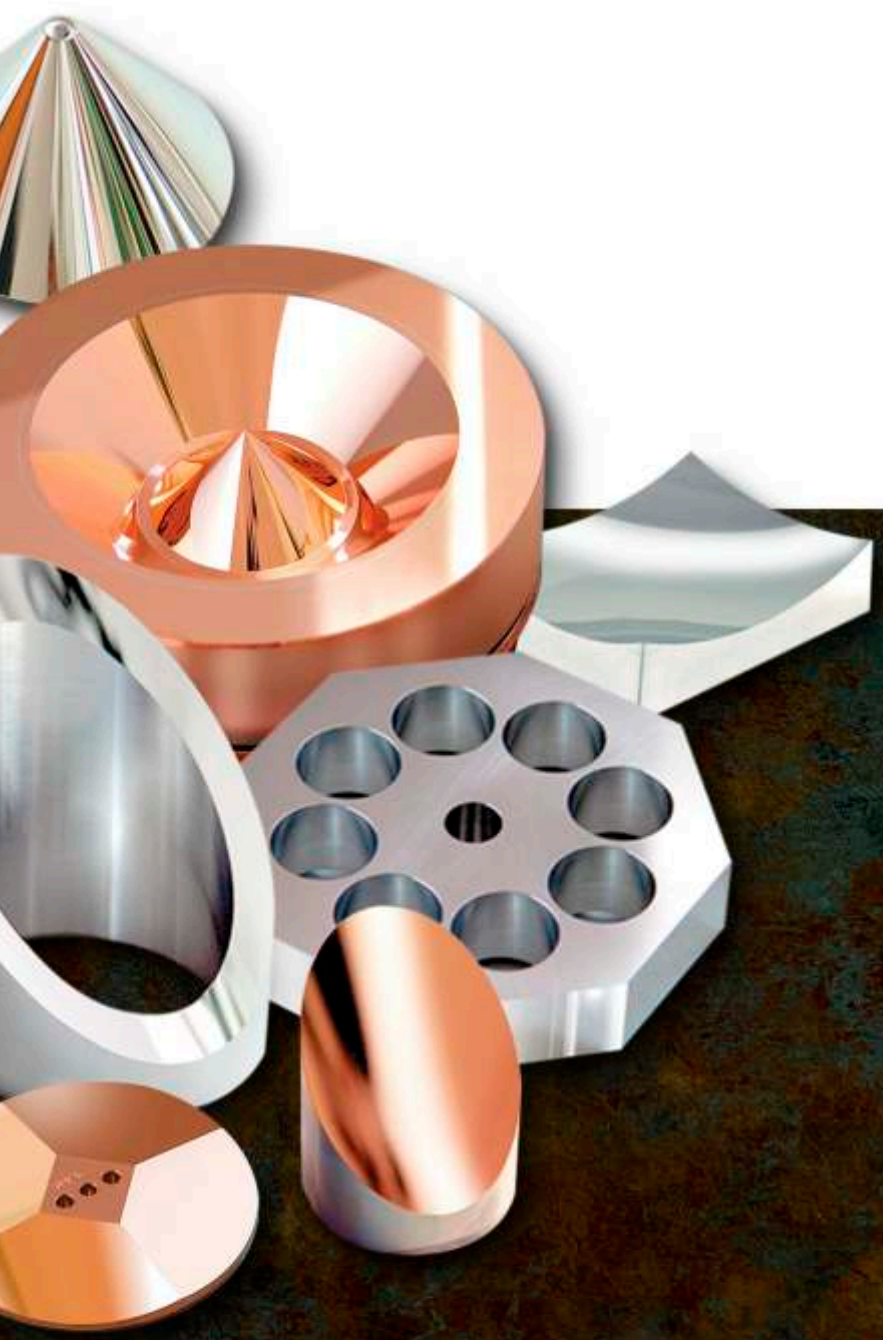
LT ULTRA
OUR PROFESSION IS PRECISION



METAL OPTICS OVERVIEW

OPTICS

OUR MISSION

We are proud to make contributions to some of the big scientific developments of the new millennium.

We develop components for experiments
with a diameter of 26.695 meters
on an energy level of 50 TeV
on a distance of 14 billion light years
... or just a few nanometers

Projects and products for our customers in industry and science benefit from our experience.

OUR PROFESSION IS PRECISION

FLAT MIRRORS

An extensive range of sophisticated diamond-cutting technologies is available, for single piece as well as for series production.

Technical data:

Typical dimensions	
50 mm x 50 mm or 500 mm x 500 mm	
50 mm up to 500 mm dia.	
Surface figure	
Approx. 0.1 µm over100 mm*	
Surface roughness	
Ra approx. 1 nm - 5 nm*	
Optionally coatings available.	
Other specifications available on special order.	
Custom dimensions available on special order.	

*Vary with the material involved and its structural rigidity.

Materials

- Oxygen-free copper (OFHC-CU)
- Aluminum
- Aluminum alloys (6082 and 6061 preferred)
- Brass
- Plastics (usually PMMA)
- Crystalline materials
- All nonferrous metals

SPHERICAL MIRRORS

Technical data:

Radii ranges
from approx. 5 mm to infinite
(concave or convex surfaces)
Typical dimensions
50 mm x 50 mm or 500 mm x 500 mm
50 mm up to 500 mm dia.
Surface figure
Approx. 0.1 µm over 100 mm*
Surface roughness
Ra approx. 1 - 5 nm*
Other specifications available on special order.
Optionally coatings available.

*Vary with the material involved and its structural rigidity.

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ASPHERICAL MIRRORS

Three-axes turning technology

Our advanced, three-axes turning technology allows us to turn optics having any symmetric geometric shape

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Technical data:

Typical dimensions	
on-axis Ø 50 mm up to Ø 500 mm	
Surface figure	
Approx. 0.5 µm over 100 mm*	
Surface roughness	
Ra approx. 2 - 15 nm*	
Optionally coatings available.	
Other specifications available on special order.	
Custom dimensions available on special order.	

*Vary with the material involved and its structural rigidity.

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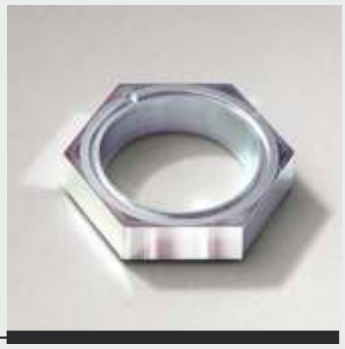
POLYGON MIRRORS & SCANNERS



Raster-scanning polygons

We manufacture polygons having arbitrary pyramidal angles. We can also machine varying pyramidal angles on individual polygons.

Technical data:

Widths across flats

Approx. 10 mm to 500 mm

Surface figure

Approx. $\lambda/10$ in the visible spectral region

Machining tolerances*

Indexing error, approx. 5 arcsec

Pyramidal error, approx. 5 arcsec

Surface roughness

Ra approx. 1 - 5 nm*

Optionally coatings available.

Other specifications available on special order.

Custom dimensions available on special order.

*Vary with the material involved and its structural rigidity.

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SPECIAL OPTICS


Pyramidal mirrors


Ellipsoids


Masters


Toroids of all types


Roof mirrors


Conical mirrors

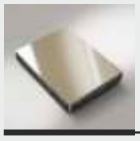

Bifocal paraboloidal mirrors


Waxicons/ axicons


Stepped mirrors


Chopper blades


Scraper mirrors


Cylindrical mirrors

NEW!
Optical surfaces out of steel without polishing.
Ultrasonic assisted diamond-turning on steel parts.

Other special shapes are available on special order.

We look forward to receiving your inquiry.

Figuring accuracy and surface roughness varies with:

- reflective-surface dimensions
- the types of surface figures specified
- the materials employed

Materials

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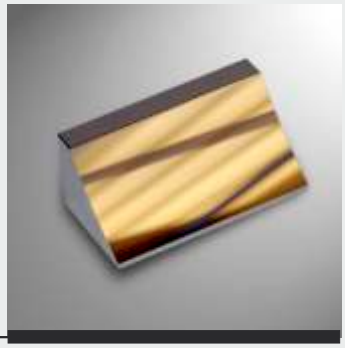
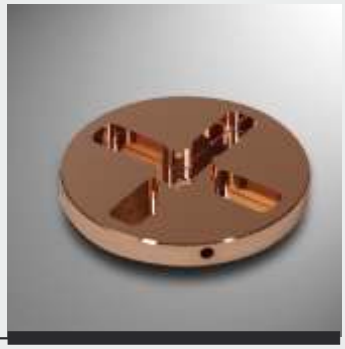
UP-MILLING PARTS





Technical data:

Axes stroke

X 900 mm / Y 350 mm / Z 200 mm

Surface figure and roughness

depending on design and dimension

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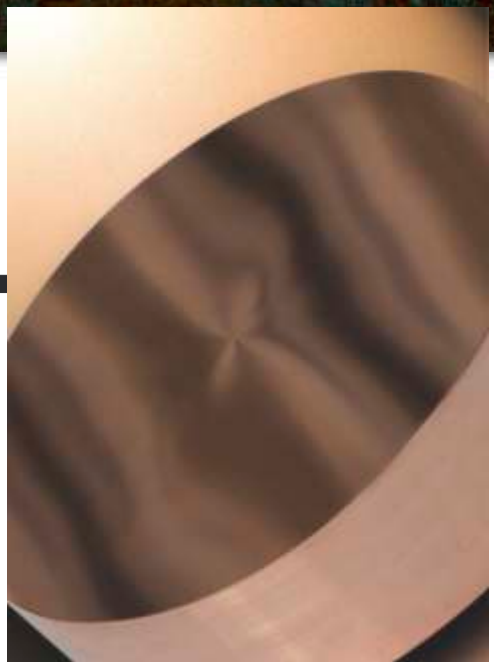
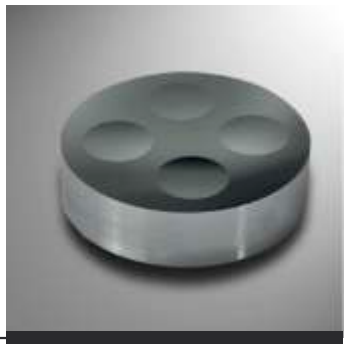
UP-milling parts — **Micro milling**

DYNAMIC-AXIS TECHNOLOGY



Freeform surfaces

With the dynamic-axis technology even non-rotationsymmetric geometries are possible



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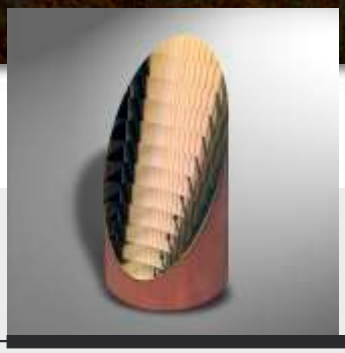
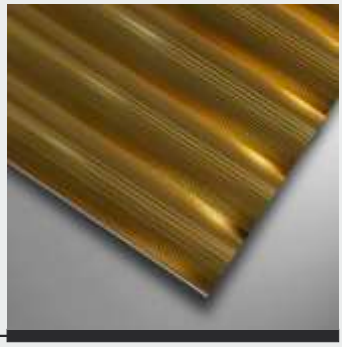
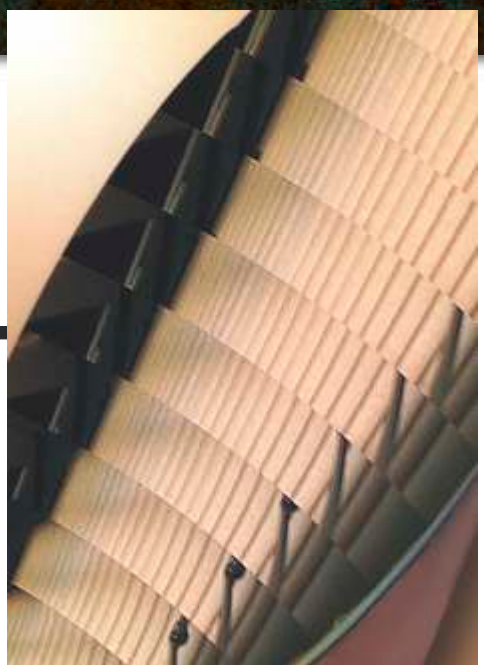
STRUCTURED OPTICS







Different types:

- Microlenses
- Grids
- Fresnel- optics
- ...

Manufacturing technologies:

- Diamond- turning
- Diamond- milling
- Diamond- planing
- Structure size down to submicron area

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Coatings for CO_2-laser optics

Coating type	Code	Reflectivity [%] λ = 10,6 µm 0°	45° (S)	45° (P)	HeNe 45°	Phase Retardation
Molybdenum	MO	97,7	98,2	96,6	~55	< 1°
Protected Gold	PG	99,0	99,2	97,2	~91	0 ± 3°
Unprotected Gold	AU	99,2	99,4	99,2	~90	0 ± 2°
Hard Gold	HG	98,8	98,7	97,5	~93	< 1°
Enhanced Coating	EC	99,6	99,2	99,15	~60	< 1°
Super-Enhanced Coating	SEC	99,8	99,9	99,7	~85	0 ± 1°
Phase-Retarding Coating	PRC	99,5	99,1	98,1	~70	90 ± 3°
Zero-Phase-Shift Coating	ZPC	99,8	99,9	99,6	~85	0 ± 2°

Other coatings

Enhanced Coating (YAG)	ECY	High-reflecting coating for use with Nd: YAG-lasers (1.064 µm)
Protected Aluminum	PAL	Protected Aluminum coating primarily for use in the VIS and IR spectral regions*
Unprotected Aluminum	AL	Unprotected, pure-aluminum coating
Enhanced Aluminum	EAL	Provides enhanced reflectivity in the UV / VIS due to ist multi-layer dielectric overcoating*
Protected Silver	PAG	Silver with a protective dielectric overcoating*
SiO2	SiO2	Protective SiO2-overcoating
Yttrium Oxide	YO	Protective Yttrium Oxide overcoating

* These coatings may be optimized for a specified wavelength range.

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OPTICS