

High performance, low installation effort

Oriental Motor develops a gearhead with high torque and high radial load

The new CS gearheads from Oriental Motor have a significantly higher permissible torque than conventional spur gearheads. This is made possible by an innovative design. As a result, users can now utilise the drive technology specialist's motors in an even wider range of machines and systems.



Fig. 1: PKP Series stepper motors from Oriental Motor with CS gearhead

With the development of the CS gearheads, Oriental Motor is responding to the increasing demand on the market for drives with high permissible torque. In 2021, the company presented its PKP Series of high-torque motors, which were developed precisely for these requirements. PKP stepper motors offer up to 70 per cent higher torque than comparable drives of the same size. The larger winding diameter also reduces heat generation and power loss. By using PKP steppers, machine manufacturers also have the option of designing their systems to be significantly more compact.

Denser winding increases the torque

The higher torque and even better vibration behaviour of the PKP stepper motors was achieved primarily by reducing the air gap between the teeth of the stator and the rotor. Oriental Motor's research had shown that reducing the gap by 10 microns increases the torque by around 5 per cent. Optimising the winding density by 8 per cent also contributes to the increase in torque.

Drives are suitable for many applications

Stepper motors in the PKP Series have a resolution of 200, 400, 500 or 1000 steps per revolution and holding torques between 0.0075 and 9.5 Nm. The drives are available with flange dimensions from 13 to 85 mm - many of them are available with various options. Oriental Motor also supplies the stepper motors with an electromagnetic brake, encoder, gearhead or as flat drives with a particularly short motor length, for example. The basic step angle for the 2-phase stepper motors is 1.8° and 0.72° for the 5-phase motors. Special versions with high resolution are also available, which halve the basic step angle to 0.9° or 0.36°. These motor variants are preferably used in applications where very smooth running is required. Drives from

the PKP Series are installed in medical devices as well as in CNC milling machines, scanners, cameras, labelling systems and conveyor systems with high torque requirements at low speeds.

CS gearhead facilitates attachment of accessories

Oriental Motor now offers the stepper motors of the PKP Series with a new CS gearhead. This is a further development of a spur gearhead. The new design offers a clear advantage over the conventional design of such a gearhead. Until now, helical gearheads have been designed in such a way that the gearhead output shaft is mounted offset to the motor output shaft. When designing the flange, the offset between the motor output shaft and the gearhead output shaft must therefore be taken into account. This increases the effort required to integrate the gearhead into the application or to connect the gearhead to the drive.

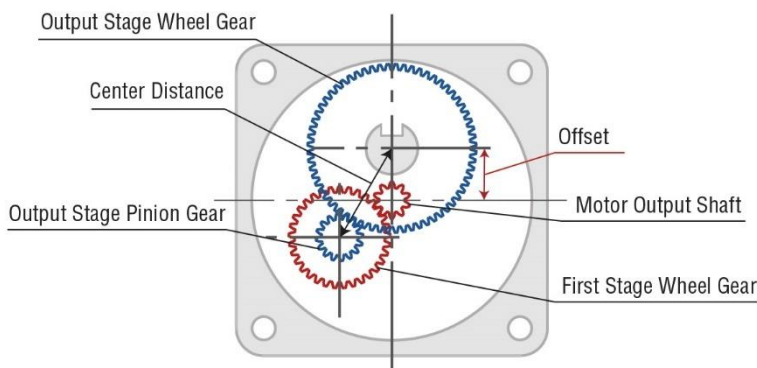


Fig. 2: Arrangement of the gears in the spur gearhead

With the CS gearhead, on the other hand, the output shaft is located in the centre of the flange or mounting surface: This makes it much easier to attach accessories than with classic spur gearheads.

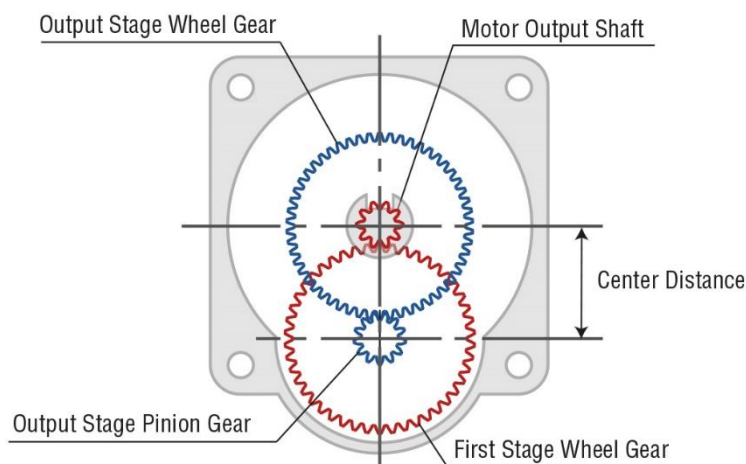


Fig. 3: Arrangement of the gears in the CS gearhead

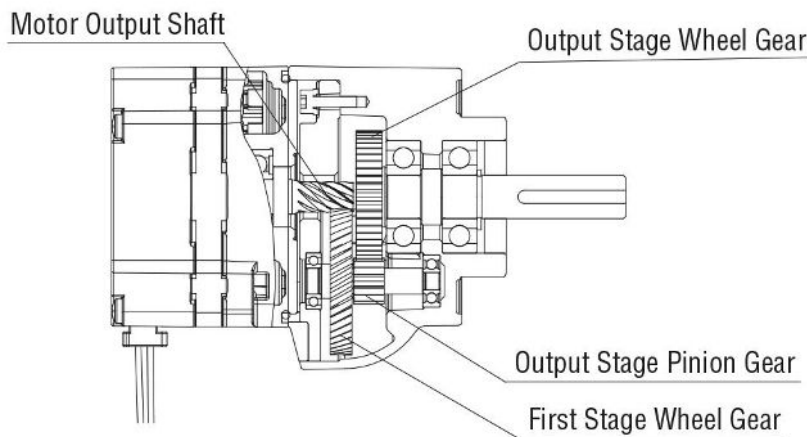


Fig. 4: Cross-section of the CS gearhead

Gear ratio is limited for spur gearheads

Conventional spur gearheads are also designed so that the gearhead housing fits into the projection plane of the motor frame size. If an attempt is made to combine this design with a concentric shaft structure, the centre distance between the motor output shaft and the first stage gear pair is limited. As a result, the centre distance of all gear pairs is short and the output stage gear has a small diameter. This makes it difficult to design spur gearheads with a transmission ratio >10 or to transmit high torques with them.

Larger centre distance of the gear wheels

To overcome this disadvantage, the engineers at Oriental Motor added a protrusion to the housing of their new CS gearhead. It provides space for a gearwheel so that the installation space inside the gearhead could be extended. This design measure increases the centre-to-centre distance of the gear pairs and the diameter of the gear wheel of the transmission output stage. The larger gear wheel in turn enables the transmission ratio to be increased to 20 and allows a high torque to be transmitted.

With the CS gearhead, it was also possible to reduce the number of mounting parts required because the bearings of the output shaft are only supported by the gearhead housing. Conventional spur gearheads require an additional intermediate flange for this purpose. This can be omitted with the CS gearhead.

Fewer components required

However, the new CS gearhead not only has advantages over pure spur gearheads. It also requires significantly fewer components than planetary gearheads. A planetary gearhead requires a large number of bearings to support the planetary gears. In addition, high-precision ring gear machining is required. However, as the new CS

gearhead is based on a spur gearhead, the design requires fewer parts and production takes considerably less time.

Conventional CS gearheads with planetary gears must also be combined with a different motor for each desired transmission ratio. This is due to the fact that the specifications of the motor output shaft for these gearheads have to be changed for each transmission ratio. A separate motor is therefore required for each transmission ratio. The new CS gearhead, on the other hand, makes it possible to use a single motor for different applications, as it delivers different transmission ratios.

Significantly higher torques and radial loads

With the new CS gearhead, Oriental Motor has not only completely revised the design of standard spur gearheads. The gearheads have also been heat-treated. This measure has enabled the permissible torque to be increased by a factor of two compared to the SH gearhead.

By increasing the centre distance of the gear pairs, it was also possible to enlarge the bearings so that the permissible radial load could be increased by up to four times compared to the SH gearheads from Oriental Motor. This enables a higher belt tension - which is particularly important when high forces are to be transmitted by the belt drive.

Application range of stepper motors extended

With the new CS gearhead, Oriental Motor is significantly expanding the application areas of its PKP stepper motors. In addition to a concentric shaft, machine builders can now realise even higher permissible torques and radial loads. The stepper motors in the PKP series are ideal for all applications with regular start and stop processes - e.g. in wafer production or in labelling systems.

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