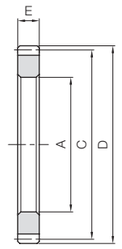
Specifications	
Precision grade	JIS grade N9 (JIS B1702-1: 1998)
Gear teeth	Standard full depth
Pressure angle	20°
Material	S45C
Heat treatment	—
Tooth hardness	(less than 194HB)



S5

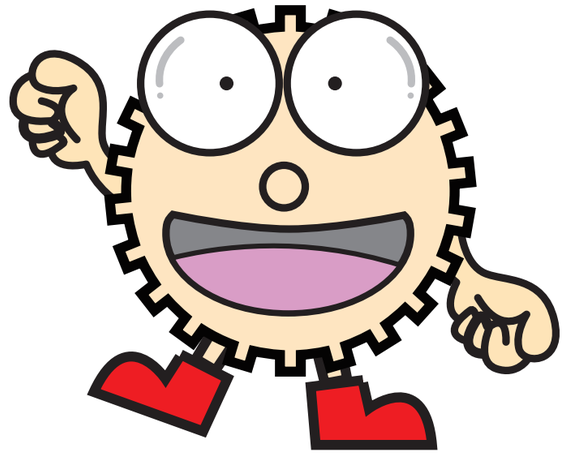
Catalog Number	Module	No. of teeth	Shape	Bore	Pitch dia.	Outside dia.	Face width	Allowable torque (N·m)		Allowable torque (kgf·m)	
				A_{H8}	C	D	E	Bending strength	Surface durability	Bending strength	Surface durability
SSR2-120	***m*2**	120	S5	194	240	244	20	366	44.0	37.4	4.49
SSR2-200		200		354	400	404		630	84.2	64.3	8.59
SSR2.5-120	***m*2.5**	120	S5	245	300	305	25	715	88.5	72.9	9.02
SSR2.5-200		200		445	500	505		1230	169	126	17.2
SSR3-120	***m*3**	120	S5	296	360	366	30	1240	157	126	16.0
SSR3-160		160		416	480	486		1680	226	171	23.0

Backlash (mm)	Weight (kg)	Catalog Number
0.12~0.26	2.46 4.28	**SSR2-120** **SSR2-200**
0.14~0.28	4.62 8.01	**SSR2.5-120** **SSR2.5-200**
0.14~0.32	7.77 10.6	**SSR3-120** **SSR3-160**

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

Helical Gears

KHG Ground Helical Gears	SH Helical Gears
	
Material: SCM440	Material: S45C
***m*1~3** **Page 194**	***m*2, 3** **Page 202**



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) Helical Gears

K H G 1 - 20 R

- R — Direction of Helix (Right)
- 20 — No. of Teeth (20)
- 1 — Module (1)
- G — Other Products (Ground Gears)
- H — Type (Helical Gears)
- K — Material (SCM440)

Material
S S45C
K SCM440

Type
H Helical Gears

Other Information
G Ground Gears

Features

KHK stock helical gears are quiet, high-strength and easy to use. They are suitable wherever you require high-speed rotation including in machine tools, speed reducers, etc. The following table lists the main features.

Catalog Number	KHG	SH
Module	1~3	2~3
Reference section of gear	Rotating plane	Normal plane
Material	SCM440	S45C
Heat Treatment	Thermal refined, gear teeth induction hardened	—
Tooth Surface Finish	Ground	Cut
Precision JIS B 1702-1:1998	N6	N8
Secondary Operations	Possible except for tooth	Possible
Features	It has excellent accuracy, strength, wear resistance and quietness, and allows secondary operations. Usable in the same center distance of the spur gear.	It has higher strength and quietness than the SS spur gears.

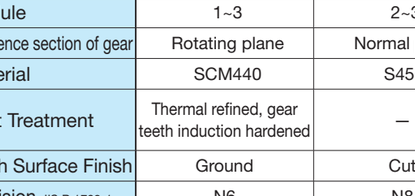
Selection Hints

It is important to thoroughly understand the contents of the product tables as well as “CAUTION” notes before making the selection. You must specify the right or left hand by including the letter R or L in the catalog number when ordering.

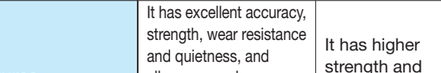
1. Caution in Selecting the Mating Gears

The KHK stock helical gears KHG series (transverse module) and SH series (normal module) are not interchangeable. Please keep this in mind when making your selection. Also, right hand and left hand helical mating gears operate as a set. See the photos below for reference and for help in making a proper selection.

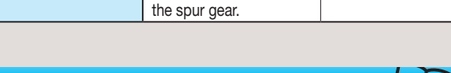
■ Direction of Helix



Left (L) Right (R)



Pinion (L) & Rack (R)



Pinion (R) & Rack (L)

■ Mating Helical Gear Selection Chart (○ Allowable × Not allowable)

Catalog Number and Direction of Helix		KHG		SH		KRHG KRHGF		SRH	
		RH	LH	RH	LH	RH	LH	RH	LH
KHG	RH	×	○	×	×	×	○	×	×
	LH	○	×	×	×	○	×	×	×
SH	RH	×	×	×	○	×	×	×	○
	LH	×	×	○	×	×	×	○	×

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	KHG	SH
Formula NOTE 1	Formula of spur and helical gears on bending strength (JGMA401-01)	
No. of teeth of mating gears	Same no. of teeth	
Rotational Speed	600rpm	100rpm
Design Life (Durability)	Over 10^7cycles	
Impact from motor	Uniform load	
Impact from load	Uniform load	
Direction of load	Bidirectional load (calculated with allowable bending stress of 2/3)	
Allowable bending stress at root σ_{Flim} (kgf/mm^2) NOTE 2	30	19
Safety factor S_F	1.2	

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

Item \ Catalog Number	KHG	SH
Formula NOTE 1	Formula of spur and helical gears on surface durability (JGMA402-01)	
Kinematic viscosity of lubricant	100cSt(50°C)	
Gear support	Symmetric support by bearings	
Allowable Hertz stress σ_{Hlim} (kgf/mm^2)	116	49
Safety factor S_H	1.15	

[NOTE 1] The gear strength formula is based on JGMA (Japanese Gear Manufacturers Association) specifications.
The units for the rotational speed (rpm) and the stress (kgf/mm^2) are adjusted to the units needed in the formula.

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 190 for more details.
(2) The backlash values shown in the table are the theoretical values for the backlash in the normal direction of gears of the same series in mesh.
(3) A set of helical gears must be identical in module and number of teeth, but opposite in spiral hands.
(4) These helical gears produce axial thrust forces. Please see Page 193 for more details.
(5) For the helical gear series combinations, see the Mating Gear Selection Chart on Page 190.
(6) Keyways are made according to JIS B1301 standards, Js9 tolerance. Also note that keyway tooth position alignment is not performed.
(7) For products having a tapped hole, a set screw is included.

[Caution on Secondary Operations]

(1) Please read "Cautions on Performing Secondary Operations" on Page 192 when performing modifications and/or secondary operations for safety concerns.
(2) Due to the gear teeth being induction hardened, no secondary operations can be performed on tooth areas including the bottom land (approx. 2 to 3 mm).

[J Series]

(1) Cancellation is not possible for made-to-order products. For lead time details, see Page 38.
(2) Certain products which would otherwise have a very long tapped hole are counterbored. For details, please see the KHK website.
(3) Black oxide is not re-applied to parts undergoing secondary operations.
(4) For bores over ϕ 50, the bore tolerance is H8.

KHG Ground Helical Gears

[Caution on Secondary Operations]

(1) Because of the influence of hardening residual stress, avoid removing the entire boss, as it may cause the gears to deform.

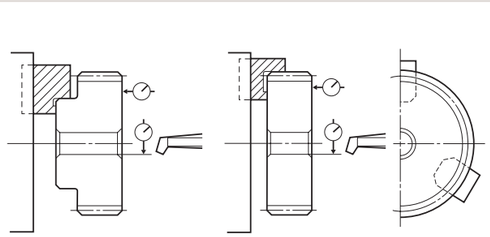
Application Hints

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.

E-mail: info@khkgears.net

1. Caution on Performing Secondary Operations

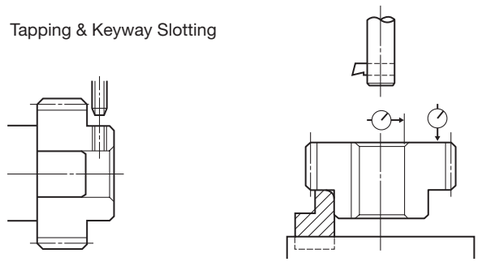
① If reboring, it is important to pay special attention to locating the center in order to avoid runout.
② The reference datum for gear machining is the bore. Therefore, use the bore for locating the center. If it is too difficult to do for small bores, the alternative is to use one spot on the bore 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 The maximum bore size is dictated by the requirement that the strength of the hub is to be higher than that of the gear teeth. The maximum bore size should be 60% to 70% of the hub diameter (or tooth root diameter), and 50% to 60% for keyway applied modifications.
⑤ In order to avoid stress concentration, round the keyway corners.

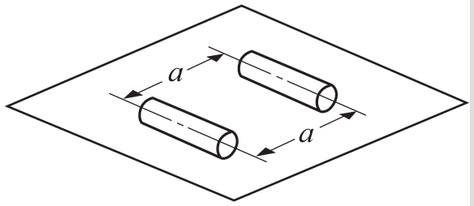
Tapping & Keyway Slotting



⑥ To avoid problems of reduced gear precision and other manufacturing difficulties, do not attempt to machine the gears to reduce face widths.
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.

2. Points of Caution during Assembly

① The recommended center distance tolerance of KHK stock helical gears is H7 for ground gears and H8 for cut gears.
The amount of backlash is given in the product table for each gear. For the center distance of SH, refer to the dimensional table page.



$$a = \frac{d_1 + d_2}{2}$$

Where
a : Center distance
d_1 : Pitch diameter of pinion
d_2 : Pitch diameter of gear

② The table below indicates the tolerance on the total length of KHK stock spur gears. Please refer to this data when designing gearboxes or other components.

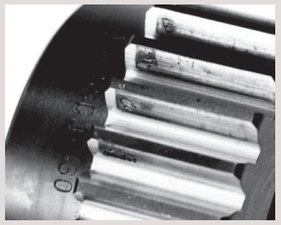
■ Total Length Tolerance for Spur and Helical Gears

Total Length (mm)	Tolerance
30 or less	0 -0.10
31 to 100	0 -0.15
Over 100	0 -0.20

[Note] The following products are excluded from this table: Hardened plus, Spur pinion shafts, Injection molded spur gears, F-loc hub spur gears, and MC nylon products.

③ Verify that the two shafts are parallel. Incorrect assembly will lead to uneven teeth contact which will cause noise and wear. (After assembly, check the tooth contact by painting a thin layer of red lead primer or the like on the gear teeth, meshing them together and rotating them.)

■ Test example: Abrasion occurred on SSG3-30 due to poor edge contact (only 30% with proper contact).

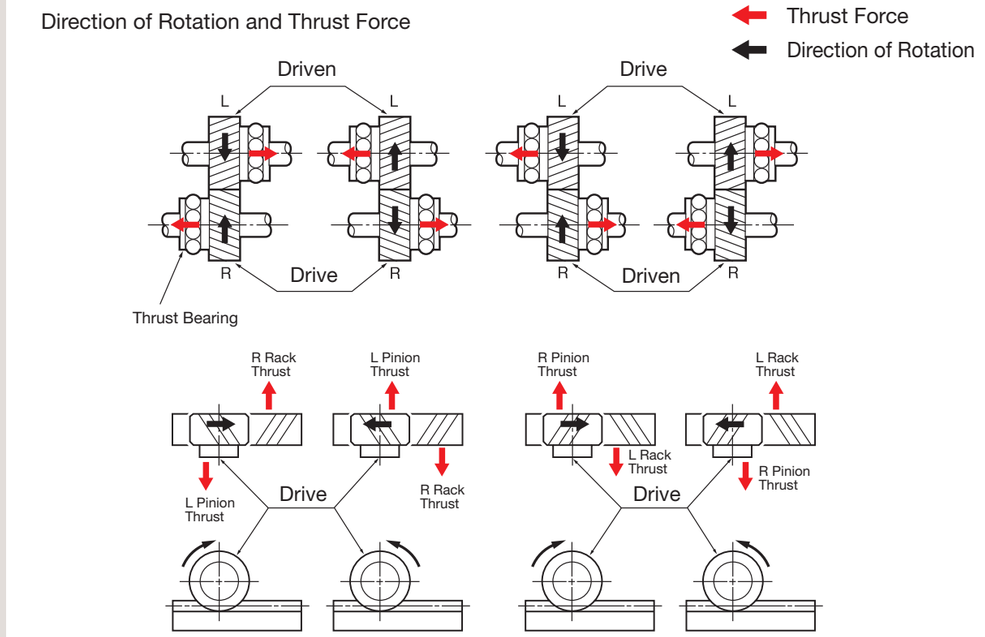


Poor tooth contact and pitting

Gear oil (equivalent to JIS gear oil category 2 No. 3)
The design conditions were load torque at 278 rpm, 42.5 kg/m (12 kW), 1.5 times the allowable bending strength, and 3 times the allowable surface durability torque.
The pitting occurred on the poor tooth contact area after 60 hours of continuous operation.

④ Due to the helix of helical gears, they produce thrust force (axial). The bearings must be selected properly to be able to handle these thrust forces. The direction of the thrust forces depend on the helix direction and the direction of rotation as shown below.
For details, use gear calculation software GCSW.

Direction of Rotation and Thrust Force



3. Cautions on Starting

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

② If gears are exposed, be sure to attach a safety cover to ensure safety. Also, be careful not to touch rotating gears.
③ 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 ISO9000 quality management system; if you notice any malfunctions upon purchasing a product, please contact the supplier.