23	**MMSA2.5-20L** **MMSB2.5-20L**
14	34.4				61.9	61.1	6.32	6.23	0.08~0.18	0.40 0.39	**MMSA3-20R** **MMSB3-20R**
										0.40 0.39	**MMSA3-20L** **MMSB3-20L**
16	42.75	8 x 3.3	2-M6		97.1	96.7	9.90	9.86	0.10~0.25	0.46 0.43	**MMSA3.5-20R** **MMSB3.5-20R**
										0.46 0.43	**MMSA3.5-20L** **MMSB3.5-20L**
18	49.08			9	144	144	14.6	14.7	0.12~0.27	0.70 0.68	**MMSA4-20R** **MMSB4-20R**
										0.70 0.68	**MMSA4-20L** **MMSB4-20L**
23	60.95	8 x 3.3 10 x 3.3	2-M6 2-M8		284	288	29.0	29.4	0.14~0.34	1.32 1.25	**MMSA5-20R** **MMSB5-20R**
		8 x 3.3 10 x 3.3	2-M6 2-M8							1.32 1.25	**MMSA5-20L** **MMSB5-20L**
27	73.63	12 x 3.3 14 x 3.8	2-M8 2-M10	10	475	496	48.4	50.6	0.16~0.36	2.11 1.99	**MMSA6-20R** **MMSB6-20R**
		12 x 3.3 14 x 3.8	2-M8 2-M10							2.11 1.99	**MMSA6-20L** **MMSB6-20L**
35	101	—	6-M10	110	1080	1170	111	119	0.20~0.45	3.98 3.98	**MMSA8-20R** **MMSA8-20L**
45	122.72			130	1660	1840	169	188	0.25~0.50	7.88 7.88	**MMSA10-20R** **MMSA10-20L**

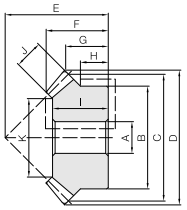
[Caution on Product Characteristics]
① A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. Please see Page 304 for more details.
⑤ Although the dimensions of the keyway are made to the JIS B1301 (Js9) tolerance, there may be some deviations due to the effects of the heat treatment.
⑥ For products having a tapped hole (excludes B7), a set screw is included.

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

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



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



B3

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

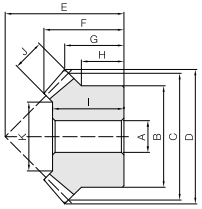
[Caution on Product Characteristics] ① A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. Please see Page 304 for more details.

Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog Number
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability			
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 “Cautions on Performing Secondary Operations” (Page 304) when performing modifications and/or secondary operations for safety concerns.
KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② In the illustration, the area surrounded with – – – – line is masked during the carburization process and can be modified. However, note that high hardness (HRC40 at maximum) occurs in some cases.

Spiral Miter Gears

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



B3

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

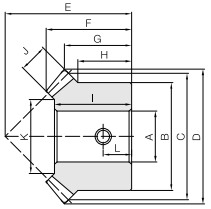
[Caution on Product Characteristics]
① A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ These gears produce axial thrust forces. Please see Page 304 for more details.
⑤ The bore may slightly vary due to the effect of heat treatment. When using with the indicated hole diameter, provide machining with a reamer or the like before use.

Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash (mm)	Weight (kg)	Catalog Number
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability			
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**

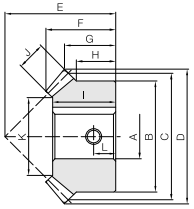
[Caution on Secondary Operations]
① Please read “Cautions on Performing Secondary Operations” (Page 304) when performing modifications and/or secondary operations for safety concerns.
KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).

Finished Bore Miter Gears

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



BT



BK

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

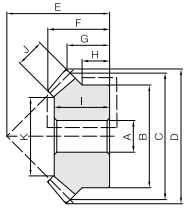
Face width	Holding surface dia.	Keyway	Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability			
5	9.86 10	— —	M4	4	0.90	0.37	0.091	0.038	0.03~0.13	0.016 0.014	**SMA1-20** **SMB1-20**
8	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	**SMA1.5-20** **SMB1.5-20**
10	21.72	5 x 2.3 5 x 2.3	M5	7	7.17	3.05	0.73	0.31	0.06~0.16	0.14 0.13	**SMA2-20** **SMB2-20**
12	28.06	5 x 2.3* 6 x 2.8	M6	9.5	13.7	5.90	1.39	0.60	0.07~0.17	0.27 0.26	**SMA2.5-20** **SMB2.5-20**
15	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	**SMA3-20** **SMB3-20** **SMC3-20**
18	39.09	7 x 3* 8 x 3.3	M8	12.5	39.0	17.2	3.98	1.75	0.10~0.25	0.71 0.68	**SMA3.5-20** **SMB3.5-20**
20	43.43	7 x 3* 10 x 3.3 8 x 3.3	M8	13.5	57.3	25.4	5.85	2.59	0.12~0.27	1.00 0.96 1.07	**SMA4-20** **SMB4-20** **SMC4-20**
26	54.46	10 x 3.3* 8 x 3.3 10 x 3.3	M8	15	114	51.3	11.7	5.23	0.14~0.34	1.80 2.04 1.93	**SMA5-20** **SMB5-20** **SMC5-20**
30	67.15	12 x 3.3* 14 x 3.8 12 x 3.3	M8	17	190	87.5	19.3	8.92	0.16~0.36	3.19 3.01 3.35	**SMA6-20** **SMB6-20** **SMC6-20**
35	95	18 x 4.4	M10	15	406	194	41.4	19.8	0.20~0.45	5.96	**SMA8-20**
6	15.03	—	M4	4	1.48	0.71	0.15	0.072	0.03~0.13	0.029	**SMA1-25**
9	19.54	4 x 1.8	M5	5.75	4.98	2.44	0.51	0.25	0.05~0.15	0.10	**SMA1.5-25**
12	26.06	6 x 2.8 5 x 2.3	M6 M5	5	11.8	5.90	1.20	0.60	0.06~0.16	0.19 0.20	**SMA2-25** **SMB2-25**
15	34.57	5 x 2.3* 6 x 2.8	M6	6	23.1	11.7	2.35	1.19	0.07~0.17	0.39 0.40	**SMA2.5-25** **SMB2.5-25**
20	37.43	7 x 3* 8 x 3.3	M8	7.5	42.3	21.6	4.31	2.20	0.08~0.18	0.63 0.69	**SMA3-25** **SMB3-25**
22	46.77	10 x 3.3 8 x 3.3	M8	8.5	65.0	33.5	6.63	3.42	0.10~0.25	1.04 1.09	**SMA3.5-25** **SMB3.5-25**
25	55.29	10 x 3.3 8 x 3.3	M8	10	96.8	50.2	9.87	5.12	0.12~0.27	1.59 1.68	**SMA4-25** **SMB4-25**
30	65.15	12 x 3.3*	M8	12.5	185	96.8	18.8	9.87	0.14~0.34	2.86	**SMA5-25**
35	83	16 x 4.3	M10	15	307	166	31.3	16.9	0.16~0.36	5.13	**SMA6-25**
6	19.03	4 x 1.8	M5	5	2.00	1.11	0.20	0.11	0.03~0.13	0.047	**SMA1-30**
10	25.71	5 x 2.3	M5	8	7.22	4.08	0.74	0.42	0.05~0.15	0.19	**SMA1.5-30**
12	36.06	6 x 2.8 5 x 2.3	M6 M5	6.25	16.0	9.20	1.63	0.94	0.06~0.16	0.32 0.35	**SMA2-30** **SMB2-30**
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	**SMA2.5-30** **SMB2.5-30**
20	53.43	10 x 3.3 8 x 3.3	M8	10	57.8	34.0	5.89	3.46	0.08~0.18	1.15 1.25	**SMA3-30** **SMB3-30**
22	67.77	10 x 3.3 8 x 3.3	M8	12.5	88.4	52.3	9.01	5.34	0.10~0.25	2.01 2.10	**SMA3.5-30** **SMB3.5-30**
25	79.29	12 x 3.3 8 x 3.3	M8	12.5	131	78.3	13.4	7.99	0.12~0.27	2.81 3.03	**SMA4-30** **SMB4-30**
30	99.15	16 x 4.3	M10	17.5	250	150	25.5	15.3	0.14~0.34	5.56	**SMA5-30**

[Caution on Product Characteristics] ① The key groove used is a JIS B 1301 normal type (Js9) and a set screw is included for products with a tapped hole.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ The dimensions of the keyway marked with * are different from the JIS Standards.

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns.
KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).

MM Module 2~5
Miter Gears

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



B3

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

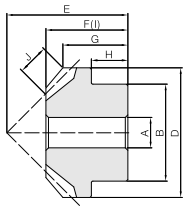
[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
② Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

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

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② In the illustration, the area surrounded with — · — · — line is masked during the carburization process and can be modified. However, note that high hardness (HRC40 at maximum) occurs in some cases.

LM Module 0.8~1.5
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 to 95HRB)



B1

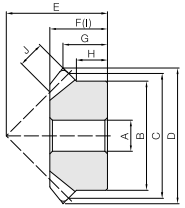
Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width
					A_{H8}	B		D	E	F	G	H
LM0.8-20	1	***m*0.8**	20	B1	4	12	16	17.13	16	11	8.57	5.5
LM1-20		***m*1**			5	16	20	21.41	20	13.5	10.71	6
LM1.25-20		***m*1.25**		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

[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
② Steam treatment (where the surface is rusted using steam) is provided to this product for rust prevention, but it is not guaranteed.
③ Lubricity is retained due to the characteristics of sintering (porosity), but the product is not oil impregated.

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog Number
I	J		Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(g)	
11	4.24	—	0.22	0.027	0.022	0.0027	0~0.16	9.67	**LM0.8-20**
13.5	4.95		0.41	0.050	0.042	0.0051	0~0.18	20.7	**LM1-20**
15	6.36		0.81	0.099	0.083	0.010	0~0.20	38.8	**LM1.25-20**
21	8.48		1.48	0.19	0.15	0.019	0~0.22	78.6	**LM1.5-20**

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.

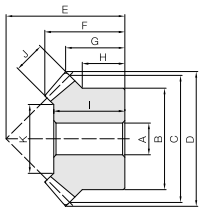
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



B2

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

[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
② Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.



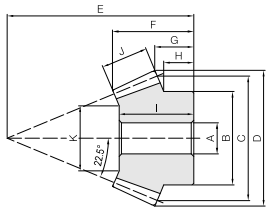
B3

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog Number
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
19	7	—	3.84	0.33	0.39	0.034	0.06~0.16	0.076	**SM2-16**
21	9		7.63	0.68	0.78	0.069	0.07~0.17	0.14	**SM2.5-16**
23	11		13.3	1.21	1.36	0.12	0.08~0.18	0.22	**SM3-16**
28	14		30.7	2.87	3.13	0.29	0.12~0.27	0.49	**SM4-16**
37	17		58.9	5.62	6.00	0.57	0.14~0.34	1.03	**SM5-16**
12	5	9.86	0.89	0.084	0.091	0.0086	0.03~0.13	0.019	**SM1-20**
13	6	13.03	1.70	0.16	0.17	0.017	0.04~0.14	0.036	**SM1.25-20**
19	8	15.37	3.12	0.30	0.32	0.031	0.05~0.15	0.074	**SM1.5-20**
22	10	21.72	7.13	0.72	0.73	0.073	0.06~0.16	0.15	**SM2-20**
29	12	28.06	13.6	1.41	1.39	0.14	0.07~0.17	0.30	**SM2.5-20**
35	15	31.57	24.1	2.54	2.45	0.26	0.08~0.18	0.53	**SM3-20**
40	18	39.09	38.8	4.15	3.96	0.42	0.10~0.25	0.82	**SM3.5-20**
45	20	43.43	57.0	6.19	5.82	0.63	0.12~0.27	1.15	**SM4-20**
54	26	54.46	114	12.6	11.6	1.29	0.14~0.34	2.15	**SM5-20**
60	30	67.15	191	21.8	19.4	2.22	0.16~0.36	3.68	**SM6-20**
62	35	95	413	49.6	42.1	5.06	0.20~0.45	7.05	**SM8-20**
14	6	15.03	1.47	0.16	0.15	0.017	0.03~0.13	0.035	**SM1-25**
16	7	18.7	2.75	0.31	0.28	0.032	0.04~0.14	0.063	**SM1.25-25**
19	9	19.54	4.96	0.57	0.51	0.059	0.05~0.15	0.11	**SM1.5-25**
20	12	26.06	11.8	1.41	1.20	0.14	0.06~0.16	0.22	**SM2-25**
26	15	34.57	23.0	2.81	2.34	0.29	0.07~0.17	0.42	**SM2.5-25**
32	20	37.43	42.1	5.24	4.29	0.53	0.08~0.18	0.74	**SM3-25**
37	22	46.77	64.7	8.19	6.60	0.83	0.10~0.25	1.15	**SM3.5-25**
43	25	55.29	96.3	12.4	9.82	1.26	0.12~0.27	1.73	**SM4-25**
50	30	65.15	184	24.2	18.7	2.47	0.14~0.34	3.41	**SM5-25**
61	35	83	309	42.1	31.5	4.29	0.16~0.36	6.03	**SM6-25**
16	6	19.03	1.99	0.26	0.20	0.026	0.03~0.13	0.057	**SM1-30**
21	8	22.37	4.05	0.54	0.41	0.055	0.04~0.14	0.12	**SM1.25-30**
25	10	25.71	7.19	0.97	0.73	0.099	0.05~0.15	0.21	**SM1.5-30**
25	12	36.06	15.9	2.22	1.62	0.23	0.06~0.16	0.37	**SM2-30**
32	15	47.57	31.1	4.43	3.17	0.45	0.07~0.17	0.76	**SM2.5-30**
40	20	53.43	57.5	8.33	5.87	0.85	0.08~0.18	1.32	**SM3-30**
45	22	67.77	88.0	13.0	8.97	1.32	0.10~0.25	2.20	**SM3.5-30**
50	25	79.29	131	19.6	13.3	2.00	0.12~0.27	3.09	**SM4-30**
62	30	99.15	249	38.3	25.4	3.91	0.14~0.34	6.47	**SM5-30**

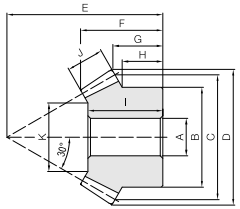
[Caution on Secondary Operations] ① Please read “Cautions on Performing Secondary Operations” (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.

Shaft angle 45°

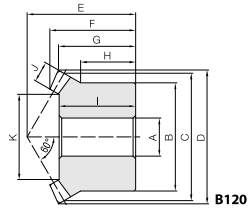
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	S45C
Heat treatment	–
Tooth hardness	(less than 194HB)
Surface treatment	Black oxide coating



B45



B60



B120

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

Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N-m)		Allowable torque (kgf-m)		Backlash	Weight	Catalog Number
H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
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 Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
② Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
③ The axis angle is where the same products are set together. The axis angle cannot be changed by using it with a different product.

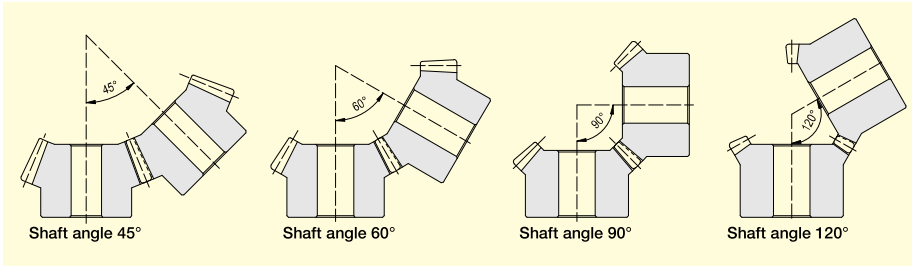
[Caution on Secondary Operations] ① Please read “Cautions on Performing Secondary Operations” (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.

Shaft angle 60°

Shaft angle 120°

■ Angular miter

The axis angle of a normal miter is set to 90°, but the angle is set arbitrarily for the angular miter. The SAM Angular Miters are products with standardized axial angles of 45°, 60° and 120°. Be sure to pair products with the same model number. Custom items of other shaft angles are available, but may not be manufacturable due to the capabilities of the machine.

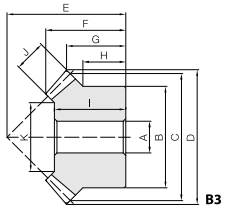


Shaft angle 45° Shaft angle 60° Shaft angle 90° Shaft angle 120°

■ Angular Miter Gear Box Example

SUM Module 1~4
Stainless Steel Miter Gears

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



B3

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width
					A_{H7}	B	C	D	E	F	G	H
SUM1-20	1	***m*1**	20	B3	6	16	20	21.41	20	13.95	10.71	8
SUM1.5-20		***m*1.5**			8	26	30	32.12	30	21.24	16.06	13
SUM2-20		***m*2**			12	34	40	42.83	37	24.89	18.41	14
SUM2.5-20		***m*2.5**			14	42	50	53.54	48	32.54	24.77	19
SUM3-20		***m*3**			16	50	60	64.24	58	39.84	30.12	23
SUM4-20		***m*4**			20	64	80	85.65	75	50.78	37.83	27
SUM1-25	1	***m*1**	25	B3	6	20	25	26.41	23	15.16	11.21	8
SUM1.5-25		***m*1.5**			10	30	37.5	39.62	34	22.25	16.31	11.5
SUM2-25		***m*2**			12	45	50	52.83	40	24.33	16.41	12.5
SUM2.5-25		***m*2.5**			16	55	62.5	66.04	50	30.41	20.52	15
SUM3-25		***m*3**			20	65	75	79.24	60	37.81	24.62	17.5
SUM4-25		***m*4**			28	80	100	105.66	80	49.32	32.83	20
SUM1-30	1	***m*1**	30	B3	8	24	30	31.41	28	17.71	13.71	10
SUM1.5-30		***m*1.5**			10	36	45	47.12	43	28.24	21.56	16
SUM2-30		***m*2**			12	45	60	62.83	50	29.43	21.41	12.5
SUM2.5-30		***m*2.5**			16	60	75	78.54	62	36.28	26.27	17
SUM3-30		***m*3**			20	70	90	94.24	75	45.47	32.12	20

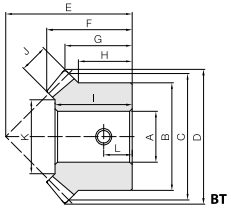
[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
② Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
I	J	K	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] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.

SUMA Module 1~4
Finished Bore Stainless Steel Miter Gears

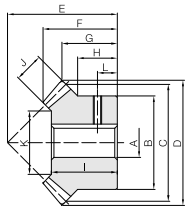
Specifications	
Precision grade	JIS B 1704: 1978 grade 3
Gear teeth	Gleason
Pressure angle	20°
Material	SUS303
Heat treatment	—
Tooth hardness	(less than 187HB)



BT

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

[Caution on Product Characteristics] ① The key groove used is a JIS B 1301 normal type (Js9) and a set screw is included for products with a tapped hole.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.



BK

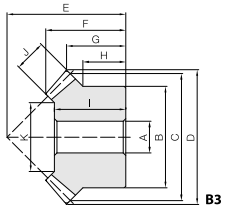
Face width	Holding surface dia.	Keyway	Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability			
5	9.86	—	M4	4	0.49	0.060	0.050	0.0061	0.03~0.13	0.018	**SUMA1-20**
8	15.37	—	M4	6.5	1.72	0.22	0.18	0.022	0.05~0.15	0.073	**SUMA1.5-20**
10	21.72	4 x 1.8	M4	7	3.94	0.51	0.40	0.052	0.06~0.16	0.14	**SUMA2-20**
12	28.06	5 x 2.3	M5	9.5	7.52	1.00	0.77	0.10	0.07~0.17	0.29	**SUMA2.5-20**
15	31.57	5 x 2.3	M5	11.5	13.3	1.80	1.36	0.18	0.08~0.18	0.52	**SUMA3-20**
20	43.43	6 x 2.8	M5	13.5	31.5	4.39	3.22	0.45	0.12~0.27	1.14	**SUMA4-20**
6	15.03	—	M4	4	0.81	0.12	0.083	0.012	0.03~0.13	0.034	**SUMA1-25**
9	19.54	—	M4	6	2.74	0.41	0.28	0.042	0.05~0.15	0.11	**SUMA1.5-25**
12	26.06	4 x 1.8	M4	6.5	6.50	1.00	0.66	0.10	0.06~0.16	0.24	**SUMA2-25**
15	34.57	5 x 2.3	M5	7.5	12.7	2.00	1.29	0.20	0.07~0.17	0.46	**SUMA2.5-25**
20	37.43	6 x 2.8	M5	9	23.3	3.73	2.37	0.38	0.08~0.18	0.79	**SUMA3-25**
25	55.29	8 x 3.3	M6	10	53.2	8.79	5.43	0.90	0.12~0.27	1.67	**SUMA4-25**

[Caution on Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.

PM Module 1~4
Plastic Miter Gears

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

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



B3

Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width
					A	B	C	D	E	F	G	H
PM1-20	1	***m*1**	20	B3	6	16	20	21.41	20	13.95	10.71	8
PM1.25-20		***m*1.25**			8	22	25	26.77	23	15.27	11.38	9
PM1.5-20		***m*1.5**			8	26	30	32.12	30	21.24	16.06	13
PM2-20		***m*2**			10	34	40	42.83	37	24.89	18.41	14
PM2.5-20		***m*2.5**			12	42	50	53.54	48	32.54	24.77	19
PM3-20		***m*3**			14	50	60	64.24	58	39.84	30.12	23
PM3.5-20		***m*3.5**			20	60	70	74.95	65	44.13	32.47	25
PM4-20		***m*4**			20	64	80	85.66	75	50.78	37.83	27
PM1-25	1	***m*1**	25	B3	6	20	25	26.41	23	15.16	11.21	8
PM1.25-25		***m*1.25**			8	25	31.25	33.02	28	17.88	13.26	9.25
PM1.5-25		***m*1.5**			8	30	37.5	39.62	34	22.25	16.31	11.5
PM2-25		***m*2**			10	40	50	52.83	40	24.33	16.41	10
PM2.5-25		***m*2.5**			14	50	62.5	66.04	50	30.41	20.52	12.5
PM3-25		***m*3**			15	60	75	79.24	60	37.81	24.62	15
PM1-30	1	***m*1**	30	B3	8	24	30	31.41	28	17.71	13.71	10
PM1.5-30		***m*1.5**			10	36	45	47.12	43	28.24	21.56	16
PM2-30		***m*2**			12	45	60	62.83	50	29.43	21.41	12.5
PM2.5-30		***m*2.5**			16	60	75	78.54	62	36.28	26.27	17
PM3-30		***m*3**			20	70	90	94.24	75	45.47	32.12	20

[Caution on Product Characteristics] ① Significant variations in temperature or humidity can cause dimensional changes in plastic gears, including bore size (H8 when produced), tooth diameter, and backlash. Please see the section "Design of Plastic Gears" in our separate technical reference book.
② The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
③ Dimensions of the outside diameter, the total length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.
④ Without lubrication, using plastic gears in pairs may generate heat and dilation. It is recommended to mate them with steel gears.

* In regard to MC Nylon gears, other materials are available for plastic gears, including Ultra High Molecular Weight Polyethylene (U-PE), which has excellent abrasion resistance and resin conforming to the Plastic Implementation Measure (PIM).
A single piece order is acceptable and will be produced as a custom-made gear.
Please see Page 24 for more details on quotations and orders.

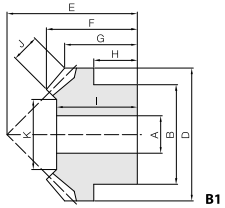
Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (g)	Catalog Number
I	J	K	Bending strength	Surface durability	Bending strength	Surface durability			
12	5	9.86	0.22	–	0.022	–	0~0.23	2.77	**PM1-20**
13	6	13.03	0.42		0.043		0~0.24	5.31	**PM1.25-20**
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 Secondary Operations] ① Please read "Cautions on Performing Secondary Operations" (Page 304) when performing modifications and/or secondary operations for safety concerns. KHK Quick-Mod Gears, the KHK system for quick modification of KHK stock gears, is also available.
② Plastic gears are susceptible to the effects of temperature and moisture. Dimensional changes may occur while performing secondary operations and during post-machining operations.

DM Module 0.5~1.5
Injection Molded Miter Gears

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

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



B1

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

[Caution on Product Characteristics] ① The allowable torques shown in the table are calculated values according to the assumed usage conditions. Please see Page 302 for more details.
② The bore tolerance is -0.05 to -0.3, but it may be slightly higher at the center of the hole.
③ For the dimensional accuracy of each part, see the dimensional tolerance of molded items in the separate table.

When using the injection molded bevel gear with an idler gear (bearing metal press fitting) and diameter smaller than the inside diameter of the molded gear, please press fit the following standard bushing.
For details on bushings, please see Page 330.

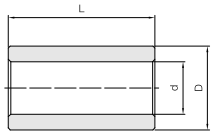
■ Dimensional tolerance of molded item (unit: mm)

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

Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)	Allowable torque (kgf·m)	Backlash (mm)	Weight (g)	Catalog Number
H	I	J	K	Bending strength	Bending strength			
4	7	2.5	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 Secondary Operations] ① As it is a molded item, bubbles may form inside the material. Avoid performing secondary operations.

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



T8

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

Material: Oil-free copper alloy