

## Product information

## Business Case – AMR sensors

*The Institute of Micro Production Technology, part of Leibnitz University Hannover (IMPT), has investigated alternative production methods for sensor applications. One study showed that modified polyether ether ketone (PEEK) can replace expensive substrates such as silicon.*

Magnetic field sensors, for example such as hall probes or magnetoresistive sensors (MR sensors), represent the majority of sensors used in modern vehicles for measuring distances. The increasing use of MR sensors is the result of their many advantages, such as robustness, signal quality and cost efficiency. Anisotropic magnetoresistive sensors (AMR sensors) in particular play an important role here.

Such sensors are expensive and complex to manufacture. A research study was therefore initiated at IMPT to explore new development approaches.

### Objectives

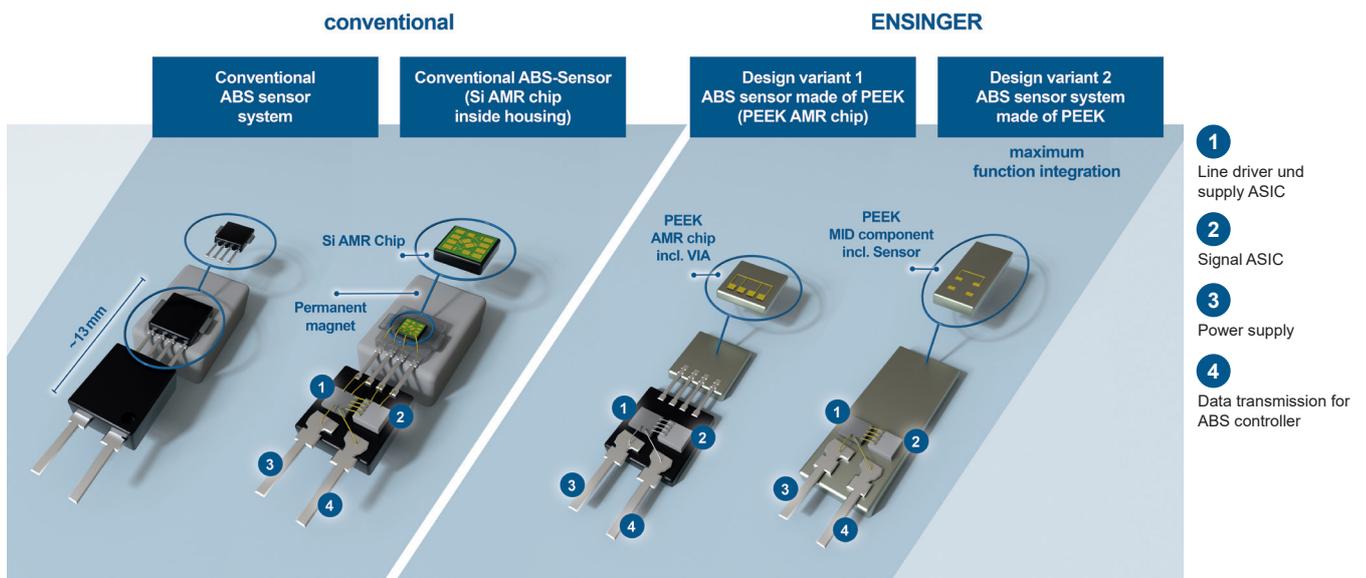
- Cost reduction across the entire chain of production
- New, more robust design
- Smaller format for better integration
- Lower energy consumption

### Result

A new sensor concept was developed with pre-structured sensor technology on the basis of a laser direct structuring (LDS) compound. The compound TECACOMP PEEK LDS grey from Ensinger proved to be suitable for production.

### Detailed description / explanation

With the LDS method, production of an enclosed sensor that can be integrated easily into PCB assembly processes now requires only three production stages rather than seven, as in the conventional wafer process.



Conventional ABS sensor system

Conventional ABS-Sensor (Si AMR chip inside housing)

Design variant 1  
ABS sensor made of PEEK  
(PEEK AMR chip)

Design variant 2  
ABS sensor system made of PEEK

Si AMR Chip

Permanent magnet

PEEK AMR chip incl. VIA

PEEK MID component incl. Sensor

~13mm

- 1** Line driver und supply ASIC
- 2** Signal ASIC
- 3** Power supply
- 4** Data transmission for ABS controller

## Advantages

The following advantages emerge in respect of the requirements for the automotive sensors

- Reduced material costs (silicon is approx. ten times more expensive than TECACOMP PEEK LDS)
- The number of production stages falls from 7 to 3

- The requirements in terms of system technology and operating equipment are significantly lower
- No clean room class S is required
- Elimination of packaging (biggest cost driver with silicon wafers)

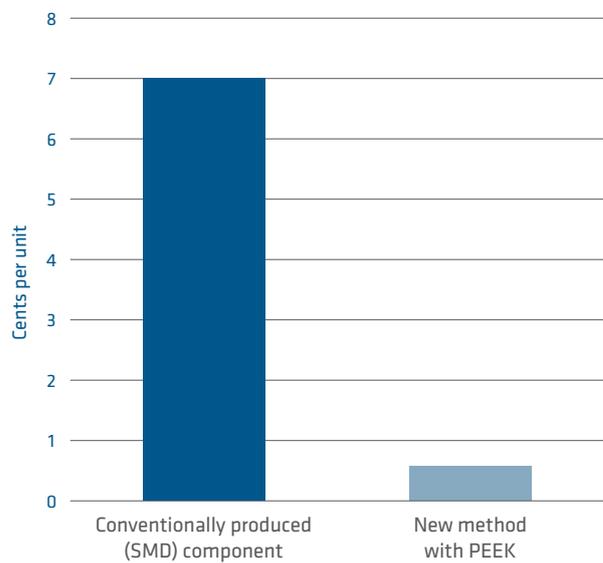
### Example

The cost saving in the example of an ABS (anti-lock braking system) sensor can be shown as follows:

#### Initial situation

1. Four AMR sensors are required per ABS. For approx. 10 m vehicles per year, a total of 40 m sensors is needed.
2. With a substrate diameter of 4 inches, there is space for 2500 sensors/wafer on a silicon wafer but only 1000 sensors/wafer on a PEEK wafer.
3. Although more wafers are required with the PEEK-based sensor, the production costs are reduced many times over.

### Cost comparison



### Contact

Ensinger GmbH  
 Compounds  
 Rudolf-Diesel-Straße 8  
 71154 Nufringen  
 Phone +49 7032 819 0  
[compounds@ensingerplastics.com](mailto:compounds@ensingerplastics.com)  
[ensingerplastics.com](http://ensingerplastics.com)