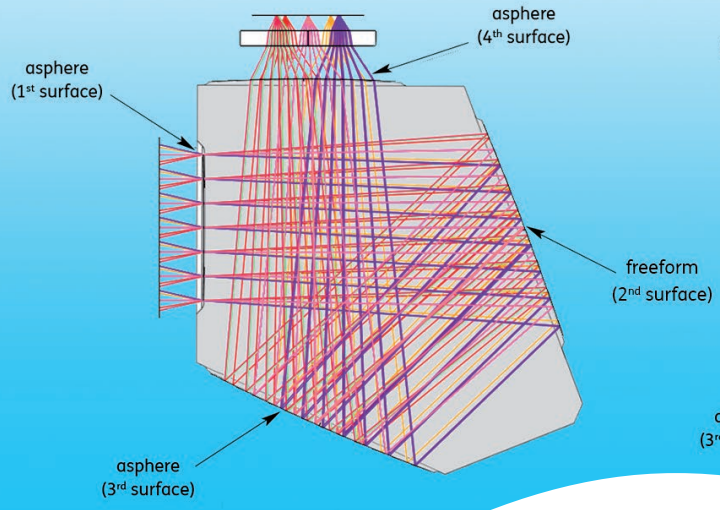
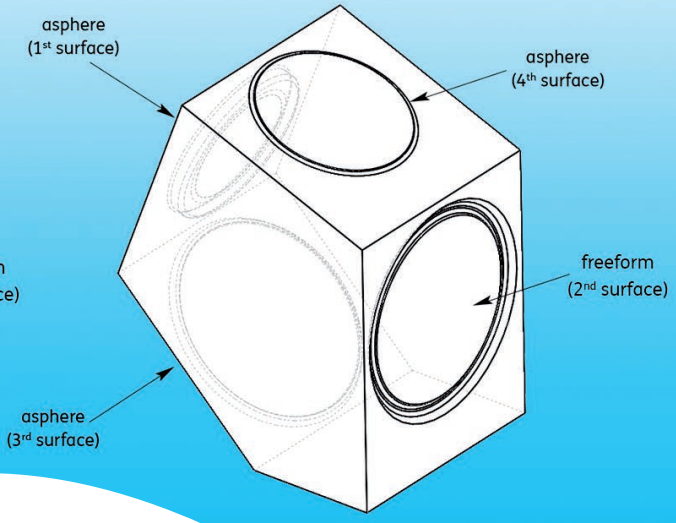




asphericon

Monolithic Germanium Freeform Optics

IR Optics for Assisted Driving Devices and Object Detection

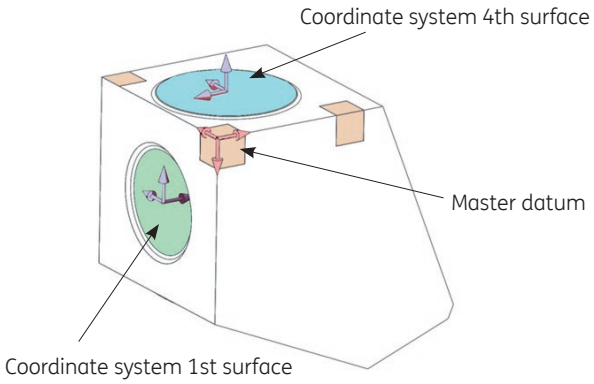
Project description:

Thermographic imaging is, among numerous other sensors, an essential part of assisted driving systems, e.g. for detection of pedestrians in the driveway. In addition, to being as compact as possible, there are also requirements for easy integration of optics into the sensor, low susceptibility and high resolution. Fulfilling these requirements, a monolithic IR freeform element was designed within the project fo+ (freeform optics plus), under the patronage of the German Federal Ministry of Education and Research. Being a vital part of this project, asphericon engineered the complete technical production chain for the optical freeform system, the definition of the reference system and the design of the overall shape of the monolithic element.

Project implementation:

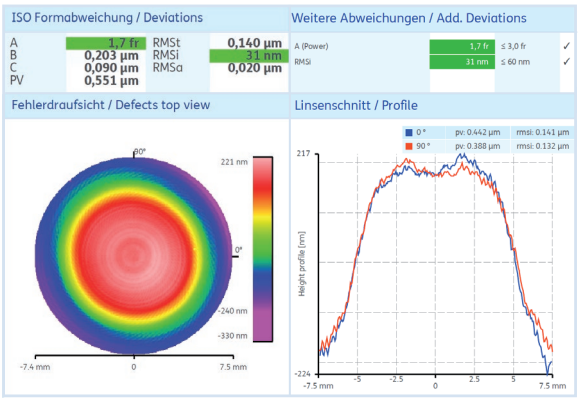
asphericon developed and manufactured a monolithic IR element, combining three aspheres and one freeform surface, essentially folding the beam within in a mirror system. The freeform has a 25 µm deviation from the best-fit sphere with a total sagitta of approx. 200 µm and compensates aberrations of the system. As a result, the volume of the optics was reduced by 75% to 2.6 cm³, while preserving excellent imaging qualities. Most challenging during production was the correct positioning of all optical surfaces to each other, because tilt and misalignment directly result in the loss of imaging quality. Therefore, asphericon defined a set of coordinate systems and a master datum for the monolith and engineered certain reference areas. Those reference areas facilitate the integration of the optics into the thermographic sensor. As a result, the specification for surface form deviation and imaging capacity were clearly exceeded (see measurement below).

Defining References and Coordinate Systems



All surface coordinate systems are referenced to a base coordinate system of the monolith, which acts as a master datum, defined according to ISO 10110.

Surface Form Deviation of Freeform Surface



Full surface measurement of surface form deviation of the freeform element, showing the outstanding quality with a RMS_i of 31 nm.

asphericon GmbH | Stockholmer Straße 9 | 07747 Jena | Germany | Phone: +49(0)3641-3100 500 | Fax: +49 3641-3100 501 | Email: sales@asphericon.com
www.asphericon.com