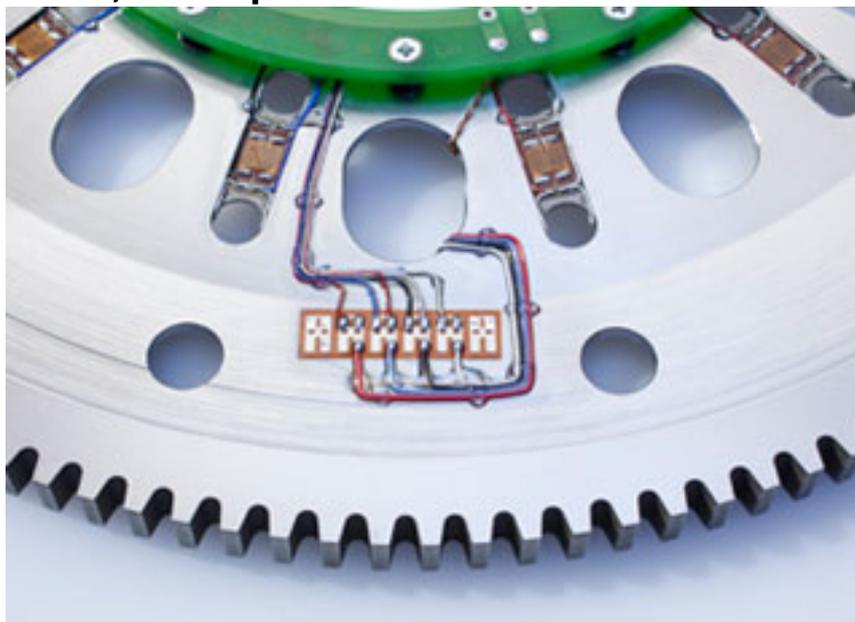


A Component Becomes A Sensor

Randy Hopkins, Sensor Business Director, HBM

Gearwheels, load bolts, drive trains - with the right know-how, individual components can be converted into functional sensors to measure force, strain, or torque.



The installed strain gage on the flex plate.

Continuous testing and checking is extremely important in product development and production. Physical parameters such as force, torque, and strain are primarily measured in order to obtain more precise data about material loading, durability, and any weak points in a structure.

Special transducers, usually based on strain gages, are normally used for these tasks. The main advantages of these transducers are their particularly high accuracy and reliability. However, there are often situations where the installation of transducers and sensors is not possible – for example, where there is very little space available in a product or component.

An increasingly popular and attractive option is to explore the possibility of creating a sensor from an existing component of the customer's assembly. This option involves little change from the customer's standpoint, and in this manner [HBM](#) [1] produces an intelligent measurement device directly within the existing assembly.

The advantages of this procedure include lower space requirements and practically no influence on the structure of the object being measured.

Custom Torque Transducers

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Published on Industrial Maintenance & Plant Operation (<http://www.impomag.com>)

HBM has a range of experience with this technology. A typical example is a customer-specific torque transducer directly developed in the drive chain for a customer.

Vehicle drives are at optimum performance when the drive train and engine control match perfectly. The torque at the transition from engine to gears determines the design of the components. However, there is insufficient space to make a measurement when attempting to install torque transducers. Since customers are increasingly demanding the highest accuracies, the Flexplate transducer has been designed as a monolithic component made from high-strength stainless steel, with the mechanical interfaces of the original components capable of operating at temperature ranges up to 120°C.

This permits a linearity and reversibility error of less than 0.1%. The optimized construction and design also compensates for axial, bending, and lateral force effects. The data is transmitted with a 16-bit resolution without contact, using digital 1 kHz telemetry technology.

The advantages of this solution are obvious:

- The installation of an addition transducer is not necessary.
- The mechanical behavior of the drive train does not change.
- Continuous long-term measurements are possible.
- The operating temperature range falls between -20° and +120°C.
- The robust transducer can be used for continuous operation.
- The transducer is immune to electromagnetic interferences (EMC).

Partner Early & Often

The development of customer-specific measurement technology directly on the component is not only suitable for torque measurement, but for many other applications as well.

Early cooperation between the product developer and sensor provider is essential in designing such a transducer. At HBM, the custom sensor team develops the appropriate sensor based on FEA analysis. Hence, the necessary strain gages can be installed directly at the manufacturing facility or on site. The customer profits from the precision measurement technology integrated directly and without time delays in their system.

In addition to the individual production of customer-specific transducers (used mainly for testing and checking purposes), it is also possible to develop and produce OEM sensors according to customer requirements. Such OEM sensors are used to measure strain and weight in a variety of industries, such as automotive and medical components.

Randy Hopkins is the sensor business director at Marlboro, MA-based HBM. With more than 28 years of experience designing and providing custom sensor solutions

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Source URL (retrieved on 04/01/2015 - 9:39am):

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