

Table of Contents

Special Characteristics, Point of Caution
in Selecting and Using Miter Gears..... page 194
MMSG Ground Spiral Miter Gears page 200
SMSG Ground Spiral Miter Gears page 202
MMSA(B) Finished Bore Spiral Miter Gears page 204
MMS Spiral Miter Gears page 206
SMS Spiral Miter Gears..... page 208
SMA(B)(C) Finished Bore Miter Gears page 212
MM Carburized & Hardened Miter Gears..... page 216
LM Sintered Metal Miter Gears page 216
SM Miter Gears..... page 218
SAM Angular Miter Gears page 220
SUM Stainless Steel Miter Gears page 222
PM Plastic Miter Gears..... page 224
DM Injection Molded Miter Gears page 226
BB Sintered Metal Bushings..... page 226

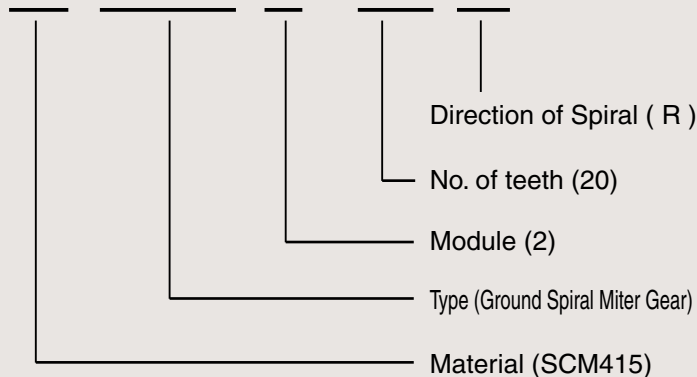
Catalog Number of KHK Stock Gears

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 MSG 2 - 20 R



Material		Type	
S	S45C	M	Miter Gears
M	SCM415	MS	Spiral Miter Gears
SU	SUS303	MSG	Ground Spiral Miter Gears
L	SMF5040	AM	Angular Miter Gears
P	MC901		
D	Duracon(M90-44)		



6

Miter Gears





Miter Gears

Wide Variety from High Precision to Commercial Grades!



Characteristics

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

Main Features of Stock Miter Gears Offered

The following table lists the main features for easy selection.

Type	Catalog No.	Module	No. of teeth () denotes shafts angle	Material	Heat treatment	Tooth surface finish	Precision JIS B 1704	Secondary Operations	Features
Spiral Miter Gears	MMSG	2~4	20, 25, 30	SCM415	Carburizing <small>NOTE 3</small>	Ground	2	△	High strength, abrasion-resistant and compact for high speed & torque use.
	SMSG	2~5	20, 25, 30	S45C	Gear teeth induction hardened	Ground	2	△	Reasonably priced ground gear, yet remachinable except for the gear teeth.
	MMSA(B) <small>NOTE 1</small>	1~10	20	SCM415	Overall Carburizing <small>NOTE 4</small>	Cut	4	×	Ready to use without performing secondary operations. Strong and abrasion resistant.
	MMS	2~5	20, 25	SCM415	Carburizing <small>NOTE 3</small>	Cut	4	△	Only teeth are induction hardened, allowing user to perform secondary operations elsewhere.
	SMS	1~8	20, 25, 30	S45C	Gear teeth induction hardened	Cut	4	△	Large numbers of teeth and modules are offered in these affordable spiral miter gears.
Straight Miter Gears	SMA(B)(C) <small>NOTE 1</small>	1~8	20, 25, 30	S45C	Gear teeth induction hardened	Cut	4	△	Usable without remachining, offered in 3 bore sizes.
	MM	2~5	20, 25	SCM415	Carburizing <small>NOTE 3</small>	Cut	4	△	Compared to SM miters, these are stronger and less abrasive, and allow secondary operations.
	LM <small>NOTE 2</small>	0.8~1.5	20	SMF5040 (Equiv. to S45C)	—	Sintered	5	○	Mass-produced, low cost sintered products. Small and light weight.
	SM	1~8	16, 20, 25, 30	S45C	—	Cut	3	○	Popular straight miter for many uses.
	SAM	1.5~3	20 (45°, 60°, 120°)	S45C	—	Cut	3	○	3 types are available for shafts at 45°, 60° and 120°.
	SUM	1~3	20, 25	SUS303	—	Cut	3	○	Suitable for food machinery due to SUS303's rust-resistant quality.
	PM	1~4	20, 25	MC901	—	Cut	4	○	MC nylon products are light and can be used without lubricant.
DM	0.5~1.5	20	M90-44	—	Injection molded	8	△	Injection molded, mass-produced products, suitable for office machines.	

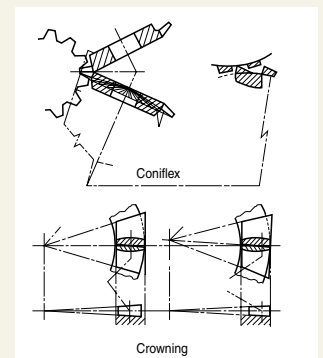
NOTE 1: The letters "B" and "C" at the end of catalog numbers designate same items except for changes in the bore and keyway sizes.

NOTE 2: Sintered metal Miter Gears are manufactured by mixing powdered metal and pressing them in a mold under heat to fuse, sizing and impregnating with oil.

NOTE 3: Even though the bore and the hub portions are masked during the carburization and they can be modified, care should be exercised since the hardness is somewhat higher.

NOTE 4: MMSA(B) spiral miter gears are carburized throughout so that they do not permit any secondary operations. However, the back surface of B7 style gears is masked during the process so that it is possible to drill and pin on this surface.

○ Possible △ Possible on some areas
× Not possible



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

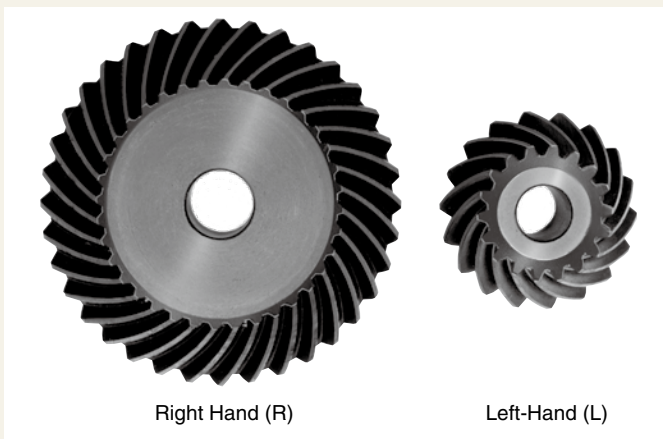


Selection Hints

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. Use of catalog numbers when ordering will simplify and expedite the processing of your order.

1. Caution in Selecting the Mating Gears

① Among KHK stock miter gears, there are products which are not interchangeable even when the module and the number of teeth are the same. Also, spiral miter gears require additional consideration since the right-hand mates with the left-hand spiral as shown in the table below.



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

Catalog No.& Spiral hand	MMSG (R)	SMSG (R)	MMSA(B) (R)	MMS (R)	SMS (R)
MMSG(L)	○	×	×	×	×
SMSG(L)	×	○	×	×	×
MMSA(B)-(L)	×	×	○	△	△
MMS(L)	×	×	△	○	△
SMS(L)	×	×	△	△	○

CAUTION: Spiral miter gears are paired to the items with the same catalog number except the last characters are “R” and “L”. For selecting items in the “△” category, please reconfirm with your nearest KHK dealer that the pair can work.

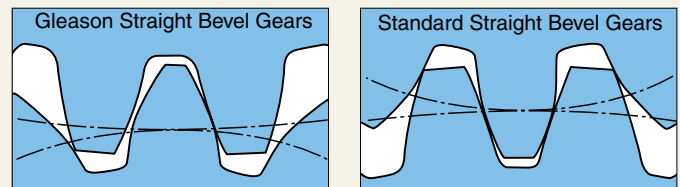
■ Straight Miter (○ Allowable × Not allowable)

Catalog No.	SMA (B)(C)	MM	SM	SUM	PM	DM	LM	SAM
SMA(B)(C)	○	○	○	○	○	×	×	×
MM	○	○	○	○	○	×	×	×
SM	○	○	○	○	○	×	×	×
SUM	○	○	○	○	○	×	×	×
PM	○	○	○	○	○	×	×	×
DM	×	×	×	×	×	○	×	×
LM	×	×	×	×	×	×	○	×
SAM	×	×	×	×	×	×	×	○

② Miter gears are bevel gears with 1:1 gear ratio. Needless to say, they mate only with gears of the same module and number of teeth. Also, since KHK uses the Gleason system, our miter gears may not mesh with those made by another company or custom-made. It is best to order as a set.

Difference between Gleason Straight Bevel Gears and Standard Straight Bevel Gears

There are differences in the gear blank shapes between the two systems. In the table below, we illustrate the differences in various angles and dimensions for typical straight bevel gear pairs.



<Example>

Module $m = 3$, No. of teeth of pinion $z_1 = 20$,
Gear $z_2 = 40$, Face width $b = 22$, Pressure angle $\alpha_0 = 20^\circ$

		Gleason straight bevel system		Standard straight bevel system	
		$z_1=20$	$z_2=40$	$z_1=20$	$z_2=40$
1	d_o	60	120	60	120
2	δ_o	$26^\circ 34'$	$63^\circ 26'$	$26^\circ 34'$	$63^\circ 26'$
3	R_o	67.083		67.083	
*4	h_k	4.035	1.965	3.00	
*5	h_f	2.529	4.599	3.75	
*6	δ_k	$30^\circ 29'$	$65^\circ 36'$	$29^\circ 08'$	$66^\circ 00'$
*7	δ_r	$24^\circ 24'$	$59^\circ 31'$	$23^\circ 22'$	$60^\circ 14'$
*8	d_k	67.218	121.758	65.367	122.683
*9	X	58.197	28.242	58.658	27.317

CAUTION: In items 4 through 9 (marked with *), dimensions and angles are different in two systems.



Miter Gears

2. Caution in Selecting Gears Based on Gear Strength

The gear strength values shown in the product pages were computed by assuming a certain application environment. Therefore, they should be used as reference only. We recommend that each user computes their own values by applying the actual usage conditions. The table below contains the assumptions established for these products in order to compute gear strengths.

Definition of bending strength

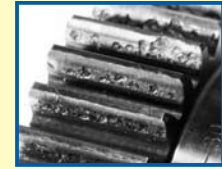
The allowable bending strength of a gear is defined as the allowable tangential force at the pitch circle based on the mutually allowable root stress of two meshing gears under load.



Example of the failure due to insufficient bending strength.

Definition of surface durability

The surface durability of a gear is defined as the allowable tangential force at the pitch circle, which permits the force to be transmitted safely without incurring surface failure.



Example of the defacement due to insufficient surface durability.

Calculation of Bending Strength of Gears

Catalog No. Item	MMSG MMS MM	MMSA(B)	SMSG SMS SMA(B)(C)	SM SAM	SUM LM	PM	DM
Formula <small>NOTE 1</small>	Formula of bevel gears on bending strength (JGMA403-01)					The Lewis formula	
No. of teeth of mating gears	Same number of teeth					—	
Rotation	100min ⁻¹ (600min ⁻¹ for MMSG & SMSG)					100min ⁻¹	
Durability	Over 10 ⁷ cycles					—	
Impact from motor	Uniform load					Allowable bending stress	
Impact from load	Uniform load					1.15kgf/mm ² (40°C with no lubricant)	<small>NOTE 3</small> m0.5 4.5 m0.8 4.0 m1.0 3.5 m1.5 1.8 kgf/mm ²
Direction of load	Bidirectional						
Allowable bending stress at root σ_{Flim} <small>NOTE 2</small>	31.33kgf/mm ²	31.33kgf/mm ²	14kgf/mm ²	12.67kgf/mm ²	7kgf/mm ²		
Safety factor K_R	1.2						

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

NOTE 2: Since the load is bidirectional, the allowable bending stress at root σ_{Flim} , used in JGMA 403-01 formula is set to 2/3 of the value.

NOTE 3: The values of the allowable bending stresses for DM m0.5 and m1.5 and the allowable root bending stress for LM gears are our own estimates.

Calculation of Surface Durability (Except those in common with bending strength)

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

3. Caution with Regard to the Special Characteristics of Miter Gears

- MMSA(B) spiral miter gears are carburized throughout so that they do not permit any secondary operations. However, the back surface of B7 style gears is masked during the process so that it is possible to drill and pin on this surface.
- The keyway sizes of MMSA(B) finished bore spiral miter gears are made according to JIS B 1301, medium quality, but the final heat treating may cause some deformation.
- The bore of SMS spiral miter gears may somewhat be deformed due to heat treatment and does not reach H7 tolerance.
- Due to the characteristics of the material, PM plastic miter gears' product quality may be affected by heat or moisture absorption.
- Items with black oxide finish are somewhat effective in resisting rust but are not totally rustproof.
- SUM stainless steel miter gears use material which is especially resistant to rust but still is not 100% rustproof.
- The bore tolerance of DM injection molded miter gears is generally -0.05 to -0.10, but may be plus values at the central portion of the hole. Remachining the bore is not recommended since reworking may expose voids in the plastic.

4. Other Points to Consider in the Selection Process

- There are various footnotes to the product pages under the headings of "CAUTION" and "NOTE". Please consider them carefully when selecting these products.
- There may be slight differences in color or shape of products shown in the photographs from the actual products.
- KHK reserves the right to make changes in specifications and dimensions without notice.
- KHK is ready to produce and supply custom order products. When you require specific gears different from KHK Stock Gears please contact our distributor for quotation. Also, please refer to page 16 "KHK Custom Order Products".



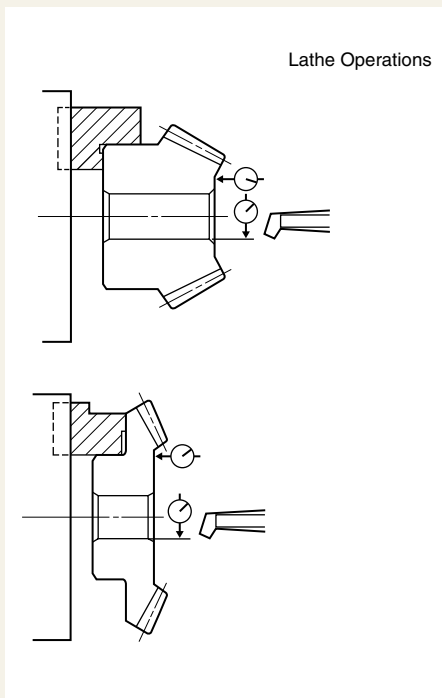
Application Hints

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

KHK CO., LTD. TECHNICAL DEPARTMENT
PHONE: 81-48-254-1744 FAX: 81-48-254-1765
E-mail export@khkgears.co.jp

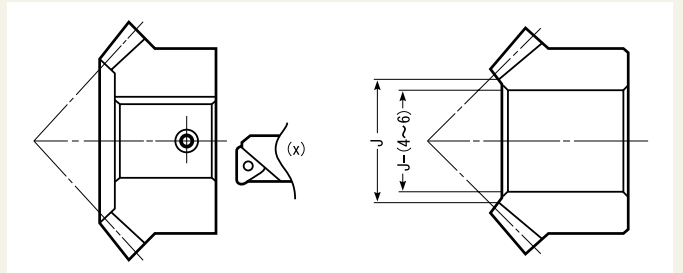
1. Caution on Performing Secondary Operations

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

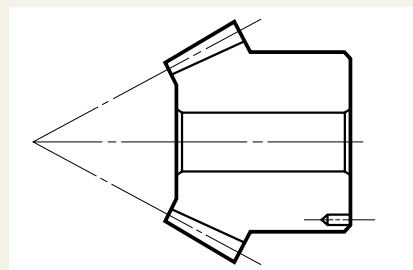


- ④ Starting in August 2003, the tooling holes on the hub face of the spiral miter gears (except ground gears) module 2.5 and above have been eliminated. However, we may have some items in stock with the hole.

- ⑤ MMSA(B) spiral miter gears are carburized throughout, so that no secondary operations can be performed (except B7 style items). For items with induction hardened teeth, such as SMSG and SMS series, the hardness is high near the tooth root. When machining the front face, the machined area should be 4 to 6mm smaller than the dimension, J.



- ⑥ For tapping and keyway operations, see the examples given in “1. Caution on Performing Secondary Operations” in KHK Stock Spur Gear section. When cutting keyways, to avoid stress concentration, always leave radii on corners.
- ⑦ PM plastic miter gears are susceptible to changes due to temperature and humidity. Dimensions may change between during and after remachining operations.
- ⑧ When heat treating S45C products, it is possible to get thermal stress cracks. It is best to subject them to penetrant inspection afterwards. While the teeth strength may increase four fold, the precision of the gear will drop approximately one grade.

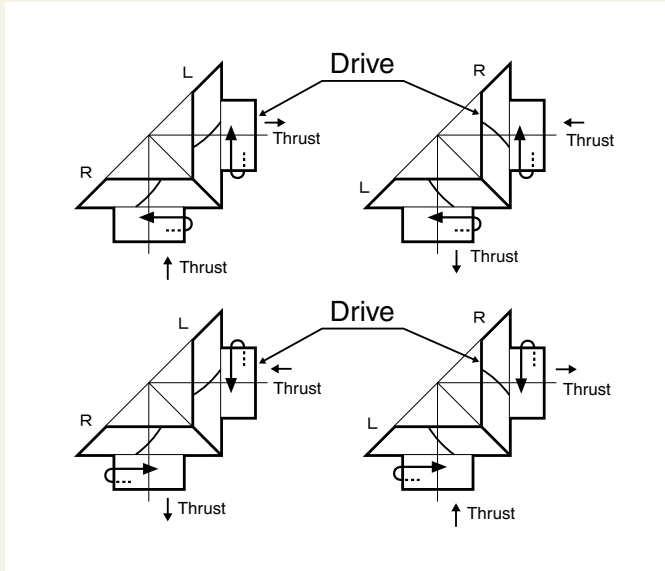




Miter Gears

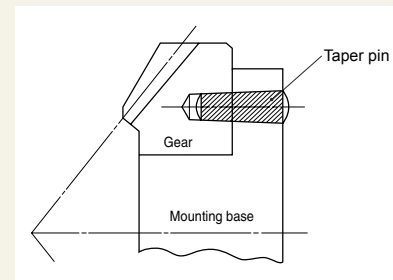
2. Points of Caution in Assembling

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



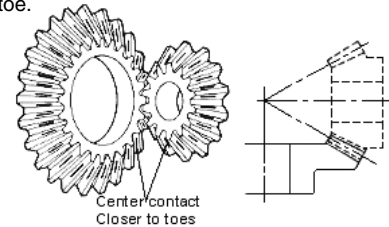
② KHK stock miter gears are designed such that, when assembled according to the specified mounting distance with a tolerance of H7~H8, the backlash shown in the table are obtained. Mounting distance error, offset error and shaft angle error must be minimized to avoid excessive noise and wear. Inaccurate assembly will lead to irregular noises and uneven wear. Various conditions of teeth contact are shown below.

- ③ If a miter gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend mounting bevel gears as close to the bearings as possible. This is especially important since most miter gears are supported on one end. The bending of shafts will cause abnormal noise and wear, and may even cause fatigue failure of the shafts. Both shafts and bearings must be designed with sufficient strength.
- ④ Due to the thrust load of miter gears, the gears, shafts and bearings have the tendency to loosen up during operation. Miter gears should be fastened to the shaft with keys and set screws, taper pins, step shafts, etc.
- ⑤ When installing MMSA(B) finished bore spiral miter gears in B7 style (ring type), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only.



Correct Tooth Contact

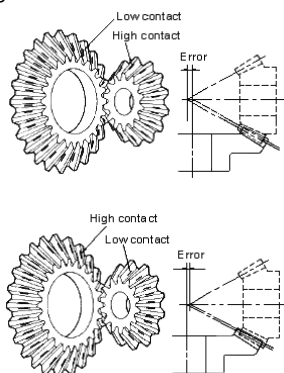
- When assembled correctly, the contact will occur on both gears in the middle of the flank and center of face width but somewhat closer to the toe.



Incorrect Tooth Contact

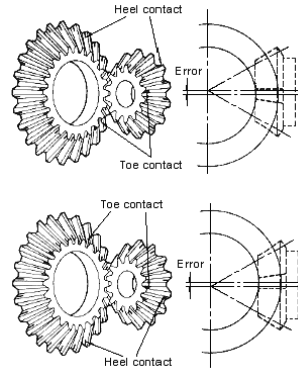
Mounting Distance Error

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



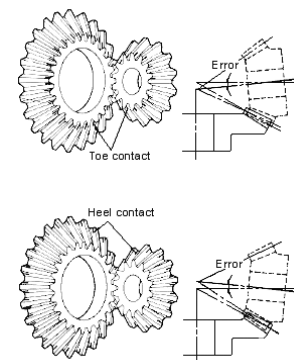
Offset Error

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



Shaft Angle Error

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





3. Notes on Starting Operations

- ① Before operating, check the following:
 - Are the gears firmly mounted on the shafts?
 - Have you eliminated uneven tooth contact?
 - Does the gear mesh have a proper amount of backlash?
(Please avoid the condition of no backlash)
 - Is there sufficient lubrication?
- ② If the gears are exposed, install a safety cover for protection.
- ③ Check the noise and vibration while the machine is in operation for any unusual conditions. If an abnormality is encountered, recheck the gears and assembly conditions. Also, check lubrication after start-up. Sometimes, when the unit is initially being operated, lubricating oil deteriorates rapidly.

4. Other Points to Consider in Applications

- ① KHK products are individually packaged to avoid damages. Depending on how they are handled, it is still possible to deform or break them. It is important to exercise care in handling these parts.
- ② Check the products as they are being taken out of the boxes. If any of them are rusted, scratched or dented, please return to the dealer where they were bought, for exchange.
- ③ KHK cannot guarantee the precision of gears once the customer performs a secondary operation on them.

PRODUCT IMPROVEMENT ANNOUNCEMENT

In order to increase the gear strength of KHK standard Miter Gears, starting in June 2004, the following changes have been introduced. During this transition, some of the specifications will change.

1. Applicable Series

- ① MMSG Ground Spiral Miter Gears –(30 Items)
- ② MMS Spiral Miter Gears – (20 Items)
- ③ MM Miter Gears – (10 Items)

2. Improvement Details

Increase in gear strength (Approximately 15% higher bending strength compared to previous one)

3. Change in the specifications

	Before	After
Heat treatment	Teeth induction hardened after carburizing	Carburizing (bore & hub portion masked)
Surface Treatment	Black oxide	No black Oxide

The corner tips of the gear-teeth of KHK stock Miter Gears are machine chamfered for safety and for prevention of damages.

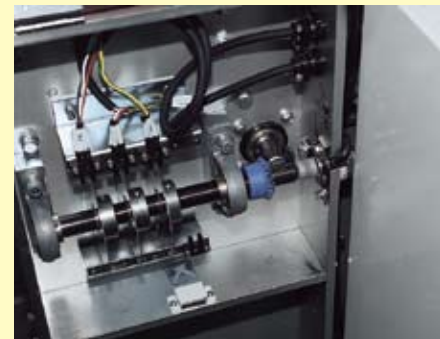
■ The chamfering of the corner gear tips for miter gear (unit: mm)

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

Example of KHK Gear Applications



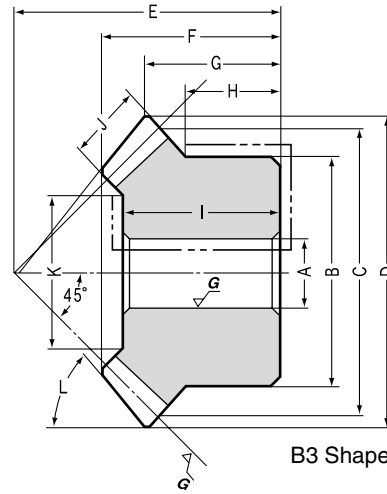
Automatic packaging machine (Spur gears)
(Miter gears - inset)



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



MMSG Ground Spiral Miter Gears Modules 2~4



20 Tooth Miter Gears Modules 2~4

Catalog No.	Direction of Spiral	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width
		<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J
MMSG2 -20R MMSG2 -20L	R L	2	20	12	35	40	42.7	35	21.98	16.35	12.5	20	9
MMSG2.5-20R MMSG2.5-20L	R L	2.5	20	14	42	50	53.2	45	28.63	21.6	16	26	11
MMSG3 -20R MMSG3 -20L	R L	3	20	16	52	60	63.99	50	30.78	21.99	16	27	14
MMSG3.5-20R MMSG3.5-20L	R L	3.5	20	20	50	70	74.53	55	32.45	22.26	14	29	16
MMSG4 -20R MMSG4 -20L	R L	4	20	20	55	80	84.99	65	39.13	27.5	17	35	18

25 Tooth Miter Gears Modules 2~4

MMSG2 -25R MMSG2 -25L	R L	2	25	12	38	50	52.5	40	23.43	16.25	11	21	11
MMSG2.5-25R MMSG2.5-25L	R L	2.5	25	16	45	62.5	65.54	50	29.57	20.27	14	26	14
MMSG3 -25R MMSG3 -25L	R L	3	25	20	55	75	78.78	60	35.6	24.39	17	31	17
MMSG3.5-25R MMSG3.5-25L	R L	3.5	25	25	65	87.5	91.81	70	41.65	28.41	19	37	20
MMSG4 -25R MMSG4 -25L	R L	4	25	28	75	100	104.7	80	47.8	32.35	22	42	23

30 Tooth Miter Gears Modules 2~4

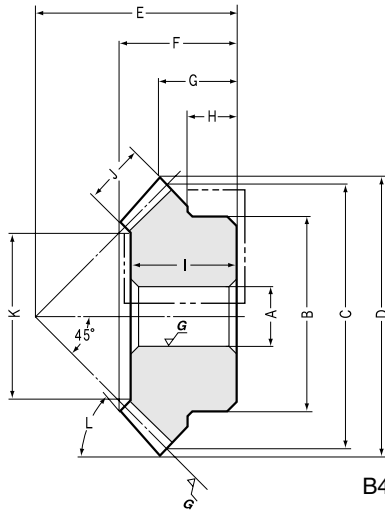
MMSG2 -30R MMSG2 -30L	R L	2	30	14	45	60	62.42	50	29.27	21.21	15	26	12
MMSG2.5-30R MMSG2.5-30L	R L	2.5	30	16	55	75	78.04	60	34.08	24.02	16	30	15
MMSG3 -30R MMSG3 -30L	R L	3	30	20	65	90	93.61	70	40.25	26.8	18	36	20
MMSG3.5-30R MMSG3.5-30L	R L	3.5	30	25	80	105	109.21	80	44.4	29.6	20	40	22
MMSG4 -30R MMSG4 -30L	R L	4	30	28	90	120	124.7	90	49.27	32.35	22	44	25

CAUTION: A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.

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



Ground Spiral Miter Gears



B4 Shape

Specifications

Precision grade	JIS B 1704 grade 2	Tooth hardness	55~60HRC
Gear teeth	Gleason	Surface treatment	—
Pressure angle	20°	Tooth surface finish	Ground
Helix angle	35°	Datum reference surface for gear grinding	Bore
Material	SCM415	Secondary Operations	Possible where masking for carburizing
Heat treatment	Carburizing NOTE 1		

NOTE 1: The areas marked with ---- on the diagram are masked during the carburizing and can be modified, even though the hardness is somewhat higher.

Holding surface dia. K	Tip angle L	Shape	Allowable torque (N·m) NOTE 2		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
24.54	51°34'	B3	15.59	21.7	(1.589)	(2.213)	0.05 ~ 0.11	0.14	MMSG2 -20R MMSG2 -20L
30.89	50°28'	B3	30	42.63	(3.06)	(4.347)	0.06 ~ 0.12	0.26	MMSG2.5-20R MMSG2.5-20L
34.4	51°24'	B3	53.8	77.59	(5.48)	(7.912)	0.07 ~ 0.13	0.44	MMSG3 -20R MMSG3 -20L
42.75	50°40'	B4	84.3	123.5	(8.6)	(12.59)	0.08 ~ 0.14	0.5	MMSG3.5-20R MMSG3.5-20L
49.08	49°54'	B4	124.7	184.9	(12.71)	(18.85)	0.1 ~ 0.16	0.72	MMSG4 -20R MMSG4 -20L

Pitch Angle 45°

30.89	49°23'	B4	25.3	43.49	(2.57)	(4.435)	0.05 ~ 0.11	0.2	MMSG2 -25R MMSG2 -25L
37.4	48°26'	B4	49.9	87.62	(5.09)	(8.935)	0.06 ~ 0.12	0.4	MMSG2.5-25R MMSG2.5-25L
43.92	48°52'	B4	86.8	155.1	(8.85)	(15.82)	0.07 ~ 0.13	0.7	MMSG3 -25R MMSG3 -25L
52.43	48°37'	B4	138.6	251.4	(14.13)	(25.64)	0.08 ~ 0.14	1.1	MMSG3.5-25R MMSG3.5-25L
58.95	47°52'	B4	191.7	352.6	(19.55)	(35.96)	0.1 ~ 0.16	1.7	MMSG4 -25R MMSG4 -25L

Pitch Angle 45°

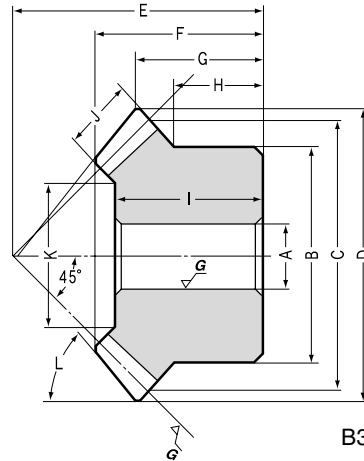
38.06	47°53'	B4	35.4	72.87	(3.61)	(7.431)	0.05 ~ 0.11	0.37	MMSG2 -30R MMSG2 -30L
47.57	47°58'	B4	69.1	145.3	(7.05)	(14.82)	0.06 ~ 0.12	0.77	MMSG2.5-30R MMSG2.5-30L
55.43	47°47'	B4	127.9	273.6	(13.04)	(27.9)	0.07 ~ 0.13	1.3	MMSG3 -30R MMSG3 -30L
67.77	47°48'	B4	180.5	392.8	(18.41)	(40.05)	0.08 ~ 0.14	2.3	MMSG3.5-30R MMSG3.5-30L
77.29	47°26'	B4	268	593.1	(27.4)	(60.48)	0.1 ~ 0.16	3.2	MMSG4 -30R MMSG4 -30L

NOTE2: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

Pitch Angle 45°



SMSG Ground Spiral Miter Gears Module 2~5



B3 Shape

20 Tooth Miter Gears Modules 2~5

Catalog No.	Direction of Spiral	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width
		<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J
SMSG2 -20R SMSG2 -20L	R L	2	20	12	34	40	42.4	37	24.75	18.2	14	22	10
SMSG2.5-20R SMSG2.5-20L	R L	2.5	20	14	42	50	52.94	48	32.42	24.47	19	29	12
SMSG3 -20R SMSG3 -20L	R L	3	20	16	50	60	63.72	58	39.6	29.86	23	35	15
SMSG3.5-20R SMSG3.5-20L	R L	3.5	20	20	60	70	74.47	65	43.81	32.23	25	40	18
SMSG4 -20R SMSG4 -20L	R L	4	20	20	64	80	84.88	75	50.51	37.44	27	45	20
SMSG5 -20R SMSG5 -20L	R L	5	20	25	80	100	105.9	90	60.16	42.95	30	54	26

25 Tooth Miter Gears Modules 2~5

SMSG2 -25R SMSG2 -25L	R L	2	25	12	40	50	52.4	40	24.19	16.2	10	20	12
SMSG2.5-25R SMSG2.5-25L	R L	2.5	25	16	50	62.5	65.54	50	30.24	20.27	12.5	26	15
SMSG3 -25R SMSG3 -25L	R L	3	25	20	60	75	78.77	60	37.57	24.39	15	32	20
SMSG3.5-25R SMSG3.5-25L	R L	3.5	25	25	70	87.5	91.81	70	42.98	28.41	17.5	37	22
SMSG4 -25R SMSG4 -25L	R L	4	25	28	80	100	104.7	80	49.14	32.55	20	43	25
SMSG5 -25R SMSG5 -25L	R L	5	25	28	100	125	130.86	100	60.59	40.43	25	50	30

30 Tooth Miter Gears Modules 2~4

SMSG2 -30R SMSG2 -30L	R L	2	30	12	45	60	62.42	50	29.27	21.21	12.5	25	12
SMSG2.5-30R SMSG2.5-30L	R L	2.5	30	16	60	75	78.04	62	36.08	26.02	17	32	15
SMSG3 -30R SMSG3 -30L	R L	3	30	20	70	90	93.61	75	45.25	31.8	20	40	20
SMSG3.5-30R SMSG3.5-30L	R L	3.5	30	25	90	105	109.21	85	49.4	34.6	25	45	22
SMSG4 -30R SMSG4 -30L	R L	4	30	28	100	120	124.71	95	54.28	37.35	25	50	25

CAUTION: A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.

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

Miter Gears SMSG



Ground Spiral Miter Gears

Specifications

Precision grade	JIS B 1704 grade 2	Tooth hardness	48~53HRC
Gear teeth	Gleason	Surface treatment	Black oxide except Ground surface
Pressure angle	20°	Tooth surface finish	Ground
Helix angle	35°	Datum reference surface for gear grinding	Bore
Material	S45C	Secondary Operations	Possible except tooth areas
Heat treatment	Teeth induction hardened		

Holding surface dia. K	Tip angle L	Shape	Allowable torque (N-m) NOTE 1		Allowable torque (kgf-m)		Backlash (mm)	Weight (kgf)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
21.72	49°12'	B3	7.827	6.785	(0.7981)	(0.6919)	0.05 ~ 0.11	0.15	SMSG2 -20R SMSG2 -20L
28.06	48°38'	B3	14.93	13.2	(1.522)	(1.346)	0.06 ~ 0.12	0.3	SMSG2.5-20R SMSG2.5-20L
31.57	49°38'	B3	26.42	23.73	(2.694)	(2.42)	0.07 ~ 0.13	0.5	SMSG3 -20R SMSG3 -20L
39.09	50°10'	B3	42.62	38.83	(4.346)	(3.96)	0.08 ~ 0.14	0.8	SMSG3.5-20R SMSG3.5-20L
43.43	49°20'	B3	62.61	57.82	(6.385)	(5.896)	0.1 ~ 0.16	1.1	SMSG4 -20R SMSG4 -20L
54.46	48°39'	B3	115.4	109	(11.77)	(11.11)	0.1 ~ 0.16	2.1	SMSG5 -20R SMSG5 -20L

Pitch Angle 45°

26.06	48°22'	B3	12.56	13.47	(1.281)	(1.374)	0.05 ~ 0.11	0.2	SMSG2 -25R SMSG2 -25L
34.57	48°26'	B3	24.53	26.84	(2.501)	(2.737)	0.06 ~ 0.12	0.4	SMSG2.5-25R SMSG2.5-25L
37.43	48°51'	B3	44.98	50.02	(4.587)	(5.101)	0.07 ~ 0.13	0.7	SMSG3 -25R SMSG3 -25L
46.77	48°37'	B3	69.15	78.13	(7.051)	(7.967)	0.08 ~ 0.14	1.1	SMSG3.5-25R SMSG3.5-25L
55.29	47°52'	B3	94.97	108.9	(9.684)	(11.1)	0.1 ~ 0.16	1.7	SMSG4 -25R SMSG4 -25L
65.15	47°50'	B3	181.1	213	(18.47)	(21.72)	0.12 ~ 0.18	3.4	SMSG5 -25R SMSG5 -25L

Pitch Angle 45°

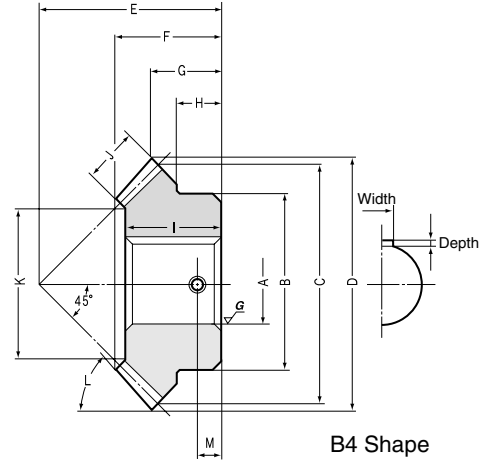
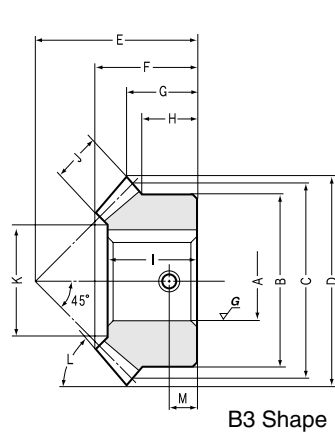
36.06	47°53'	B3	16.68	21.42	(1.701)	(2.184)	0.05 ~ 0.11	0.37	SMSG2 -30R SMSG2 -30L
47.57	47°58'	B3	32.59	42.72	(3.323)	(4.356)	0.06 ~ 0.12	0.77	SMSG2.5-30R SMSG2.5-30L
53.43	47°48'	B3	60.3	80.42	(6.149)	(8.201)	0.07 ~ 0.13	1.3	SMSG3 -30R SMSG3 -30L
67.77	47°48'	B3	85.12	115.4	(8.68)	(11.77)	0.08 ~ 0.14	2.3	SMSG3.5-30R SMSG3.5-30L
79.29	47°26'	B3	126.6	174.4	(12.91)	(17.78)	0.1 ~ 0.16	3.2	SMSG4 -30R SMSG4 -30L

NOTE 1: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

Pitch Angle 45°



MMSA(B) Finished Bore Spiral Miter Gears Modules 1~10



20 Tooth Miter Gears Modules 1~10

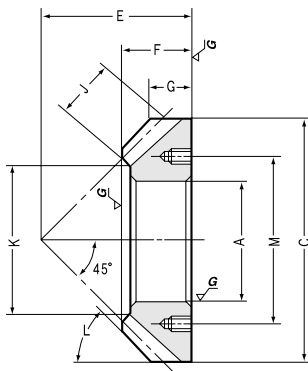
Catalog No.	Direction of Spiral	Module m	No. of teeth z	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back length G	Hub width H	Length of bore I	Face width J	Holding surface dia. K	Tip angle L
MMSA1 -20R MMSB1 -20R	R	1	20	8 10	17	20	21.29	20	13.53	10.64	8.5	12.2	4.5	11.67	50°21'
MMSA1 -20L MMSB1 -20L	L	1	20	8 10	17	20	21.29	20	13.53	10.64	8.5	12.2	4.5	11.67	50°21'
MMSA1.5-20R MMSB1.5-20R	R	1.5	20	10 12	25	30	31.9	28	18.48	13.95	10.5	16.5	7	17.2	49°52'
MMSA1.5-20L MMSB1.5-20L	L	1.5	20	10 12	25	30	31.9	28	18.48	13.95	10.5	16.5	7	17.2	49°52'
MMSA2 -20R MMSB2 -20R	R	2	20	14 16	35	40	42.52	35	22.09	16.26	12.5	20	9	24.54	49°49'
MMSA2 -20L MMSB2 -20L	L	2	20	14 16	35	40	42.52	35	22.09	16.26	12.5	20	9	24.54	49°49'
MMSA2.5-20R MMSB2.5-20R	R	2.5	20	18 20	42	50	53.2	45	28.63	21.6	16	26	11	30.89	50°28'
MMSA2.5-20L MMSB2.5-20L	L	2.5	20	18 20	42	50	53.2	45	28.63	21.6	16	26	11	30.89	50°28'
MMSA3 -20R MMSB3 -20R	R	3	20	20 22	52	60	63.99	50	30.78	21.99	16	27	14	34.4	51°24'
MMSA3 -20L MMSB3 -20L	L	3	20	20 22	52	60	63.99	50	30.78	21.99	16	27	14	34.4	51°24'
MMSA3.5-20R MMSB3.5-20R	R	3.5	20	25 28	50	70	74.53	55	32.45	22.26	14	29	16	42.7	50°40'
MMSA3.5-20L MMSB3.5-20L	L	3.5	20	25 28	50	70	74.53	55	32.45	22.26	14	29	16	42.75	50°40'
MMSA4 -20R MMSB4 -20R	R	4	20	28 30	55	80	84.99	65	39.13	27.5	17	35	18	49.08	49°54'
MMSA4 -20L MMSB4 -20L	L	4	20	28 30	55	80	84.99	65	39.13	27.5	17	35	18	49.08	49°54'
MMSA5 -20R MMSB5 -20R	R	5	20	30 35	70	100	106.25	75	42.99	28.13	17	38	23	60.95	49°56'
MMSA5 -20L MMSB5 -20L	L	5	20	30 35	70	100	106.25	75	42.99	28.13	17	38	23	60.95	49°56'
MMSA6 -20R MMSB6 -20R	R	6	20	40 45	80	120	127.59	90	51.13	33.8	20	45	27	73.63	50°16'
MMSA6 -20L MMSB6 -20L	L	6	20	40 45	80	120	127.59	90	51.13	33.8	20	45	27	73.63	50°16'
MMSA8 -20R MMSA8 -20L	R L	8	20	80	—	160	—	100	45	29.16	—	40	35	101	49°53'
MMSA10 -20R MMSA10 -20L	R L	10	20	100	—	200	—	125	58	36.48	—	50	45	122.72	49°57'

CAUTION: These products which are hardened by carburizing allow no secondary machining. However, the back surface of B7 type gears is masked during the process so that it is possible to drill and pin on this surface.

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

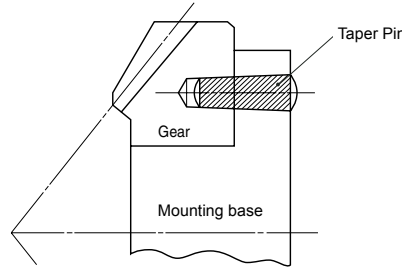


Finished Bore Spiral Miter Gears



B7 Shape

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



Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	55~60HRC
Gear teeth	Gleason	Surface treatment	—
Pressure angle	20°	Tooth surface finish	Cut
Helix angle	35°	Datum reference surface for gear cutting	Bore
Material	SCM415	Secondary Operations	Not Possible (Except the mounting surface on B7 shape)
Heat treatment	Overall Carburizing <small>NOTE4</small>		

NOTE 4: It is possible to perform secondary operations on the mounting surface of style B7 due to masking during carburizing.

Keyway <small>NOTE 1</small>	Threaded hole <small>NOTE 2</small>		Shape	Allowable torque (N·m) <small>NOTE 3</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Width × Depth	M		Thread Size	Bending strength	Surface durability	Bending strength			
—	4.5	M4	B3	2.243	2.089	(0.2287)	(0.213)	0.03 ~ 0.13	0.02 0.02	MMSA1 -20R MMSB1 -20R
—	4.5	M4	B3	2.243	2.089	(0.2287)	(0.213)	0.03 ~ 0.13	0.02 0.02	MMSA1 -20L MMSB1 -20L
4 × 1.8	6	M4 M5	B3	7.741	7.342	(0.7894)	(0.7487)	0.05 ~ 0.15	0.06 0.05	MMSA1.5-20R MMSB1.5-20R
4 × 1.8	6	M4 M5	B3	7.741	7.342	(0.7894)	(0.7487)	0.05 ~ 0.15	0.06 0.05	MMSA1.5-20L MMSB1.5-20L
5 × 2.3 5 × 2.3	7	M5	B3	17.95	17.26	(1.83)	(1.76)	0.06 ~ 0.16	0.14 0.13	MMSA2 -20R MMSB2 -20R
5 × 2.3 5 × 2.3	7	M5	B3	17.95	17.26	(1.83)	(1.76)	0.06 ~ 0.16	0.14 0.13	MMSA2 -20L MMSB2 -20L
6 × 2.8 6 × 2.8	8	M6	B3	34.56	33.74	(3.524)	(3.441)	0.07 ~ 0.17	0.26 0.24	MMSA2.5-20R MMSB2.5-20R
6 × 2.8 6 × 2.8	8	M6	B3	34.56	33.74	(3.524)	(3.441)	0.07 ~ 0.17	0.26 0.24	MMSA2.5-20L MMSB2.5-20L
6 × 2.8 6 × 2.8	8	M6	B3	61.93	61.09	(6.315)	(6.23)	0.08 ~ 0.18	0.44 0.42	MMSA3 -20R MMSB3 -20R
6 × 2.8 6 × 2.8	8	M6	B3	61.93	61.09	(6.315)	(6.23)	0.08 ~ 0.18	0.44 0.42	MMSA3 -20L MMSB3 -20L
8 × 3.3 8 × 3.3	8	M8	B4	97.11	96.68	(9.903)	(9.859)	0.1 ~ 0.25	0.5 0.47	MMSA3.5-20R MMSB3.5-20R
8 × 3.3 8 × 3.3	8	M8	B4	97.11	96.68	(9.903)	(9.859)	0.1 ~ 0.25	0.5 0.47	MMSA3.5-20L MMSB3.5-20L
8 × 3.3 8 × 3.3	9	M8	B4	143.6	144	(14.64)	(14.68)	0.12 ~ 0.27	0.72 0.7	MMSA4 -20R MMSB4 -20R
8 × 3.3 8 × 3.3	9	M8	B4	143.6	144	(14.64)	(14.68)	0.12 ~ 0.27	0.72 0.7	MMSA4 -20L MMSB4 -20L
8 × 3.3 10 × 3.3	9	M8	B4	284.2	288.2	(28.98)	(29.39)	0.14 ~ 0.34	1.4 1.3	MMSA5 -20R MMSB5 -20R
8 × 3.3 10 × 3.3	9	M8	B4	284.2	288.2	(28.98)	(29.39)	0.14 ~ 0.34	1.4 1.3	MMSA5 -20L MMSB5 -20L
12 × 3.3 14 × 3.8	10	M8	B4	474.8	495.7	(48.42)	(50.55)	0.16 ~ 0.36	2.3 2.2	MMSA6 -20R MMSB6 -20R
12 × 3.3 14 × 3.8	10	M8	B4	474.8	495.7	(48.42)	(50.55)	0.16 ~ 0.36	2.3 2.2	MMSA6 -20L MMSB6 -20L
—	110	6-M10	B7	1084	1169	(110.5)	(119.2)	0.2 ~ 0.45	4 4	MMSA8 -20R MMSA8 -20L
—	130	6-M10	B7	1656	1844	(168.9)	(188)	0.25 ~ 0.50	8.1 8.1	MMSA10 -20R MMSA10 -20L

NOTE 1: Although the dimensions of the keyway are made to the Js9 tolerance, there may be some deviations due to the effects of the heat treatment.

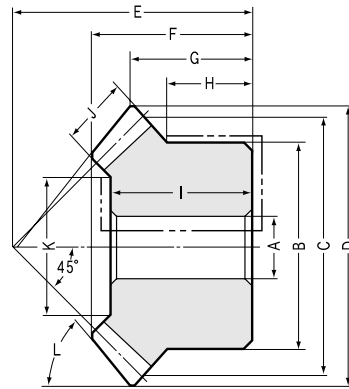
NOTE 2: A set screw comes with these products.

NOTE 3: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

Pitch Angle 45°



MMS Spiral Miter Gears Modules 2~5



B3 Shape

20 Tooth Miter Gears Modules 2~5

Catalog No.	Direction of Spiral	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width
		<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J
MMS2 -20R MMS2 -20L	R L	2	20	12	34	40	42.31	35	22.14	16.15	12	20	9
MMS2.5-20R MMS2.5-20L	R L	2.5	20	15	42	50	53.2	45	28.63	21.6	16	26	11
MMS3 -20R MMS3 -20L	R L	3	20	16	52	60	63	50	30.78	21.99	16	27	14
MMS4 -20R MMS4 -20L	R L	4	20	20	65	80	84.99	65	39.13	27.5	17.5	35	18
MMS5 -20R MMS5 -20L	R L	5	20	25	85	100	106.25	75	42.99	28.13	17.5	38	23

25 Tooth Miter Gears Modules 2~5

MMS2 -25R MMS2 -25L	R L	2	25	12	45	50	52.4	40	24.19	16.2	12.5	21	12
MMS2.5-25R MMS2.5-25L	R L	2.5	25	16	55	62.5	65.54	50	30.24	20.27	15	27	15
MMS3 -25R MMS3 -25L	R L	3	25	20	65	75	78.77	60	37.57	24.39	17.5	33	20
MMS4 -25R MMS4 -25L	R L	4	25	25	85	100	104.7	80	49.14	32.35	22.5	44	25
MMS5 -25R MMS5 -25L	R L	5	25	28	100	125	130.86	100	60.59	40.43	25	50	30

CAUTION: A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.

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

Miter Gears

MMS



Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	55~60HRC
Gear teeth	Gleason	Surface treatment	---
Pressure angle	20°	Tooth surface finish	Cut
Helix angle	35°	Datum reference surface for gear cutting	Bore
Material	SCM415	Secondary Operations	Possible where masking for carburizing
Heat treatment	Carburizing <small>NOTE 1</small>		

NOTE 1: The areas marked with ---- on the diagram are masked during the carburizing and can be modified, even though the hardness is somewhat higher.

Holding surface dia.	Tip angle	Shape	Allowable torque (N·m) <small>NOTE 2</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
K	L								
24.54	48°21'	B3	17	17.26	(1.734)	(1.76)	0.06 ~ 0.16	0.13	MMS2 -20R MMS2 -20L
30.89	50°28'	B3	32.7	33.74	(3.34)	(3.441)	0.07 ~ 0.17	0.26	MMS2.5-20R MMS2.5-20L
34.4	51°24'	B3	58.7	61.09	(5.98)	(6.23)	0.08 ~ 0.18	0.43	MMS3 -20R MMS3 -20L
49.08	49°54'	B3	136	144	(13.87)	(14.68)	0.12 ~ 0.27	0.97	MMS4 -20R MMS4 -20L
60.95	49°56'	B3	269	288.2	(27.5)	(29.39)	0.14 ~ 0.34	1.7	MMS5 -20R MMS5 -20L

Pitch Angle 45°

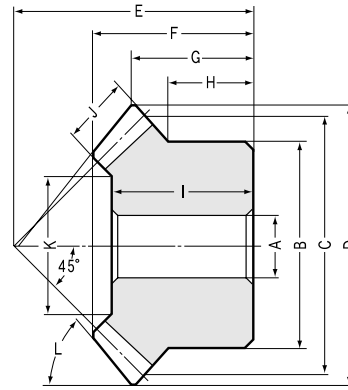
28.06	48°22'	B3	29.1	36.27	(2.96)	(3.699)	0.06 ~ 0.16	0.22	MMS2 -25R MMS2 -25L
36.57	48°26'	B3	56.7	71.8	(5.79)	(7.322)	0.07 ~ 0.17	0.42	MMS2.5-25R MMS2.5-25L
39.43	48°52'	B3	104.1	132.9	(10.61)	(13.55)	0.08 ~ 0.18	0.81	MMS3 -25R MMS3 -25L
57.29	47°52'	B3	238	308.7	(24.3)	(31.48)	0.12 ~ 0.27	1.9	MMS4 -25R MMS4 -25L
65.15	47°50'	B3	454	595.3	(46.3)	(60.7)	0.14 ~ 0.34	3.4	MMS5 -25R MMS5 -25L

NOTE 2: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

Pitch Angle 45°



SMS Spiral Miter Gears Modules 1~8



B3 Shape

20 Tooth Miter Gears Modules 1~8

Catalog No.	Direction of Spiral	Module	No. of teeth	Bore NOTE 1	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width
		<i>m</i>	<i>z</i>	A	B	C	D	E	F	G	H	I	J
SMS1 -20R SMS1 -20L	R L	1	20	6	16	20	21.3	20	13.84	10.65	8	12	5
SMS1.5 -20R SMS1.5 -20L	R L	1.5	20	8	26	30	31.74	30	21.18	15.87	13	19	8
SMS2 -20R SMS2 -20L	R L	2	20	12	34	40	42.4	37	24.75	18.2	14	22	10
SMS2.5 -20R SMS2.5 -20L	R L	2.5	20	14	42	50	52.94	48	32.42	24.47	19	29	12
SMS3 -20R SMS3 -20L	R L	3	20	16	50	60	63.72	58	39.6	29.86	23	35	15
SMS3.5 -20R SMS3.5 -20L	R L	3.5	20	20	60	70	74.47	65	43.81	32.23	25	40	18
SMS4 -20R SMS4 -20L	R L	4	20	20	64	80	84.88	75	50.51	37.44	27	45	20
SMS5 -20R SMS5 -20L	R L	5	20	25	80	100	105.9	90	60.16	42.95	30	54	26
SMS6 -20R SMS6 -20L	R L	6	20	28	100	120	127.16	104	67.35	47.58	34	60	30
SMS8 -20R SMS8 -20L	R L	8	20	30	130	160	169.94	125	72.6	49.97	30	62	35

CAUTION: A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.

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

NOTE 1: Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.



Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	48~53HRC
Gear teeth	Gleason	Surface treatment	Black oxide
Pressure angle	20°	Tooth surface finish	Cut
Helix angle	35°	Datum reference surface for gear cutting	Bore
Material	S45C	Secondary Operations	Possible except tooth areas
Heat treatment	Teeth induction hardened		

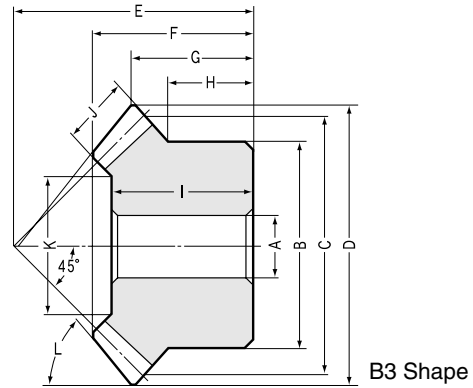
Holding surface dia.	Tip angle	Shape	Allowable torque (N·m) <small>NOTE 2</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
K	L								
9.86	50°39'	B3	1.067	0.6531	(0.1088)	(0.0666)	0.03 ~ 0.13	0.02	SMS1 -20R SMS1 -20L
15.37	48°29'	B3	3.733	2.326	(0.3807)	(0.2372)	0.05 ~ 0.15	0.07	SMS1.5 -20R SMS1.5 -20L
21.72	49°12'	B3	8.539	5.398	(0.8707)	(0.5504)	0.06 ~ 0.16	0.15	SMS2 -20R SMS2 -20L
28.06	48°38'	B3	16.29	10.45	(1.661)	(1.066)	0.07 ~ 0.17	0.3	SMS2.5 -20R SMS2.5 -20L
31.57	49°38'	B3	28.81	18.69	(2.938)	(1.906)	0.08 ~ 0.18	0.5	SMS3 -20R SMS3 -20L
39.09	50°10'	B3	46.49	30.41	(4.741)	(3.101)	0.1 ~ 0.25	0.8	SMS3.5 -20R SMS3.5 -20L
43.43	49°20'	B3	68.3	45.02	(6.965)	(4.591)	0.12 ~ 0.27	1.1	SMS4 -20R SMS4 -20L
54.46	48°39'	B3	136.4	90.88	(13.91)	(9.267)	0.14 ~ 0.34	2.1	SMS5 -20R SMS5 -20L
67.15	48°53'	B3	225.9	155	(23.04)	(15.81)	0.16 ~ 0.36	3.6	SMS6 -20R SMS6 -20L
95	49°53'	B3	484	343.7	(49.35)	(35.05)	0.2 ~ 0.45	7.1	SMS8 -20R SMS8 -20L

NOTE 2: The allowable torques shown in the table are the calculated values according to the assumed usage conditions.
Please see page 196 for more details.

Pitch Angle 45°



SMS Spiral Miter Gears Modules 1~6



25 Tooth Miter Gears Modules 1~6

Catalog No.	Direction of Spiral	Module	No. of teeth	Bore NOTE 1	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width
		<i>m</i>	<i>z</i>	A	B	C	D	E	F	G	H	I	J
SMS1 -25R SMS1 -25L	R L	1	25	6	20	25	26.22	23	15.08	11.11	8	14	6
SMS1.5 -25R SMS1.5 -25L	R L	1.5	25	10	30	37	39.3	34	22.14	16.15	11.5	19	9
SMS2 -25R SMS2 -25L	R L	2	25	12	40	50	52.38	40	24.2	16.19	10	20	12
SMS2.5 -25R SMS2.5 -25L	R L	2.5	25	16	50	62.5	65.54	50	30.24	20.27	12.5	26	15
SMS3 -25R SMS3 -25L	R L	3	25	20	60	75	78.77	60	37.57	24.39	15	32	20
SMS3.5 -25R SMS3.5 -25L	R L	3.5	25	25	70	87.5	91.81	70	42.98	28.41	17.5	37	22
SMS4 -25R SMS4 -25L	R L	4	25	28	80	100	104.7	80	49.14	32.35	20	43	25
SMS5 -25R SMS5 -25L	R L	5	25	28	100	125	130.86	100	60.59	40.43	25	50	30
SMS6 -25R SMS6 -25L	R L	6	25	28	120	150	157.17	120	71.97	48.54	30	61	35

30 Tooth Miter Gears Modules 1~5

SMS1 -30R SMS1 -30L	R L	1	30	8	24	30	31.26	28	17.61	13.63	10	16	6
SMS1.5 -30R SMS1.5 -30L	R L	1.5	30	10	36	45	46.84	43	28.11	21.42	16	25	10
SMS2 -30R SMS2 -30L	R L	2	30	12	45	60	62.42	50	29.27	21.21	12.5	25	12
SMS2.5 -30R SMS2.5 -30L	R L	2.5	30	16	60	75	78.04	62	36.08	26.02	17	32	15
SMS3 -30R SMS3 -30L	R L	3	30	20	70	90	93.61	75	45.25	31.8	20	40	20
SMS3.5 -30R SMS3.5 -30L	R L	3.5	30	25	90	105	109.21	85	49.4	34.6	25	45	22
SMS4 -30R SMS4 -30L	R L	4	30	28	100	120	124.71	95	54.28	37.35	25	50	25
SMS5 -30R SMS5 -30L	R L	5	30	28	130	150	155.89	120	68.2	47.95	35	62	30

CAUTION: A set of miter gears must be identical in module and number of teeth, but opposite in spiral hands.

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

NOTE1: Due to heat treating, some deformation of the bore may occur. It may be necessary to ream the bore to bring it to the stated dimensions.



Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	48~53HRC
Gear teeth	Gleason	Surface treatment	Black oxide
Pressure angle	20°	Tooth surface finish	Cut
Helix angle	35°	Datum reference surface for gear cutting	Bore
Material	S45C	Secondary Operations	Possible except tooth areas
Heat treatment	Teeth induction hardened		

Holding surface dia.	Tip angle	Shape	Allowable torque (N·m) <small>NOTE 2</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
			Bending strength	Surface durability	Bending strength	Surface durability			
K	L								
15.03	48°38'	B3	1.712	1.284	(0.1746)	(0.1309)	0.03 ~ 0.13	0.05	SMS1 -25R SMS1 -25L
19.54	48°22'	B3	5.78	4.42	(0.5894)	(0.4507)	0.05 ~ 0.15	0.12	SMS1.5 -25R SMS1.5 -25L
26.06	48°12'	B3	13.7	10.66	(1.397)	(1.087)	0.06 ~ 0.16	0.2	SMS2 -25R SMS2 -25L
34.57	48°26'	B3	26.76	21.1	(2.729)	(2.152)	0.07 ~ 0.17	0.4	SMS2.5 -25R SMS2.5 -25L
37.43	48°52'	B3	49.07	39.05	(5.004)	(3.982)	0.08 ~ 0.18	0.7	SMS3 -25R SMS3 -25L
46.77	48°37'	B3	75.43	60.58	(7.692)	(6.177)	0.1 ~ 0.25	1.1	SMS3.5 -25R SMS3.5 -25L
55.29	47°52'	B3	112.3	90.74	(11.45)	(9.253)	0.12 ~ 0.27	1.7	SMS4 -25R SMS4 -25L
65.15	47°49'	B3	214.1	174.9	(21.83)	(17.84)	0.14 ~ 0.34	3.4	SMS5 -25R SMS5 -25L
83	48°09'	B3	356.5	299.8	(36.35)	(30.57)	0.16 ~ 0.36	5.4	SMS6 -25R SMS6 -25L

Pitch Angle 45°

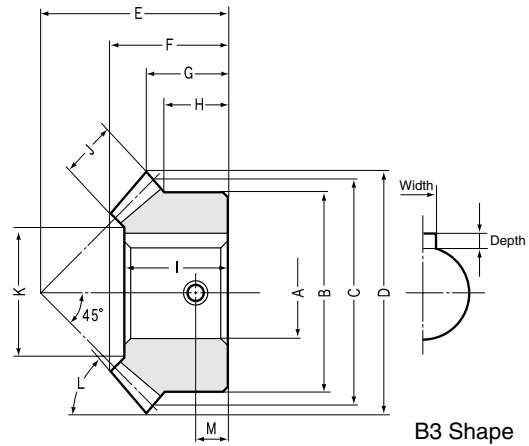
19.03	48°29'	B3	2.275	2.027	(0.232)	(0.2067)	0.03 ~ 0.13	0.05	SMS1 -30R SMS1 -30L
25.72	48°03'	B3	8.222	7.479	(0.8384)	(0.7627)	0.05 ~ 0.15	0.2	SMS1.5 -30R SMS1.5 -30L
36.06	47°53'	B3	18.2	16.87	(1.856)	(1.72)	0.06 ~ 0.16	0.37	SMS2 -30R SMS2 -30L
47.57	47°58'	B3	35.55	33.36	(3.625)	(3.402)	0.07 ~ 0.17	0.77	SMS2.5 -30R SMS2.5 -30L
53.43	47°48'	B3	65.78	62.27	(6.708)	(6.35)	0.08 ~ 0.18	1.3	SMS3 -30R SMS3 -30L
67.77	47°48'	B3	100.6	96.01	(10.26)	(9.79)	0.1 ~ 0.25	2.3	SMS3.5 -30R SMS3.5 -30L
79.29	47°26'	B3	149.5	143.7	(15.25)	(14.65)	0.12 ~ 0.27	3.2	SMS4 -30R SMS4 -30L
99.15	47°36'	B3	284.4	275.9	(29)	(28.13)	0.14 ~ 0.34	6	SMS5 -30R SMS5 -30L

NOTE 2: The allowable torques shown in the table are the calculated values according to the assumed usage conditions.
Please see page 196 for more details.

Pitch Angle 45°



SMA(B)(C) Finished Bore Miter Gears Modules 1~8



B3 Shape

20 Tooth Miter Gears Modules 1~8

Catalog No.	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J	K	L
SMA1 -20 SMB1 -20	1	20	8 10	16	20	21.41	20	13.95	10.71	8	12 12.07	5	9.86 10	49°48'
SMA1.5-20 SMB1.5-20	1.5	20	10 12	26	30	32.12	30	21.24	16.06	13	19	8	15.37	49°48'
SMA2 -20 SMB2 -20	2	20	14 15	34	40	42.83	37	24.89	18.41	14	22	10	21.72	49°48'
SMA2.5-20 SMB2.5-20	2.5	20	18 20	42	50	53.54	48	32.54	24.77	19	29	12	28.06	49°48'
SMA3 -20 SMB3 -20 SMC3 -20	3	20	22 25 20	50	60	64.24	58	39.84	30.12	23	35	15	31.57	49°48'
SMA3.5-20 SMB3.5-20	3.5	20	28 30	60	70	74.95	65	44.13	32.47	25	40	18	39.09	49°48'
SMA4 -20 SMB4 -20 SMC4 -20	4	20	30 32 25	64	80	85.65	75	50.78	37.83	27	45	20	43.43	49°48'
SMA5 -20 SMB5 -20 SMC5 -20	5	20	40 30 35	80	100	107.07	90	60.38	43.54	30	54	26	54.46	49°48'
SMA6 -20 SMB6 -20 SMC6 -20	6	20	45 50 40	100	120	128.48	104	67.67	48.24	34	60	30	67.15	49°48'
SMA8 -20	8	20	60	130	160	171.31	125	73.33	50.66	30	62	35	95	49°48'

CAUTION: SMA, SMB and SMC gears are identical in all features except for bore and keyway dimensions.

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

Miter Gears
SMA · SMB · SMC



Finished Bore Miter Gears

Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	48~53HRC
Gear teeth	Gleason	Surface treatment	Black oxide
Pressure angle	20°	Tooth surface finish	Cut
Helix angle	—	Datum reference surface for gear cutting	Bore
Material	S45C	Secondary Operations	Possible except tooth areas and bore
Heat treatment	Teeth induction hardened		

Keyway NOTE 1 Width×Depth	Threaded hole NOTE 2		Shape	Allowable torque (N·m) NOTE 3		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	M	Thread Size		Bending strength	Surface durability	Bending strength	Surface durability			
—	4	M4	B3	0.8953	0.3687	(0.0913)	(0.0376)	0.03 ~ 0.13	0.015 0.015	SMA1 -20 SMB1 -20
— 4 x 1.8	6.5	M4 M5	B3	3.132	1.312	(0.3194)	(0.1338)	0.05 ~ 0.15	0.07 0.07	SMA1.5-20 SMB1.5-20
5 x 2.3 5 x 2.3	7	M5	B3	7.165	3.045	(0.7306)	(0.3105)	0.06 ~ 0.16	0.14 0.14	SMA2 -20 SMB2 -20
* 5 x 2.3 6 x 2.8	9.5	M6	B3	13.66	5.896	(1.393)	(0.6012)	0.07 ~ 0.17	0.28 0.25	SMA2.5-20 SMB2.5-20
* 7 x 3 * 7 x 3 * 6 x 2.8	11.5	M6 M8 M6	B3	24.18	10.54	(2.466)	(1.075)	0.08 ~ 0.18	0.41 0.39 0.5	SMA3 -20 SMB3 -20 SMC3 -20
* 7 x 3 * 8 x 3.3	12.5	M8	B3	39.01	17.15	(3.978)	(1.749)	0.1 ~ 0.25	0.7 0.65	SMA3.5-20 SMB3.5-20
* 7 x 3 * 10 x 3.3 * 8 x 3.3	13.5	M8	B3	57.32	25.4	(5.845)	(2.59)	0.12 ~ 0.27	1 1 1.1	SMA4 -20 SMB4 -20 SMC4 -20
* 10 x 3.3 * 8 x 3.3 * 10 x 3.3	15	M8	B3	114.4	51.27	(11.67)	(5.228)	0.14 ~ 0.34	2 2.1 2	SMA5 -20 SMB5 -20 SMC5 -20
* 12 x 3.3 * 14 x 3.8 * 12 x 3.3	17	M8	B3	189.6	87.46	(19.33)	(8.919)	0.16 ~ 0.36	3.4 3.3 3.5	SMA6 -20 SMB6 -20 SMC6 -20
18 x 4.4	15	M10	B3	406.1	193.9	(41.41)	(19.77)	0.2 ~ 0.45	6	SMA8 -20

NOTE 1: The keyway dimensions of items with "*" marks do not conform to JIS Standards.

Pitch Angle 45°

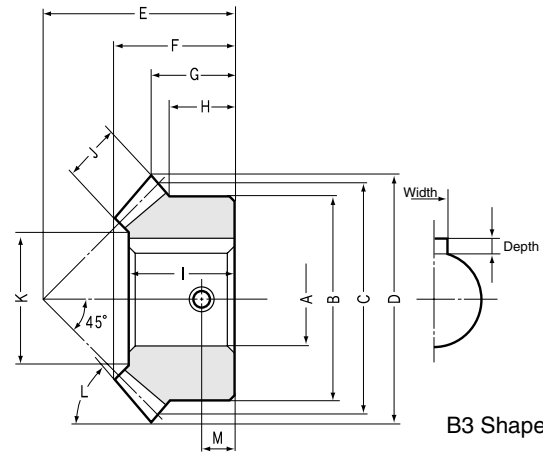
NOTE 2: A set screw comes with these products.

NOTE 3: The allowable torques shown in the table are the calculated values according to the assumed usage conditions.

Please see page 196 for more details.



SMA(B) Finished Bore Miter Gears Modules 1~6



25 Tooth Miter Gears Modules 1~6

Catalog No.	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J	K	L
SMA1 -25	1	25	10	20	25	26.41	23	15.16	11.21	8	14	6	15.03	48°51'
SMA1.5-25	1.5	25	12	30	37.5	39.62	34	22.25	16.31	11.5	19	9	19.54	48°51'
SMA2 -25 SMB2 -25	2	25	18 15	40	50	52.83	40	24.33	16.41	10	20	12	26.06	48°51'
SMA2.5-25 SMB2.5-25	2.5	25	20 18	50	62.5	66.04	50	30.41	20.52	12.5	26	15	34.57	48°51'
SMA3 -25 SMB3 -25	3	25	30 25	60	75	79.24	60	37.81	24.62	15	32	20	37.43	48°51'
SMA3.5-25 SMB3.5-25	3.5	25	32 28	70	87.5	92.45	70	43.23	28.72	17.5	37	22	46.77	48°51'
SMA4 -25 SMB4 -25	4	25	35 30	80	100	105.66	80	49.32	32.83	20	43	25	55.29	48°51'
SMA5 -25	5	25	50	100	125	132.07	100	60.82	41.04	25	50	30	65.15	48°51'
SMA6 -25	6	25	55	120	150	158.48	120	72.32	49.24	30	61	35	83	48°51'

30 Tooth Miter Gears Modules 1~5

SMA1 -30	1	30	12	24	30	31.41	28	17.71	13.71	10	16	6	19.03	48°12'
SMA1.5-30	1.5	30	15	36	45	47.12	43	28.24	21.56	16	25	10	25.71	48°12'
SMA2 -30 SMB2 -30	2	30	20 15	45	60	62.83	50	29.42	21.41	12.5	25	12	36.06	48°12'
SMA2.5-30 SMB2.5-30	2.5	30	25 20	60	75	78.54	62	36.28	26.27	17	32	15	47.57	48°12'
SMA3 -30 SMB3 -30	3	30	32 25	70	90	94.24	75	45.47	32.12	20	40	20	53.43	48°12'
SMA3.5-30 SMB3.5-30	3.5	30	35 30	90	105	109.95	85	49.66	34.97	25	45	22	67.77	48°12'
SMA4 -30 SMB4 -30	4	30	40 30	100	120	125.66	95	54.52	37.83	25	50	25	79.29	48°12'
SMA5 -30	5	30	55	130	150	157.07	120	68.56	48.54	35	62	30	99.15	48°12'

CAUTION: SMA and SMB gears are identical in all features except for bore and keyway dimensions.

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



Finished Bore Miter Gears

Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	48~53HRC
Gear teeth	Gleason	Surface treatment	Black oxide
Pressure angle	20°	Tooth surface finish	Cut
Helix angle	—	Datum reference surface for gear cutting	Bore
Material	S45C	Secondary Operations	Possible except tooth areas and bore
Heat treatment	Teeth induction hardened		

Keyway NOTE 1	Threaded hole NOTE 2		Shape	Allowable torque (N·m) NOTE 3		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Width×Depth	M		Thread Size	Bending strength	Surface durability	Bending strength			
—	4	M4	B3	1.477	0.71	(0.1506)	(0.0724)	0.03 ~ 0.13	0.04	SMA1 -25
4 x 1.8	5.75	M5	B3	4.983	2.444	(0.5081)	(0.2492)	0.05 ~ 0.15	0.06	SMA1.5-25
6 x 2.8 5 x 2.3	5	M6 M5	B3	11.81	5.896	(1.204)	(0.6012)	0.06 ~ 0.16	0.17	SMA2 -25 SMB2 -25
* 5 x 2.3 6 x 2.8	6	M6	B3	23.07	11.67	(2.352)	(1.19)	0.07 ~ 0.17	0.4	SMA2.5-25 SMB2.5-25
* 7 x 3 8 x 3.3	7.5	M8	B3	42.31	21.59	(4.314)	(2.202)	0.08 ~ 0.18	0.6	SMA3 -25 SMB3 -25
10 x 3.3 8 x 3.3	8.5	M8	B3	65.03	33.5	(6.631)	(3.416)	0.1 ~ 0.25	1	SMA3.5-25 SMB3.5-25
10 x 3.3 8 x 3.3	10	M8	B3	96.76	50.18	(9.867)	(5.117)	0.12 ~ 0.27	1.6	SMA4 -25 SMB4 -25
* 12 x 3.3	12.5	M8	B3	184.6	96.76	(18.82)	(9.867)	0.14 ~ 0.34	3	SMA5 -25
16 x 4.3	15	M10	B3	307.3	165.7	(31.34)	(16.9)	0.16 ~ 0.36	4.5	SMA6 -25

Pitch Angle 45°

4 x 1.8	5	M5	B3	1.999	1.105	(0.2038)	(0.1127)	0.03 ~ 0.13	0.05	SMA1 -30
5 x 2.3	8	M5	B3	7.224	4.078	(0.7366)	(0.4158)	0.05 ~ 0.15	0.19	SMA1.5-30
6 x 2.8 5 x 2.3	6.25	M6 M5	B3	15.98	9.198	(1.63)	(0.9379)	0.06 ~ 0.16	0.32	SMA2 -30 SMB2 -30
8 x 3.3 6 x 2.8	8.5	M8 M6	B3	31.23	18.19	(3.185)	(1.855)	0.07 ~ 0.17	0.7	SMA2.5-30 SMB2.5-30
10 x 3.3 8 x 3.3	10	M8	B3	57.79	33.95	(5.893)	(3.462)	0.08 ~ 0.18	1.1	SMA3 -30 SMB3 -30
10 x 3.3 8 x 3.3	12.5	M8	B3	88.38	52.34	(9.012)	(5.337)	0.1 ~ 0.25	2.1	SMA3.5-30 SMB3.5-30
12 x 3.3 8 x 3.3	12.5	M8	B3	131.4	78.32	(13.4)	(7.987)	0.12 ~ 0.27	2.9	SMA4 -30 SMB4 -30
16 x 4.3	17.5	M10	B3	249.9	150.4	(25.48)	(15.34)	0.14 ~ 0.34	5.2	SMA5 -30

NOTE 1: The keyway dimensions of items with "*" marks do not conform to JIS Standards.

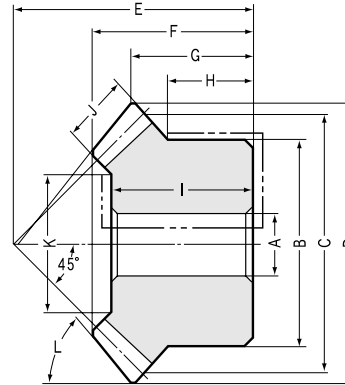
NOTE 2: A set screw comes with these products.

NOTE 3: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

Pitch Angle 45°



MM Carburized & Hardened Miter Gears Modules 2~5



B3 Shape

20 Tooth Miter Gears Modules 2~5

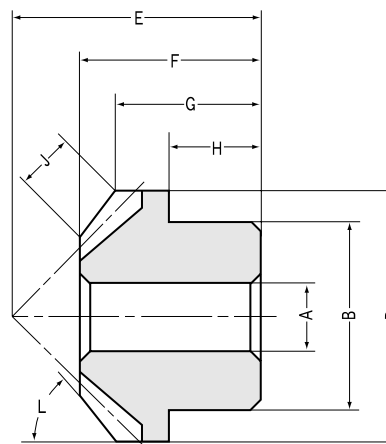
Catalog No.	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J	K	L
MM2 -20	2	20	12	34	40	42.83	35	22.24	16.41	12	20	9	24.54	49°48'
MM2.5-20	2.5	20	15	42	50	53.54	45	28.89	21.77	16	26	11	30.89	49°48'
MM3 -20	3	20	16	52	60	64.24	50	31.19	22.12	16	27	14	34.4	49°48'
MM4 -20	4	20	20	65	80	85.66	65	39.49	27.83	17.5	35	18	49.09	49°48'
MM5 -20	5	20	25	80	100	107.07	90	60.38	43.54	30	54	26	54.46	49°48'

25 Tooth Miter Gears Modules 2~5

MM2 -25	2	25	12	45	50	52.83	40	24.33	16.41	12.5	21	12	28.06	48°51'
MM2.5-25	2.5	25	16	55	62.5	66.03	50	30.41	20.52	15	27	15	36.57	48°51'
MM3 -25	3	25	20	65	75	79.24	60	37.81	24.62	17.5	33	20	39.43	48°51'
MM4 -25	4	25	25	85	100	105.66	80	49.32	32.83	22.5	44	25	57.29	48°51'
MM5 -25	5	25	28	100	125	132.07	100	60.82	41.04	25	50	30	65.15	48°51'



LM Sintered Metal Miter Gears Modules 0.8~1.5



B1Shape

20 Tooth Miter Gears Modules 0.8~1.5

Catalog No.	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J	K	L
LM0.8 -20	0.8	20	4	12	16	17.13	16	11	8.57	5.5	11	4.24	—	49°48'
LM1 -20	1	20	5	16	20	21.41	20	13.5	10.71	6	13.5	4.95	—	49°48'
LM1.25-20	1.25	20	6	22	25	26.77	23	15	11.38	6	15	6.36	—	49°48'
LM1.5 -20	1.5	20	6	26	30	32.12	30	21	16.06	9	21	8.48	—	49°48'

CAUTION: Although the sintering process allows for the inclusion of oil to maintain lubricity, these gears have not been oil impregnated.

CAUTION: The rust prevention process involves treating the gears with steam (in effect, creating the surface oxidation). The black oxide treatment cannot be applied to these gears.



Carburized & Hardened Miter Gears

Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	55~60HRC
Gear teeth	Gleason	Surface treatment	—
Pressure angle	20°	Tooth surface finish	Cut
Material	SCM415	Datum reference surface for gear cutting	Bore
Heat treatment	Carburizing <small>NOTE 1</small>	Secondary Operations	Possible where masking for carburizing

NOTE 1: The areas marked with ---- on the diagram are masked during the carburizing and can be modified, even though the hardness is somewhat higher.

Shape	Allowable torque (N·m) <small>NOTE 2</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B3	15.06	9.74	(1.536)	(0.9932)	0.06 ~ 0.16	0.13	MM2 -20
B3	29	19.03	(2.96)	(1.941)	0.07 ~ 0.17	0.26	MM2.5-20
B3	52	34.47	(5.3)	(3.515)	0.08 ~ 0.18	0.43	MM3 -20
B3	120.5	81.24	(12.29)	(8.284)	0.12 ~ 0.27	0.97	MM4 -20
B3	256	174.5	(26.1)	(17.79)	0.14 ~ 0.34	2.1	MM5 -20

Pitch Angle 45°

B3	26.0	20.05	(2.7)	(2.045)	0.06 ~ 0.16	0.22	MM2 -25
B3	51.6	39.71	(5.27)	(4.049)	0.07 ~ 0.17	0.41	MM2.5-25
B3	94.7	73.47	(9.66)	(7.492)	0.08 ~ 0.18	0.81	MM3 -25
B3	217	170.7	(22.1)	(17.41)	0.12 ~ 0.27	1.9	MM4 -25
B3	413	329.2	(42.1)	(33.57)	0.14 ~ 0.34	3.4	MM5 -25

NOTE 2: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

Pitch Angle 45°



Sintered Metal Miter Gears

Specifications

Precision grade	JIS B 1704 grade 5	Tooth hardness	70~95HRB
Gear teeth	Gleason	Surface treatment	Steam treatment
Pressure angle	20°	Tooth surface finish	Sintered
Material	SMF5040	Datum reference surface for gear cutting	Bore
Heat treatment	—	Secondary Operations	Possible

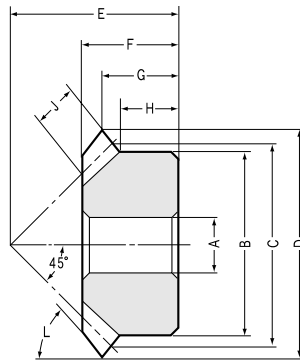
Shape	Allowable torque (N·m) <small>NOTE 1</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B1	0.2167	0.0265	(0.0221)	(0.0027)	0 ~ 0.16	0.01	LM0.8 -20
B1	0.408	0.05	(0.0416)	(0.0051)	0 ~ 0.18	0.022	LM1 -20
B1	0.81	0.099	(0.0826)	(0.0101)	0 ~ 0.2	0.037	LM1.25-20
B1	1.48	0.1853	(0.1509)	(0.0189)	0 ~ 0.22	0.07	LM1.5 -20

NOTE 1: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.

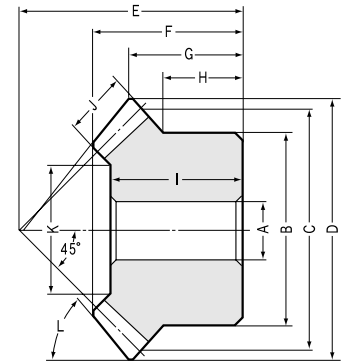
Pitch Angle 45°



SM Miter Gears Modules 1~8



B2 Shape



B3 Shape

16 Tooth Miter Gears Modules 2~5

Catalog No.	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I(F)	J	K	L
SM2 -16	2	16	10	27	32	34.83	30	19	15.41	11.5	19	7	—	51°00'
SM2.5-16	2.5	16	12	34	40	43.53	35	21	16.77	12	21	9	—	51°00'
SM3 -16	3	16	14	42	48	52.24	40	23	18.12	13	23	11	—	51°00'
SM4 -16	4	16	16	55	64	69.66	50	28	20.83	13.5	28	14	—	51°00'
SM5 -16	5	16	20	70	80	87.07	65	37	28.53	20	37	17	—	51°00'

20 Tooth Miter Gears Modules 1~8

SM1 -20	1	20	6	16	20	21.41	20	13.94	10.71	8	12	5	9.86	49°48'
SM1.25-20	1.25	20	8	22	25	26.77	23	15.27	11.38	9	13	6	13.03	49°48'
SM1.5 -20	1.5	20	8	26	30	32.12	30	21.24	16.06	13	19	8	15.37	49°48'
SM2 -20	2	20	12	34	40	42.83	37	24.89	18.41	14	22	10	21.72	49°48'
SM2.5 -20	2.5	20	14	42	50	53.54	48	32.54	24.77	19	29	12	28.06	49°48'
SM3 -20	3	20	16	50	60	64.24	58	39.84	30.12	23	35	15	31.57	49°48'
SM3.5 -20	3.5	20	20	60	70	74.95	65	44.13	32.47	25	40	18	39.09	49°48'
SM4 -20	4	20	20	64	80	85.65	75	50.78	37.83	27	45	20	43.43	49°48'
SM5 -20	5	20	25	80	100	107.07	90	60.38	43.54	30	54	26	54.46	49°48'
SM6 -20	6	20	28	100	120	128.48	104	67.67	48.24	34	60	30	67.15	49°48'
SM8 -20	8	20	30	130	160	171.31	125	73.33	50.66	30	62	35	95	49°48'

25 Tooth Miter Gears Modules 1~6

SM1 -25	1	25	6	20	25	26.41	23	15.16	11.21	8	14	6	15.03	48°51'
SM1.25-25	1.25	25	8	25	31.25	33.02	28	17.88	13.26	9.25	16	7	18.70	48°51'
SM1.5 -25	1.5	25	10	30	37.5	39.62	34	22.25	16.31	11.5	19	9	19.54	48°51'
SM2 -25	2	25	12	40	50	52.83	40	24.33	16.41	10	20	12	26.06	48°51'
SM2.5 -25	2.5	25	16	50	62.5	66.04	50	30.41	20.52	12.5	26	15	34.57	48°51'
SM3 -25	3	25	20	60	75	79.24	60	37.81	24.62	15	32	20	37.43	48°51'
SM3.5 -25	3.5	25	25	70	87.5	92.45	70	43.23	28.72	17.5	37	22	46.77	48°51'
SM4 -25	4	25	28	80	100	105.66	80	49.32	32.83	20	43	25	55.29	48°51'
SM5 -25	5	25	28	100	125	132.07	100	60.82	41.04	25	50	30	65.15	48°51'
SM6 -25	6	25	28	120	150	158.48	120	72.32	49.24	30	61	35	83	48°51'

30 Tooth Miter Gears Module 1~5

SM1 -30	1	30	8	24	30	31.41	28	17.71	13.71	10	16	6	19.03	48°12'
SM1.25-30	1.25	30	10	30	37.5	39.27	36	23.47	18.13	13.5	21	8	22.37	48°12'
SM1.5 -30	1.5	30	10	36	45	47.12	43	28.24	21.56	16	25	10	25.71	48°12'
SM2 -30	2	30	12	45	60	62.83	50	29.42	21.41	12.5	25	12	36.06	48°12'
SM2.5 -30	2.5	30	16	60	75	78.54	62	36.28	26.27	17	32	15	47.57	48°12'
SM3 -30	3	30	20	70	90	94.24	75	45.47	32.12	20	40	20	53.43	48°12'
SM3.5 -30	3.5	30	25	90	105	109.95	85	49.66	34.97	25	45	22	67.77	48°12'
SM4 -30	4	30	28	100	120	125.66	95	54.52	37.83	25	50	25	79.29	48°12'
SM5 -30	5	30	28	130	150	157.07	120	68.56	48.54	35	62	30	99.15	48°12'

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



Specifications

Precision grade	JIS B 1704 grade 3	Tooth hardness	Less than 194HB
Gear teeth	Gleason	Surface treatment	Black oxide
Pressure angle	20°	Tooth surface finish	Cut
Material	S45C	Datum reference surface for gear cutting	Bore
Heat treatment	—	Secondary Operations	Possible

Shape	Allowable torque (N·m) <small>NOTE 1</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B2	3.837	0.3324	(0.3913)	(0.0339)	0.06 ~ 0.16	0.09	SM2 -16
B2	7.629	0.6767	(0.778)	(0.069)	0.07 ~ 0.17	0.13	SM2.5-16
B2	13.34	1.207	(1.36)	(0.1231)	0.08 ~ 0.18	0.22	SM3 -16
B2	30.7	2.866	(3.131)	(0.2923)	0.12 ~ 0.27	0.48	SM4 -16
B2	58.86	5.617	(6.002)	(0.5728)	0.14 ~ 0.34	1	SM5 -16

Pitch Angle 45°

B3	0.8914	0.0843	(0.0909)	(0.0086)	0.03 ~ 0.13	0.02	SM1 -20
B3	1.7	0.1628	(0.1734)	(0.0166)	0.04 ~ 0.14	0.04	SM1.25-20
B3	3.118	0.304	(0.3179)	(0.031)	0.05 ~ 0.15	0.07	SM1.5 -20
B3	7.13	0.7188	(0.7271)	(0.0733)	0.06 ~ 0.16	0.15	SM2 -20
B3	13.6	1.407	(1.387)	(0.1435)	0.07 ~ 0.17	0.3	SM2.5 -20
B3	24.07	2.537	(2.454)	(0.2587)	0.08 ~ 0.18	0.5	SM3 -20
B3	38.82	4.154	(3.959)	(0.4236)	0.1 ~ 0.25	0.8	SM3.5 -20
B3	57.04	6.185	(5.817)	(0.6307)	0.12 ~ 0.27	1.1	SM4 -20
B3	113.9	12.63	(11.61)	(1.288)	0.14 ~ 0.34	2.1	SM5 -20
B3	190.6	21.81	(19.44)	(2.224)	0.16 ~ 0.36	3.6	SM6 -20
B3	412.6	49.63	(42.07)	(5.061)	0.2 ~ 0.45	7.1	SM8 -20

Pitch Angle 45°

B3	1.469	0.1628	(0.1498)	(0.0166)	0.03 ~ 0.13	0.04	SM1 -25
B3	2.752	0.3128	(0.2806)	(0.0319)	0.04 ~ 0.14	0.06	SM1.25-25
B3	4.959	0.5747	(0.5057)	(0.0586)	0.05 ~ 0.15	0.14	SM1.5 -25
B3	11.76	1.407	(1.199)	(0.1435)	0.06 ~ 0.16	0.2	SM2 -25
B3	22.96	2.814	(2.341)	(0.287)	0.07 ~ 0.17	0.4	SM2.5 -25
B3	42.1	5.243	(4.293)	(0.5346)	0.08 ~ 0.18	0.7	SM3 -25
B3	64.72	8.187	(6.6)	(0.8348)	0.1 ~ 0.25	1.1	SM3.5 -25
B3	96.3	12.38	(9.82)	(1.262)	0.12 ~ 0.27	1.7	SM4 -25
B3	183.7	24.2	(18.73)	(2.468)	0.14 ~ 0.34	3.4	SM5 -25
B3	309	42.1	(31.51)	(4.293)	0.16 ~ 0.36	5.4	SM6 -25

Pitch Angle 45°

B3	1.989	0.2569	(0.2028)	(0.0262)	0.03 ~ 0.13	0.05	SM1 -30
B3	4.054	0.5354	(0.4134)	(0.0546)	0.04 ~ 0.14	0.13	SM1.25-30
B3	7.189	0.9689	(0.7331)	(0.0988)	0.05 ~ 0.15	0.2	SM1.5 -30
B3	15.92	2.217	(1.623)	(0.2261)	0.06 ~ 0.16	0.37	SM2 -30
B3	31.08	4.426	(3.169)	(0.4513)	0.07 ~ 0.17	0.77	SM2.5 -30
B3	57.52	8.326	(5.865)	(0.849)	0.08 ~ 0.18	1.3	SM3 -30
B3	87.95	12.97	(8.969)	(1.323)	0.1 ~ 0.25	2.3	SM3.5 -30
B3	130.8	19.57	(13.34)	(1.996)	0.12 ~ 0.27	3.2	SM4 -30
B3	248.7	38.3	(25.36)	(3.906)	0.14 ~ 0.34	6	SM5 -30

Pitch Angle 45°

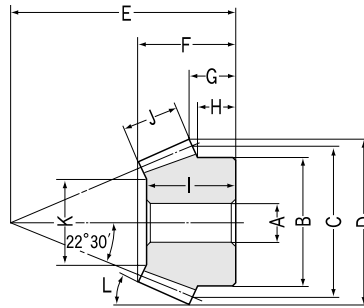
NOTE 1: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details



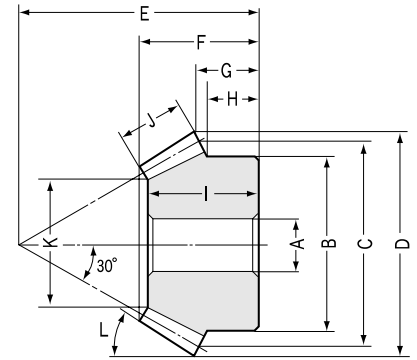
SAM Angular Miter Gears Modules 1.5~3



$\Sigma = 45^\circ$



B3 Shape $\Sigma = 45^\circ$



B3 Shape $\Sigma = 60^\circ$

Shaft Angle $\Sigma = 45^\circ$ 20 Tooth Miter Gears Modules 1.5~3

Catalog No.	Shaft angle	Module	No. of teeth	Bore	Hub dia.	Pitch dia.		Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	Σ					m	z									
SAM1.5-20045	45°	1.5	20	8	25	30	32.77	45	19.33	9.36	7.75	18	11	17	25°06'	
SAM2-20045	45°	2	20	10	30	40	43.69	60	26.08	12.48	9.65	24	15	20.92	25°06'	
SAM2.5-20045	45°	2.5	20	12	40	50	54.62	75	31.92	15.6	12.58	30	18	30.07	25°06'	
SAM3-20045	45°	3	20	14	50	60	65.54	90	38.66	18.72	15.51	36	22	34	25°06'	

Shaft Angle $\Sigma = 60^\circ$ 20 Tooth Miter Gears Modules 1.5~3

SAM1.5-20060	60°	1.5	20	8	25	30	32.59	40	22.3	14.77	12.58	21	9	18.18	33°24'
SAM2-20060	60°	2	20	12	32	40	43.46	50	26.39	16.36	13.05	24	12	21.93	33°24'
SAM2.5-20060	60°	2.5	20	14	40	50	54.33	60	30.49	17.94	13.82	28	15	29.15	33°24'
SAM3-20060	60°	3	20	16	50	60	65.19	70	34.59	19.54	15.16	32	18	36.36	33°24'

Shaft Angle $\Sigma = 120^\circ$ 20 Tooth Miter Gears Modules 1.5~3

SAM1.5-20120	120°	1.5	20	8	26	30	31.5	26	20.69	18.64	13.88	18	5	19.22	65°52'
SAM2-20120	120°	2	20	12	34	40	42	34	26.86	24.18	17.26	24	6.5	26.78	65°52'
SAM2.5-20120	120°	2.5	20	14	42	50	52.5	42	33.22	29.73	20.64	29	8.5	32.03	65°52'
SAM3-20120	120°	3	20	16	50	60	63	50	39.39	35.28	24.02	35	10	39.59	65°52'

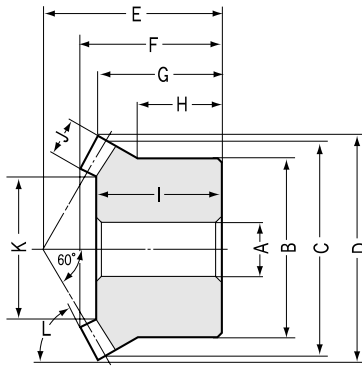
CAUTION: Dimensions of the outside diameter, the overall length and crown to back length are all theoretical values, and some differences will occur due to the corner chamfering of the gear tips.



$\Sigma = 60^\circ$



$\Sigma = 120^\circ$



B3 Shape $\Sigma = 120^\circ$

Specifications

Precision grade	JIS B 1704 grade 3	Tooth hardness	Less than 194HB
Gear teeth	Gleason	Surface treatment	Black oxide
Pressure angle	20°	Tooth surface finish	Cut
Material	S45C	Datum reference surface for gear cutting	Bore
Heat treatment	—	Secondary Operations	Possible

Shape	Allowable torque (N·m) NOTE 1		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B3	4.296	0.3834	(0.4381)	(0.0391)	0.05 ~ 0.15	0.07	SAM1.5-20045
B3	10.34	0.9503	(1.054)	(0.0969)	0.06 ~ 0.16	0.15	SAM2 -20045
B3	19.64	1.846	(2.003)	(0.1882)	0.07 ~ 0.17	0.31	SAM2.5-20045
B3	34.37	3.296	(3.505)	(0.3361)	0.08 ~ 0.18	0.55	SAM3 -20045

Pitch Angle 22°30'

B3	3.54	0.3187	(0.361)	(0.0325)	0.05 ~ 0.15	0.08	SAM1.5-20060
B3	8.391	0.7806	(0.8557)	(0.0796)	0.06 ~ 0.16	0.15	SAM2 -20060
B3	16.39	1.558	(1.671)	(0.1589)	0.07 ~ 0.17	0.27	SAM2.5-20060
B3	28.32	2.74	(2.888)	(0.2794)	0.08 ~ 0.18	0.47	SAM3 -20060

Pitch Angle 30°

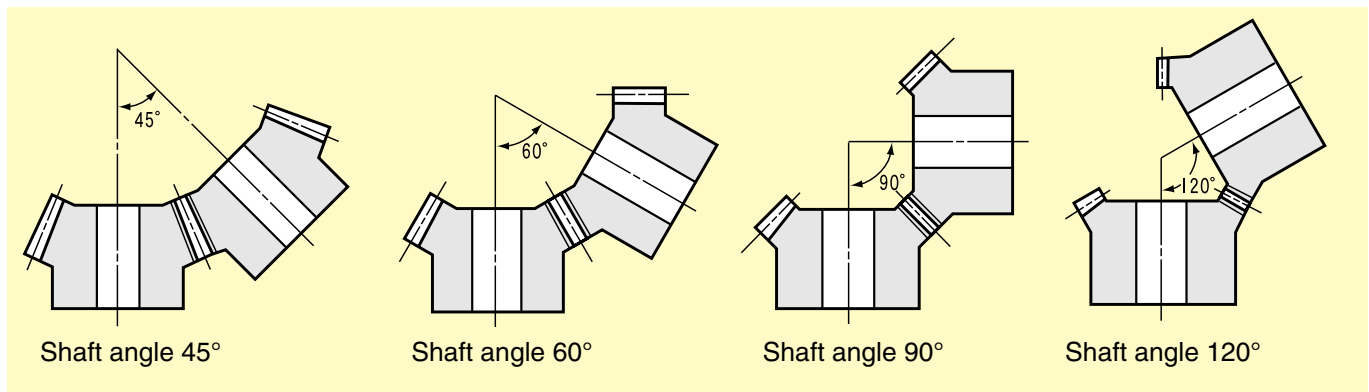
B3	2.429	0.2922	(0.2477)	(0.0298)	0.05 ~ 0.15	0.07	SAM1.5-20120
B3	5.662	0.7041	(0.5774)	(0.0718)	0.06 ~ 0.16	0.16	SAM2 -20120
B3	11.4	1.451	(1.162)	(0.148)	0.07 ~ 0.17	0.31	SAM2.5-20120
B3	19.44	2.529	(1.982)	(0.2579)	0.08 ~ 0.18	0.53	SAM3 -20120

Pitch Angle 60°

NOTE 1: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 more details.

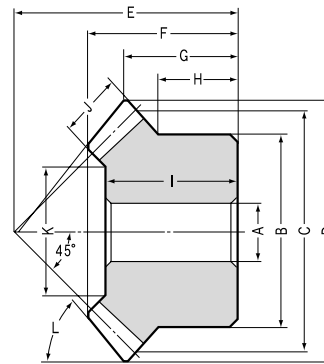
Regarding Angular Miter Gears

The shafts of standard miter gears are at 90°. Miter gears with other angles are called angular miter gears. SAM series of KHK standard angular miter gears are available with 45°, 60° and 120° shaft angles. Other shaft angles may be ordered as custom gears. However, because of the limitations of manufacturing equipment, some gears are not possible to be made.





SUM Stainless Steel Miter Gears Modules 1~3



B3 Shape

20 Tooth Miter Gears Modules 1~3

Catalog No.	Module	No. of teeth	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	AH7	B	C	D	E	F	G	H	I	J	K	L
SUM1 -20	1	20	6	16	20	21.41	20	13.95	10.71	8	12	5	9.86	49°48'
SUM1.5-20	1.5	20	8	26	30	32.12	30	21.24	16.06	13	19	8	15.37	49°48'
SUM2 -20	2	20	12	34	40	42.83	37	24.89	18.41	14	22	10	21.72	49°48'
SUM2.5-20	2.5	20	14	42	50	53.54	48	32.54	24.77	19	29	12	28.06	49°48'
SUM3 -20	3	20	16	50	60	64.24	58	39.84	30.12	23	35	15	31.57	49°48'

25 Tooth Miter Gears Modules 1~3

SUM1 -25	1	25	6	20	25	26.41	23	15.16	11.21	8	14	6	15.03	48°51'
SUM1.5-25	1.5	25	10	30	37.5	39.62	34	22.25	16.31	11.5	19	9	19.54	48°51'
SUM2 -25	2	25	12	45	50	52.83	40	24.33	16.41	12.5	20	12	26.06	48°51'
SUM2.5-25	2.5	25	16	55	62.5	66.04	50	30.41	20.52	15	26	15	34.57	48°51'
SUM3 -25	3	25	20	65	75	79.24	60	37.81	24.62	17.5	32	20	37.43	48°51'

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



Specifications

Precision grade	JIS B 1704 grade 3	Tooth hardness	Less than 187HB
Gear teeth	Gleason	Surface treatment	—
Pressure angle	20°	Tooth surface finish	Cut
Material	SUS303	Datum reference surface for gear cutting	Bore
Heat treatment	—	Secondary Operations	Possible

*Available on special order: Same gear made from SUS304.

Shape	Allowable torque (N·m) <small>NOTE 1</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B3	0.4923	0.0598	(0.0502)	(0.0061)	0.03 ~ 0.13	0.02	SUM1 -20
B3	1.723	0.2157	(0.1757)	(0.022)	0.05 ~ 0.15	0.07	SUM1.5-20
B3	3.94	0.5109	(0.4018)	(0.0521)	0.06 ~ 0.16	0.15	SUM2 -20
B3	7.516	1	(0.7664)	(0.102)	0.07 ~ 0.17	0.3	SUM2.5-20
B3	13.3	1.802	(1.356)	(0.1838)	0.08 ~ 0.18	0.5	SUM3 -20

Pitch Angle 45°

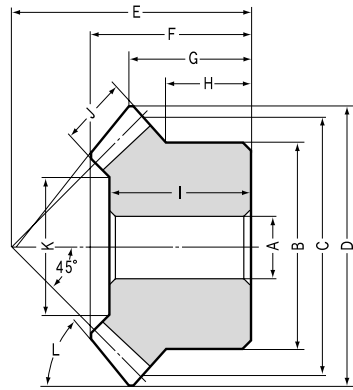
B3	0.812	0.1157	(0.0828)	(0.0118)	0.03 ~ 0.13	0.03	SUM1 -25
B3	2.741	0.408	(0.2795)	(0.0416)	0.05 ~ 0.15	0.13	SUM1.5-25
B3	6.496	1	(0.6624)	(0.102)	0.06 ~ 0.16	0.22	SUM2 -25
B3	12.69	2	(1.294)	(0.2039)	0.07 ~ 0.17	0.41	SUM2.5-25
B3	23.27	3.725	(2.373)	(0.3798)	0.08 ~ 0.18	0.81	SUM3 -25

Pitch Angle 45°

NOTE1: The allowable torques shown in the table are the calculated values according to the assumed usage conditions. Please see page 196 for more details.



PM Plastic Miter Gears Modules 1~4



B3 Shape

20 Tooth Miter Gears Modules 1~4

Catalog No.	Module	No. of teeth	Bore NOTE 1	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	A	B	C	D	E	F	G	H	I	J	K	L
PM1 -20	1	20	6	16	20	21.41	20	13.95	10.71	8	12	5	9.86	49°48'
PM1.25-20	1.25	20	8	22	25	26.77	23	15.27	11.38	9	13	6	13.03	49°48'
PM1.5 -20	1.5	20	8	26	30	32.12	30	21.24	16.06	13	19	8	15.37	49°48'
PM2 -20	2	20	10	34	40	42.83	37	24.89	18.41	14	22	10	21.72	49°48'
PM2.5 -20	2.5	20	12	42	50	53.54	48	32.54	24.77	19	29	12	28.06	49°48'
PM3 -20	3	20	14	50	60	64.24	58	39.84	30.12	23	35	15	31.57	49°48'
PM3.5 -20	3.5	20	20	60	70	74.95	65	44.13	32.47	25	40	18	39.09	49°48'
PM4 -20	4	20	20	64	80	85.66	75	50.78	37.83	27	45	20	43.43	49°48'

25 Tooth Miter Gears Modules 1~3

PM1 -25	1	25	6	20	25	26.41	23	15.16	11.21	8	14	6	15.03	48°51'
PM1.25-25	1.25	25	8	25	31.25	33.02	28	17.88	13.26	9.25	16	7	18.7	48°51'
PM1.5 -25	1.5	25	8	30	37.5	39.62	34	22.25	16.31	11.5	19	9	19.54	48°51'
PM2 -25	2	25	10	40	50	52.83	40	24.33	16.41	10	20	12	26.06	48°51'
PM2.5 -25	2.5	25	14	50	62.5	66.04	50	30.41	20.52	12.5	26	15	34.57	48°51'
PM3 -25	3	25	15	60	75	79.24	60	37.81	24.62	15	32	20	37.43	48°51'

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

NOTE 1: Significant variation in temperature or humidity can cause dimensional changes in plastic gears (MC Nylon gears). Please see the technical section on the characteristics of plastic gears (page 32).



Specifications

Precision grade	JIS B 1704 grade 4	Tooth hardness	115~120HRR
Gear teeth	Gleason	Surface treatment	—
Pressure angle	20°	Tooth surface finish	Cut
Material	MC901	Datum reference surface for gear cutting	Bore
Heat treatment	—	Secondary Operations	Possible

Shape	Allowable torque (N·m) <small>NOTE 2</small>		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B3	0.1795	—	(0.0183)	—	0.08 ~ 0.18	0.01	PM1 -20
B3	0.3472	—	(0.0354)	—	0.09 ~ 0.19	0.01	PM1.25-20
B3	0.6139	—	(0.0626)	—	0.1 ~ 0.2	0.01	PM1.5 -20
B3	1.437	—	(0.1465)	—	0.11 ~ 0.21	0.02	PM2 -20
B3	2.775	—	(0.283)	—	0.12 ~ 0.22	0.04	PM2.5 -20
B3	4.847	—	(0.4943)	—	0.13 ~ 0.23	0.07	PM3 -20
B3	7.746	—	(0.7899)	—	0.15 ~ 0.25	0.12	PM3.5 -20
B3	11.49	—	(1.172)	—	0.17 ~ 0.27	0.16	PM4 -20

Pitch Angle 45°

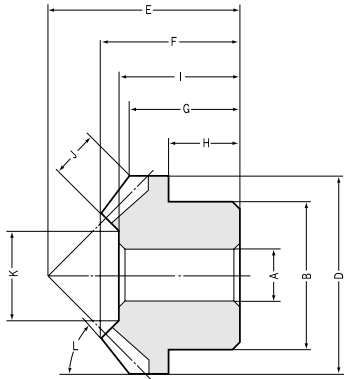
B3	0.2952	—	(0.0301)	—	0.08 ~ 0.18	0.01	PM1 -25
B3	0.5639	—	(0.0575)	—	0.09 ~ 0.19	0.01	PM1.25-25
B3	0.9954	—	(0.1015)	—	0.1 ~ 0.2	0.02	PM1.5 -25
B3	2.359	—	(0.2406)	—	0.11 ~ 0.21	0.03	PM2 -25
B3	4.609	—	(0.47)	—	0.12 ~ 0.22	0.06	PM2.5 -25
B3	8.154	—	(0.8315)	—	0.13 ~ 0.23	0.1	PM3 -25

NOTE 2: The allowable torques shown in the table are the calculated values using the Lewis formula.

Pitch Angle 45°



DM Injection Molded Miter Gears Modules 0.5~1.5



B1 Shape

Dimensional tolerance table (unit: mm)

Range	Tolerance
Below 3mm	±0.2
3 up to 6 mm	±0.25
6 up to 10 mm	±0.3
10 up to 18 mm	±0.35
18 up to 30 mm	±0.4
30 mm up	±0.5

Specifications

Precision grade	JIS B 1704 grade 8
Gear teeth	Gleason
Pressure angle	20°
Material	Duracon(M90-44)
Heat treatment	—
Tooth hardness	110~120HRR
Surface treatment	—
Tooth surface finish	Injection molded
Datum reference surface for tooth forming	Bore
Secondary Operations	Not recommended

20 Tooth Miter Gears Modules 0.5~1.5

Catalog No.	Module	No. of teeth	Bore NOTE 1	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back length	Hub width	Length of bore	Face width	Holding surface dia.	Tip angle
	<i>m</i>	<i>z</i>	A	B	C	D	E	F	G	H	I	J	K	L
DM0.5-20	0.5	20	3	8	10	10.71	11	7.97	6.35	4	7	2.5	4.93	49°48'
DM0.8-20	0.8	20	5	12	16	17.13	16	10.83	8.56	5	10	3.5	10.1	49°48'
DM1-20	1	20	6	16	20	21.41	21	14.62	11.71	7	13	4.5	11.27	49°48'
DM1.5-20	1.5	20	8	20	30	32.12	30	20.59	16.06	10	19	7	18.2	49°48'

NOTE 1: The bore tolerance is generally -0.05 to -0.1 but may be + value at the central portion of the hole. Re-machining the bore is not recommended since reworking material may expose voids.

Shape	Allowable torque (N·m) NOTE 2		Allowable torque (kgf·m)		Backlash (mm)	Weight (kgf)	Catalog No.
	Bending strength	Surface durability	Bending strength	Surface durability			
B1	0.1	—	(0.0102)	—	0.04 ~ 0.14	1	DM0.5-20 DM0.8-20 DM1-20 DM1.5-20
B1	0.3491	—	(0.0356)	—	0.06 ~ 0.16	2	
B1	0.6021	—	(0.0614)	—	0.08 ~ 0.18	4	
B1	1.057	—	(0.1078)	—	0.1 ~ 0.2	13	

NOTE 2: The allowable torques shown in the table are the calculated values using the Lewis formula.

Pitch Angle 45°



BB Sintered Metal Bushings

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

(unit: mm)

Catalog No.	I.D. of bushing	O.D. of bushing	Length	Products that can use the bushing
	$d_{-0}^{+0.02}$	$D_{-0.01}^{+0.02}$	$L_{-0.3}^0$	
BB30507	3	5	7	DS0.5, DM0.8, DB0.8
BB30608	3	6	8	DS0.5, DS0.8, DM1
BB40609	4	6	9	DS0.8, DM1
BB40612	4	6	12	DS1, DB1
BB50812	5	8	12	DS1
BB50814	5	8	14	DS1, DM1.5

Material: Oil impregnated sintered bronze.

