Miter Gears

MMSGQ Ground Spiral Miter Gears	MMSG Ground Spiral Miter Gears	SMSG Ground Spiral Miter Gears	MMSA/MMSB Finished Bore Spiral Miter Gears	MMS Spiral Miter Gears	SMS Spiral Miter Gears	SMA/SMB/SMC Finished Bore Miter Gears	MM Miter Gears
							
Material: SCM415	Material: SCM415	Material: S45C	Material: SCM415	Material: SCM415	Material: S45C	Material: S45C	Material: SCM415
*m*2~4 Page 314	*m*2~4 Page 316	*m*1~4 Page 318	*m*1~10 Page 320	*m*2~5 Page 322	*m*1~8 Page 324	*m*1~5 Page 326	*m*2~5 Page 328

LM Sintered Metal Miter Gears	SM-H Hardened Miter Gears	SM Miter Gears	SAM-H Hardened Angular Miter Gears	SAM Angular Miter Gears	SUM Stainless Steel Miter Gears	SUMA Finished Bore Stainless Steel Miter Gears	PM Plastic Miter Gears
	NEW 		NEW 				
Material: SMF5040	Material: S45C	Material: S45C	Material: S45C	Material: S45C	Material: SUS303	Material: SUS303	Material: MC901
*m*0.8~1.5 Page 328	*m*1~8 Page 330	*m*1~8 Page 330	*m*1.5~3 Page 332	*m*1.5~3 Page 332	*m*1~4 Page 334	*m*1~4 Page 334	*m*1~4 Page 336

DM Injection Molded Miter Gears	BB Sintered Metal Bushings	Nissei KSP Ground Spiral Miter
		
Material: Duracon (R) (M90-44)	Material: Oil-free copper alloy	Material: SCM415
*m*0.5~1.5 Page 336	*ϕ* 5~8 Page 338	*m*1.5~6 Page 374

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.

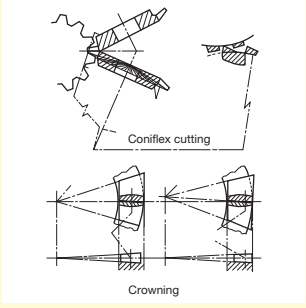
Type	Catalog Number	Module	No. of Teeth ( ) Shaft Angle	Material	Heat Treatment	Tooth Surface Finish	Precision JIS B 1704: 1978	Secondary Operations	Features
Spiral Miter Gears	**MMSGQ**	2~4	20, 30	SCM415	Carburized Note 1	Ground	0	△	Gears that have been hardened and ground that has grade-0 accuracy, 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	1~4	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 Note 1	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	1~5	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	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.

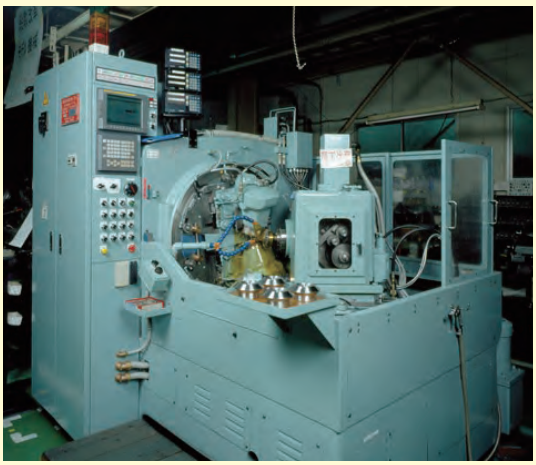
[NOTE 1] Although these are carburized products, secondary operations can be performed on the areas where are masked during the carburization. However, note that high hardness (HRC40 at maximum) occurs in some cases.
[NOTE 2] "Duracon (R)" is a registered trademark of Polyplastics Co., Ltd. in Japan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

Miter gears are used in driving components with intersecting axes in transport devices, industrial machines, etc.

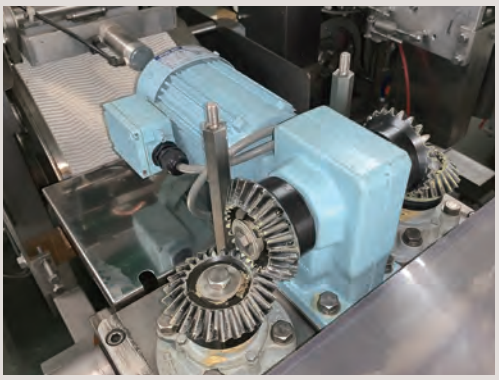
■ Masdac Dorayaki Machine

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

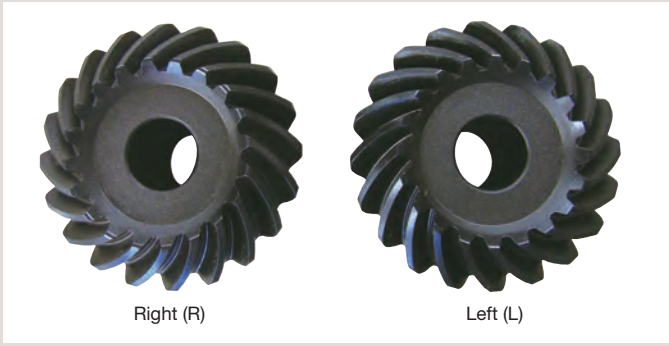
■ Angular Miter Gear Box

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.



Right (R) Left (L)

■ 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.

■ Calculation of Bending Strength of Gears

Item \ Catalog Number	MMSGQ,MMSG MMSA,MMSB MMS,MM	SMSG/SMS SMA/SMB/ SMC	SM SAM	SM-H SAM-H	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	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	90	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 in this catalog based on the load torque.

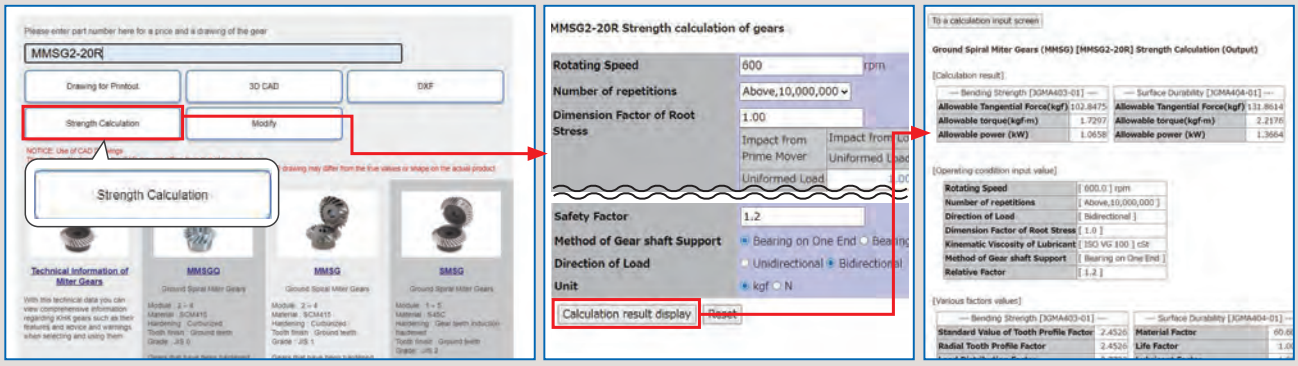
■ For provisional selection from this catalog

Catalog Number	Gear Ratio	No. of teeth	Shape	Bore A H7	Hub dia. B	Pitch dia. C	Outside dia. D	Face dim. E	Total length F	Crown to back G	Hub width H	Hub height I	Face width J	Mating surface dia. K	Allowable torque (N·m) Bending strength	Surface durability	Allowable torque (kgf·m) Bending strength	Surface durability	Backlash (mm)
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
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
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
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
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
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
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
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
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
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

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 Website that allows the strength to be easily calculated.

■ Use the strength calculation function on our website.



■ 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 Product Precautions on page 310 and Cautions on Performing Secondary Operations on each page.

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 26 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

Product Precautions

Common Notes

[Caution on Product Characteristics]

(1) The allowable torque shown in the table are calculated values according to the assumed usage conditions. Please see page 308 for more details.

(2) The backlash values shown in the table are the theoretical values for the backlash in the normal direction of a pair of identical gears in mesh.

(3) A set of spiral miter gears must be identical in module and number of teeth, but opposite in spiral hands.

(4) 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.

(5) These bevel gears produce axial thrust forces. Please see page 312 for more details.

(6) Variations in temperature or humidity can cause dimensional changes in plastic gears, including tooth diameter, bore, and backlash. The accuracy and tolerances shown in the catalog are values obtained when machining is performed.

(7) Keyways are made according to JIS B1301 standards, Js9 tolerance. Also note that keyway tooth position alignment is not performed.

(8) For products having a tapped hole, a set screw is included. (excludes B7)

(9) See page 22 for more details on Hardened Plus (H Series and HJ Series).

● KHK's Specifications for Heat Treatment
Hardened location: Tooth surface, or Tooth surface and Tooth root
Hardness: 50 to 60 HRC

* Hardness and Depth of Gear-teeth Induction Hardening
The hardening method and the state of the hardened teeth area vary depending on the size of gears.
Since different hardening treatment is applied in accordance with the module and number of teeth, the hardness level is referred to as the hardness of the reference diameter.
For some of our products, the hardness at tooth tip / root may not be equal to the hardness you designated.
As to the effective case depth, it is specified by JIS, as "The distance from the surface of the case to the area with hardness HV450." The case depth differs from area to area of a tooth, so the depth cannot be specified.
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).

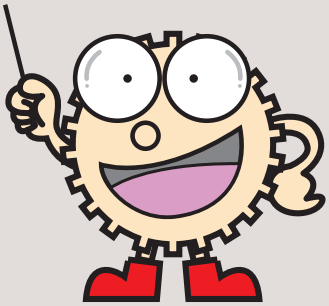
[J Series]

(1) Certain products which would otherwise have a very long tapped hole are counterbored. For details, please see the KHK website.

(2) Black oxide is not re-applied to parts undergoing secondary operations.

(3) For bores over ϕ 50, the bore tolerance is H8.

MEMO



Application Hints

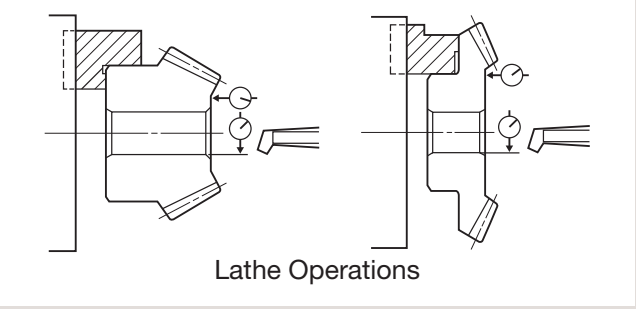
In order to use KHK stock miters safely, carefully read the Application Hints before proceeding. If there are questions or you require clarifications, please contact our technical department or your nearest distributor. E-mail: info@khkgears.net
Please read “Cautions on Performing Secondary Operations” below when performing modifications and/or secondary operations for safety concerns.

1. Cautions on Handling

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

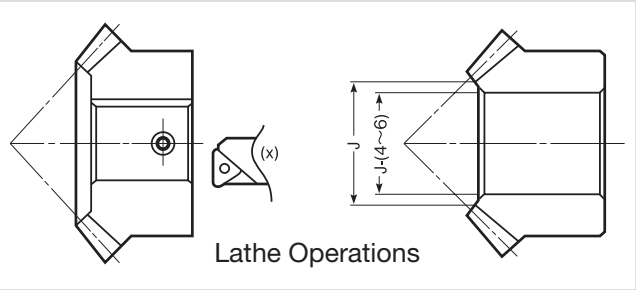
2. Caution on Performing Secondary Operations

① If 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.



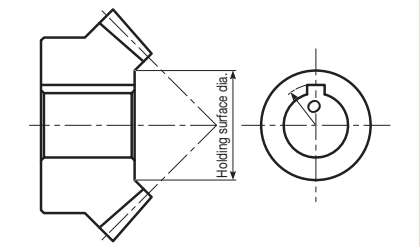
Lathe Operations

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 holding surface diameter dimensions.



Lathe Operations

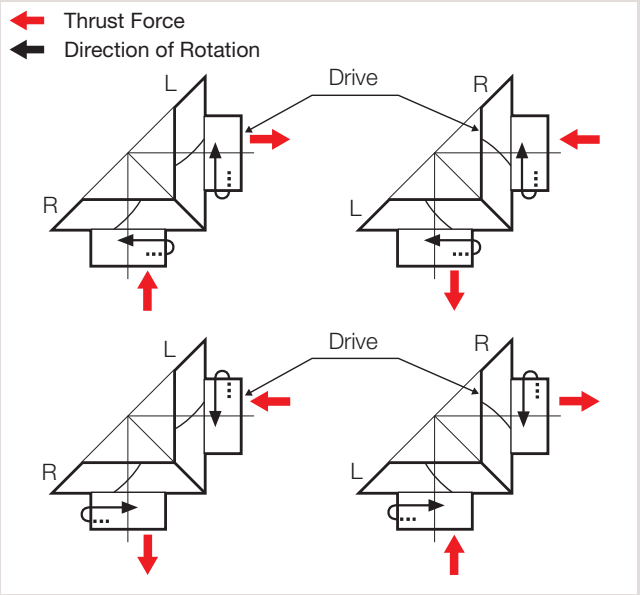
⑤ For tapping and keyway operations, see the examples given in “Caution on Performing Secondary Operations” in KHK Stock Spur Gear section. When providing keyway operations, to avoid stress concentration, always round the corners. Make sure that the diameter (O) of the keyway angle is smaller than the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



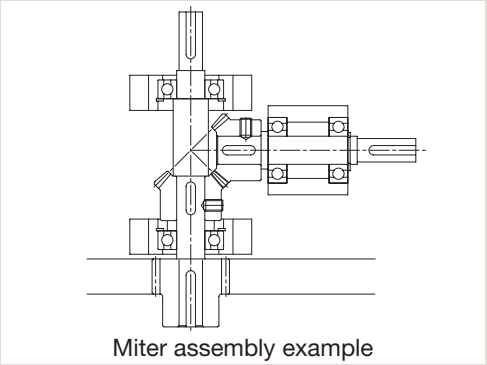
⑥ PM plastic miter gears are susceptible to changes due to temperature and humidity. Dimensions may change between, during, and after re-machining operations.
⑦ When induction-hardening S45C products, thermal stress cracks may appear. Also, note that the precision grade of the product declines by 1 or 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 helix and the direction of rotation. This is illustrated below. The bearings must be selected properly to be able to handle these thrust forces. For details, use gear calculation software GCSW.

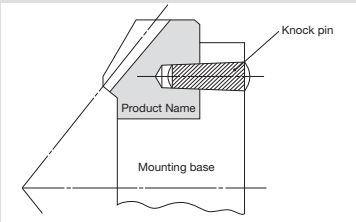


② If a gear is mounted on a shaft far from the bearings, the shaft may bend. We recommend designing bevel gears to be as close to the bearings as possible. Design the gear box, shaft and bearing with high rigidity.



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)

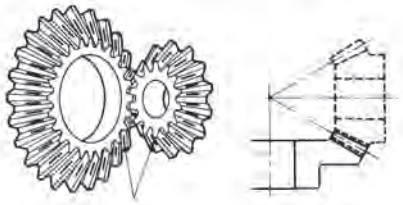


Shaft angle (°)	Normal direction Backlash	Travel in axial direction	
		Drive gear	Driven gear
90	j_n	$1.03 \times j_n$	$1.03 \times j_n$
60		$1.46 \times j_n$	$1.46 \times j_n$
120		$0.84 \times j_n$	$0.84 \times j_n$

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.

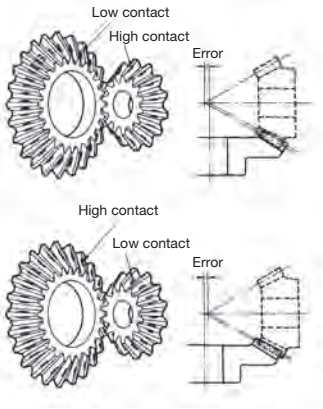


Center contact closer to toes

Incorrect Tooth Contact

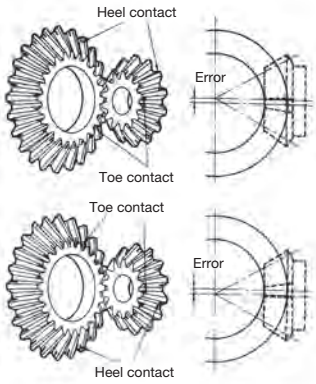
■ Mounting Distance Error

● 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.



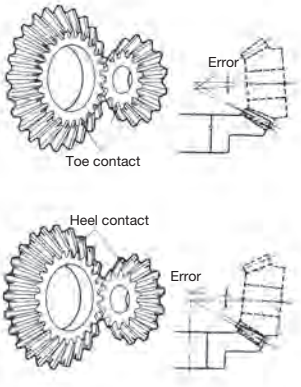
■ Offset Error

● 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 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.

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.

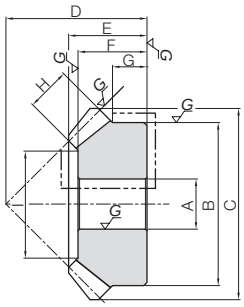
⚠ Caution: Cautions in Preventing Accidents

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 ISO9001 quality management system; if you notice any malfunctions upon purchasing a product, please contact the supplier.

Ground Spiral Miter Gears

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

* The precision grade of J Series products is equivalent to the value shown in the table.
** In the illustration, the area surrounded with –·–·– line is masked during the carburization process (max. HRC40 or so) and can be modified.

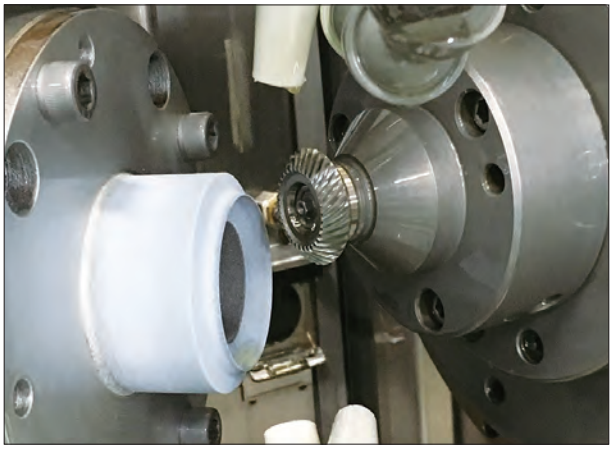


B3

Catalog Number	Gear Ratio	No. of teeth	Shape	Direction of spiral	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)
					A_{H7}	B	C	D	E	F	G	H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability		
MMSGQ2-20R	1	20	B3	R	12	35	40	40	35	21	16.35	12.5	20	9	24.54	17.0	23.5	1.73	2.40	0~0.05	0.14
MMSGQ2-20L				L																	
MMSGQ2.5-20R				R	14	42	50	51	45	28	21.6	16	26	11	30.89	32.7	46.1	3.33	4.70	0.05~0.10	0.27
MMSGQ2.5-20L				L																	
MMSGQ3-20R				R	16	52	60	61	50	30	21.99	16	27	14	34.4	58.5	83.7	5.97	8.54		0.43
MMSGQ3-20L				L																	
MMSGQ3.5-20R			B4	R	20	50	70	71	55	31.5	22.26	14	29	16	42.75	91.8	133	9.36	13.6		0.51
MMSGQ3.5-20L				L																	
MMSGQ4-20R				R	20	55	80	81	65	38	27.5	17	35	18	49.08	136	199	13.8	20.3		0.80
MMSGQ4-20L				L																	
MMSGQ2-30R	1	30	B4	R	14	45	60	60	50	28.5	21.21	15	26	12	38.06	38.5	78.6	3.93	8.02	0~0.05	0.36
MMSGQ2-30L				L																	
MMSGQ2.5-30R				R	16	55	75	76	60	33	24.02	16	30	15	47.57	75.3	156	7.68	16.0	0.05~0.10	0.66
MMSGQ2.5-30L				L																	
MMSGQ3-30R				R	20	65	90	91	70	39.5	26.8	18	36	20	55.43	139	294	14.2	30.0		1.11
MMSGQ3-30L				L																	
MMSGQ3.5-30R				R	25	80	105	106	80	43.5	29.6	20	40	22	67.77	204	436	20.8	44.5		1.75
MMSGQ3.5-30L				L																	
MMSGQ4-30R				R	28	90	120	121	90	48	32.35	22	44	25	77.29	303	657	30.9	67.0		2.49
MMSGQ4-30L				L																	

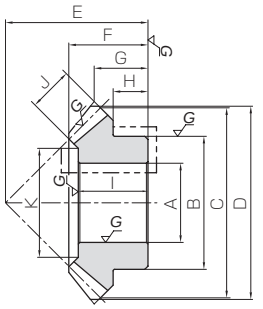
Product Precautions → Page 310
Precautions for Standard Machined Products → Pages 42~44

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

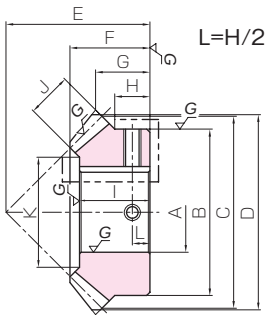


CNC Bevel Gear Grinding Machine (PH-280HG)

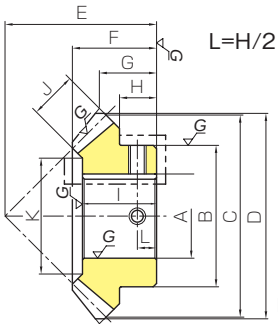
J Series



B4



B3K



B4K

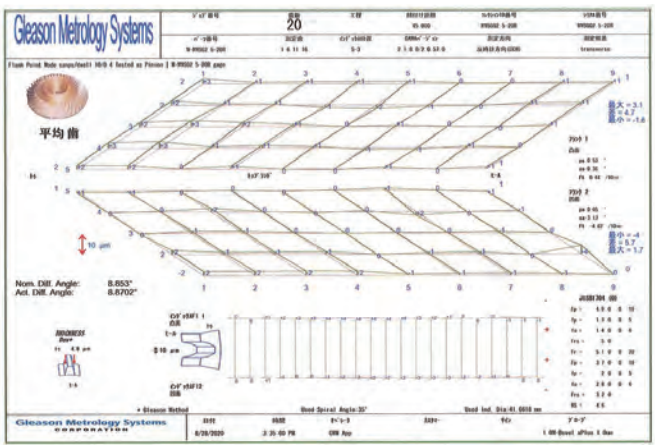
To order J Series products, please specify: Catalog No. + J + BORE.

Bore H7	* The product shapes of J Series items are identified by background color.																	
Keyway Js9	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50
Screw size	4×1.8	5×2.3				6×2.8				8×3.3			10×3.3		12×3.3	14×3.8	
Catalog Number	M4					M5				M6			M8			M10	
MMSGQ2-20R J BORE																	
MMSGQ2-20L J BORE																	
MMSGQ2.5-20R J BORE																	
MMSGQ2.5-20L J BORE																	
MMSGQ3-20R J BORE																	
MMSGQ3-20L J BORE																	
MMSGQ3.5-20R J BORE																	
MMSGQ3.5-20L J BORE																	
MMSGQ4-20R J BORE																	
MMSGQ4-20L J BORE																	
MMSGQ2-30R J BORE																	
MMSGQ2-30L J BORE																	
MMSGQ2.5-30R J BORE																	
MMSGQ2.5-30L J BORE																	
MMSGQ3-30R J BORE																	
MMSGQ3-30L J BORE																	
MMSGQ3.5-30R J BORE																	
MMSGQ3.5-30L J BORE																	
MMSGQ4-30R J BORE																	
MMSGQ4-30L J BORE																	

[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.

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

Gear Measuring System (350GMS)

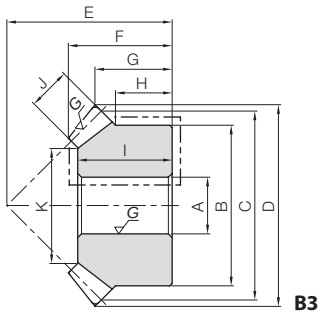


Gear Measurement Data

Ground Spiral Miter Gears

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

* The precision grade of J Series products is equivalent to the value shown in the table.
** In the illustration, the area surrounded with ---- line is masked during the carburization process (max. HRC40 or so) and can be modified.

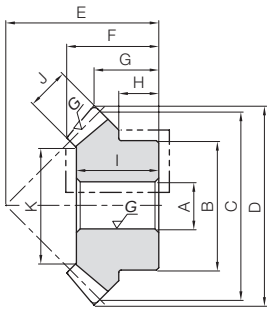


B3

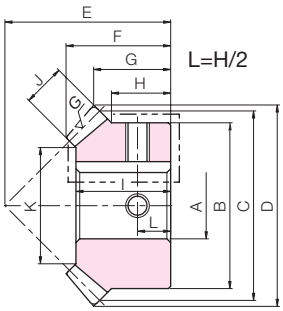
Catalog Number	Gear Ratio	No. of teeth	Shape	Direction of spiral	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)
					A_{H7}	B	C	D	E	F	G	H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability		
MMSG2-20R	1	20	B3	R	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
MMSG2-20L				L																	
MMSG2.5-20R				R	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
MMSG2.5-20L				L																	
MMSG3-20R				R	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
MMSG3-20L				L																	
MMSG3.5-20R			B4	R	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
MMSG3.5-20L				L																	
MMSG4-20R				R	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
MMSG4-20L				L																	
MMSG2-25R	1	25	B4	R	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
MMSG2-25L				L																	
MMSG2.5-25R				R	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
MMSG2.5-25L				L																	
MMSG3-25R				R	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
MMSG3-25L				L																	
MMSG3.5-25R				R	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
MMSG3.5-25L				L																	
MMSG4-25R				R	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
MMSG4-25L				L																	
MMSG2-30R	1	30	B4	R	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
MMSG2-30L				L																	
MMSG2.5-30R				R	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
MMSG2.5-30L				L																	
MMSG3-30R				R	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
MMSG3-30L				L																	
MMSG3.5-30R				R	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
MMSG3.5-30L				L																	
MMSG4-30R				R	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
MMSG4-30L				L																	

Product Precautions → Page 310
Precautions for Standard Machined Products → Pages 42~44

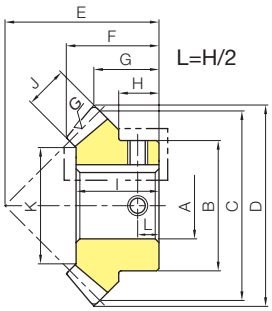
J Series



B4



B3K



B4K

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

Bore H7	* The product shapes of J Series items are identified by background color.																
Keyway Js9	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50
Screw size	4 × 1.8	5 × 2.3				6 × 2.8				8 × 3.3			10 × 3.3		12 × 3.3	14 × 3.8	
Catalog Number	M4					M5				M6			M8			M10	
MMSG2-20R J BORE																	
MMSG2-20L J BORE																	
MMSG2.5-20R J BORE																	
MMSG2.5-20L J BORE																	
MMSG3-20R J BORE																	
MMSG3-20L J BORE																	
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MMSG3.5-20L J BORE																	
MMSG4-20R J BORE																	
MMSG4-20L J BORE																	
MMSG2-25R J BORE																	
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MMSG2-30R J BORE																	
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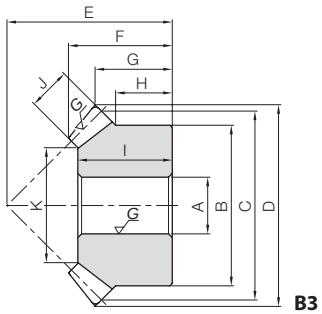
MMSG3-30R J BORE																	
MMSG3-30L J BORE																	
MMSG3.5-30R J BORE																	
MMSG3.5-30L J BORE																	
MMSG4-30R J BORE																	
MMSG4-30L J BORE																	

[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.

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

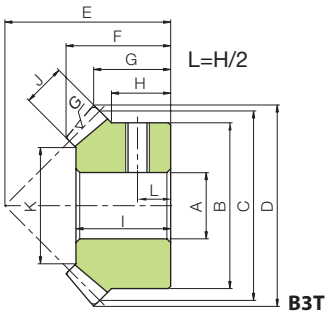
* The precision grade of J Series products is equivalent to the value shown in the table.
** Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).



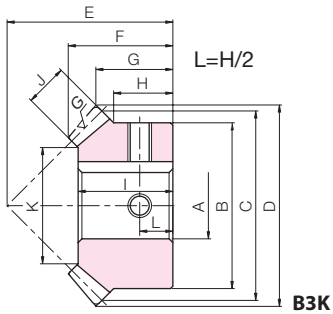
B3

Catalog Number	Gear Ratio	No. of teeth	Shape	Direction of spiral	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight
					A_{H7}	B	C	D	E	F	G	H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)
SMSG1-20R	1	20	B3	R	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
SMSG1-20L				L																	
SMSG1.5-20R				R	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
SMSG1.5-20L				L																	
SMSG2-20R				R	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
SMSG2-20L				L																	
SMSG2.5-20R				R	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
SMSG2.5-20L				L																	
SMSG3-20R				R	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
SMSG3-20L				L																	
SMSG3.5-20R				R	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
SMSG3.5-20L				L																	
SMSG4-20R				R	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
SMSG4-20L				L																	
SMSG1-25R	1	25	B3	R	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
SMSG1-25L				L																	
SMSG1.5-25R				R	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
SMSG1.5-25L				L																	
SMSG2-25R				R	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
SMSG2-25L				L																	
SMSG2.5-25R				R	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
SMSG2.5-25L				L																	
SMSG3-30R	1	30	B3	R	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
SMSG3-30L				L																	
SMSG3.5-30R				R	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
SMSG3.5-30L				L																	
SMSG4-30R				R	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
SMSG4-30L				L																	

J Series



B3T



B3K

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

Bore H7	* The product shapes of J Series items are identified by background color.																			
Keyway Js9	6	8	10	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50
Screw size	-		4 × 1.8		5 × 2.3				6 × 2.8				8 × 3.3			10 × 3.3		12 X 3.3	14 × 3.8	
Catalog Number	M4	M5	M4						M5				M6			M8			M10	
SMSG1-20R J BORE																				
SMSG1-20L J BORE																				
SMSG1.5-20R J BORE																				
SMSG1.5-20L J BORE																				
SMSG2-20R J BORE																				
SMSG2-20L J BORE																				
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SMSG2-25R J BORE																				
SMSG2-25L J BORE																				
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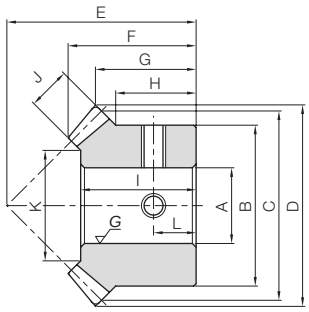
SMSG2.5-25L J BORE																				
SMSG3-30R J BORE																				
SMSG3-30L J BORE																				
SMSG3.5-30R J BORE																				
SMSG3.5-30L J BORE																				
SMSG4-30R J BORE																				
SMSG4-30L J BORE																				

[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.

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

* No secondary operations can be performed on these finished gears due to the applied carburizing process.

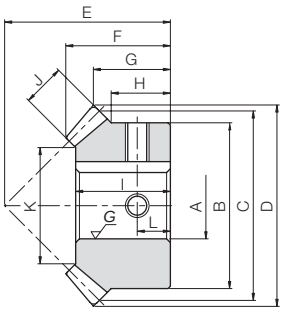


BT

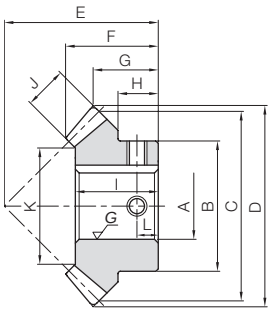
Catalog Number	Gear Ratio	Module	No. of teeth	Direction of spiral	Shape	Bore A_{H7}	Hub dia. B	Pitch dia. C	Outside dia. D	Mounting distance E	Total length F	Crown to back G	Hub width H	Hole length I
MMSA1-20R MMSB1-20R	1	***m*1**	20	R	BT	8	17	20	21.29	20	13.53	10.64	8.5	12.2
MMSA1-20L MMSB1-20L				L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

[Caution on Product Characteristics] ① The keyway tolerance is the value before hardening.

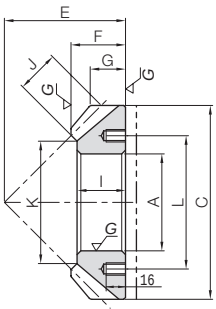
Product Precautions → Page 310



BK



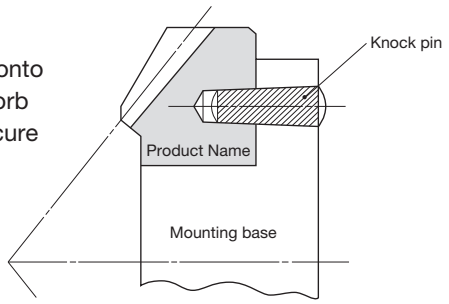
B4



B7

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**

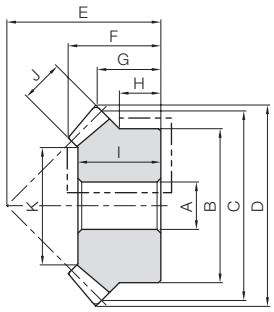
When installing products produced in B7 style (ring type), always secure the gears onto the mounting base with taper pins to absorb the rotational loads. It is dangerous to secure with bolts only.



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
Surface treatment	Black oxide coating

* In the illustration, the area surrounded with ----- line is masked during the carburization process (max. HRC40 or so) and can be modified.



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
MMS4-30R **MMS4-30L**	1	***m*4**	30	R L	B3	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

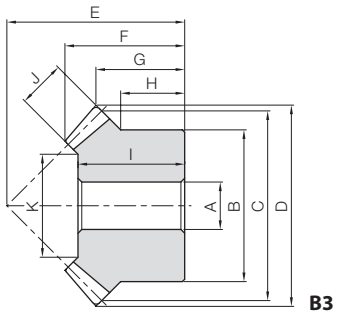
Product Precautions → Page 310

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**
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**

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

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



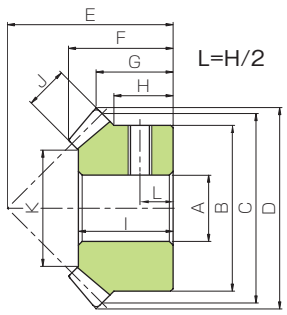
B3

Catalog Number	Gear Ratio	No. of teeth	Shape	Direction of spiral	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight
					A_{H7}	B	C	D	E	F	G	H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)
SMS1-20R	1	20	B3	R	6	16	20	21.3	20	13.84	10.65	8	12	5	9.86	1.07	0.65	0.11	0.067	0.03~0.13	0.019
SMS1-20L				L																	
SMS1.5-20R				R	8	26	30	31.74	30	21.18	15.87	13	19	8	15.37	3.73	2.33	0.38	0.24	0.05~0.15	0.074
SMS1.5-20L				L																	
SMS2-20R				R	12	34	40	42.4	37	24.75	18.2	14	22	10	21.72	8.54	5.40	0.87	0.55	0.06~0.16	0.15
SMS2-20L				L																	
SMS2.5-20R				R	14	42	50	52.94	48	32.42	24.47	19	29	12	28.06	16.3	10.5	1.66	1.07	0.07~0.17	0.30
SMS2.5-20L				L																	
SMS3-20R				R	16	50	60	63.72	58	39.6	29.86	23	35	15	31.57	28.8	18.7	2.94	1.91	0.08~0.18	0.52
SMS3-20L				L																	
SMS3.5-20R				R	20	60	70	74.47	65	43.81	32.23	25	40	18	39.09	46.5	30.4	4.74	3.10	0.10~0.25	0.82
SMS3.5-20L				L																	
SMS4-20R				R	20	64	80	84.88	75	50.51	37.44	27	45	20	43.43	68.3	45.0	6.97	4.59	0.12~0.27	1.15
SMS4-20L				L																	
SMS5-20R				R	25	80	100	105.9	90	60.16	42.95	30	54	26	54.46	136	90.9	13.9	9.27	0.14~0.34	2.13
SMS5-20L				L																	
SMS6-20R				R	28	100	120	127.16	104	67.35	47.58	34	60	30	67.15	226	155	23.0	15.8	0.16~0.36	3.65
SMS6-20L				L																	
SMS8-20R				R	30	130	160	169.94	125	72.6	49.97	30	62	35	95	484	344	49.4	35.1	0.20~0.45	7.00
SMS8-20L				L																	
SMS1-25R	1	25	B3	R	6	20	25	26.22	23	15.08	11.11	8	14	6	15.03	1.71	1.28	0.17	0.13	0.03~0.13	0.035
SMS1-25L				L																	
SMS1.5-25R				R	10	30	37.5	39.31	34	22.14	16.16	11.5	19	9	19.54	5.78	4.42	0.59	0.45	0.05~0.15	0.11
SMS1.5-25L				L																	
SMS2-25R				R	12	40	50	52.38	40	24.2	16.19	10	20	12	26.06	13.7	10.7	1.40	1.09	0.06~0.16	0.21
SMS2-25L				L																	
SMS2.5-25R				R	16	50	62.5	65.54	50	30.24	20.27	12.5	26	15	34.57	26.8	21.1	2.73	2.15	0.07~0.17	0.42
SMS2.5-25L				L																	
SMS3-25R				R	20	60	75	78.77	60	37.57	24.39	15	32	20	37.43	49.1	39.1	5.00	3.98	0.08~0.18	0.74
SMS3-25L				L																	
SMS3.5-25R				R	25	70	87.5	91.81	70	42.98	28.41	17.5	37	22	46.77	75.4	60.6	7.69	6.18	0.10~0.25	1.14
SMS3.5-25L				L																	
SMS4-25R				R	28	80	100	104.7	80	49.14	32.35	20	43	25	55.29	112	90.7	11.5	9.25	0.12~0.27	1.71
SMS4-25L				L																	
SMS5-25R				R	28	100	125	130.86	100	60.59	40.43	25	50	30	65.15	214	175	21.8	17.8	0.14~0.34	3.39
SMS5-25L				L																	
SMS6-25R				R	28	120	150	157.17	120	71.97	48.58	30	61	35	83	357	300	36.4	30.6	0.16~0.36	5.99
SMS6-25L				L																	
SMS2-30R	1	30	B3	R	12	45	60	62.42	50	29.27	21.21	12.5	25	12	36.06	18.2	16.9	1.86	1.72	0.06~0.16	0.37
SMS2-30L				L																	
SMS2.5-30R				R	16	60	75	78.04	62	36.08	26.02	17	32	15	47.57	35.6	33.4	3.63	3.40	0.07~0.17	0.76
SMS2.5-30L				L																	
SMS3-30R				R	20	70	90	93.61	75	45.25	31.8	20	40	20	53.43	65.8	62.3	6.71	6.35	0.08~0.18	1.32
SMS3-30L				L																	
SMS3.5-30R				R	25	90	105	109.21	85	49.4	34.6	25	45	22	67.77	101	96.0	10.3	9.79	0.10~0.25	2.19
SMS3.5-30L				L																	
SMS4-30R				R	28	100	120	124.71	95	54.28	37.35	25	50	25	79.29	150	144	15.3	14.7	0.12~0.27	3.07
SMS4-30L				L																	
SMS5-30R				R	28	130	150	155.90	120	68.2	47.95	35	62	30	99.15	284	276	29.0	28.1	0.14~0.34	6.44
SMS5-30L				L																	

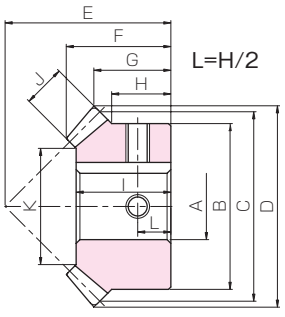
[Caution on Product Characteristics] ① The bore may slightly vary due to the effect of heat treatment. When using with the listed bore diameter, you may need to ream the bore prior to use.

Product Precautions → Page 310
Precautions for Standard Machined Products → Pages 42~44

J Series



B3T



B3K

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

Bore H7	* The product shapes of J Series items are identified by background color.																										
Keyway Js9	8	10	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50	55	60	65	70	75	80	85
Screw size	—	4×1.8		5×2.3				6×2.8				8×3.3			10×3.3		12×3.3	14×3.8		16×4.3	18×4.4		20×4.9		22×5.4	
Catalog Number	M5	M4						M5				M6			M8			M10		M12			M16			
SMS1-20R J BORE **SMS1-20L J** BORE																										
SMS1.5-20R J BORE **SMS1.5-20L J** BORE																										
SMS2-20R J BORE **SMS2-20L J** BORE																										
SMS2.5-20R J BORE **SMS2.5-20L J** BORE																										
SMS3-20R J BORE **SMS3-20L J** BORE																										
SMS3.5-20R J BORE **SMS3.5-20L J** BORE																										
SMS4-20R J BORE **SMS4-20L J** BORE																										
SMS5-20R J BORE **SMS5-20L J** BORE																										
SMS6-20R J BORE **SMS6-20L J** BORE																										
SMS8-20R J BORE **SMS8-20L J** BORE																										
SMS1-25R J BORE **SMS1-25L J** BORE																										
SMS1.5-25R J BORE **SMS1.5-25L J** BORE																										
SMS2-25R J BORE **SMS2-25L J** BORE																										
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SMS3-25R J BORE **SMS3-25L J** BORE																										
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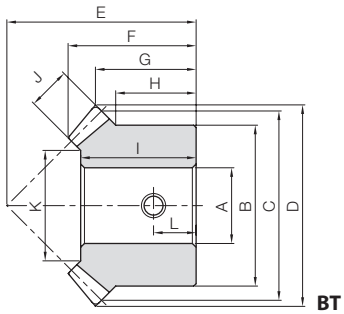
SMS5-25R J BORE **SMS5-25L J** BORE																										
SMS6-25R J BORE **SMS6-25L J** BORE																										
SMS2-30R J BORE **SMS2-30L J** BORE																										
SMS2.5-30R J BORE **SMS2.5-30L J** BORE																										
SMS3-30R J BORE **SMS3-30L J** BORE																										
SMS3.5-30R J BORE **SMS3.5-30L J** BORE																										
SMS4-30R J BORE **SMS4-30L J** BORE																										
SMS5-30R J BORE **SMS5-30L J** BORE																										

[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.

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

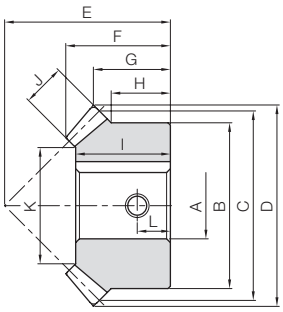
* Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).



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
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
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
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
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
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

[Caution on Product Characteristics] ① The dimensions of the keyway marked with * (depth) are made to old JIS Standards.
The dimensions of the keyway marked with ** are different from the JIS Standards for the bore.

Product Precautions → Page 310



BK

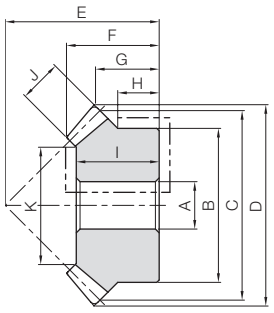
Face width	Holding surface dia.	Keyway	Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability			
5	9.86 10	— —	M4	4	0.90	0.37	0.091	0.038	0.03~0.13	0.016 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**
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**
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**
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**
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**
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**

MM Module 2~5
Miter Gears

J

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

* The precision grade of J Series products is equivalent to the value shown in the table.
** In the illustration, the area surrounded with –·–·– line is masked during the carburization process (max. HRC40 or so) and can be modified.

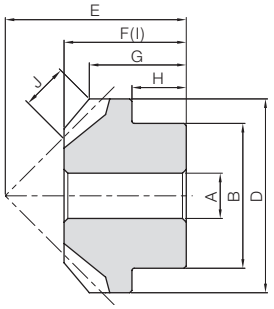


B3

Catalog Number	Gear Ratio	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (kg)
				A_{H7}	B	C	D	E	F	G	H	I	J	K	Bending strength	Surface durability	Bending strength	Surface durability		
MM2-20	1	20	B3	12	34	40	42.83	35	22.24	16.41	12	20	9	24.54	15.1	9.74	1.54	0.99	0.06~0.16	0.13
MM2.5-20				15	42	50	53.54	45	28.89	21.77	16	26	11	30.89	29.0	19.0	2.96	1.94	0.07~0.17	0.27
MM3-20				16	52	60	64.24	50	31.19	22.12	16	27	14	34.4	52.0	34.5	5.30	3.52	0.08~0.18	0.43
MM4-20				20	65	80	85.66	65	39.49	27.83	17.5	35	18	49.09	121	81.2	12.3	8.28	0.12~0.27	0.93
MM5-20				25	80	100	107.07	90	60.38	43.54	30	54	26	54.46	256	175	26.1	17.8	0.14~0.34	2.15
MM2-25	1	25	B3	12	45	50	52.83	40	24.33	16.41	12.5	21	12	28.06	26.4	20.1	2.70	2.05	0.06~0.16	0.25
MM2.5-25				16	55	62.5	66.03	50	30.41	20.52	15	27	15	36.57	51.6	39.7	5.27	4.05	0.07~0.17	0.47
MM3-25				20	65	75	79.24	60	37.81	24.62	17.5	33	20	39.43	94.7	73.5	9.66	7.49	0.08~0.18	0.81
MM4-25				25	85	100	105.66	80	49.32	32.83	22.5	44	25	57.29	217	171	22.1	17.4	0.12~0.27	1.89
MM5-25				28	100	125	132.07	100	60.82	41.04	25	50	30	65.15	413	329	42.1	33.6	0.14~0.34	3.41
MM2-30	1	30	B3	12	45	60	62.83	50	29.43	21.41	12.5	25	12	36.06	35.7	31.1	3.64	3.17	0.06~0.16	0.37
MM2.5-30				16	60	75	78.54	62	36.28	26.27	17	32	15	47.57	69.7	61.5	7.11	6.27	0.07~0.17	0.76
MM3-30				20	70	90	94.24	75	45.47	32.12	20	40	20	53.43	129	115	13.2	11.7	0.08~0.18	1.32
MM4-30				28	100	120	125.66	95	54.52	37.83	25	50	25	79.29	293	266	29.9	27.1	0.12~0.27	3.09
MM5-30				28	130	150	157.07	120	68.56	48.54	35	62	30	99.15	558	513	56.9	52.3	0.14~0.34	6.47

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)



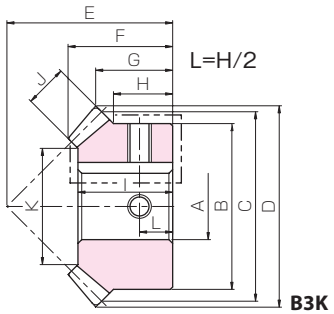
B1

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 Steam treatment (where the surface is rusted using steam) is provided.
② The product is not impregnated with lubricating oil.

Product Precautions → Page 310
Precautions for Standard Machined Products → Pages 42~44

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	55	60	65	70	75	80	85
Screw size	4×1.8	5×2.3				6×2.8				8×3.3			10×3.3		12×3.3	14×3.8		16×4.3	18×4.4		20×4.9		22×5.4	
Catalog Number	M4					M5				M6			M8			M10		M12			M16			
MM2-20 J BORE																								
MM2.5-20 J BORE																								
MM3-20 J BORE																								
MM4-20 J BORE																								
MM5-20 J BORE																								
MM2-25 J BORE																								
MM2.5-25 J BORE																								
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MM4-25 J BORE																								
MM5-25 J BORE																								
MM2-30 J BORE																								
MM2.5-30 J BORE																								
MM3-30 J BORE																								
MM4-30 J BORE																								
MM5-30 J BORE																								

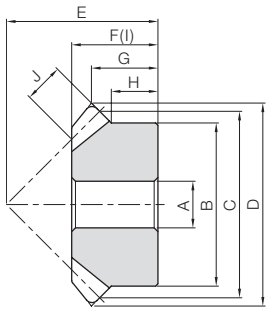
[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.

Sintered Metal Miter Gears

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash (mm)	Weight (g)	Catalog Number
l	J		Bending strength	Surface durability	Bending strength	Surface durability			
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**

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

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



B2

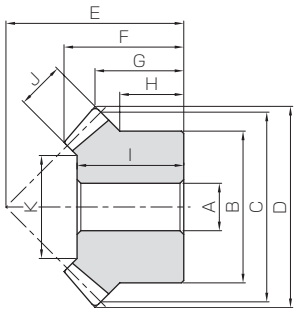
To order Hardened Plus, please specify Catalog No. + H. **Example: SM2-16H**

Catalog Number	Gear Ratio	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width	Hole length	Face width	Holding surface dia.	Allowable torque: Bending strength		Allowable torque: Surface durability		Allowable torque: Surface durability (H)		Weight (kg)
				A_{H7}	B	C	D	E	F	G	H	I	J	K	N·m	kgf·m	N·m	kgf·m	N·m	kgf·m	
SM2-16	1	16	B2	10	27	32	34.83	30	19	15.41	11.5	19	7	—	3.84	0.39	0.33	0.034	1.42	0.15	0.076
SM2.5-16				12	34	40	43.53	35	21	16.77	12	21	9		7.63	0.78	0.68	0.069	2.86	0.29	0.14
SM3-16				14	42	48	52.24	40	23	18.12	13	23	11		13.3	1.36	1.21	0.12	5.06	0.52	0.22
SM1-20	1	20	B3	6	16	20	21.41	20	13.94	10.71	8	12	5	9.86	0.89	0.091	0.084	0.0086	0.37	0.038	0.019
SM1.25-20				8	22	25	26.77	23	15.27	11.38	9	13	6	13.03	1.70	0.17	0.16	0.017	0.71	0.072	0.036
SM1.5-20				8	26	30	32.12	30	21.24	16.06	13	19	8	15.37	3.12	0.32	0.30	0.031	1.31	0.13	0.074
SM2-20				12	34	40	42.83	37	24.89	18.41	14	22	10	21.72	7.13	0.73	0.72	0.073	3.05	0.31	0.15
SM2.5-20				14	42	50	53.54	48	32.54	24.77	19	29	12	28.06	13.6	1.39	1.41	0.14	5.90	0.60	0.30
SM3-20				16	50	60	64.24	58	39.84	30.12	23	35	15	31.57	24.1	2.45	2.54	0.26	10.5	1.08	0.53
SM3.5-20				20	60	70	74.95	65	44.13	32.47	25	40	18	39.09	38.8	3.96	4.15	0.42	17.2	1.75	0.82
SM4-20				20	64	80	85.65	75	50.78	37.83	27	45	20	43.43	57.0	5.82	6.19	0.63	25.4	2.59	1.15
SM5-20				25	80	100	107.07	90	60.38	43.54	30	54	26	54.46	114	11.6	12.6	1.29	51.3	5.23	2.15
SM6-20				28	100	120	128.48	104	67.67	48.24	34	60	30	67.15	191	19.4	21.8	2.22	87.5	8.92	3.68
SM8-20				30	130	160	171.31	125	73.33	50.66	30	62	35	95	413	42.1	49.6	5.06	194	19.8	7.05
SM1-25	1	25	B3	6	20	25	26.41	23	15.16	11.21	8	14	6	15.03	1.47	0.15	0.16	0.017	0.71	0.072	0.035
SM1.25-25				8	25	31.25	33.02	28	17.88	13.26	9.25	16	7	18.7	2.75	0.28	0.31	0.032	1.35	0.14	0.063
SM1.5-25				10	30	37.5	39.62	34	22.25	16.31	11.5	19	9	19.54	4.96	0.51	0.57	0.059	2.44	0.25	0.11
SM2-25				12	40	50	52.83	40	24.33	16.41	10	20	12	26.06	11.8	1.20	1.41	0.14	5.90	0.60	0.22
SM2.5-25				16	50	62.5	66.04	50	30.41	20.52	12.5	26	15	34.57	23.0	2.34	2.81	0.29	11.7	1.19	0.42
SM3-25				20	60	75	79.24	60	37.81	24.62	15	32	20	37.43	42.1	4.29	5.24	0.53	21.6	2.20	0.74
SM3.5-25				25	70	87.5	92.45	70	43.23	28.72	17.5	37	22	46.77	64.7	6.60	8.19	0.83	33.5	3.42	1.15
SM4-25				28	80	100	105.66	80	49.32	32.83	20	43	25	55.29	96.3	9.82	12.4	1.26	50.2	5.12	1.73
SM5-25				28	100	125	132.07	100	60.82	41.04	25	50	30	65.15	184	18.7	24.2	2.47	96.8	9.87	3.41
SM6-25				28	120	150	158.48	120	72.32	49.24	30	61	35	83	309	31.5	42.1	4.29	166	16.9	6.03
SM1-30	1	30	B3	8	24	30	31.41	28	17.71	13.71	10	16	6	19.03	1.99	0.20	0.26	0.026	1.11	0.11	0.057
SM1.25-30				10	30	37.5	39.27	36	23.47	18.13	13.5	21	8	22.37	4.05	0.41	0.54	0.055	2.28	0.23	0.12
SM1.5-30				10	36	45	47.12	43	28.24	21.56	16	25	10	25.71	7.19	0.73	0.97	0.099	4.08	0.42	0.21
SM2-30				12	45	60	62.83	50	29.42	21.41	12.5	25	12	36.06	15.9	1.62	2.22	0.23	9.20	0.94	0.37
SM2.5-30				16	60	75	78.54	62	36.28	26.27	17	32	15	47.57	31.1	3.17	4.43	0.45	18.2	1.86	0.76
SM3-30				20	70	90	94.24	75	45.47	32.12	20	40	20	53.43	57.5	5.87	8.33	0.85	34.0	3.46	1.32
SM3.5-30				25	90	105	109.95	85	49.66	34.97	25	45	22	67.77	88.0	8.97	13.0	1.32	52.3	5.34	2.20
SM4-30				28	100	120	125.66	95	54.52	37.83	25	50	25	79.29	131	13.3	19.6	2.00	78.3	7.99	3.09
SM5-30				28	130	150	157.07	120	68.56	48.54	35	62	30	99.15	249	25.4	38.3	3.91	150	15.3	6.47

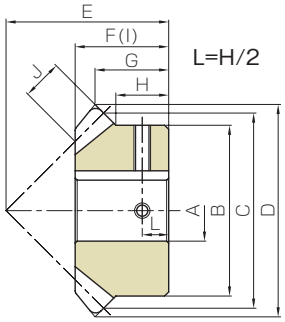
[Caution on Secondary Operations] ① See Page 22 for more details on Hardened Plus (H Series and HJ Series).

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

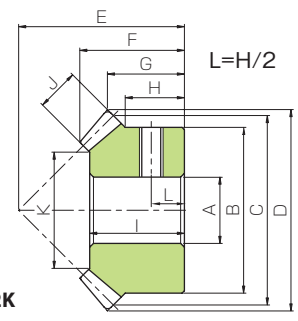
J Series



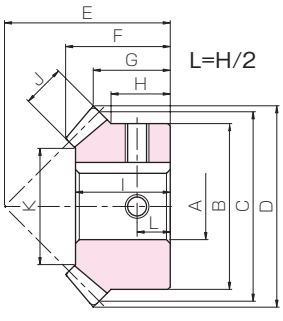
B3



B2K



B3T



B3K

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

Bore H7	* The product shapes of J Series items are identified by background color.																											
Keyway Js9	6	8	10	12	14	15	16	17	18	19	20	22	25	28	30	32	35	40	45	50	55	60	65	70	75	80	85	
Screw size	—		4×1.8		5×2.3				6×2.8				8×3.3			10×3.3		12×3.3	14×3.8		16×4.3	18×4.4		20×4.9		22×5.4		
Catalog Number	M4	M5	M4						M5				M6			M8			M10		M12			M16				
SM2-16 J BORE																												
SM2.5-16 J BORE																												
SM3-16 J BORE																												
SM1-20 J BORE																												
SM1.25-20 J BORE																												
SM1.5-20 J BORE																												
SM2-20 J BORE																												
SM2.5-20 J BORE																												
SM3-20 J BORE																												
SM3.5-20 J BORE																												
SM4-20 J BORE																												
SM5-20 J BORE																												
SM6-20 J BORE																												
SM8-20 J BORE																												
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SM5-25 J BORE																												
SM6-25 J BORE																												
SM1-30 J BORE																												
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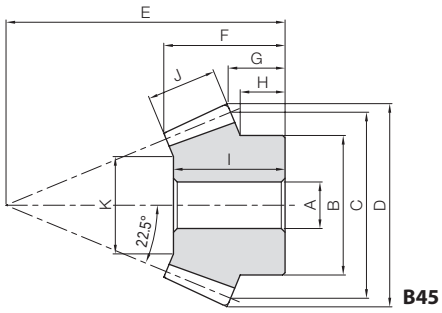
SM3-30 J BORE																												
SM3.5-30 J BORE																												
SM4-30 J BORE																												
SM5-30 J BORE																												

[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.
② Hardened Plus is not available for products listed in the J Series lineup.

Angular Miter Gears NEW

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

H To order Hardened Plus, please specify Catalog No. + H. **Example: SAM1.5-20045H**

Catalog Number	Gear Ratio	Module	No. of teeth	Shaft angle	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Hub width	Hole length
						A_{H7}	B	C	D	E	F	H	I
SAM1.5-20045 H	1	***m*1.5**	20	45°	B45	8	25	30	32.77	45	19.33	7.75	18
SAM2-20045 H		***m*2**				10	30	40	43.69	60	26.08	9.65	24
SAM2.5-20045 H		***m*2.5**				12	40	50	54.62	75	31.92	12.58	30
SAM3-20045 H		***m*3**				14	50	60	65.54	90	38.66	15.51	36
SAM1.5-20060 H	1	***m*1.5**	20	60°	B60	8	25	30	32.59	40	22.3	12.58	21
SAM2-20060 H		***m*2**				12	32	40	43.46	50	26.39	13.05	24
SAM2.5-20060 H		***m*2.5**				14	40	50	54.33	60	30.49	13.82	28
SAM3-20060 H		***m*3**				16	50	60	65.19	70	34.59	15.16	32
SAM1.5-20120 H	1	***m*1.5**	20	120°	B120	8	26	30	31.5	26	20.69	13.88	18
SAM2-20120 H		***m*2**				12	34	40	42	34	26.86	17.26	24
SAM2.5-20120 H		***m*2.5**				14	42	50	52.5	42	33.22	20.64	29
SAM3-20120 H		***m*3**				16	50	60	63	50	39.39	24.02	35

[Caution on Product Characteristics] ① The shaft angle is where the same products are set together. The shaft angle cannot be changed by using it with a different product.

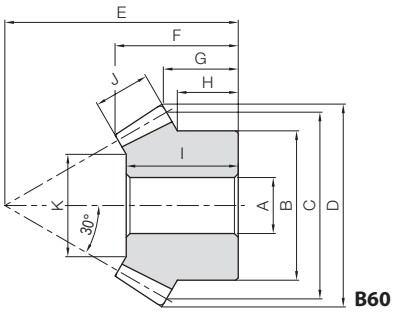
[Caution on Secondary Operations] ① See Page 22 for more details on Hardened Plus (H Series and HJ Series).

Product Precautions → Page 310 Precautions for Standard Machined Products → Pages 42~44

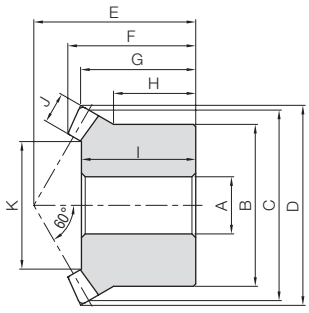
Shaft angle 60°

Shaft angle 120°

■ Angular Miter Gear Box Example



B60

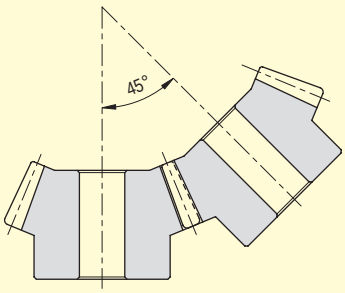


B120

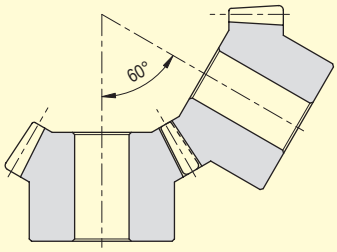
Face width	Holding surface dia.	Allowable torque						Backlash (mm)	Weight (kg)	Catalog Number	
		Bending strength		Surface durability		Surface durability (H)					
J	K	N·m	kgf·m	N·m	kgf·m	N·m	kgf·m				
11	17	4.30	0.44	0.38	0.039	1.60	0.16	0.05~0.15	0.067	**SAM1.5-20045**	(H)
15	20.92	10.3	1.05	0.95	0.097	3.92	0.40	0.06~0.16	0.15	**SAM2-20045**	(H)
18	30.07	19.6	2.00	1.85	0.19	7.54	0.77	0.07~0.17	0.31	**SAM2.5-20045**	(H)
22	34	34.4	3.51	3.30	0.34	13.3	1.36	0.08~0.18	0.55	**SAM3-20045**	(H)
9	18.18	3.54	0.36	0.32	0.033	1.35	0.14	0.05~0.15	0.077	**SAM1.5-20060**	(H)
12	21.93	8.39	0.86	0.78	0.080	3.25	0.33	0.06~0.16	0.15	**SAM2-20060**	(H)
15	29.15	16.4	1.67	1.56	0.16	6.43	0.66	0.07~0.17	0.27	**SAM2.5-20060**	(H)
18	36.36	28.3	2.89	2.74	0.28	11.2	1.14	0.08~0.18	0.47	**SAM3-20060**	(H)
5	19.22	2.43	0.25	0.29	0.030	1.28	0.13	0.05~0.15	0.073	**SAM1.5-20120**	(H)
6.5	26.78	5.66	0.58	0.70	0.072	3.02	0.31	0.06~0.16	0.16	**SAM2-20120**	(H)
8.5	32.03	11.4	1.16	1.45	0.15	6.14	0.63	0.07~0.17	0.31	**SAM2.5-20120**	(H)
10	39.59	19.4	1.98	2.53	0.26	10.6	1.08	0.08~0.18	0.53	**SAM3-20120**	(H)

■ Angular miter

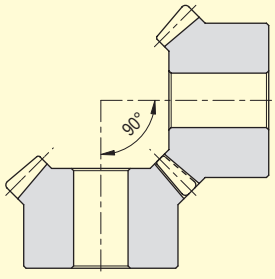
The axis angle of a normal miter is set to 90°, but the angle is set arbitrarily for the angular miter. The SAM Angular Miters are products with standardized axial angles of 45°, 60° and 120°. Be sure to pair products with the same model number. Custom items of other shaft angles are available, but may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



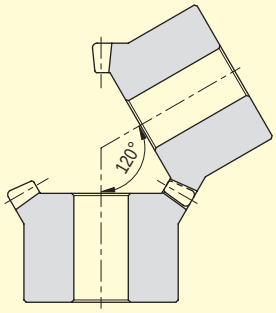
Shaft angle 45°



Shaft angle 60°



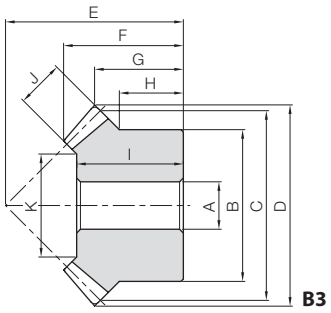
Shaft angle 90°



Shaft angle 120°

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)

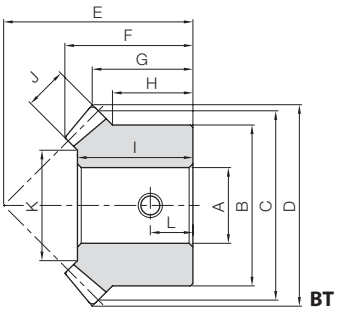


B3

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
SUM2-30	1	***m*2**	30	B3	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

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)



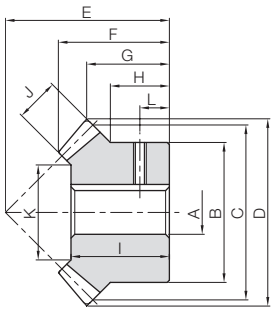
BT

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

Product Precautions → Page 310

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)	
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	0.075	**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	0.53	**SUM3-20**
45	20	43.43	31.5	4.39	3.22	0.45	0.12~0.27	1.17	**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	0.25	**SUM2-25**
26	15	34.57	12.7	2.00	1.29	0.20	0.07~0.17	0.47	**SUM2.5-25**
32	20	37.43	23.3	3.73	2.37	0.38	0.08~0.18	0.81	**SUM3-25**
43	25	55.29	53.2	8.79	5.43	0.90	0.12~0.27	1.75	**SUM4-25**
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	0.77	**SUM2.5-30**
40	20	53.43	31.7	5.86	3.23	0.60	0.08~0.18	1.34	**SUM3-30**

Finished Bore Stainless Steel Miter Gears



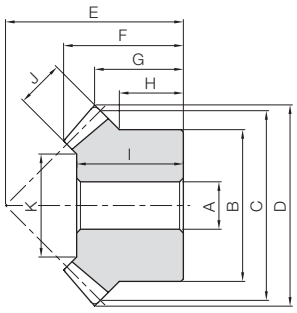
BK

Face width	Holding surface dia.	Keyway	Socket head screw		Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog Number
J	K	Width × Depth	Size	L	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(kg)	
5	9.86	—	M4	4	0.49	0.060	0.050	0.0061	0.03~0.13	0.018	**SUMA1-20**
8	15.37	—	M4	6.5	1.72	0.22	0.18	0.022	0.05~0.15	0.074	**SUMA1.5-20**
10	21.72	4 x 1.8	M4	7	3.94	0.51	0.40	0.052	0.06~0.16	0.15	**SUMA2-20**
12	28.06	5 x 2.3	M5	9.5	7.52	1.00	0.77	0.10	0.07~0.17	0.30	**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	0.53	**SUMA3-20**
20	43.43	6 x 2.8	M5	13.5	31.5	4.39	3.22	0.45	0.12~0.27	1.16	**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	0.25	**SUMA2-25**
15	34.57	5 x 2.3	M5	7.5	12.7	2.00	1.29	0.20	0.07~0.17	0.47	**SUMA2.5-25**
20	37.43	6 x 2.8	M5	9	23.3	3.73	2.37	0.38	0.08~0.18	0.81	**SUMA3-25**
25	55.29	8 x 3.3	M6	10	53.2	8.79	5.43	0.90	0.12~0.27	1.70	**SUMA4-25**

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

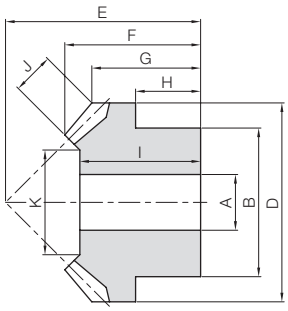
Catalog Number	Gear Ratio	Module	No. of teeth	Shape	Bore	Hub dia.	Pitch dia.	Outside dia.	Mounting distance	Total length	Crown to back	Hub width
					A_{H8}	B	C	D	E	F	G	H
PM1-20	1	***m*1**	20	B3	6	16	20	21.41	20	13.95	10.71	8
PM1.25-20		***m*1.25**			8	22	25	26.77	23	15.27	11.38	9
PM1.5-20		***m*1.5**			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
PM1.5-25		***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

[Caution on Product Characteristics] ① To reduce heat generation, it is recommended to mate plastic gears with steel gears.

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)

* The precision grade is equivalent to the value shown in the table.
** "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 bore tolerance is -0.05 to -0.30, but it may be slightly higher at the center of the hole.
② For the dimensional accuracy of each part, see the dimensional tolerance of molded items in the table at right.
[Caution on Secondary Operations] ① As it is a molded item, bubbles may form inside the material. Avoid performing secondary operations.

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* 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 26 for more details on quotations and orders.

Hole length	Face width	Holding surface dia.	Allowable torque (N·m)		Allowable torque (kgf·m)		Backlash	Weight	Catalog Number
l	J	K	Bending strength	Surface durability	Bending strength	Surface durability	(mm)	(g)	
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**
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**

Injection Molded Miter Gears

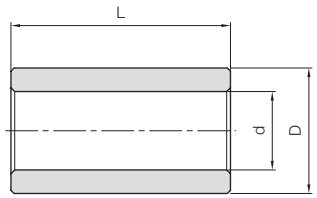
When using the injection molded bevel gear as an idler gear and a shaft diameter smaller than the inside diameter of the molded gear, please press fit one of the standard bushings. For details on bushings, please see Page 338.

■ Dimensional tolerance of molded item (unit: mm)

Grade / Dimensional classification	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	Weight	Catalog Number
H	l	J	K	Bending strength	Bending strength	(mm)	(g)	
4	7	2.5	4.93	0.082	0.0083	0~0.30	0.57	**DM0.5-20**
5	10	3.5	10.1	0.31	0.032	0~0.48	1.93	**DM0.8-20**
7	13	4.5	11.27	0.54	0.055	0~0.60	4.28	**DM1-20**
10	19	7	18.2	0.96	0.098	0~0.60	11.8	**DM1.5-20**

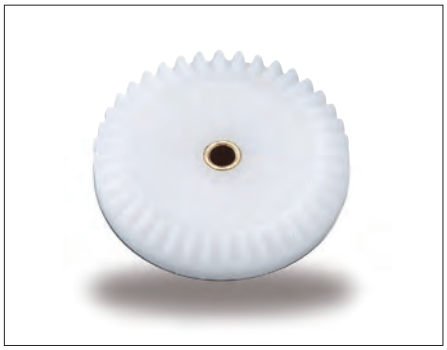
When using the injection molded bevel gear as an idler gear and a shaft diameter smaller than the inside diameter of the molded gear, please press fit one of the following standard bushings.



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



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