

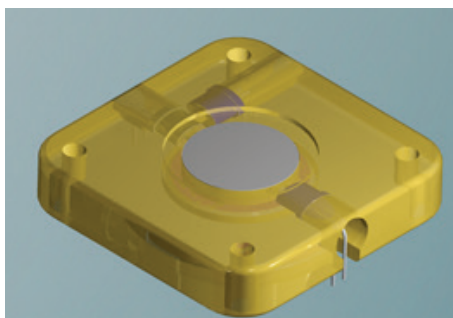
## OPTICAL ANGLE SENSOR

The optical angle sensor can statically measure the rotation angle of any apparatus. At the core of the sensor is an optical medium with an embossed structure which diffracts light according to Fresnel's formula. The measurement is conducted by at least two photodiodes (measuring probe and reference diode). Through a stacked construction the sensor can measure up to more than 270 degrees.

### BACKGROUND

There are different measurement principles for angle sensors: Rotary encoders mostly operate according to the light barrier principle. Static sensors either use inductive or capacitive measuring or electrical resistance measuring (potentiometer). Disadvantages of static sensors are the required referencing, frequent voltage fluctuations and abrasion of the metering elements. Thus at least one more sensor is necessary to create a redundant system.

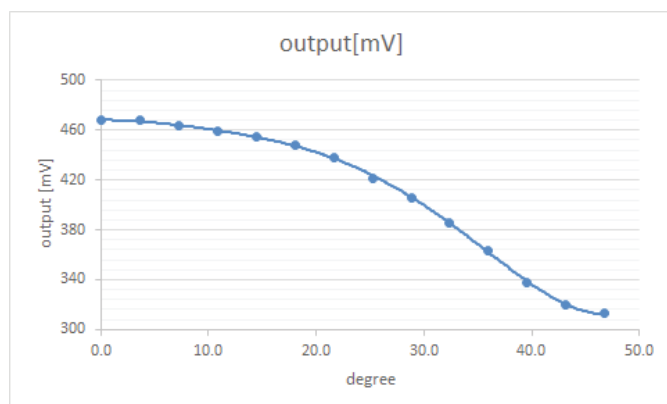
### TECHNOLOGY



The optical sensor principle uses the angle-dependent transmission of a light ray with defined wavelength through an optical interface between materials showing different refractive indexes. In a slice (e.g. a silicon wafer) a depression in the surface is created (e.g. through chemical etching) which gets beamed at by laser diodes from

different directions. Depending on the wafer's rotation angle the light is refracted multiple times which allows the exact determination of angular positioning through photodiodes.

The following graph shows the sensor's transfer function. Through embedding multiple photodiodes in a stacked or integrated array the angle measuring range is significantly extended from approx. 30 degrees (for a single photodiode) to more than 270 degrees.



### ADVANTAGES

- Optical System - independent again E- und B- field
- Redundant setting
- Self referencing
- Cost-efficient components
- Contactless measuring

**REFERENCE:**  
M033/2015

### APPLICATIONS:

- aerospace industry
- automotive industry
- setting device
- robotic
- potentiometer

### KEYWORDS:

- angle sensor
- optical sensor
- self referencing
- non-contact
- redundant

### DEVELOPMENT STATUS:

labor prototype available

### IPR:

Austrian (AT) Patent filed

### OPTIONS:

R&D - Cooperation  
License Agreement

### INVENTORS:

Alexander DABSCH  
Franz KEPLINGER  
Andreas KAINZ

### CONTACT:

**Angelika Valenta**

Research and Transfer Support  
T: +43.1.58801.41538  
[angelika.valenta@tuwien.ac.at](mailto:angelika.valenta@tuwien.ac.at)  
[www.rt.tuwien.ac.at](http://www.rt.tuwien.ac.at)