Press release

Ball screw drives with nut cooling for machine tools – Improved precision and longer service life

Hornberg, Germany, August 2019. Kammerer Gewindetechnik GmbH has developed ball screw drives with cooled nut for use in machine tools. The cooled nut makes it easier to cool the ball screw drive. This improves the precision and prolongs the service life of the ball screw drives permanently and enables machine tools to work at greater speeds and with greater precision. Kammerer will present the new ball screw drives at EMO 2019 exhibition in Hannover.

In order to reduce heat generation during operation, Kammerer has continued development of its ball screw drives with driven nut. The choice of materials for the installed parts has been optimised in respect of thermal properties. To this end, particular consideration was given to the thermosymmetrical construction of the parts and thermal decoupling. Cooling of the axes and of the machine is variably controllable. The spring-biased stretching of the ball screw drives and the cooling bore in the spindle and nut minimise axis displacement. The linear shift of the axes is compensated by a direct path measuring system.

"The partial heating of certain areas of the spindle which occurs in some sections as a result of reversing movements can only be achieved by temperature regulation", explains Reinhard Besenbeck, Technical Director and Product Manager for Ball Screw Drives with Kammerer at Hornberg in the Black Forest (Germany). "For example, a temperature difference of 5 degrees Celsius and an assumed deflection distance of 100 mm results in distortion of 5.5 µm between the nut and the spindle. This increases the preload and therewith the temperature into undesirable ranges. This in turn all leads to service life losses, vibration and neutralization of the preload in the ball contact area. In order to lower energy costs, an average temperature should be determined and set, at which only the smallest amount of energy is needed – this does not necessarily have to be 21 degrees Celsius. The spiral cooling channel on the circumference of the nut housing conducts the generated heat away from the region of the bearing and the ball contact. Because the primary heat sources are load, rotating speed and preload. The same applies for the four mounted axial and radial bearings, which act on the compact nut housing. The new construction improves the precision and lengthens the service life of the ball screw drive permanently!"

Besides reduced heat generation, the ball screw drives are also notable for generating less noise: The hard skiving process during production developed by Kammerer results in demonstrably reduced noise generation during operation. The drive concept for the driven cooled nut enables high linear speeds with a long effective stroke of the ball screw drives. Together with a steep pitch, it is possible to reach speeds of over 120 m/min, under ideal conditions rotating speeds as high as 4000 rpm are possible. This in turn means that cycle times can be improved in case of long travel lengths. The preloaded spindle system increases overall rigidity in the drivetrain. The bend-critical speed is unlimited. Spindles can be accelerated by up to 30 m/sec². And existing rotating speed limits can be raised further still by using hybrid bearings and ceramic balls. The increased dynamics of the ball screw drives directly increases the productivity of the machine tool.

Ball screw drives with cooled nut are available with diameters ranging from 16 mm to 160 mm with various pitches. Besides machine tools such as portal milling machines or broaching machines, possible application areas include plastic injection moulding machines, lifting and assembly equipment for aircraft and rail vehicles, and other lifting and hoisting devices. Kammerer ball screw drives are manufactured in Hornberg in the Black Forest and marketed all over the world.

Image:
Ball screw drive by Kammerer with cooled driven nut, here with opening in the cooling housing for illustrative purposes: the cooling medium circulates in the spiral and dissipates heat from bearing friction and the ball contact region.

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Kammerer at EMO 2019:

16 to 21 September 2019, Hannover, Germany: Hall 7 Stand E36

Company information:

Kammerer Gewindetechnik GmbH manufactures quality ball screws in the Black Forest town of Hornberg, Germany. Established in 1938, Kammerer is a family-run business with today 180 employees. The product range includes ball screws, trapezoidal ball screws, custom assemblies and complete systems. Kammerer offers all manufacturing processes for the production of threads. The products are used throughout the world in machine tools, general mechanical engineering, precision engineering, handling automation, robotics, medical equipment, the automotive and aerospace industry.

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