

CAN-based monitoring system for spindle bearings

Schaeffler's Spindle-Sense monitoring system reduces downtimes and increases utilization of machine capacity. The variant C-A1 outputs the measurements via CAN.

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The spindle bearing monitor system comprises distance sensors (1), an evaluation unit (2), and the cable with CAN connectivity (3)
(Source: Schaeffler)

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The main spindle is crucial to the performance capability of the complete machine tool. It is at the heart of the machine and largely defines the achievable cutting capacity, surface quality, and precision. In turn, the spindle bearing support is one of the most heavily loaded components because it must transmit machining forces precisely at very high speeds for long periods of time and the risk of collisions can never be ruled out. It therefore comes as no surprise that the majority of machine tool downtimes can be traced back to defective spindles, particularly as a result of collisions and continuous, undetected overloads. In milling operation, for example, the combination of high radial loads, long tool protrusions, and high speeds leads to particularly high loads and unfavorable kinematic conditions on the spindle bearing in the vicinity of the tool. These unfavorable and in some cases impermissible loads occur because operators have hitherto not had a suitable tool, with which they could monitor borderline loads on spindle bearings. Schaeffler has now solved this problem with its new Spindle-Sense monitoring system.

Ready for volume production

The first production-ready SRS sensor ring units, including radial and axial measuring ring, with an inside diameter of 70 mm is available for customers to test in practical applications to coincide with EMO 2019. Additional sizes with inside 80-mm and 100-mm diameter will be available at the end of the year. All units have a standard width of 16 mm. The scope of delivery includes an SST setup service tool, with which the product can be parameterized and put into operation.

The sensor system integrated into the spindle bearing measures the displacement of the spindle shaft under load in a very high resolution and in five spatial directions – three translational and two rotatory. The sensor ring transmits an electrical warning signal to the machine's control system if the deflections measured on the rolling elements exceed a specific threshold, which is set individually for every spindle and machine type. The threshold is based on an assessment of operation-related bearing parameters such as pressure, spin/roll ratio, and cage pocket clearance, into which Schaeffler has integrated its many years of expertise in rolling bearings.

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