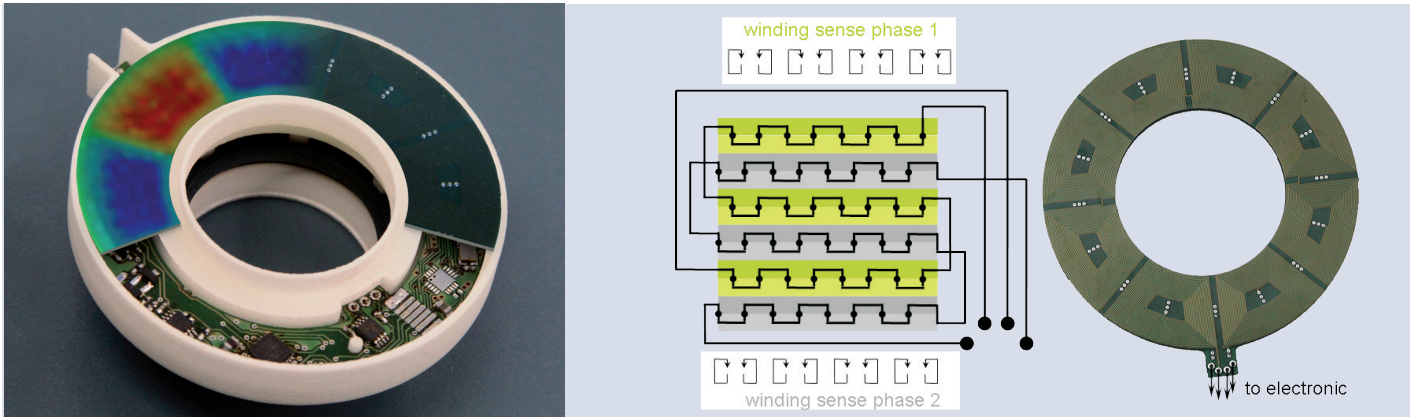


# SENSOR INTEGRATION WITH AUTARKIC POWER SUPPLY INTO A SIMMERRING



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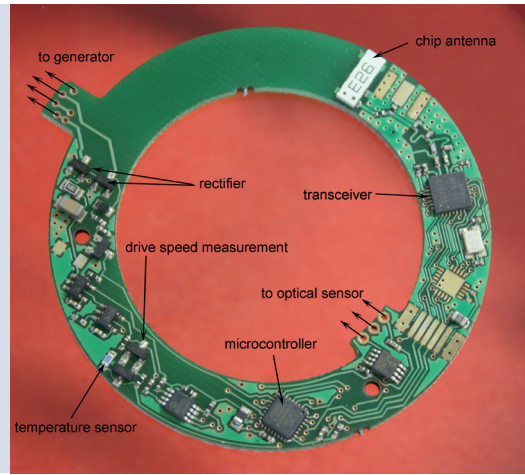
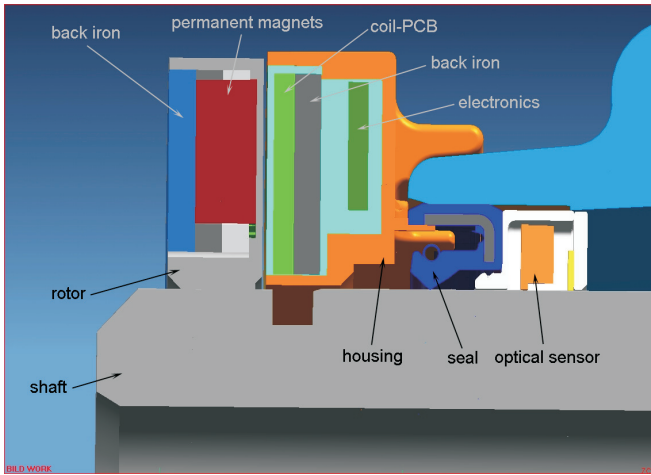
## Condition monitoring of engines

Current industrial trends in mechanical engineering and plant manufacturing address engines condition monitoring mainly to minimizing system failures. Appropriate machine elements therefore are seals since they can be found in nearly every machine. At this point, informations such as impermeability, temperature of the sealing lip or wastage of the seal, are important reliability parameters. Measuring these parameters preventive ensures a trouble-free working of the machine, and avoids cost-intensive down time or failures. The implementation of sensors, electronics for signal conditioning, wireless signal transmission (necessary due to rotating parts) and self-sustaining power supply allows an autonomous and efficient operation of those for various applications. Two different approaches of such seals (Simmering® with optical sealing function detection on air side, Radiamatic HTSII with sputtered platinum layer for wastage and temperature control) were developed in a jointly cooperation with Freudenberg Dichtungs- und Schwingungstechnik

GmbH & Co. KG, Weinheim and Fraunhofer IZM, Berlin. In this paper the sensor system with optical sealing function detection is described in detail.

## Sensors for detecting sealing and temperature

The optical sensor system consists of an absorption system for the leakage which is placed behind the sealing. During normal operation mode, the sealed media is not in contact with this absorption system. If damage or wear causes sealing function loss, permeated liquids are absorbed by the porous medium. Then the medium changes its optical characteristic (e.g. color, contrast, reflection), which is detected by an Infrared Reflective Interrupter. A temperature sensor was integrated into the electronics for detecting the temperature.



## Electronics

An universal electronic layout thereby allowed us to implement various functions, e.g. rectification of the input voltage, rotation speed measurement, acquisition and interpretation of the sensor readings (wastage, temperature) as well as wireless transmission of the output data. Thereby internal wireless communication is achieved using synchronous serial data bus system (SPI).

Processed sensor parameters are transmitted every 3 seconds to an internal that is connected via cable to an external customer interface.

### Description

### Value / Unit

transmitter frequency	2.4 GHz
protocol	IEEE 802.15.4 (ZigBee)
transmission distance within the housing	> 0.5 m
temperature resolution	0.65 K
temperature range	-40 bis 100 °C
rotation speed	≥ 1.000 U/min
rotation speed accuracy	± 1.5 U/min