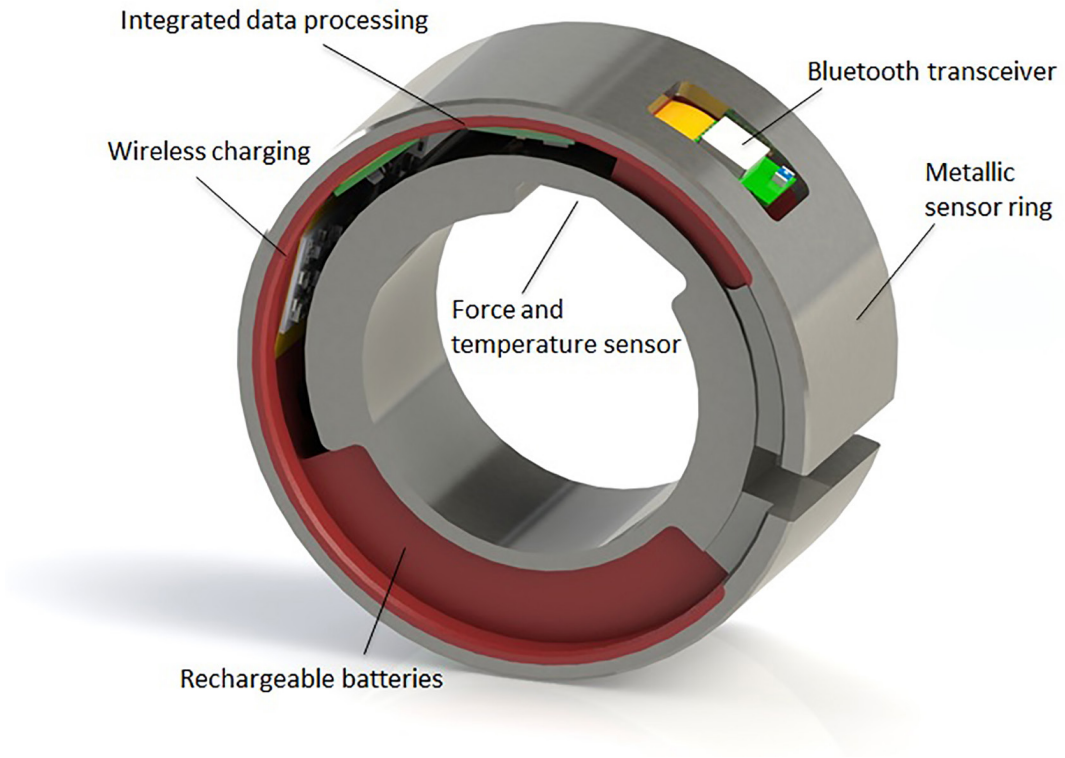
Structure-integrated wireless sensor nodes for production equipment

Figure 1



A self-organizing, user-oriented and demand-driven automated production (Industry 4.0) requires a large variety of connected, structure-integrated sensors. These devices must be robust, have a small form factor and should communicate wirelessly. A promising approach is the functional and structural integration of microelectronic and micromechanical devices and subsystems into the equipment.

Implementing such sensor nodes is often challenging, as the components to be monitored are located inside the machinery and are difficult to access. Therefore, miniaturized, cross-linked, and energy-efficient devices for data acquisition, processing and transmission must be implemented and integrated directly into the structures of the equipment's mechanical drives and components. This becomes especially critical when retrofitting und integrating sensor nodes is required to upgrade existing tools.

We have built-up a development kit for structure-integrated wireless sensor nodes. As an exemplary use case, we have implemented and tested an intelligent ball screw drive with a built-in sensor ring (see Figure 1).

We realize for our customer:

1. application-specific concepts based on customer workshops and on-site analysis,
2. feasibility studies and evaluation of system-concepts,
3. in-lab validation and test of e.g. MEMS-based sensor solutions,
4. demonstrators for customer evaluation and prototypes

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We support our customers in:

1. selection and analysis of sensor data
2. setup of production chain (with focus on microelectronics and MEMS technologies)
3. reliability testing and failure analysis

Targeted applications:

1. condition monitoring
2. predictive maintenance
3. adaptive process control

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