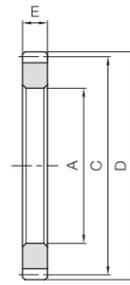




| Specifications | |
|-----------------|----------------------------------|
| Precision grade | JIS grade N9 (JIS B1702-1: 1998) |
| Gear teeth | Standard full depth |
| Pressure angle | 20° |
| Material | S45C |
| Heat treatment | — |
| Tooth hardness | (less than 194HB) |



S5

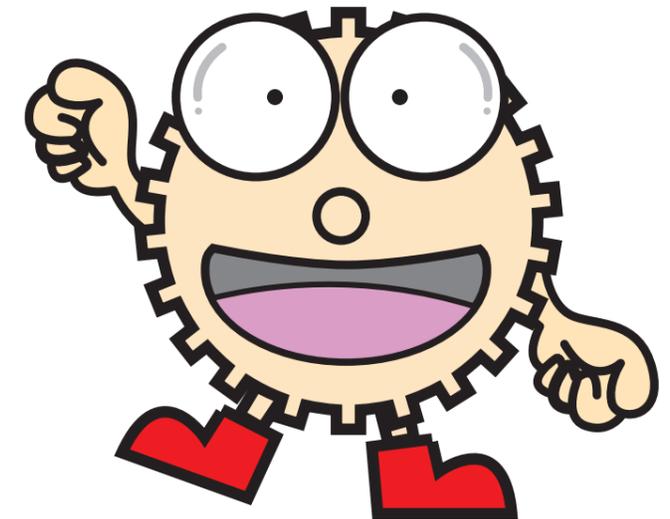
| Catalog Number | Module | No. of teeth | Shape | Bore | | Pitch dia. | Outside dia. | Face width | Allowable torque (N·m) | | Allowable torque (kgf·m) | |
|--|-------------|--------------|-------|-----------------|------------|------------|--------------|--------------|------------------------|--------------|--------------------------|--------------------|
| | | | | A _{H8} | C | | | | D | E | Bending strength | Surface durability |
| SSR2-120 SSR2-200 | m2 | 120 200 | S5 | 194 354 | 240 400 | 244 404 | 20 | 366 630 | 44.0 84.2 | 37.4 64.3 | 4.49 8.59 | |
| SSR2.5-120 SSR2.5-200 | m2.5 | 120 200 | S5 | 245 445 | 300 500 | 305 505 | 25 | 715 1230 | 88.5 169 | 72.9 126 | 9.02 17.2 | |
| SSR3-120 SSR3-160 | m3 | 120 160 | S5 | 296 416 | 360 480 | 366 486 | 30 | 1240 1680 | 157 226 | 126 171 | 16.0 23.0 | |

- [Caution on Product Characteristics]
- The backlash values shown in the table are the theoretical values for the normal direction for the internal ring in mesh with an SS spur gear.
 - The bore tolerance is modified at H8, but there may be some errors as the ring shape deforms easily.

| 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 |



Helical Gears



Catalog Number of KHK Stock Gears

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

(Example) Helical Gears

K H G 1 - 20 R

Direction of Helix (Right)

No. of Teeth (20)

Module (1)

Other Products (Ground Gears)

Type (Helical Gears)

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 | 1~6 | 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

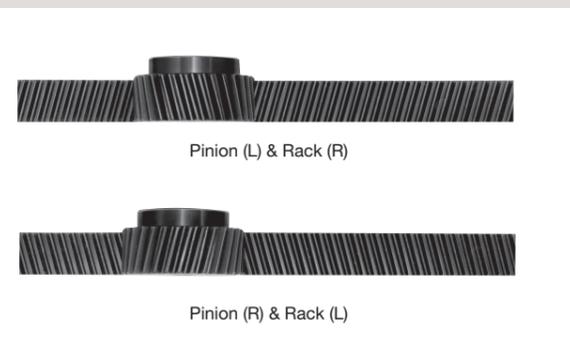


It is important to thoroughly understand the contents of the product tables as well as "CAUTION" notes before making the selection. You must specify the right or left hand by including the letter R or L in the catalog number when ordering.

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



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 NOTE 2 | 100rpm |
| Design Life (Durability) | | Over 10 ⁷ cycles | |
| 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_{Fim} (kgf/mm 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) | | 112 | 49 |
| Safety factor S_{H1} | | 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/mm²) are adjusted to the units needed in the formula.

[NOTE 2] For semi-custom gears, the rotation speed is based on 300rpm.



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 192 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, but opposite in spiral hands.
- (4) These gears produce axial thrust forces. Please see page 195 for more details.
- (5) For the helical gear series combinations, see the Mating Gear Selection Chart on page 192.
- (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.
- (8) 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.

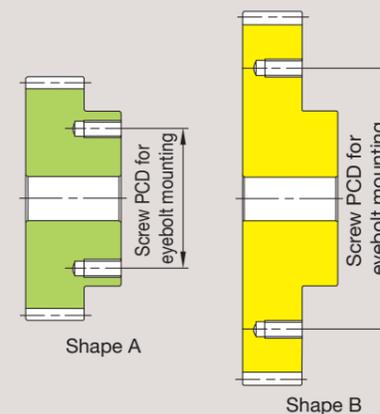
As to the effective case depth, it is specified by JIS, as "The distance from the surface of the case to the area with hardness HV450." The case depth differs from area to area of a tooth, so the depth cannot be specified.

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 $\phi 50$, the bore tolerance is H8.

Tapped Holes in Semi-Custom Standard Products



| Catalog Number | Shape | Screw P.C.D. for eyebolt mounting |
|----------------|-------|-----------------------------------|
| KHG5-50RS | A | 125 |
| KHG5-50LS | A | 125 |
| KHG5-60RS | B | 215 |
| KHG5-60LS | B | 215 |
| KHG6-36RS | A | 135 |
| KHG6-36LS | A | 135 |
| KHG6-40RS | A | 145 |
| KHG6-40LS | A | 145 |
| KHG6-50RS | A | 155 |
| KHG6-50LS | A | 155 |
| KHG6-60RS | B | 245 |
| KHG6-60LS | B | 245 |

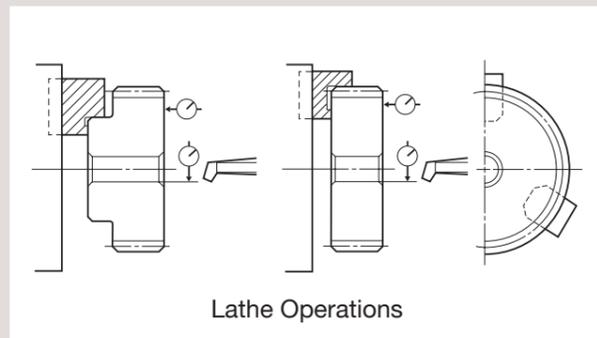
Application Hints



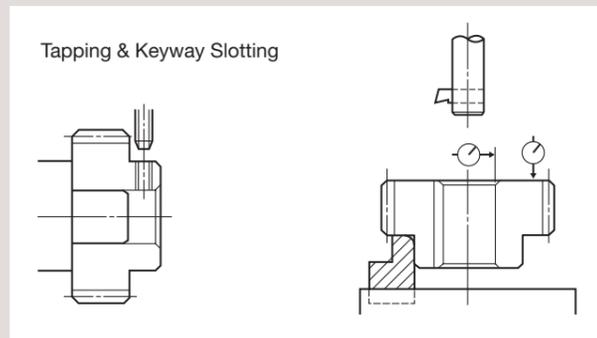
In order to use KHK stock gears safely, carefully read the Application Hints before proceeding. If there are questions or you require clarifications, please contact our technical department or your nearest distributor. E-mail: info@khkgears.net
Please read "Cautions on Performing Secondary Operations"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

1. Caution on Performing Secondary Operations

- ① If re boring, 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.



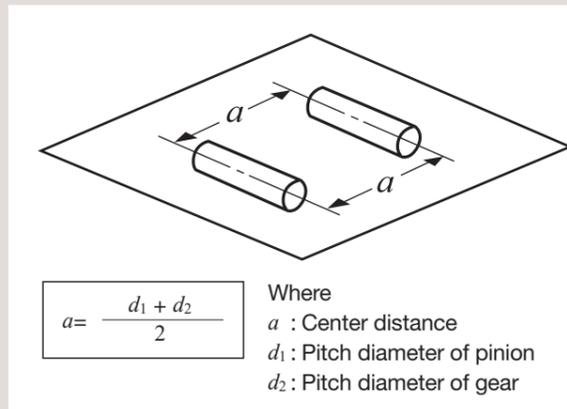
- ④ The maximum bore size is dictated by the requirement that the strength of the hub is to be higher than that of the gear teeth. The maximum bore size should be 60% to 70% of the hub diameter (or tooth root diameter), and 50% to 60% for keyway applied modifications.
- ⑤ In order to avoid stress concentration, round the keyway corners.



- 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.



- 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.)

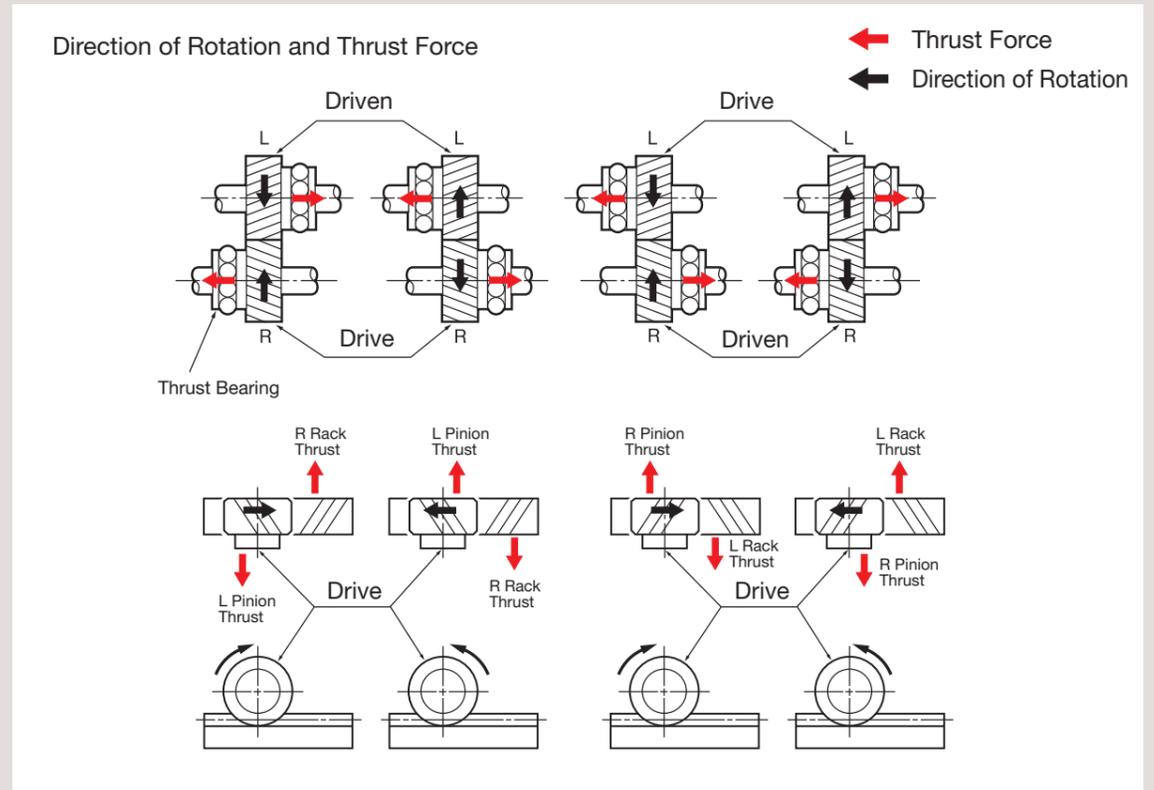
■ Test example: Abrasion occurred on SSG3-30 due to poor edge contact (only 30% with proper contact).



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.



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.). 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

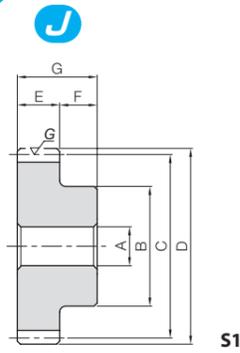
1. Before using a KHK product, read the precautions in the catalog carefully in order to use it correctly.
2. Avoid use in environments that may adversely affect the product.
3. Our products are manufactured under a superior quality control system based on the ISO9001 quality management system; if you notice any malfunctions upon purchasing a product, please contact the supplier.





| Specifications | |
|---------------------------|--|
| Precision grade | JIS grade N6 (JIS B1702-1: 1998)* |
| Reference section of gear | Rotating plane |
| Gear teeth | Standard full depth |
| Transverse pressure angle | 20° |
| Helix angle | 21°30' |
| Material | SCM440 |
| Heat treatment | Thermal refined, 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).



| Catalog Number | Module | No. of teeth | Direction of helix | Shape | Bore | | Pitch dia. | Outside dia. | Face width | Hub width | Total length | Allowable torque (N·m) | | Allowable torque (kgf·m) | | Backlash (mm) | Weight (kg) | | | | | | | |
|----------------------------|--------|--------------|--------------------|-------|-----------------|-----|------------|--------------|------------|-----------|--------------|------------------------|--------------------|--------------------------|--------------------|---------------|-------------|----|------|------|------|------|-----------|-------|
| | | | | | A _{H7} | B | | | | | | Bending strength | Surface durability | Bending strength | Surface durability | | | | | | | | | |
| KHG1-20R KHG1-20L | m1 | 20 | R L | S1 | 6 | 17 | 20 | 22 | 8 | 10 | 18 | 7.80 | 4.96 | 0.80 | 0.51 | 0.08~0.16 | 0.034 | | | | | | | |
| KHG1-24R KHG1-24L | | 24 | R L | | 8 | 20 | 24 | 26 | | | | 10.1 | 7.43 | 1.03 | 0.76 | | | | | | | | | |
| KHG1-30R KHG1-30L | | 30 | R L | | 10 | 25 | 30 | 32 | | | | 13.6 | 12.2 | 1.39 | 1.24 | | | | | | | | | |
| KHG1-40R KHG1-40L | | 40 | R L | | | 30 | 40 | 42 | | | | 17.9 | 20.8 | 1.83 | 2.12 | | | | | | | | | |
| KHG1-50R KHG1-50L | | 50 | R L | | 12 | 35 | 50 | 52 | | | | 23.6 | 33.8 | 2.41 | 3.45 | | | | | | | | | |
| KHG1-60R KHG1-60L | | 60 | R L | | | 40 | 60 | 62 | | | | 29.4 | 50.2 | 2.99 | 5.12 | | | | | | | | | |
| KHG1-70R KHG1-70L | | 70 | R L | | 40 | 70 | 72 | 35.2 | | | | 70.1 | 3.59 | 7.15 | | | | | | | | | | |
| KHG1.5-20R KHG1.5-20L | | m1.5 | 20 | | R L | S1 | 12 | 24 | | | | 30 | 33 | 12 | 12 | | | 24 | 26.3 | 17.2 | 2.68 | 1.75 | 0.08~0.16 | 0.088 |
| KHG1.5-24R KHG1.5-24L | | | 24 | | R L | | | 28 | | | | 36 | 39 | | | | | | 30.9 | 23.4 | 3.16 | 2.39 | | |
| KHG1.5-30R KHG1.5-30L | | | 30 | | R L | | 15 | 38 | | | | 45 | 48 | | | | | | 41.8 | 38.4 | 4.26 | 3.92 | | |
| KHG1.5-32R KHG1.5-32L | 32 | | R L | 40 | 48 | | | 51 | 45.5 | 44.3 | 4.64 | 4.52 | | | | | | | | | | | | |
| KHG1.5-36R KHG1.5-36L | 36 | | R L | 18 | 45 | | 54 | 57 | 53.0 | 57.4 | 5.40 | 5.85 | | | | | | | | | | | | |
| KHG1.5-40R KHG1.5-40L | 40 | | R L | | 50 | | 60 | 63 | 60.5 | 72.3 | 6.17 | 7.38 | | | | | | | | | | | | |
| KHG1.5-50R KHG1.5-50L | 50 | | R L | 20 | 60 | | 75 | 78 | 79.7 | 118 | 8.13 | 12.0 | | | | | | | | | | | | |
| KHG1.5-60R KHG1.5-60L | 60 | | R L | | 60 | | 90 | 93 | 99.1 | 175 | 10.1 | 17.9 | | | | | | | | | | | | |
| KHG1.5-80R KHG1.5-80L | 80 | | R L | 70 | 120 | | 123 | 132 | 313 | 13.5 | 32.0 | | | | | | | | | | | | | |
| KHG1.5-90R KHG1.5-90L | 90 | | R L | | 70 | | 135 | 138 | 151 | 404 | 15.4 | 41.2 | | | | | | | | | | | | |
| KHG1.5-100R KHG1.5-100L | 100 | R L | 70 | 150 | 153 | 170 | 508 | 17.4 | 51.8 | | | | | | | | | | | | | | | |

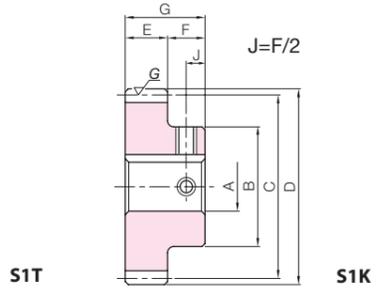
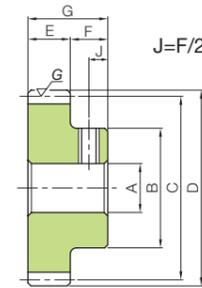
[Caution on Secondary Operations] ① Because of the influence of hardening residual stress, avoid removing the entire boss, as it may cause the gears to deform.

Usable in the assembly distance of the spur gear.

KHG ground helical gears use a "transverse" module. The assembly distance is the same as spur gear pairs with the same module and number of teeth. Improved strength and low noise: Take the next step up from spur gears.



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. | | | | | | | | | | | | | | |
|------------------------|--|----|-------|----|-------|----|----|-------|----|----|-------|----|----|----|----|
| | 6 | 8 | 10 | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 22 | 25 | 28 | 30 |
| Keyway J _{S9} | - | | 4x1.8 | | 5x2.3 | | | 6x2.8 | | | 8x3.3 | | | | |
| Screw size | - | | M4 | | M5 | | | M5 | | | M6 | | | | |
| Catalog Number | M4 | M5 | M4 | | | M5 | | | M5 | | | M6 | | | |
| KHG1-20R J BORE | | | | | | | | | | | | | | | |
| KHG1-20L J BORE | | | | | | | | | | | | | | | |
| KHG1-24R J BORE | | | | | | | | | | | | | | | |
| KHG1-24L J BORE | | | | | | | | | | | | | | | |
| KHG1-30R J BORE | | | | | | | | | | | | | | | |
| KHG1-30L J BORE | | | | | | | | | | | | | | | |
| KHG1-40R J BORE | | | | | | | | | | | | | | | |
| KHG1-40L J BORE | | | | | | | | | | | | | | | |
| KHG1-50R J BORE | | | | | | | | | | | | | | | |
| KHG1-50L J BORE | | | | | | | | | | | | | | | |
| KHG1-60R J BORE | | | | | | | | | | | | | | | |
| KHG1-60L J BORE | | | | | | | | | | | | | | | |
| KHG1-70R J BORE | | | | | | | | | | | | | | | |
| KHG1-70L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-20R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-20L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-24R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-24L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-30R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-30L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-32R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-32L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-36R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-36L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-40R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-40L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-50R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-50L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-60R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-60L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-80R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-80L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-90R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-90L J BORE | | | | | | | | | | | | | | | |
| KHG1.5-100R J BORE | | | | | | | | | | | | | | | |
| KHG1.5-100L J BORE | | | | | | | | | | | | | | | |

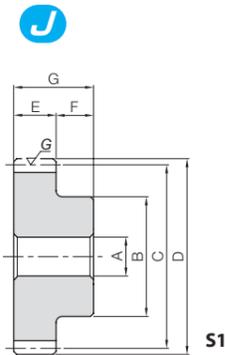
[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.





| Specifications | |
|---------------------------|--|
| Precision grade | JIS grade N6 (JIS B1702-1: 1998)* |
| Reference section of gear | Rotating plane |
| Gear teeth | Standard full depth |
| Transverse pressure angle | 20° |
| Helix angle | 21°30' |
| Material | SCM440 |
| Heat treatment | Thermal refined, 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).



| Catalog Number | Module | No. of teeth | Direction of helix | Shape | Bore | | Hub dia. | Pitch dia. | Outside dia. | Face width | Hub width | Total length | Allowable torque (N·m) | | Allowable torque (kgf·m) | | Backlash (mm) | Weight (kg) | | | | | | | | |
|----------------------|--------|--------------|--------------------|-------|-----------------|----|----------|------------|--------------|------------|-----------|--------------|------------------------|--------------------|--------------------------|--------------------|---------------|-------------|----|-----|-----|------|------|------|------|------|
| | | | | | A _{H7} | H7 | | | | | | | Bending strength | Surface durability | Bending strength | Surface durability | | | | | | | | | | |
| KHG2-15R KHG2-15L | m2 | 15 | R L | S1 | A _{H7} | H7 | 24 | 30 | 34 | 16 | 13 | 29 | 40.5 | 21.1 | 4.13 | 2.15 | 0.10~0.20 | 0.11 | | | | | | | | |
| KHG2-18R KHG2-18L | | 18 | R L | | | | | | | | | | | | | | | | 30 | 36 | 40 | 48.6 | 29.5 | 4.96 | 3.01 | 0.17 |
| KHG2-20R KHG2-20L | | 20 | R L | | | | | | | | | | | | | | | | 32 | 40 | 44 | 56.7 | 37.8 | 5.78 | 3.85 | 0.20 |
| KHG2-25R KHG2-25L | | 25 | R L | | | | | | | | | | | | | | | | 40 | 50 | 54 | 77.6 | 62.1 | 7.91 | 6.33 | 0.33 |
| KHG2-26R KHG2-26L | | 26 | R L | | | | | | | | | | | | | | | | 42 | 52 | 56 | 81.8 | 67.8 | 8.35 | 6.91 | 0.37 |
| KHG2-30R KHG2-30L | | 30 | R L | | | | | | | | | | | | | | | | 50 | 60 | 64 | 99.1 | 93.1 | 10.1 | 9.49 | 0.50 |
| KHG2-32R KHG2-32L | | 32 | R L | | | | | | | | | | | | | | | | 50 | 64 | 68 | 108 | 107 | 11.0 | 10.9 | 0.55 |
| KHG2-35R KHG2-35L | | 35 | R L | | | | | | | | | | | | | | | | 50 | 70 | 74 | 121 | 131 | 12.4 | 13.3 | 0.63 |
| KHG2-36R KHG2-36L | | 36 | R L | | | | | | | | | | | | | | | | 50 | 72 | 76 | 126 | 139 | 12.8 | 14.2 | 0.65 |
| KHG2-40R KHG2-40L | | 40 | R L | | | | | | | | | | | | | | | | 60 | 80 | 84 | 143 | 176 | 14.6 | 17.9 | 0.85 |
| KHG2-48R KHG2-48L | | 48 | R L | | | | | | | | | | | | | | | | 60 | 96 | 100 | 172 | 251 | 17.5 | 25.6 | 1.13 |
| KHG2-50R KHG2-50L | | 50 | R L | | | | | | | | | | | | | | | | 60 | 100 | 104 | 181 | 274 | 18.4 | 28.0 | 1.16 |
| KHG2-60R KHG2-60L | | 60 | R L | | | | | | | | | | | | | | | | 65 | 120 | 124 | 225 | 408 | 22.9 | 41.7 | 1.65 |
| KHG2-70R KHG2-70L | | 70 | R L | | | | | | | | | | | | | | | | 70 | 140 | 144 | 269 | 572 | 27.4 | 58.3 | 2.21 |
| KHG2-80R KHG2-80L | | 80 | R L | | | | | | | | | | | | | | | | 80 | 160 | 164 | 301 | 732 | 30.7 | 74.7 | 2.93 |

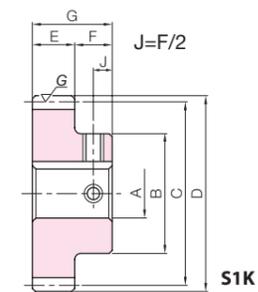
[Caution on Secondary Operations] ① Because of the influence of hardening residual stress, avoid removing the entire boss, as it may cause the gears to deform.

Usable in the assembly distance of the spur gear.

KHG ground helical gears use a "transverse" module. The assembly distance is the same as spur gear pairs with the same module and number of teeth. Improved strength and low noise: Take the next step up from spur gears.



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. | | | | | | | | | | | | | | | |
|------------------------|--|-------|----|----|-------|----|----|-------|----|----|--------|-----|--------|----|--------|----|
| | 12 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 22 | 25 | 28 | 30 | 32 | 35 | 40 | 45 |
| Keyway J _{S9} | 4x1.8 | 5x2.3 | | | 6x2.8 | | | 8x3.3 | | | 10x3.3 | | 12x3.3 | | 14x3.8 | |
| Screw size | M4 | | | M5 | | | M6 | | | M8 | | M10 | | | | |
| Catalog Number | [Grid of product availability with background shading] | | | | | | | | | | | | | | | |

[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.

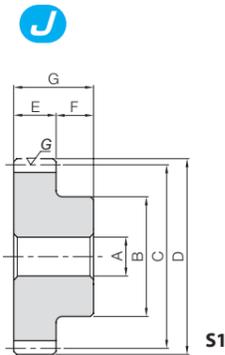
ZAHNRAD24.COM
 Tel +49 (0)9280-7390088
 info@zahnrad24.com

HAHN
 FEINWERKTECHNIK GmbH
 Oberes Dorf 1
 95152 Selbitz



| Specifications | |
|---------------------------|--|
| Precision grade | JIS grade N6 (JIS B1702-1: 1998)* |
| Reference section of gear | Rotating plane |
| Gear teeth | Standard full depth |
| Transverse pressure angle | 20° |
| Helix angle | 21°30' |
| Material | SCM440 |
| Heat treatment | Thermal refined, 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).



| Catalog Number | Module | No. of teeth | Direction of helix | Shape | Bore | | Hub dia. | Pitch dia. | Outside dia. | Face width | Hub width | Total length | Allowable torque (N·m) | | Allowable torque (kgf·m) | | Backlash (mm) | Weight (kg) | | | | | | | | | |
|--------------------------|--------|--------------|--------------------|--------|-----------------|----|----------|------------|--------------|------------|-----------|--------------|------------------------|--------------------|--------------------------|--------------------|---------------|-------------|------|--|-----|------|------|------|-----------|------|------|
| | | | | | A _{H7} | B | | | | | | | Bending strength | Surface durability | Bending strength | Surface durability | | | | | | | | | | | |
| KHG2.5-18R KHG2.5-18L | m2.5 | 18 | R L | S1 | 15 | 38 | 45 | 50 | 20 | 14 | 34 | | 94.9 | 58.6 | 9.68 | 5.97 | 0.10~0.20 | 0.33 | | | | | | | | | |
| KHG2.5-20R KHG2.5-20L | | 20 | R L | | 18 | 40 | 50 | 55 | | | | | 111 | 75.0 | 11.3 | 7.65 | | | 0.38 | | | | | | | | |
| KHG2.5-26R KHG2.5-26L | | 26 | R L | | 20 | 50 | 65 | 70 | | | | | 160 | 135 | 16.3 | 13.7 | | | 0.65 | | | | | | | | |
| KHG2.5-40R KHG2.5-40L | | 40 | R L | | 25 | 70 | 100 | 105 | | | | | 268 | 335 | 27.3 | 34.1 | | | 1.53 | | | | | | | | |
| KHG2.5-48R KHG2.5-48L | | 48 | R L | | | 75 | 120 | 125 | | | | | 336 | 500 | 34.2 | 51.0 | | | 2.13 | | | | | | | | |
| KHG2.5-60R KHG2.5-60L | | 60 | R L | | | 80 | 150 | 155 | | | | | 439 | 815 | 44.8 | 83.2 | | | 3.20 | | | | | | | | |
| KHG3-16R KHG3-16L | | m3 | 16 | | R L | S1 | 18 | 38 | | | | | 48 | 54 | 25 | 16 | | | 41 | | 143 | 80.5 | 14.6 | 8.21 | 0.10~0.20 | 0.42 | |
| KHG3-18R KHG3-18L | | | 18 | | R L | | | 40 | | | | | 54 | 60 | | | | | | | 171 | 106 | 17.4 | 10.8 | | | 0.53 |
| KHG3-20R KHG3-20L | | | 20 | | R L | | | 50 | | | | | 60 | 66 | | | | | | | 199 | 136 | 20.3 | 13.9 | | | 0.70 |
| KHG3-24R KHG3-24L | | | 20 | | 24 | | R L | 58 | | | | | 72 | 78 | | | | | | | 258 | 206 | 26.3 | 21.0 | | | 1.03 |
| KHG3-28R KHG3-28L | 28 | | | R L | 70 | | 84 | 90 | 318 | 290 | 32.4 | 29.6 | 1.47 | | | | | | | | | | | | | | |
| KHG3-30R KHG3-30L | 30 | | | R L | 75 | | 90 | 96 | 349 | 339 | 35.5 | 34.5 | 1.65 | | | | | | | | | | | | | | |
| KHG3-35R KHG3-35L | 25 | | 35 | R L | 80 | | 105 | 111 | 407 | 456 | 41.5 | 46.5 | 2.17 | | | | | | | | | | | | | | |
| KHG3-36R KHG3-36L | | | 36 | R L | 80 | | 108 | 114 | 422 | 485 | 43.1 | 49.5 | 2.27 | | | | | | | | | | | | | | |
| KHG3-40R KHG3-40L | | | 40 | R L | 80 | | 120 | 126 | 483 | 613 | 49.2 | 62.5 | 2.69 | | | | | | | | | | | | | | |
| KHG3-45R KHG3-45L | | | 45 | R L | 80 | | 135 | 141 | 559 | 795 | 57.0 | 81.0 | 3.28 | | | | | | | | | | | | | | |
| KHG3-48R KHG3-48L | 30 | | 48 | R L | 85 | | 144 | 150 | 604 | 916 | 61.6 | 93.4 | 3.75 | | | | | | | | | | | | | | |
| KHG3-50R KHG3-50L | | | 50 | R L | 85 | | 150 | 156 | 635 | 1000 | 64.8 | 102 | 3.95 | | | | | | | | | | | | | | |
| KHG3-60R KHG3-60L | | | 60 | R L | 90 | | 180 | 186 | 757 | 1430 | 77.2 | 146 | 5.57 | | | | | | | | | | | | | | |

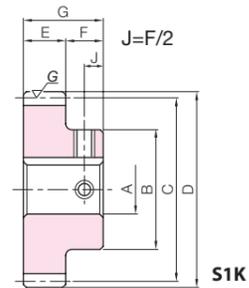
[Caution on Secondary Operations] ① Because of the influence of hardening residual stress, avoid removing the entire boss, as it may cause the gears to deform.

Usable in the assembly distance of the spur gear.

KHG ground helical gears use a "transverse" module. The assembly distance is the same as spur gear pairs with the same module and number of teeth. Improved strength and low noise: Take the next step up from spur gears.



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. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|---|----|----|-------|----|----|-------|----|----|--------|----|--------|----|--------|----|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | 15 | 16 | 17 | 18 | 19 | 20 | 22 | 25 | 28 | 30 | 32 | 35 | 40 | 45 | 50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Keyway J _{S9} | 5x2.3 | | | 6x2.8 | | | 8x3.3 | | | 10x3.3 | | 12x3.3 | | 14x3.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Screw size | M4 | | | M5 | | | M6 | | | M8 | | M10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Catalog Number | <table border="1"> <tr><td>KHG2.5-18R J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-18L J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-20R J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-20L J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-26R J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-26L J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-40R J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-40L J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-48R J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-48L J BORE</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td>KHG2.5-60R J 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| KHG2.5-40R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG2.5-40L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG2.5-48R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG2.5-48L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG2.5-60R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG2.5-60L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-16R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-16L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-18R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-18L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| KHG3-20L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-24R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-24L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-28R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-28L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-30R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-30L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-35R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-35L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| KHG3-36L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-40R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-40L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-45R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-45L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-48R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-48L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-50R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-50L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-60R J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KHG3-60L J BORE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

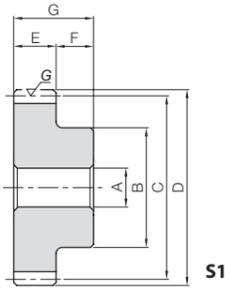
[Caution on J series] ① Cancellation is not possible for made-to-order products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.





| Specifications | |
|---------------------------|--|
| Precision grade | JIS grade N6 (JIS B 1702-1: 1998)* |
| Reference section of gear | Rotating plane |
| Gear teeth | Standard full depth |
| Transverse pressure angle | 20° |
| Helix angle | 21°30' |
| Material | SCM440 |
| Heat treatment | Thermal refined, gear teeth induction hardened** |
| Tooth hardness | 50 to 60HRC |
| Surface treatment | - |

* 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).

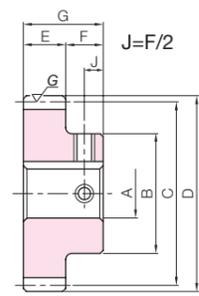


S1

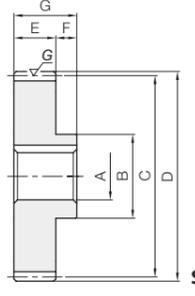


Usable in the assembly distance of the spur gear.

KHG ground helical gears use a "transverse" module. The assembly distance is the same as spur gear pairs with the same module and number of teeth. Improved strength and low noise: Take the next step up from spur gears.



S1K



S1SK

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

| Catalog Number | Module | No. of teeth | Direction of helix | Shape | Bore | | | | | | | Allowable torque (N·m) | | Allowable torque (kgf·m) | | Backlash (mm) | Weight (kg) | | | | | | | |
|------------------------|--------|--------------|--------------------|-------|-----------------|-----|-----|-----|-----|-----|-----|------------------------|--------------------|--------------------------|--------------------|---------------|-------------|-----|----|----|----|------|-----------|------|
| | | | | | A _{H7} | B | C | D | E | F | G | Bending strength | Surface durability | Bending strength | Surface durability | | | | | | | | | |
| KHG4-18RS KHG4-18LS | m4 | 18 | R | S1 | 20 | 60 | 72 | 80 | 32 | 25 | 57 | 389 | 244 | 39.7 | 24.9 | 0.10~0.20 | 1.44 | | | | | | | |
| KHG4-20RS KHG4-20LS | | | L | | | | | | | | | | | | | | | 65 | 80 | 88 | | | | |
| KHG4-25RS KHG4-25LS | | 20 | R | | | 80 | 100 | 108 | | | | | | | | | | | | | | | | |
| KHG4-30RS KHG4-30LS | | | L | | | | | | | | | 120 | 128 | | | | | | | | | | | |
| KHG4-36RS KHG4-36LS | | 25 | R | | | 90 | 144 | 152 | | | | | | | | | | | | | | | | |
| KHG4-40RS KHG4-40LS | | | L | | | | | | | | | 160 | 168 | | | | | | | | | | | |
| KHG4-50RS KHG4-50LS | | 30 | R | | 100 | 200 | 208 | | | | | | | | | | | | | | | | | |
| KHG4-60RS KHG4-60LS | | | L | | | | | 110 | | | | 240 | 248 | | | | | | | | | | | |
| KHG5-18RS KHG5-18LS | | m5 | 18 | | R | S1 | 25 | | | | | | | 70 | 90 | | | 100 | 40 | 25 | 65 | 759 | 484 | 77.4 |
| KHG5-20RS KHG5-20LS | | | | | L | | | 82 | | | | 100 | 110 | | | | | | | | | | | |
| KHG5-25RS KHG5-25LS | | | 25 | | R | | | | | | | | | 105 | 125 | | | 135 | | | | | | |
| KHG5-30RS KHG5-30LS | | | | | L | | | 120 | | | | 150 | 160 | | | | | | | | | | | |
| KHG5-36RS KHG5-36LS | 30 | | R | 130 | 180 | | | | 190 | | | | | | | | | | | | | | | |
| KHG5-40RS KHG5-40LS | | | L | | | | | 140 | | 200 | 210 | | | | | | | | | | | | | |
| KHG5-50RS KHG5-50LS | 30 | | R | 150 | 250 | | 260 | | | | | | | | | | | | | | | | | |
| KHG5-60RS KHG5-60LS | | | L | | | | | 300 | 310 | | | | | | | | | | | | | | | |
| KHG6-18RS KHG6-18LS | m6 | | 18 | R | S1 | | 25 | | | 80 | 108 | 120 | 48 | 28 | 76 | 1310 | 848 | 134 | | | | 86.5 | 0.10~0.22 | 4.26 |
| KHG6-20RS KHG6-20LS | | | | L | | | | 100 | 120 | | | | | | | | | | | | | | | |
| KHG6-25RS KHG6-25LS | | | 25 | R | | | | | | 125 | 150 | 162 | | | | | | | | | | | | |
| KHG6-30RS KHG6-30LS | | | | L | | | | 150 | 180 | | | | | | | 192 | | | | | | | | |
| KHG6-36RS KHG6-36LS | | 30 | R | 160 | | 216 | | | | 228 | | | | | | | | | | | | | | |
| KHG6-40RS KHG6-40LS | | | L | | | | | 170 | 240 | | 252 | | | | | | | | | | | | | |
| KHG6-50RS KHG6-50LS | | 40 | R | 300 | | 312 | | | | | | | | | | | | | | | | | | |
| KHG6-60RS KHG6-60LS | | | L | | | | 360 | 372 | | | | | | | | | | | | | | | | |

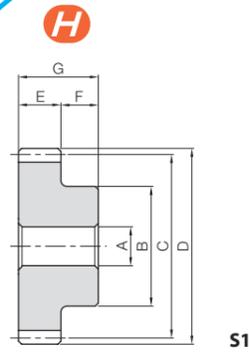
| Bore H7 | * The product shapes of J Series items are identified by background color. | | | | | | | | | | | | | | | | | | | | | |
|------------------------|--|----|----|-------|----|----|--------|--------|--------|--------|--------|----|-----|--------|--------|--------|----|----|--------|-----|-----|-----|
| | 20 | 22 | 25 | 28 | 30 | 32 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 |
| Keyway J _{S9} | 6x2.8 | | | 8x3.3 | | | 10x3.3 | 12x3.3 | 14x3.8 | 16x4.3 | 18x4.4 | | | 20x4.9 | 22x5.4 | 25x5.4 | | | 28x6.4 | | | |
| Screw size | | | | | | | | | | | | | | | | | | | | | | |
| Catalog Number | M5 | | | M6 | | | M8 | | | M10 | | | M12 | | | M16 | | | M20 | | | |
| KHG4-18RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-18LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-20RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-20LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-25RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-25LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-30RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-30LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-36RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-36LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-40RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-40LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-50RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-50LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-60RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG4-60LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-18RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-18LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-20RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-20LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-25RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-25LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-30RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-30LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-36RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-36LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-40RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-40LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-50RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-50LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-60RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG5-60LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-18RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-18LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-20RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-20LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-25RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-25LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-30RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-30LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-36RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-36LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-40RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-40LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-50RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-50LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-60RS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |
| KHG6-60LS J BORE | Ask for Quote | | | | | | | | | | | | | | | | | | | | | |

[Caution on Product Characteristics] ① Products with S at the end of the catalog number are semi-custom stock products. See page 42 for lead times and allowable order quantities. See page 44 for other precautions.
 ② For S semi-custom standard products weighing 15 kg or more, eyebolt screw threads (2-M12 depth 25 mm) are machined around the outside of the hub side surface. Details of the PCD of the screw threads are located on page 193.
 [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.

[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.



| Specifications | |
|---------------------------|---------------------------------|
| Precision grade | JIS grade N8 (JIS B1702-1:1998) |
| Reference section of gear | Normal plane |
| Gear teeth | Standard full depth |
| Normal pressure angle | 20° |
| Helix angle | 15° |
| Material | S45C |
| Heat treatment | — |
| Tooth hardness | (less than 194HB) |
| Surface treatment | Black oxide coating |



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 info@zahnrad24.com

HAAH
 FEINWERKTECHNIK GmbH
 Oberes Dorf 1
 95152 Selbitz

H To order Hardened Plus, please specify **Catalog No. + H**. Example: **SH2-15RH**

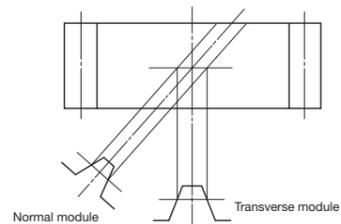
| Catalog Number | Module | No. of teeth | Direction of helix | Shape | Bore | Hub dia. | Pitch dia. | Outside dia. | Face width | Hub width | Total length |
|--------------------|--------|--------------|--------------------|-------|-----------------|----------|------------|--------------|------------|-----------|--------------|
| | | | | | A _{H7} | B | C | D | E | F | G |
| SH2-15R SH2-15L | m2 | 15 | R L | S1 | 12 | 24 | 31.06 | 35.06 | 25 | 10 | 35 |
| SH2-20R SH2-20L | | 20 | R L | | 12 | 32 | 41.41 | 45.41 | | | |
| SH2-30R SH2-30L | | 30 | R L | | 12 | 50 | 62.12 | 66.12 | | | |
| SH2-40R SH2-40L | | 40 | R L | | 18 | 60 | 82.82 | 86.82 | | | |
| SH2-60R SH2-60L | | 60 | R L | | 18 | 70 | 124.23 | 128.23 | | | |
| SH3-15R SH3-15L | m3 | 15 | R L | S1 | 15 | 36 | 46.59 | 52.59 | 35 | 15 | 50 |
| SH3-20R SH3-20L | | 20 | R L | | 15 | 50 | 62.12 | 68.12 | | | |
| SH3-30R SH3-30L | | 30 | R L | | 20 | 70 | 93.17 | 99.17 | | | |
| SH3-40R SH3-40L | | 40 | R L | | 20 | 80 | 124.23 | 130.23 | | | |
| SH3-60R SH3-60L | | 60 | R L | | 20 | 140 | 186.35 | 192.35 | | | |

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

| Allowable torque | | | | | | Backlash (mm) | Weight (kg) | Catalog Number |
|------------------|-------|--------------------|-------|-----------------------------|-------|---------------|-------------|--------------------|
| Bending strength | | Surface durability | | Surface durability H | | | | |
| N·m | kgf·m | N·m | kgf·m | N·m | kgf·m | | | |
| 43.7 | 4.46 | 2.90 | 0.30 | 13.7 | 1.40 | 0.12~0.26 | 0.15 | SH2-15R SH2-15L |
| 67.1 | 6.84 | 5.85 | 0.60 | 27.2 | 2.78 | | 0.30 | SH2-20R SH2-20L |
| 117 | 11.9 | 15.3 | 1.56 | 69.8 | 7.12 | | 0.72 | SH2-30R SH2-30L |
| 169 | 17.2 | 28.9 | 2.95 | 130 | 13.3 | | 1.21 | SH2-40R SH2-40L |
| 275 | 28.0 | 70.8 | 7.22 | 310 | 31.6 | | 2.61 | SH2-60R SH2-60L |
| 138 | 14.0 | 9.67 | 0.99 | 44.8 | 4.57 | 0.14~0.32 | 0.52 | SH3-15R SH3-15L |
| 211 | 21.6 | 19.4 | 1.98 | 88.7 | 9.05 | | 0.99 | SH3-20R SH3-20L |
| 368 | 37.5 | 50.2 | 5.12 | 225 | 22.9 | | 2.20 | SH3-30R SH3-30L |
| 531 | 54.1 | 95.5 | 9.73 | 418 | 42.6 | | 3.80 | SH3-40R SH3-40L |
| 866 | 88.3 | 236 | 24.0 | 993 | 101 | | 9.18 | SH3-60R SH3-60L |

Reference Section of Gears

Transverse module (SH helical gears) and normal module (KHG ground helical gears) are available for the gear teeth according to the gear reference cross section. Even if products have the same helix angle and module, transverse and normal module gears have different gear teeth and thus are not interchangeable.



* Above is for illustration purposes only and differs from actual tooth forms.

Center Distance Table of SH Helical Gears

| Catalog Number | SH2-15 ^R _L | SH2-20 ^R _L | SH2-30 ^R _L | SH2-40 ^R _L | SH2-60 ^R _L |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| SH2-15 ^R _L | 31.06 | — | — | — | — |
| SH2-20 ^R _L | 36.23 | 41.41 | — | — | — |
| SH2-30 ^R _L | 46.59 | 51.76 | 62.12 | — | — |
| SH2-40 ^R _L | 56.94 | 62.12 | 72.47 | 82.82 | — |
| SH2-60 ^R _L | 77.65 | 82.82 | 93.17 | 103.53 | 124.23 |

Center Distance Table of SH Helical Gears

| Catalog Number | SH3-15 ^R _L | SH3-20 ^R _L | SH3-30 ^R _L | SH3-40 ^R _L | SH3-60 ^R _L |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| SH3-15 ^R _L | 46.59 | — | — | — | — |
| SH3-20 ^R _L | 54.35 | 62.12 | — | — | — |
| SH3-30 ^R _L | 69.88 | 77.65 | 93.17 | — | — |
| SH3-40 ^R _L | 85.41 | 93.17 | 108.70 | 124.23 | — |
| SH3-60 ^R _L | 116.47 | 124.23 | 139.76 | 155.29 | 186.35 |

KHG Ground Helical Gears



Precision: JIS Grade N6
Material: SCM440
Heat Treatment: Thermal refined / gear teeth induction hardened
Module: m1 to 6

Please see Page 196 for more details.

KRHG/KRHGF/KRHGFD Ground Helical Racks

Precision: KHK Grade 1
Material: SCM440
Heat Treatment: Thermal refining only
Module: m1 to 3
Nominal Total Length: 100, 500, 1,000 mm



Please see Page 258 for more details.

SH Helical Gears



Precision: JIS Grade N8
Material: S45C
Heat Treatment: -
Module: m2, 3

Please see Page 204 for more details.

SRH·SRHF·SRHFD Helical Racks

Precision: KHK Grade 5
Material: S45C
Heat Treatment: -
Module: m2, 3
Nominal Total Length: 100, 1,000 mm



Please see Page 258 for more details.

ZSTP Ground Helical Gears Dedicated for racks



Precision: JIS Grade N6
Material: SCM440
Heat Treatment: Thermal refined / gear teeth induction hardened
Module: m2 to 6

Please see Page 266 for more details.

SHE Helical Gears Dedicated for racks

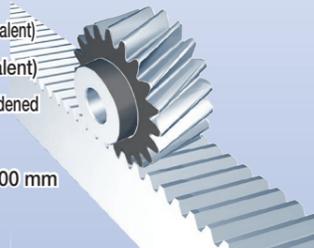


Precision: JIS Grade N8
Material: S45C
Heat Treatment: -
Module: m1.5 to 6

Please see Page 264 for more details.

ZST/ZSTD Hardened Ground Helical Racks

Precision: DIN Grade 6 (KHK Grade 2 equivalent)
Material: DIN C45 (JIS S45C equivalent)
Heat Treatment: Gear teeth induction hardened
Module: m2 to 6
Nominal Total Length: 1,000, 2,000 mm



Please see Page 266 for more details.

SRHEF Helical Racks

Precision: KHK Grade 4
Material: S45C
Heat Treatment: -
Module: m1.5 to 6
Nominal Total Length: 1,000 mm



Please see Page 264 for more details.

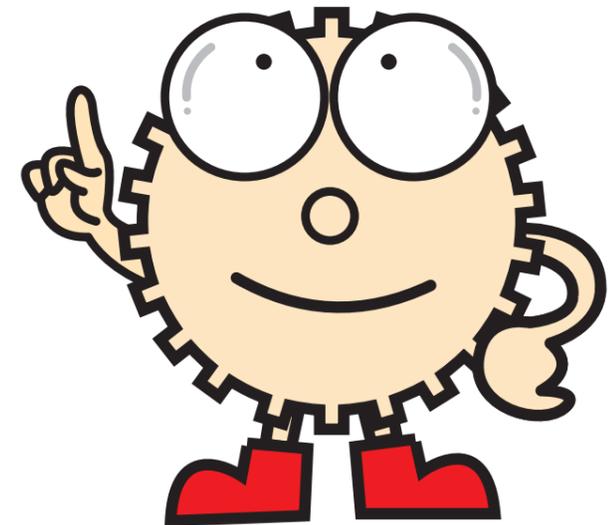


Internal Gears

| SI Steel Internal Gears | SIR Internal Ring Gears |
|---|---|
|  |  |
| Material: S45C m0.5-2.5 Page 210 | Material: S45C m2-3 Page 212 |

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Catalog Number of KHK Stock Gears

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

(Example) Internal Gears

S I R 2 - 120

