



# Additive manufacturing

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High performance solutions for metal optics  
and optical housings

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## High performance solutions for metal optics and optical housings

*Cover: Additively manufactured metal mirror with internal light-weight structure.*

*Top: Topology optimized housing.*

### Purpose

Additive manufacturing is used to optimize and customize the base bodies for high-performance metal optic applications. High weight reduction, tailored mechanical and thermal conditions and a stable performance are realized while maintaining the high optical performance efficiency of the mirrors and housings.

### Technology

- Metal-based powder-bed fusion
- Melting using a conventional cw-laser or a short and ultra-short pulsed laser
- Optimization of process chain for space applications, astronomical instrumentations or specialized custom applications

### Details

- Weight reduction of up to 75 % through topology optimization, lattice structures or stochastic foam
- Structural features down to 300  $\mu\text{m}$
- Diamond turning of optical surface
- Functional plating (NiP, Cu) and coatings (Al, Ag, Au) for application in the VIS-NIR-UV spectral range
- Surface roughness < 1 nm RMS and form deviation < 150 nm PV ( $\varnothing$  150mm) after post finishing

### Material

- Aluminum-based alloys
- Al 6061
- Aluminum-silicon alloys AlSi<sub>x</sub> with wide range of Si content (10 % to 60 %)
- AlSi40 matched to the CTE of electroless nickel polishing layer for low thermal induced distortions over an extended temperature range



*Telescope made by additive manufacturing out of AlSi40 alloy.*



*Lightweight metal mirror during ultra precision diamond turning.*

### Contact

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