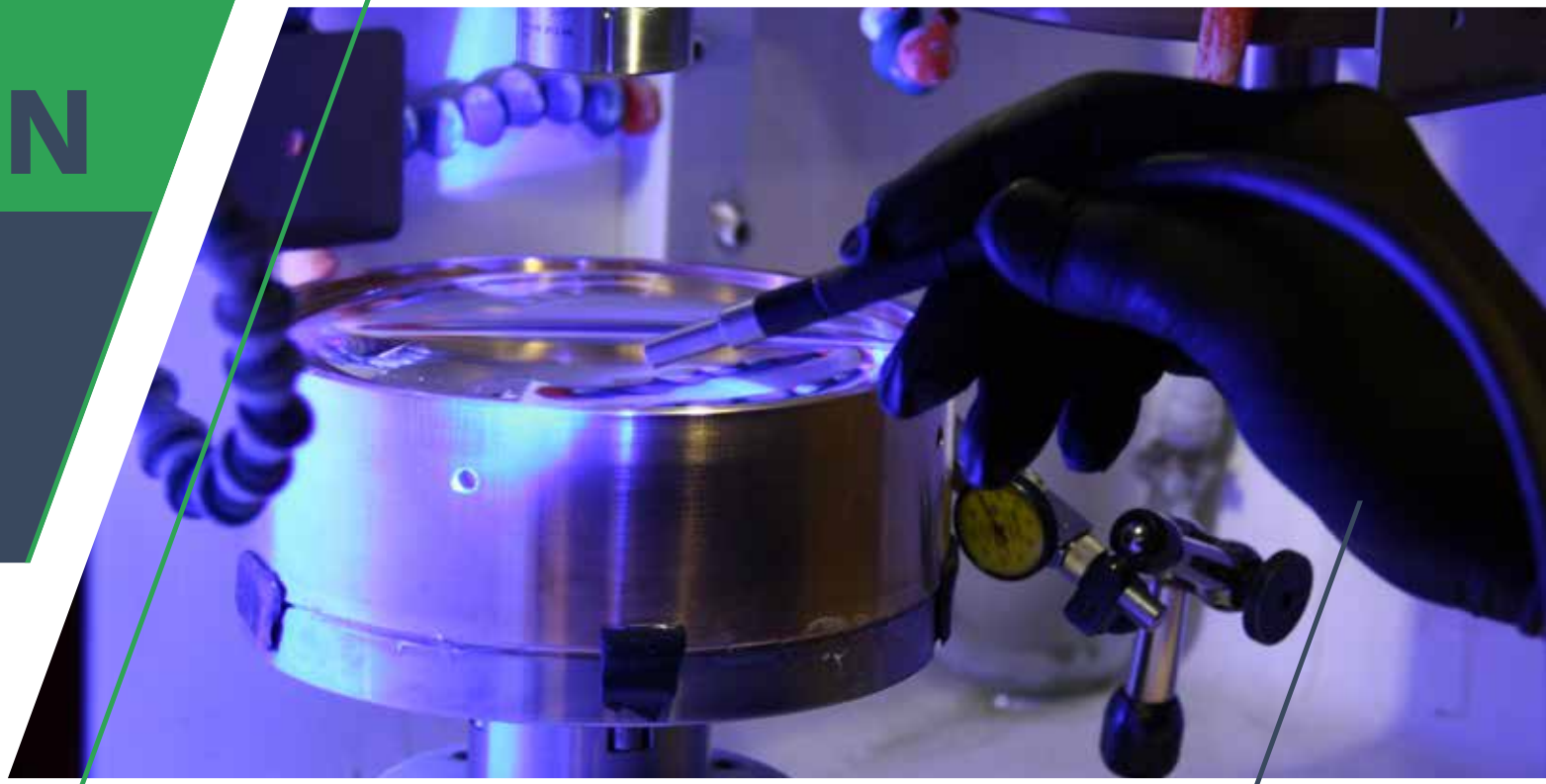
TECNOTTICA

HIGH PRECISION OPTICS

Precision Optics manufacturers since 1957



www.tecnottica.com

TECNOTTICA
CONSONNI SRL

WE HAVE
AN EYE for
PRECISION

LENSES, COMPONENTS & SYSTEMS
FOR PRECISION OPTICS

Tecnottica has been operating in the field of industrial Optics since 1957 and it is the reference company for the Italian market and increasing interest in international markets. Based in Calco (LC), a few kilometers from Milan, we are specialized in the production of single components and optical systems, in glass or plastic materials, for applications in the field of Imaging and Lighting, Biomedical, Automotive, Energy and Aerospace.

What characterizes all the products is the maximum precision of the final result, achieved thanks to a process tested and improved in over six decades of activity, the introduction of new processing and measurement tools, the complete traceability of each production batch and constant quality control in all stages of production.

We are able to satisfy any request from customers and manufacture custom solutions based on technical drawings' specifications and quality standard required by specific application, for this reason there is no catalog.

PRODUCTION
CAPABILITIES

Diameters
· between 2.7mm and 310mm
· flat optics with non-circular shape → max diagonal 400mm

Tolerances according to the geometries and dimensions of the piece
• Linear: up to +/- 0.01 mm
• Angular: up to +/- 10 arcsec

Geometries
• spherical & aspherical geometries
• flat surfaces
• particular geometries and shapes on customer request

Plastic materials Also for injection-compression molding
• PMMA
• PC

Certificated surface accuracy up to λ/20

Waterjet cutting and drilling of flat optics
with tolerances of +/- 0.03mm

SERVED MATKETS

Industrial optics
Machine Vision
Automotive
Biomedical
Optoelectronics
Aerospace
Lighting
Security/ Surveillance
Sensory

INNOVATION

Within our production department, we have the greatest technologies applied to the Optics fields: through the use of traditional machinery, up to the most modern CNC centers for precision computerized process, we are able to satisfy the most various requests according to the tolerances and qualities that the customer wishes to obtain.

QUALITY

With the help of the metrology department, integrated directly into the production area, we are also able to control, with high precision, the geometric, surface and cosmetic characteristics of our products directly during the manufacturing process.

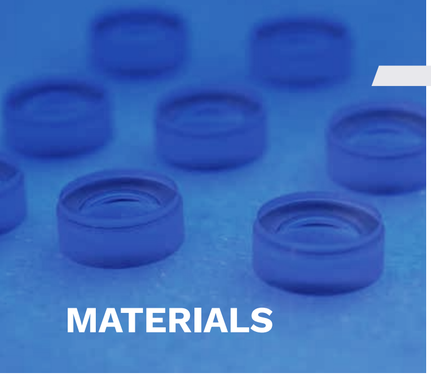
The company is certified according to the ISO system 9001: 2015 and ISO 14001:2015.

CONSULTING

We are oriented towards research and innovation, to provide specific consultancy in the design and engineering of individual optical elements and complete optical systems, accompanied by an accurate analysis and an efficient prototyping service, in order to conceive the realization of products that are industrializable and cost-optimized.

SPEED

We manage prototyping orders in a separate area of the production plant and within a few weeks we are able to supply complete prototypes. Thanks to the direct service for the acquisition of raw materials and an internal warehouse that is always stocked, we are able to reduce production times to provide products of the highest quality in the shortest possible time.



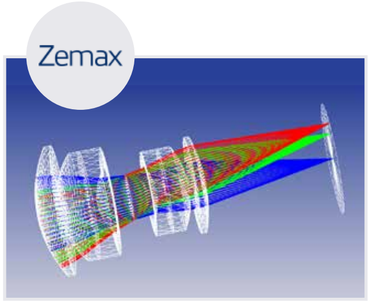
MATERIALS

All optical and Fused Silica glasses marketed by the world's leading manufacturers and suitable for working in the UV-VIS-SWIR and IR regions. The search for maximum precision begins with the materials used: selected, certified and completely traced in each process phase.

Other materials available: ZnSe, ZnS, CaF2, MgF2, Sapphire, Germanium, Silicon.

We also have a sector dedicated exclusively to the molding of lenses and optical components in plastic materials (mainly PMMA and PC). Specifically, we have ENGEL numerically controlled machines for molding management, with modern injection-compression technology.

Furthermore, the Zemax catalogue by Tecnottica gives the possibility to design with all the glasses in our warehouse or quickly available, thus simplifying the production process.



Design

Coating

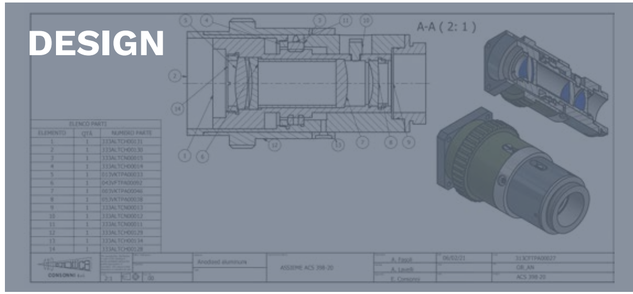
Prototyping

Mechanical Workshop

Assembly

Serialization and certification

Customer care



The experience gained in the development of numerous projects in different fields of application has allowed us to develop highly specific skills, which are today at the service of our customers to provide all the necessary support in studing, the designing and engineering of optical and opto-mechanical systems.

Starting from an idea or a specific need, we guide the customer in the world of optical components: from the definition and identification of the most appropriate material, to the choice of the appropriate tolerances.

To independent mechanical design companies, we provide direct support for the integration of the project within their mechanical system; on the contrary, we are able to provide directly - or through the help of external partners depending on the complexity of the project - an aid also for the analysis and design of the mechanical parts to be combined with the optical elements.

ADVANCED MACHINERY AND TECHNOLOGIES

Thanks to constant investments in high-tech machines, Tecnottica is able to grind, polish and center optical surfaces with the highest standard available today by the modern technology and is able to achieve optical flatness by the order of λ/20. Optical cementings and optical centerings are completed with centering values below 10 arcsec.

With the best technologies and an efficient department of metrology and control we are able to satisfy the most varied requests.

HIGH PRECISION OPTICS

Grinding, polishing and optical centering at their best

A huge part of Tecnottica's production is now dedicated to the manufacturing of plano and spherical optical components who require very tighten optical and geometrical tolerances; these elements are usually inserted in machine vision systems, imaging systems and in setups for laser applications.

The precision Optics department, built into a separated area of our plant in Calco, has been studied in a way that can operate independently from the rest of the production. Through this philosophy Tecnottica protects and guarantees the respect of tolerances and lead times of all its product lines by differentiating his own offer directly starting from the production area itself.

Grinding machines
- Schneider SLG301
- Schneider OM SLG50
- Schneider OM SLG120
- Schneider OM SCGA100
- LOH Spheromatic 120 SL

Polishing machines
- Schneider SLP301
- Optotech SPK100
- Optotech SPK150
- Schneider OM 120SL
- Satisloh SPS125
- Stock Konstruction RSP 20-3
- Stock Konstruction RSP 40-2
- Optotech HM300

Centering machines
- Optotech ZM200 CNC
- Satisloh C50
- Loh CM2 SL

Cementing station
- Optotech AZP2 HP
- Coating machines
- Optotech OAC-75F
- Leybold Bühler Syruspro 1100
- ShimadzuIRAffinity-1S
- PerkinelmerLambda 1050+
- Cleanroom ISO 14644-5

A proven method to guarantee the best control in the production of high precision.

The metrology and control department, adjacent and complementary to the production area, was designed specifically to have complete and effective control after each stage of the processing of our precision products. We are able to offer our customers a range of products with the highest quality, certified and guaranteed by our tools, while reducing waste and manufacturing defects.

METROLOGY

- Interferometer Schneider SLI 101 equipped with hardware Zygo 4"
- Interferometer Optotech OWI 150 XT equipped with hardware Zygo 6" and software Zygo Metro Pro
- Interferometer XONOX VT1200 4"
- Interferometer XONOX VT1200 6" equipped with hardware Zygo 6" and software Zygo MX
- Transmission spheres for 4" and 6" interferometers
- Thickness measurer XONOX CT100 Trioptics
- OptiSpheric
- Trioptics SpheroCompact
- Trioptics PM150MAN
- ZEISS 50X microscope with integrated camera and analysis software
- 3D Optical Profiler System ZeGage Pro

We are able to certify to our customers the following measurements:
- Radii of curvature measurements with sub-micrometric accuracy
- Measurements of prisms and wedges
- Measurements of thicknesses and sag values
- Measurements of EFL of single elements and complete systems
- Measurements of resolution and MTF curve of complete systems (performed @546 nm)
- Interferometric analysis of optical surfaces, in accordance with ISO 10110 standards
- Cosmetic defects analysis of optical surfaces, in accordance with ISO 10110 standards
- Measurements of Transmission/Reflection curves of optical materials at variables angles of incidences
- Measurements of the roughness of optical surfaces up to 0.15nm

METROLOGY AND CONTROL

Complete and effective control of every step of the process

COATING

SURFACE TREATMENTS FOR OPTICAL COMPONENTS

A new highly specialized inhouse Coating Department was recently introduced to offer our customers a complete service and even higher quality finishes.

Insourcing the surface treatment guarantees us to trace each production batch, promptly provide the entire documentation with technical specifications and satisfy the requests of our customers, thanks also to the particular attention to standards and quality control that have always distinguished us.

TYPE OF **COATINGS**

- Anti-Reflection Coating
- Broadband
- High Reflection
- Partial Reflection
- Filter
- Polarizer

TYPE OF **SUBSTRATES**

We treat all substrates marketed by the main producers and any kind of optical component and surface.

TYPE OF **APPLICATIONS**

Ideal for various applications in the UV-VIS-SWIR and IR regions: Aerospace, Laser, Biomedical, Lighting, Machine Vision, Imaging, Security and Defense.

PRODUCTION METHODS

In Tecnottica we adopt two of the most effective methods for the coating deposition, granting exceptional directionality and a higher deposition rate:

- **The Electron Beam Evaporation (EBE)**
by layering multiple optical coatings is able to achieve specific and unique reflective and transmissive properties.

- **The Ion Assisted Deposition (IAD)**
based on the EBE system with an additional Plasma Source that creates a denser micro structure on each layer able to eliminate thermal drift.

COATING METROLOGY AND CONTROL

Our Quality Control Department inspects each component to grant that they are fully certified according to:

- **Standard ISO 9211**, that defines the general characteristics, the test and measurement methods;
- **Standard ISO 9022**, that defines terms relating to environmental tests;
- **MIL-F-48616**, that defines the inspection method for Surface Quality.

For Space Applications we refer also to the Standard ECSS-Q-ST-70-17C, verifies verify the durability of the coating in hostile conditions.

The coating curve of verifies lens is measured on a Witness Sample, a plane disk made of the same material as the optical component and having the same refractive index as the substrates, to analyze the coating curve and its spectrophotometric properties.

CONTROLLED ENVIRONMENT

A grain of dust on the optical surface can compromise its functioning and the coating, for this reason in Tecnottica we pay particular attention to the critical environment in which we operate.

The temperature and humidity of the air are regulated to meet the operational needs of the production, furthermore the critical areas, where the lenses are prepared and the post-treatment inspection is carried out, are isolated to avoid any contamination and filtration of dust, molds and microorganisms.

The area is equipped with a very high level **ISO 14644-7 certified Cleanroom with ISO 14644-5 certified Laminar Flow Modules**, which guarantees high quality of the incoming air and prevents contamination; to access the clean room our skilled technicians must use appropriate garments as required in the norms above.

TEST METHODS

Specific tests are conducted based on the environment in which the lens will be used to determine a coating's characteristics. Samples shall be cleaned and inspected before and after each test step to verify that the defects are in conformance with the coating specification.

Here a list of test methods we perform or manage in Tecnottica:

- **ADHESION TEST** assesses the adhesion quality and verify that the coatings is perfectly bonded with the substrate;
- **ABRASION TEST** verifies that the coatings is not removed by cleaning and handling methodologies during its life time cycle. Two tests are commonly used: Moderate Abrasion and Severe Abrasion;
- **SPECTROPHOTOMETRIC MEASUREMENTS** tests the absorbance of the coating layers;
- **CLEANING TEST** is related to **SOLVENT COMPATIBILITY**

Some specific qualification testing for environments with harsh condition must be performed in Controlled Laboratories, all results are revised by our technical experts:

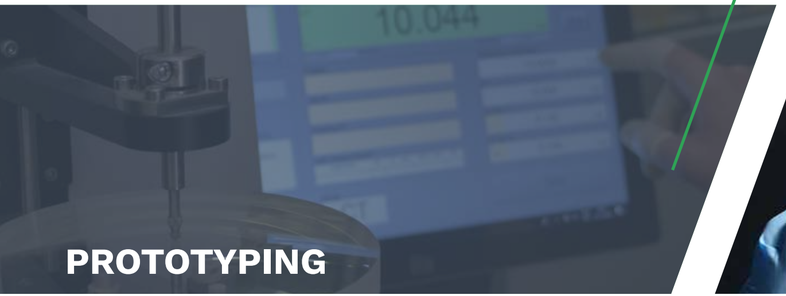
- **ATOX OR ANY KIND OF PARTICLE AND UV TEST** verifies the compliancy of the coating to radiation environment (space application);
- **THERMAL VACUUM AND CYCLING TEST** verifies the resistance of the coating to thermal cycles with high temperature changes and the compliancy of the coating in a vacuum environment (space application);
- **DAMP HEAT (HUMIDITY) OR GENERIC ENVIRONMENTAL TEST** verifies the coating can afford a rapid increase and decrease of temperature with a humidity equal to 90% (space application).

COATING MACHINES

- Optotech OAC-75F with EBE Technology
- Leybold Bühler Syrius Pro 1100 PIAD with OMS controller

COATING METROLOGY MACHINES

- Spectrophotometer Shimadzu IRAffinity-1S
- Spectrophotometer Perkinelmer Lambda 1050+
- Spectrophotometer EssentOptics PHOTON RT 190-4900



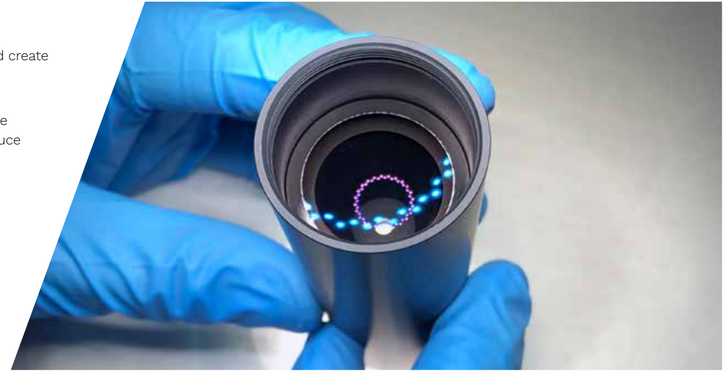
PROTOTYPING

Our experience is at the service of our customers to develop new projects and create complete optical systems starting from an idea.

Providing an efficient, timely and high quality prototyping service is essential for innovation and highly demanding markets we serve, for this reason we have an internal mechanical workshop to assemble and create prototypes that reduce production times and costs.

Within 4/6 weeks we can provide a single prototype or different versions of optical elements with any surface treatments and allow Companies to accelerate evaluation and testing of their future product.

In order to complete the circle, we can industrialize the process and serialize the production of components with characteristics and functionality loyal to the prototype, with a precise estimation of times and costs.



MECHANICAL WORKSHOP

Thanks to the mechanical workshop within the production department and our modern CNCs, we are able to quickly produce patinas and polishing tools for any radius to reduce production times. The mechanical workshop is also able to produce components, such as ring nuts and spacers for the assembly of complete optical systems.

ASSEMBLY

The assembly of the various components is perhaps the most delicate phase of the entire production of complex optical systems.

To ensure the perfect functioning of the assembled optics, we perform the correct alignment, gluing and centering with the aid of high-precision instrumentation, in a dedicated laboratory equipped with ISO 14644-5 certified Laminar Flow Modules and air-conditioned hoods, so as to ensure maximum cleanliness. For the execution of the cementing of several lenses of the same optical group (achromatic doublets, triplets ...) we develop a small “assembly line“ to manage assemblies of optical, electrical and mechanical components, providing the customer with finished optical systems.

The assembled products are checked and tested by expert technicians, who perform control of the focal length and MTF of the assemblies and verify the absence of micro-dust.

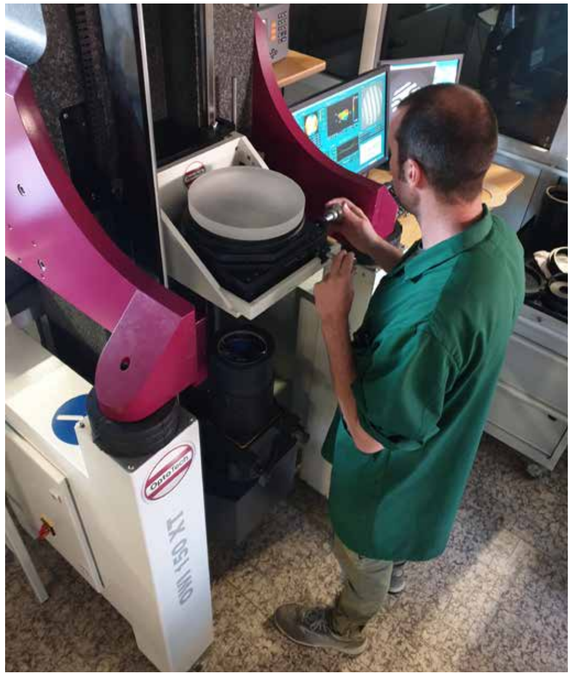
SERIALIZATION AND CERTIFICATION

The machinery and equipment of the metrology department allow us to make measurements and certify products to our customers.

From the raw material to the finished product, we carry out continuous checks and measurements, and thanks to the high technology of measuring instruments we can issue certificates attesting the accuracy of the work performed.

CUSTOMER CARE

We work directly with our customers, creating products modeled according to the needs and qualities required, to provide a finished product, which has the best quality and compatibly with the applications to which it is designated.



WE HAVE **AN EYE** for **PRECISION**

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