meopta

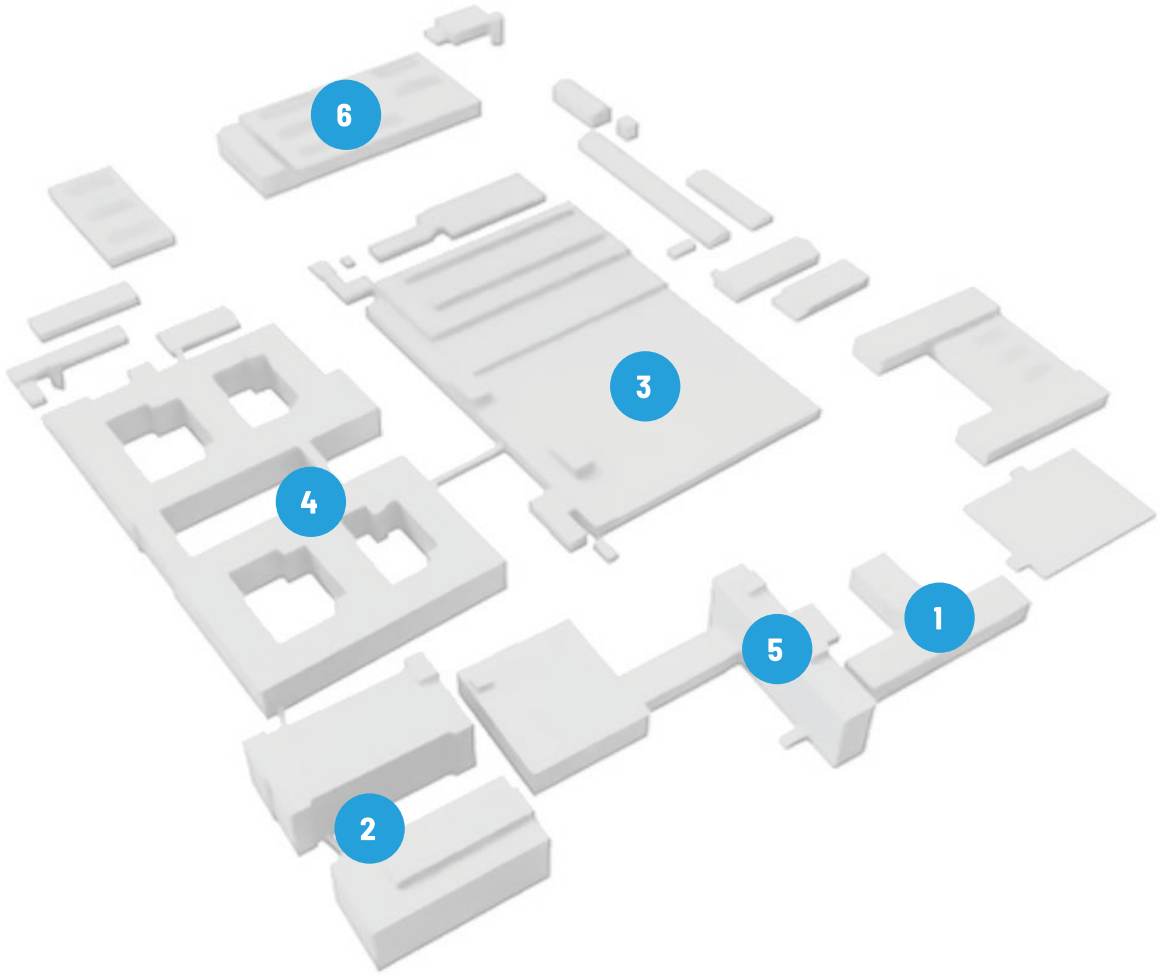
Meopta in Defence

High-Tech Industrial Park in the Heart of Europe

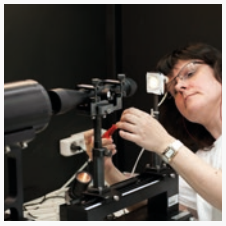
Meopta s.r.o. is headquartered in Prerov, Czech Republic. The advanced, state-of-the-art facility houses R&D, Engineering, Coating Design, Manufacturing, Assembly and Administrative offices. Since 2023, Meopta s.r.o. has been part of The Carlyle Group.

4 segments:

- **Semiconductor**
- **Defence**
- **Advanced Industrial**
- **Handheld**

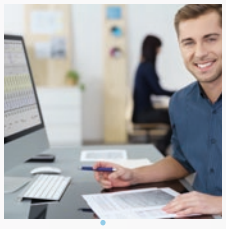


1 R&D center



4 System integration

2 Optical division



5 Administrative

3 Mechanics

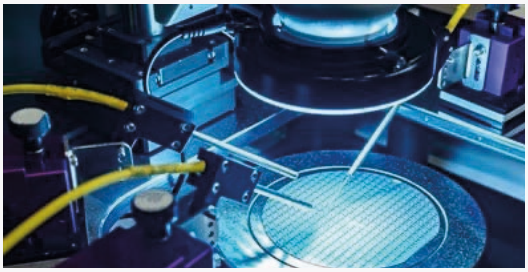
6 Clean assembly

Our Segments

OEM
High-precision opto-mechanical solutions made up of individual components and simple assemblies that are integrated according to an intricate assembly design at precise alignments

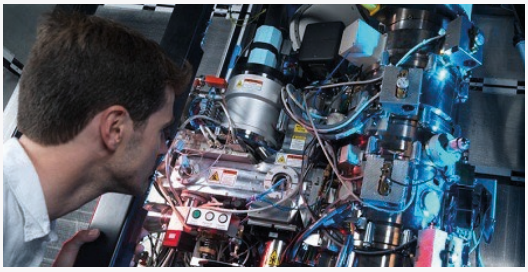
Handheld
Wide range of handheld offering for recreational (hunting, biathlon, etc.) and military (soldiers' safety) purposes

OEM



Semiconductor

Sub-systems for wafer inspection systems, metrology, and lithography



Industrial

Sub-systems and components for industrial metrology, display, automation, and microscopy

Defence

Systems and components for defence and security screening applications

Handheld

Sport Optics

Binoculars and scopes for recreational activities, and hunting equipment

Our Unique Vertically Integrated Business Model

Meopta's offering is fully vertically integrated across R&D, optics production, mechanics, assembly and metrology, with all facilities being united at one site in Prerov, CZ, allowing for strong quality reliability, scalability and flexibility

Vertically Integrated Capabilities

R&D

Research & Development

Close cooperation with customers in optimization and validation of their designs through advanced simulation and customized metrology.

Serial Production

Optics

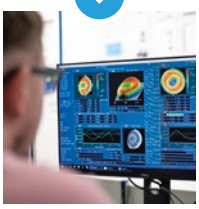
Production of high-precision optical components and systems such as prisms, beam splitters, lenses and aspheres – including glass cutting, high-end polishing and coating

Mechanics

Production of high-precision mechanical parts and assemblies to support complex optical systems and ensure precise alignment

Assembly

Sub-system assembly and enclosure of optical, mechanical and electronic components, often in clean room environment with nanometer accuracy



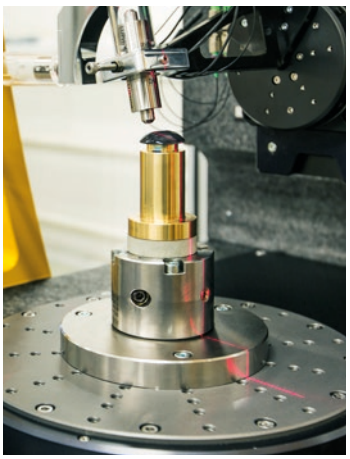
Metrology

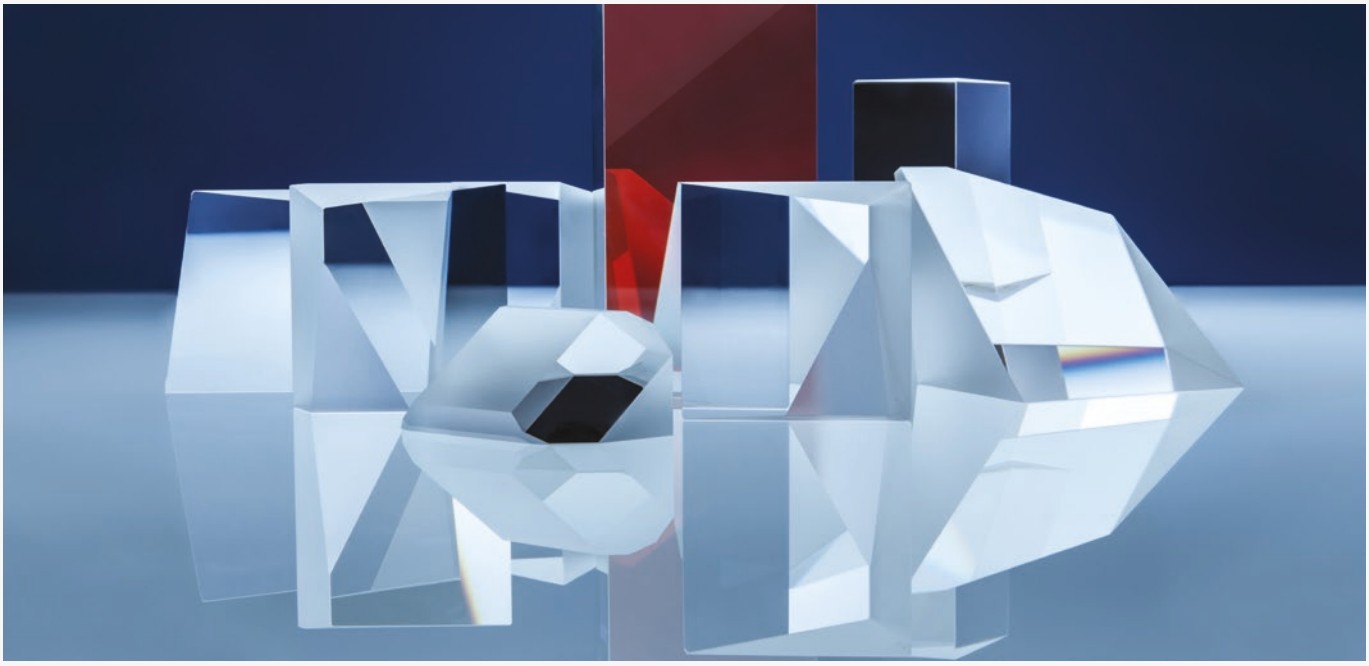
Measurement and testing of component and sub-system attributes such as dimension, surface flatness, tolerance and centration to nm accuracy

Optical Production

- Cutting, milling, grinding, polishing
- Coating, cementing, optical bonding, ...
- 360 FTE (production, quality inspection)
- 61 CNC machines
- 27 NC machines
- 32 coating machines
- >20 000 optical parts produced per month

- All types of optical glass, FuSi, Quartz, CaF_2, MgF_2, ULE, Zerodur
- Plan, spherical, aspherical, cylindrical and retardation optical elements
- All kinds of prisms, plane-parallel glasses, light homogenizers, filters, PBS cubes (optically contacted or cemented), optical path control, variety of cemented prism assembly
- Photolithography substrates, masks and patterns (white light lithography)





Flat optics

- Dimensions up to 350 mm
- Variety of grinders (CNC, conventional) & polishers (CMP, double-sided)
- Combination of synthetic pads and pitch for polishing
- Surface flatness λ/40 P-V on 1 inch (diameter and depending on the material)
- Surface quality down to S-D 10-5 (depending on the
- material)
- Roughness 2-3 Å (on 1-100 µm spatial periods, depending on the material)

  Angle accuracy up to 1-2 arcsec (size, shape and surface flatness dependable)

Parameter	Current	Future
Size [mm]	5-350	5-500
Surface accuracy [λ]	λ/40	λ/60
Surface quality [S-D]	1	1
Roughness (0.1-0.001 mm) [Å]	2-3	2
Angle accuracy [arcsec]	1	1

Spherical optics

- All kind of lenses with ø 5 mm to 250 mm
- Variety of grinders (CNC, conventional) & polishers (CNC, conventional) + CNC centering machine
- Use of synthetic pads or pitch for polishing, MRF correction
- Use of the most recent high-quality polishing slurries
- Surface shape P-V λ/30 (diameter and depending on the material)
- Surface quality down to S-D 10-5 (depending on the
- material)
- Roughness down to 2-3 Å (on 1-100 µm spatial periods, depending on the material)

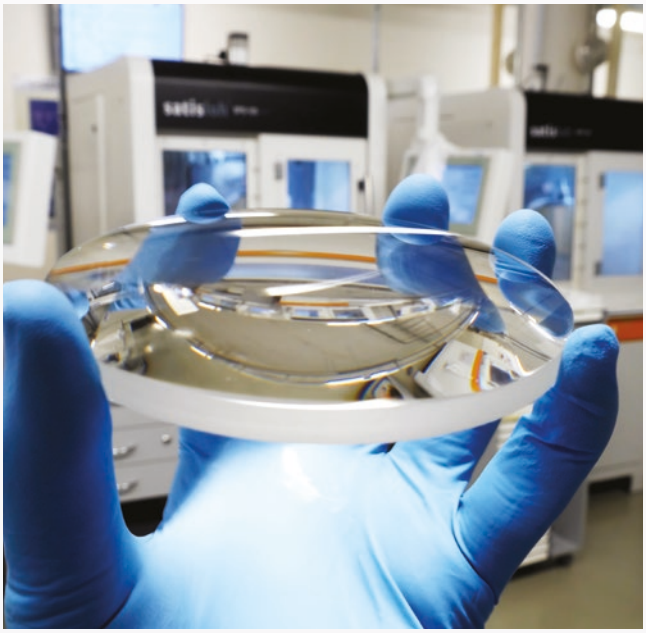
  ETD 5 µm

Parameter	Current	Future
Size [mm]	5-250	5-350
Surface accuracy [λ]	λ/30	λ/50
Surface quality [S-D]	10-5	10-5
Roughness (0.1-0.001 mm) [Å]	2	2
ETD [µm]	5	3

Aspherical optics

- Aspherical lenses ø 10 mm to 250 mm
- CNC grinders and polishers

  MRF correction
- Surface shape λ/20 (diameter, material and shape dependable)
- Surface quality S-D 20-10 (material and shape dependable)
- Roughness down to 2-3 Å (on 1-100 µm spatial periods, depending on the material)
- ETD 5 µm, centricity of up to 10 µm



Parameter	Current	Future
Size [mm]	5-350	5-500
Surface accuracy [λ]	λ/40	λ/60
Surface quality [S-D]	1	1
Roughness (0.1-0.001 mm) [Å]	2-3	2
Angle accuracy [arcsec]	1	1

Cylindrical optics

- Dimensions 10 mm to 180 mm (shape dependable)
- CNC and NC grinders and pitch polishers, MRF correction
- Surface shape λ/20 on dia 24 mm (size, material and shape dependable)
- Surface quality S-D 10-5 (material and shape dependable)
- Roughness down to 2-3 Å (on 1-100 µm spatial periods, depending on the material)
- Twist 1-2 arcmin, decenter up to 10 µm, wedge 1 arcmin (size and shape dependable)

Parameter	Current	Future
Size [mm]	5-250	5-350
Surface accuracy [λ]	λ/30	λ/50
Surface quality [S-D]	10-5	10-5
Roughness (0.1-0.001 mm) [Å]	2	2
ETD [µm]	5	3

Retardation optics

- Variety of grinders (CNC, conventional) & polishers (CMP)
- Combination of synthetic pads and pitch for polishing
- TWE λ/40 P-V on 1 inch (diameter and depending on the material)
- Surface quality down to S-D 10-5 (depending on the
- material)
- Roughness 2-3 Å (on 1-100 µm spatial periods, depending on the material)
- Wedge accuracy up to 1-2 arcsec
- Retardation accuracy λ/300 (wavelength dependable)
- Multi-order

Optically contacted zero and true zero-order waveplates in development

Parameter	Current	Future
Size [mm]	7-100	7-130
TWFE [λ]	λ/40	λ/60
Surf quality [S-D]	10-5	2-1
Roughness (0,1-0,001 mm) [Å]	2-3	2
Wedge [arcsec]	1-2	1
Multi-order	yes	yes
Zero and true zero order	no	yes

Coating capabilities

- Spectral range 193 nm to 2 000 nm
- PVD and PARMS technology, production located in clean area class 1000/10 000
- Single band or broadband AR, HR, BS, density filters, cut-off filters
- Generally R > 99,5 % for high reflective mirrors (HR R > 98.5 % for 193 nm, AOI 45°), R < 0.1 % for AR (AR R < 0.2 % for 193 nm, T > 99.5 % AOI 0°)
- PBS ER > 2500:1 for 633 nm, ER > 1000:1 for 266 nm (CA size dependable)
- Phase controlled mirrors, phase shift < 4° s and p-pol (266 nm)
- Technology for dielectric oxide and fluoride base coating, metal coating, hybrid coating based on oxides and fluorides
- Technology of evaporation from boats, electron gun, with support of plasma APS, magnetron sputtering technology PARMS in configuration of segments, planets, carriers
- LIDT and lifetime performance qualified coatings
- Absorption in ppm level measurement at 266 and 532 nm

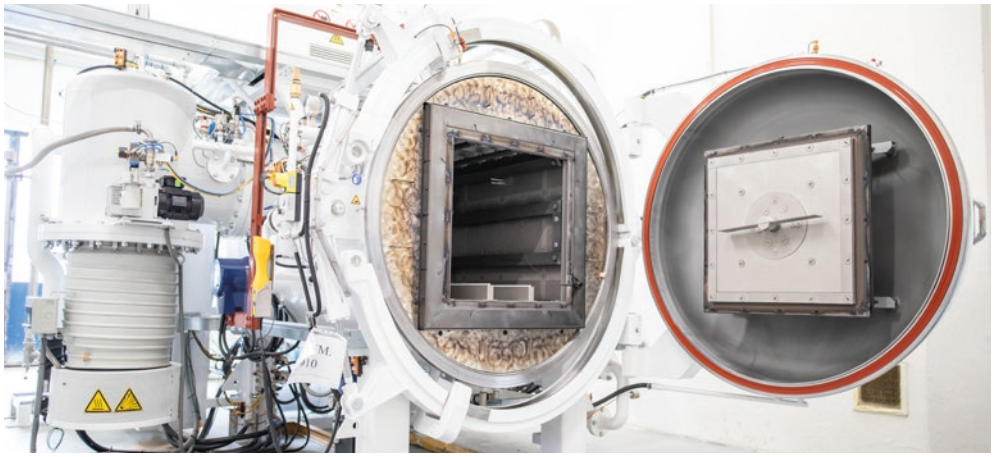
Mechanical Production

Manufacturing

- CNC Turning, Milling, Grinding, Deburring
- EDM technology
- Engraving, Lapping
- Thread cutting, Honing
- Tolerance: up to 0.005 / 0.001 mm
- Material: aluminum alloy, steel, stainless steel, titanium, magnesium, plastics, selected

120+ CNC machines

- Controlled environment for high-accuracy machines - temperature ± 1°C; controlled humidity (including measurement processes)
- Turning including production on machines with driven tools and counter spindles. Common parameters: workpiece diameter:
  - 1-200 mm, workpiece length 300 mm
  - accuracy IT5
- Milling at 3, 4 and 5 axis centers. Size of the workpiece:
  - 800x500x450 mm
  - accuracy IT5
- Grinding flat, round, internal grinding and jig grinding, precision IT4
- EDM technology, die sinking and wire cutting



Surface Finishing

- Mechanical finishing – sandblasting, grinding, brushing, polishing
- Cleaning – ultrasonic degreasing, acid pickling
- Anodizing of aluminum alloys – decorative and hard, coloring
- Electroplating – alkaline zinc, cyanide cadmium and cyanide copper plating, decorative bright nickel and chromium
- Electroless nickel plating (mid-P, ROHS and ELV compliant) on steel, stainless steel and copper alloys
- Conversion coatings – zinc phosphate, alkaline oxidation on steel, blackening of copper alloys, chemical oxidation of aluminum and magnesium alloys, passivation of stainless steel
- Wet painting, screen printing, pad printing ...
- Micro deburring and electropolishing up to Ra 0.02 on Dlyte machine

Heat Treatment

- Mechanical finishing – sandblasting, grinding, brushing, polishing
- Cleaning – ultrasonic degreasing, acid pickling
- Anodizing of aluminum alloys – decorative and hard, coloring
- Electroplating – alkaline zinc, cyanide cadmium and cyanide copper plating, decorative bright nickel and chromium

Metrology

- Workpiece – 1000x1600x600 mm
- Accuracy E0, MPE = 0,5 + L/500 µm
- Scanning on CMM with rotary probes
- Roundness, form and roughness testing
- Programming on 3D machines in advance
- Evaluation of 2D and 3D curves

Assembly

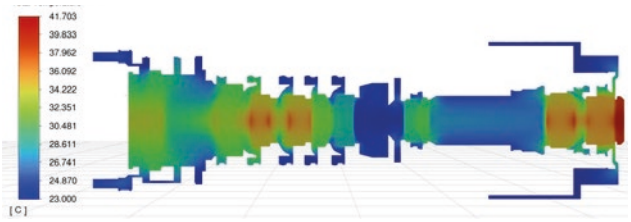
Meopta's technological capabilities support the complete assembly, integration, and qualification process.

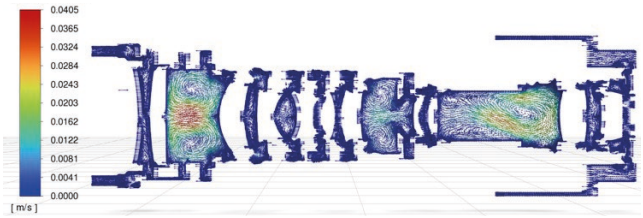
- High-precision centering of optical components within mechanical bodies via precision turning of outer reference diameters (outer diameter range up to 136 mm; accuracy up to ±0.001 mm)
- Assembly with pre-defined axial spacing between optical elements (accuracy up to ±0.001 mm)
- Active alignment of opto-mechanical assemblies enabling precise adjustment to target optical parameters (e.g. centricity, TWE, MTF)
- Technologies to eliminate contamination of internal optical surfaces by dust or humidity, assembly in laminar flow boxes with cleanliness up to ISO 5
- Ultrasonic cleaning of optical and mechanical components, including mounted optics
- Vacuum plasma activation of component surfaces prior to bonding processes
- Precision adhesive and cement application with automated positioning and controlled dosing (robot-guided applicator positioning; pneumatic dosing devices and precision volumetric dispensers with micrometer adjustment)
- UV curing of adhesives and cements
- Laser marking and engraving (CO_2 and fiber laser systems)
- Leak testing of optical assemblies using internal and external overpressure techniques
- Nitrogen purging of optical assemblies
- Handling and assembly of heavy opto-mechanical systems using dedicated manipulation equipment
- Electromechanical assembly capabilities

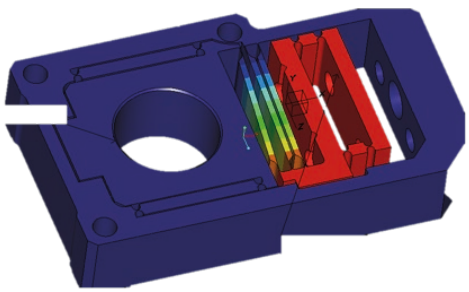
D&E Process Simulations & Analysis

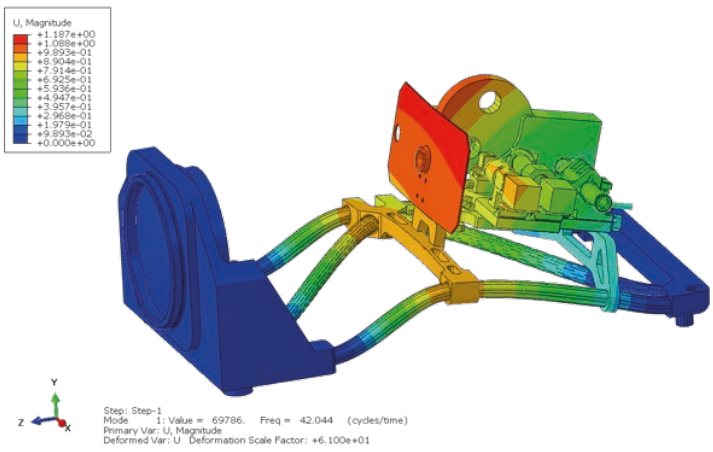
We have experience and regularly use wide range of simulation tools (mainly from ANSYS family) for optomechanical analysis. These include but are not limited to:

- Thermal analysis (optical design athermalisation, mechanical design upgrades, materials selection)
- Ghost & Stray light analysis
- Structural analysis (stiffness, robustness)
- Modal analysis (vibrations, stability)
- CFD analysis (purging, heat distribution)



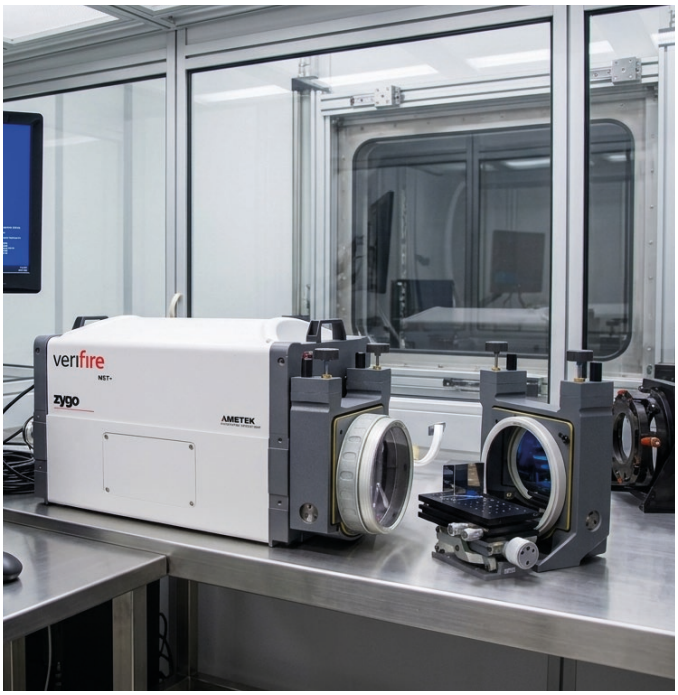






Quality Control

Because of our professionalism, we can offer customers professional measurement and testing services, as well as development of measurement methods and devices. We think these services will precisely meet your needs, and that Meopta's testing laboratory will become your reliable partner in measuring, testing and developing your own measurement methods.



Optical Measurements

Measuring of the Following Parameters

- CNC Turning, Milling, Grinding, Deburring
- EDM technology
- Engraving, Lapping
- Thread cutting, Honing
- Tolerance: up to 0.005 / 0.001 mm
- Material: aluminum alloy, steel, stainless steel, titanium, magnesium, plastics, selected

Mechanical Measurements

During each stage of mechanical component manufacturing, all required measurements are performed to ensure that specified technical parameters are met.

Achievable Inspection Ranges

- Wavelength range from 190 nm up to 3.3 microns (up to 15 microns for special conditions)
  - In any angle of incidence and polarization
  - Reflection, transmission, absorption, optical density
- Dimensional precision going down to 0.5 micron and 1 arc sec
- Surface precision up to tens of nanometers:
  - Lenses up to 20nm,
  - Flat optics up to 10 nm.
  - Measurement accuracy of the lens radius < 0.5 µm
- Mechanics opto-mechanical assemblies and optics (including rotary symmetrical aspheres)

Meopta Defence – Areas of Application

Army

- TRACKED/WHEELED VEHICLES
- PERISCOPES
- FIRE CONTROL SYSTEM
- SURVEILLANCE
- MEASUREMENT SYSTEM
- NIGHT VISION
- THERMO VISION
- LASER SYSTEM
- SURVEILLANCE

Police, Security, Rescue

- NIGHT VISION
- THERMO VISION
- SURVEILLANCE

Airforce, Aviation, Space

- SURVEILLANCE
- LASER SYSTEM
- HELMET DISPLAYS
- NIGHT VISION
- MEASUREMENT SYSTEM

Examples of applications leveraging Meopta's manufacturing capabilities

Equipment for IFV

CDND-1 DRIVERSCOPE

- Day Channel: H90°/V45°
- Night Channel: H45°/V25°, Integrated auto-gating function, automatic gain control (AGC), BSP
- Electrical focusing function
- Anti-laser filter 800, 900, 1064, 1540 nm
- Electro-heated external glass surfaces

DND-5F DRIVERSCOPE

- Day Channel: H80°/V27°, Integrated digital display
- Night Channel: H45°/V28°, integrated auto-gating function, automatic gain control (AGC), BSP
- Electrical focusing function
- Anti-laser filter 800, 900, 1064, 1540 nm
- Electro-heated external glass surfaces

Others

Handheld Segment

- The handheld business is the military and sport optics business of Meopta
- Devices for professional military users and hunters

Red Dot Sights

MeoDot DF Tm4

MeoDot DF Tm5

MeoDot DF Tm6

MeoDot DF Xm

MeoDot DF P01

MeoDot DF P02

Magnifying modules

MeoBoost DF 3 Mag

Compact riflescopes

MeoForce DF 1-4x24

MeoForce DF 5x40

MeoForce DF 4x30

MeoForce DF 1-4x22

Governed by Internationally Recognized Standards

Quality Standard Certificates:

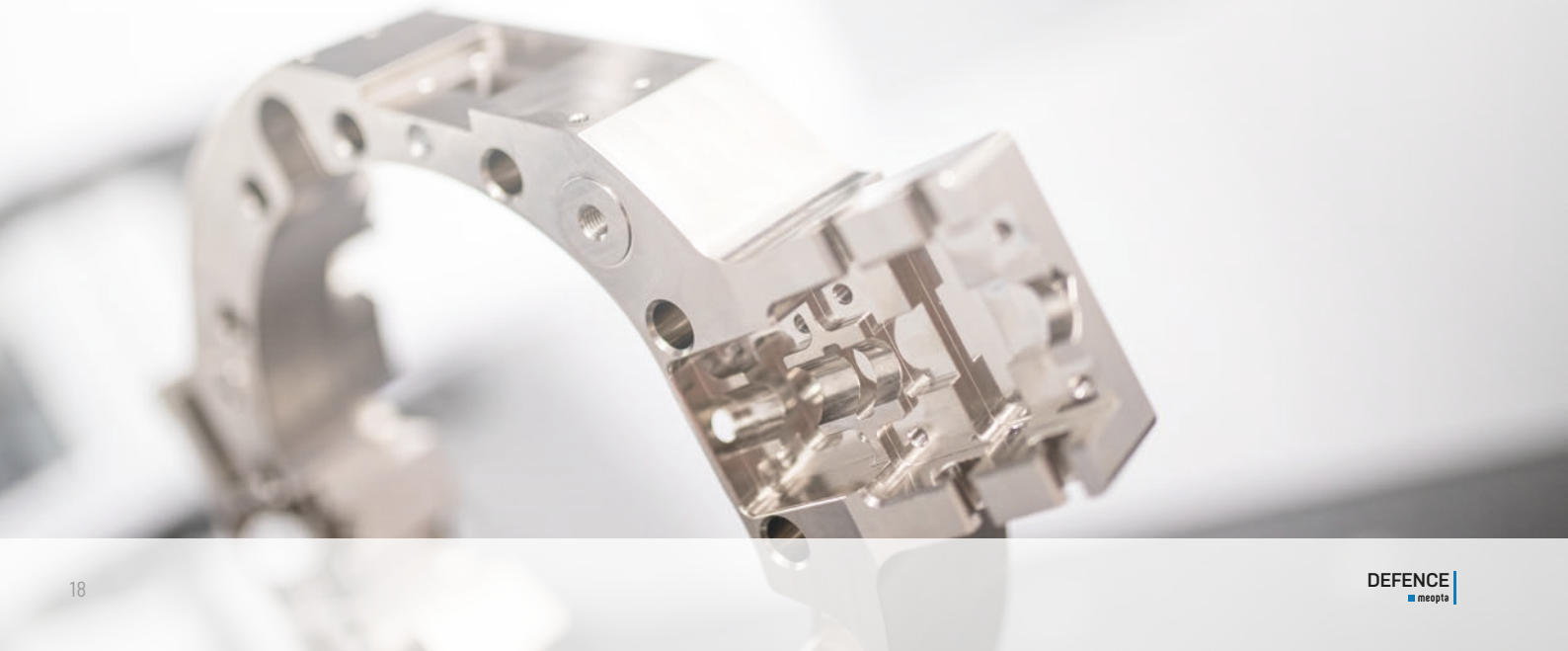
- ISO 9001 – Meopta s.r.o.
- ISO 9001 – Meopta Systems, s.r.o.

Internationally Agreed Environmental Management System Certificates:

- ISO 14001 – Meopta s.r.o.
- ISO 14001 – Meopta Systems, s.r.o.

Military Certification of Quality:

- AQAP 2110 (Defence) – Meopta s.r.o.
- AQAP 2110 (Defence) – Meopta Systems, s.r.o.
- AS9100 (Aerospace) – Meopta s.r.o., also trading as Meopta Systems, s.r.o.



Future is Young

Ideas and Energy Require Deep Expertise

To stay on top in research and development, we effectively connect the best of three worlds: academia, research, and commerce.

- **Palacky University in Olomouc**
- **Czech Technical University in Prague**
- **University of Technology in Brno**
- **Czech Academy of Sciences**
- **Institute of Scientific Instruments (UPT Brno)**
- **HiLASE centre**
- **TopTec**
- **Joint lab of optics Olomouc**

Victory Over the Darkness

Meopta Systems s.r.o.
Kabelíkova 1
750 02 Přerov
Czech Republic

Phone: +420 581 241 111
E-mail: meopta@meopta.com