

Freeform Optics for AR / VR

Angela Eckstein / asphericon GmbH

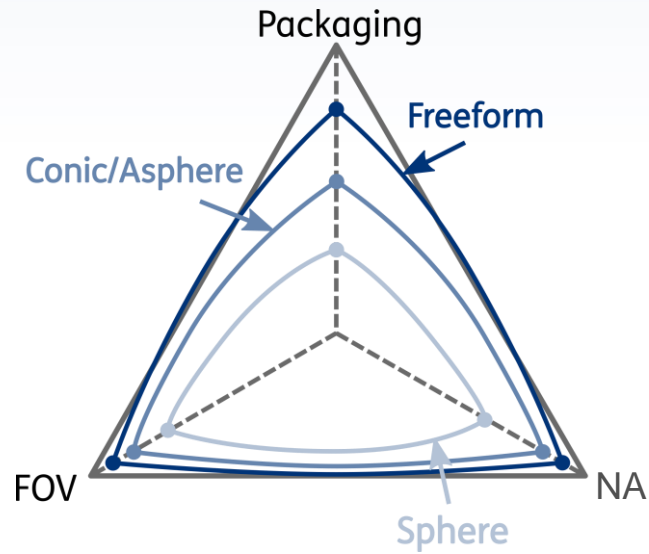




**Visionen leben – Bringing visions to life.
With this mission, asphericon is always
pushing boundaries of what is possible
and establishing new milestones in the
world of photonics.**

Freeform Optics Systems

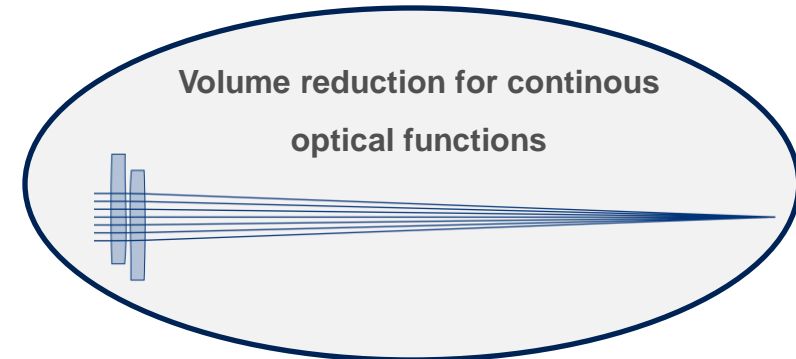
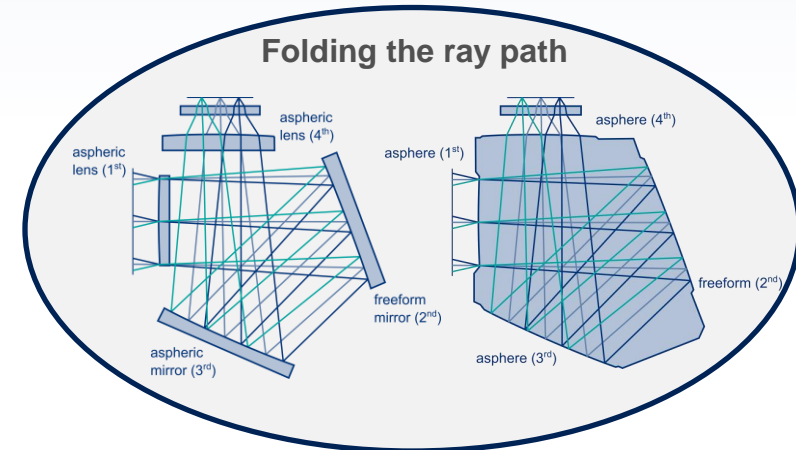
Breaking the Symmetry



inspired by K. Fuerschbach

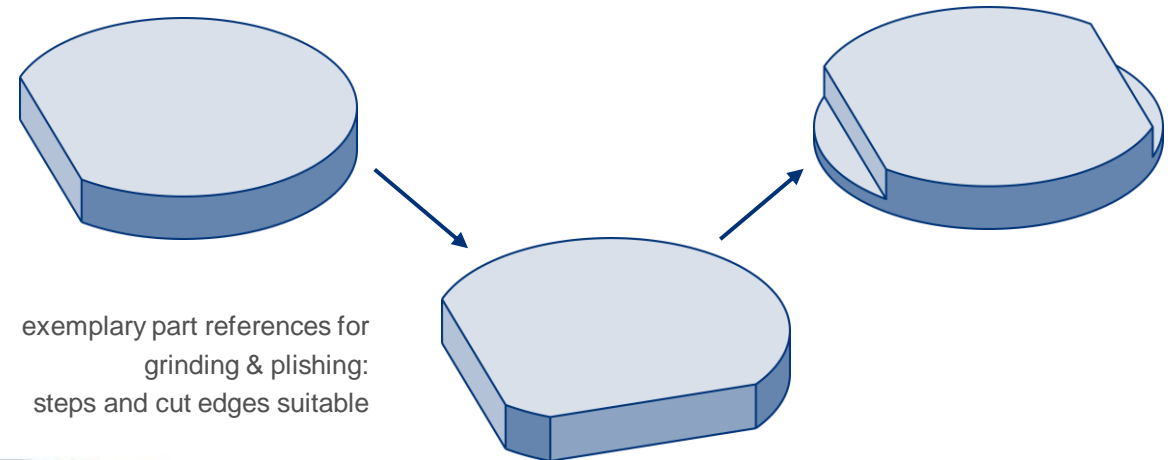
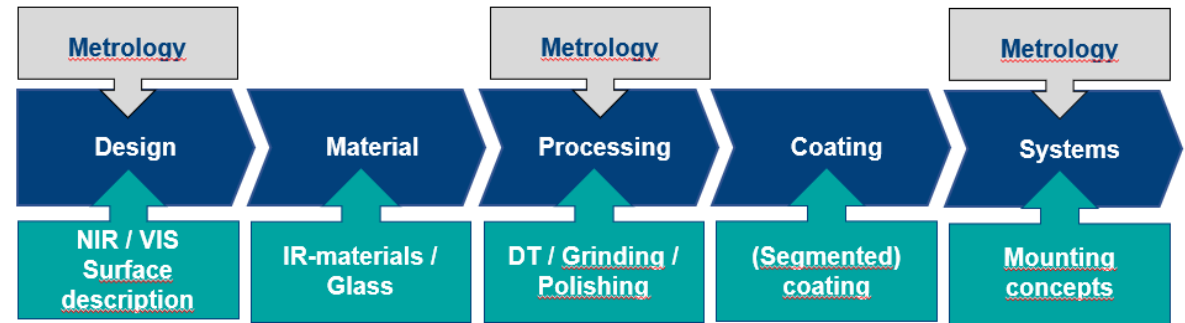
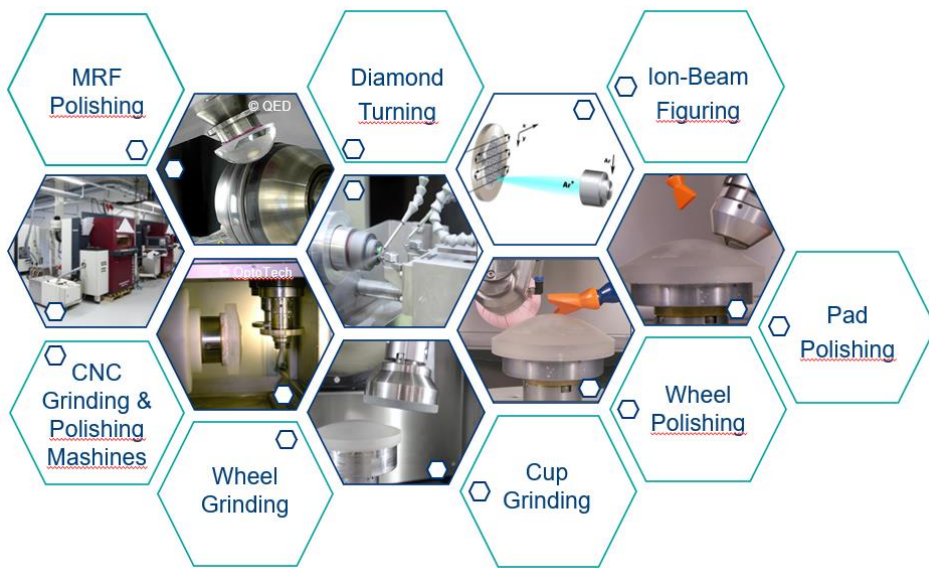
- = Higher order surfaces extend the “working range”
- = Freeform surfaces allow to break the symmetry of the optical system
- = Higher integration possible

When are freeform optical surfaces needed?



Smart Manufacturing & Process Chain

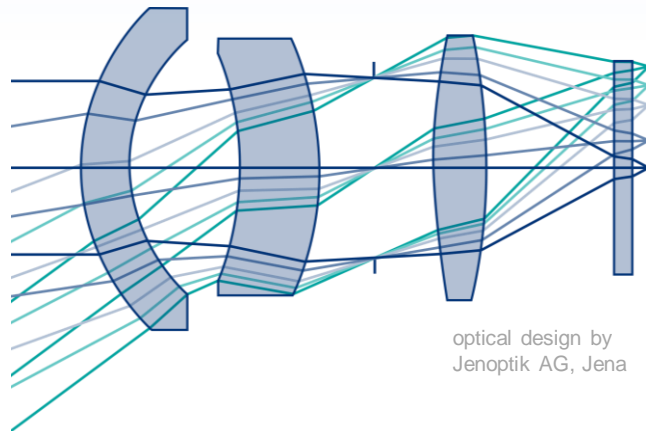
Evolution of Freeform Optical Systems



Freeform IR Imaging System

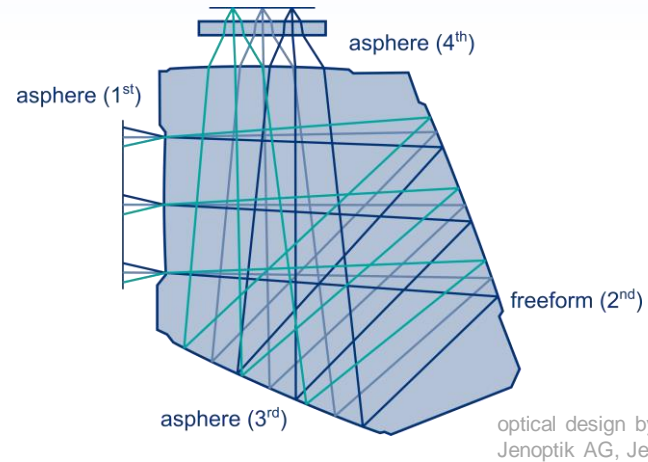
Monolithic Design, Material: Germanium

Before:



optical design by Jenoptik AG, Jena

After:

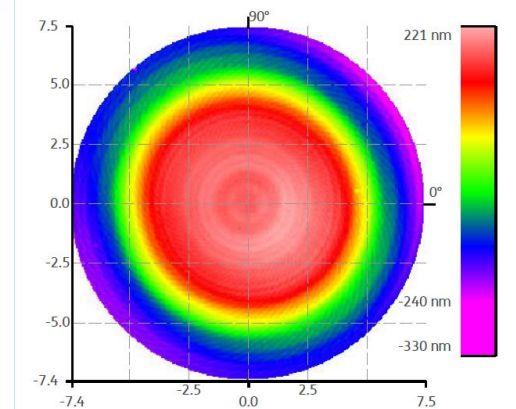


optical design by Jenoptik AG, Jena

Volume reduction of 75%

Highly reduced mounting costs

Oberflächenformabw. / Surface form dev.



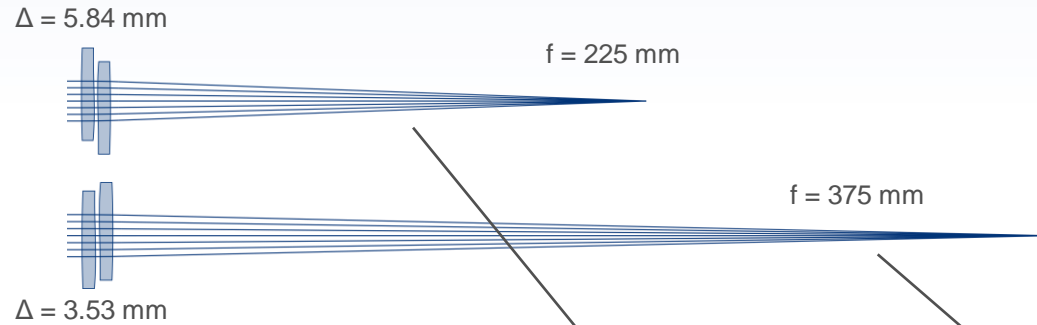
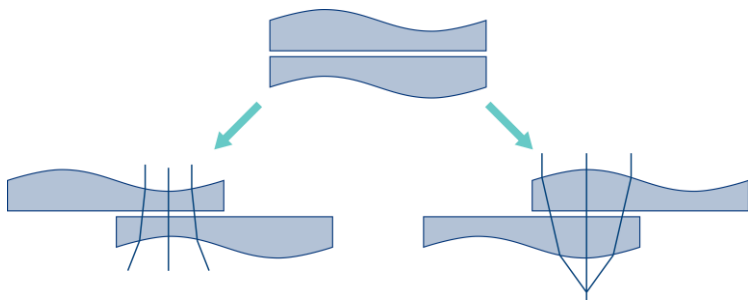
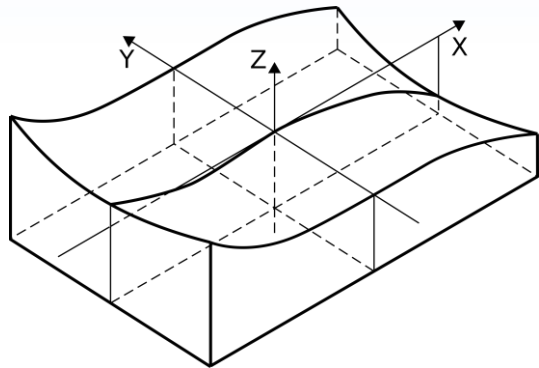
ISO Formabweichung / Deviations

A	1,7 fr	RMSt	0.140 µm
B	0.203 µm	RMSi	31 nm
C	0.090 µm	RMSa	0.020 µm
PV	0.551 µm		

Higher Order Alvarez Systems

Multi-Focal Lens // Volume reductions for continuous optical functions

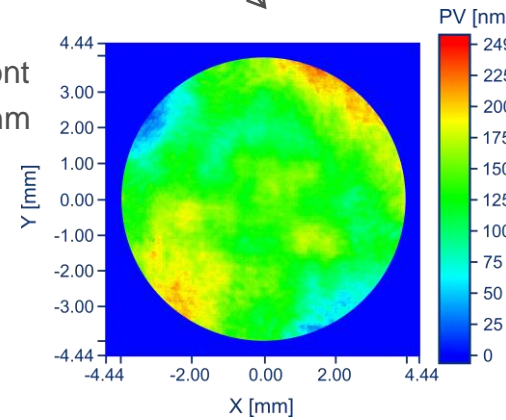
Alvarez principle:



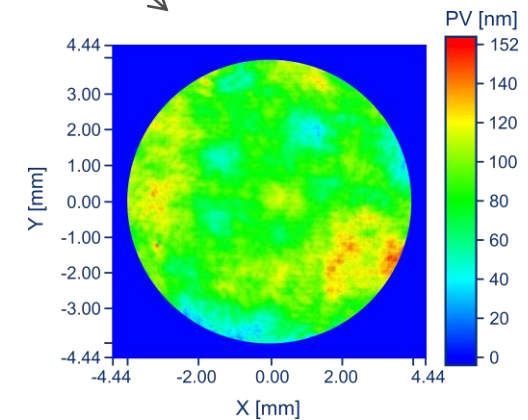
mounted Alvarez-System

⇒ Diffraction limited performance

measured wavefront maps @ 532 nm



RMS WFE = 0.055 λ



RMS WFE = 0.031 λ

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