
# ELT Instruments Day 2022

7th April 2022

Geneva, Switzerland

# Exhibitors List

A.D.S. International
ACTIVE SPACE TECHNOLOGIES S.A.
AGC Glass Europe SA
ALMATECH SA
ALPAO
ALSYMEX
ALTER TECHNOLOGY
AMOS S.A.
APCO Technologies
ASE Optics Europe
AVS Added Value Solutions
AWGE Technologies, S.L.
Bilfinger Noell GmbH
Cadinox SA
Cambridge Consultants
Centre Spatial de Liège
CoRES HES-SO//Genève
Creotech Instruments S.A.
Cryoworld BV
Cryo Diffusion
CSEM SA
Dal Ben SpA
DEMACO HOLLAND B.V.
Demcon Advanced Mechatronics
EIE Group Srl.
ENSA
First Light Imaging
Heidelberg Instruments Mikrotechnik
HEIG-VD
Heraeus Conamic
Hexagon MI
IDOM
IMEC
IPP CAS
Institute of Scientific Instruments of the Czech Academy of Sciences
JPE
Kampf Telescope Optics
Manufax Nelson Group
MAXON
Micro-Epsilon Messtechnik GmbH
MPS Microsystems
NYFORS Teknoloigi AB
Observatory Sciences Ltd
OFFICINA STELLARE SPA
OIP Sensor Systems
Optical-Calculation
Optocraft GmbH
Physik Instrumente GmbH
RFR Solutions AB
S2Innovation Sp
SAFRAN REOSC
SCHOTT AG
SENER Aeroespacial
SETIS
SwissOptic AG
SYDERAL SWISS
SYMETRIE
TECPA
Teledyne SP Devices
Thales SESO
TNO
TOPTICA Projects GmbH
VDL
von Hoerner & Sulger GmbH
Winlight System

# Foreword

**Dear Industry representatives,**
**Dear ELT Instruments work package managers & National astronomy institute members**

We are writing to you as Industry Liaison Officers to the European Organisation for Astronomical Research in the Southern Hemisphere ESO.

There is no doubt that ESO is one of the world's leading research institution in the field of astronomy. For the past 60 years, the ESO telescope infrastructures have produced spectacular scientific discoveries, and granted the international astronomy community with major achievements in the exploration of the universe. The next step is the construction of the ESO's Extremely Large optical/infrared Telescope ELT with a primary mirror of 40 meters in diameter with a "first light" milestone scheduled for 2027. The ESO's ELT will be "the world's biggest eye on the sky" — the largest optical/near-infrared telescope in the world. Once complete, the ESO's ELT will address many of the most pressing unsolved questions in astronomy.

Technology development, including industry partnerships, has been one of ESO's top priorities for the ELT construction. In parallel, the design of four of the first-generation ELT instruments to be connected to the telescope has started with HARMONI, MICADO, MAORY and METIS. Two further instrument projects, ANDES and MOSAIC, have just recently obtained budget approval from the ESO Council. These instruments concentrate a substantial amount of high-tech components in different technological fields, such as optics, mechanisms, vacuum & cryogenics, detectors or control electronics. The delivery of the ELT instruments is entrusted to national astronomy laboratories taking part within larger international consortia. Nevertheless, industry supplier companies make vital contributions to this development context as well. The construction of the ELT instruments represents a total investment of more than 100 M€.

Regular exchanges between ESO managers, physicists and engineers from the laboratories in charge, as well as with industrial companies are seen as highly valuable. In order to allow companies to anticipate technical challenges ahead of time, and for laboratories to assess expertise and capabilities of the industry for new supplier options, it is our pleasure to welcome you to the "ELT Instruments Information Day" hosted at the Geneva International Congress Center on the 7th April. Besides ESO keynote speakers, we have secured the participation of the ESO's E-ELT instrument project team leaders who will provide a full overview of the ELT Instrument activity, including technical status updates and procurement opportunities.

We are delighted that more than 60 companies from different ESO member states are showcasing their highly innovative products and services. Participating companies will be invited at small poster booths (in the spirit of a scientific conference) to present their technology offer and show their previous or ongoing projects with research facilities. This poster session will favor exchanges and serve as a basis for a "Business to Business" session.
A hybrid conference format will be set up for companies and institutes prevented from travelling.

We warmly invite you to attend the 2022 ELT Instruments Information Day and look forward to meet you in Geneva!

On behalf of the ESO Industry Liaison Officers group

**Michel Hübner**
Swiss ESO ILO

**Sophie Pireaux**
Belgian ESO ILO

**Ramon Navarro**
Dutch ESO ILO

# Program

| | |
|---|---|
| 10:00 | **Registration/ Welcome coffee** |
| 10:55 | **Welcome address**<br>Michel Hübner, ESO ILO Switzerland |

## ESO Presentations

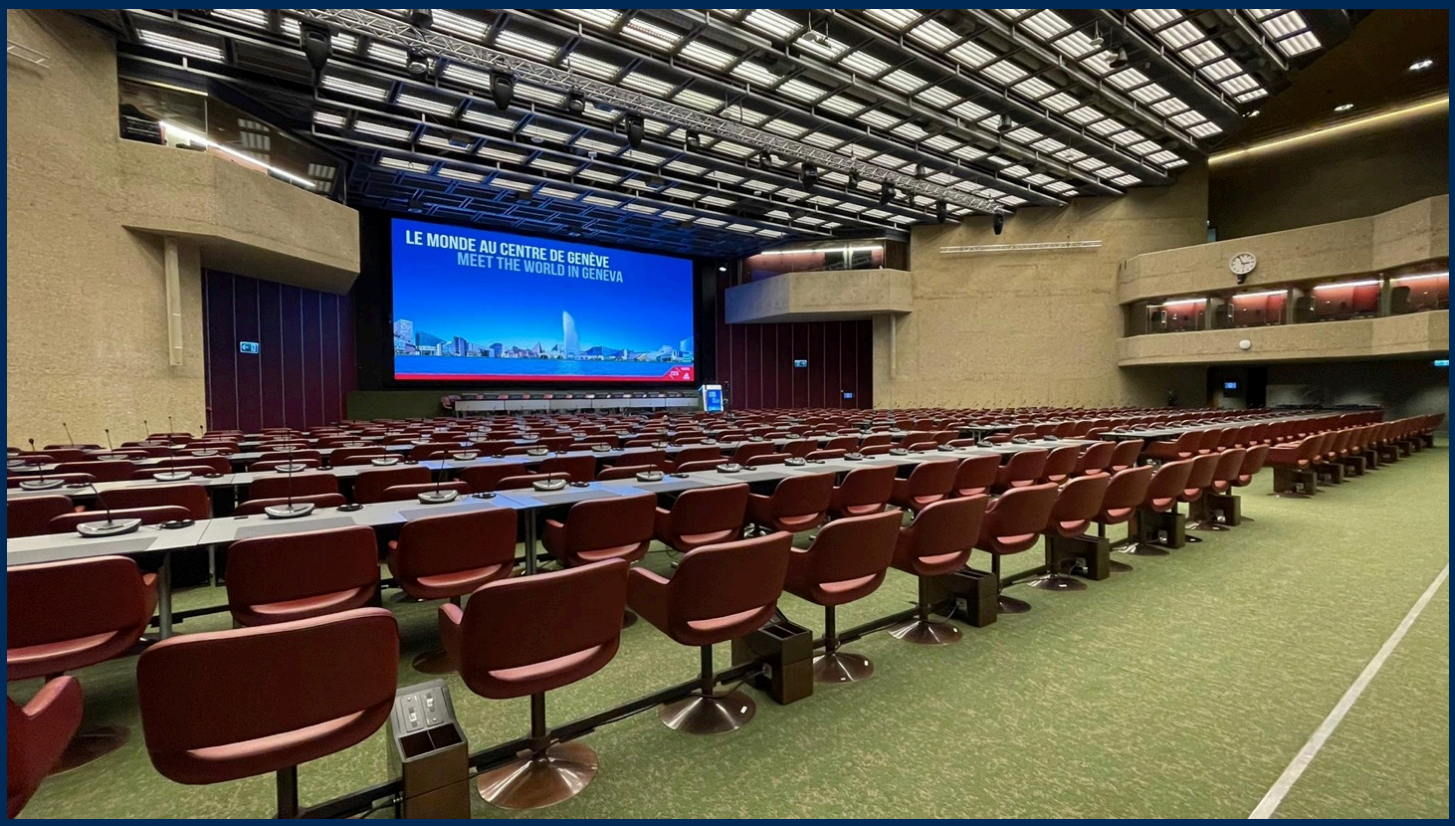
chair Sophie Pireaux, ESO ILO Belgium 11:00 – 12:15

| | |
|---|---|
| 11:00 | **ELT Telescope Progress**<br>Roberto Tamai, ESO, Head of ELT Program |
| 11:20 | **ELT Instruments – General Overview**<br>Suzanne Ramsay, ESO, ELT Instruments Project Manager |
| 11:40 | **ESO Technology Roadmap**<br>Norbert Hubin, ESO |
| 12:00 | Q&A ESO presentations |
| 12:15 | Lunch |

## ELT Instruments Presentations

chair Ramon Navarro, ESO ILO The Netherlands 13:15 – 16:05

| | |
|---|---|
| 13:15 | **HARMONI**<br>David Le Mignant, LAM Marseille |
| 13:45 | **MICADO**<br>Sebastian Rabien, Max Planck Inst. Garching |
| 14:15 | **MAORY**<br>Ugo Di Giammatteo, INAF Bologna |
| 14:45 | Coffee break |




| | |
|---|---|
| 15:00 | **METIS**<br>Jeffrey Lynn, NOVA |
| 15:30 | **ANDES**<br>Alessio Zanutta, INAF Brera |
| 15:50 | **MOSAIC**<br>Éric Prieto, LAM Marseille |

## Poster & B2B session

16:15 – 18:15

## Evening Program

Geneva Harbour 19:00 – 21:30

# A.D.S. International

A.D.S. International is an Italian private company operating in the design and production of Astronomy and Defense Systems.

https://www.ads-int.com/

## ACTIVITY KEYWORDS

Large Deformable Mirrors for Adaptive Optics - High-precision high-payload Hexapod positioner systems - Land Satcom on the Move, Airborne Datalink terminals, Ground Stations

## WHO WE ARE

Founded 25 years ago, ADS has been constantly growing and developing highly specialized skills and know-how. A lean, flexible organisation and a competent, experienced workforce allow ADS to design, develop and deliver cutting edge products and customised solutions to its international customer base. A.D.S. International has been certified to ISO 9001:2015.

Our premises feature an assembly hall 11 m tall, a mechanical workshop, an electronics lab, two clean rooms and a chemical laboratory. We develop, integrate, calibrate and test all our products in-house, to assure direct control of our processes.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Deformable Mirrors | Our Large Deformable Mirrors for Adaptive Optics (AO) correction on the telescope main optics have been adopted by most of the present and planned extremely large telescopes | VLT1120 · ELT-M4 · GMT-ASM · SUBARU-ASM |
| Hexapod | ADS high accuracy hexapod and linear actuators feature payloads from 300 kg to 3800 kg with submicron displacement accuracy and rotation. Accuracy in the arcsec range. | DeCAM · DESI · LMT_M1 · ELT_M2-M3-M4 |
| Antenna Systems | We developed a new suit of high-end antenna systems for first responders and defense market. | Ka-band COTM · Ku & C-band DataLink |

## KEY FIGURES

Turnover: 4 MEUR

Employees: 22


Daniele GALLIENI

Business development for Astronomy and Science

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## SOME REFERENCES

- ❑ European Southern Observatory
- ❑ Giant Magellan Telescope
- ❑ Large Binocular Telescope
- ❑ NAOJ
- ❑ INAF
- ❑ INAOE

*from Concept to Object*

# ACTIVE SPACE TECHNOLOGIES

Making Science a global endeavour!

www.activespacetech.com

## ACTIVITY KEYWORDS

Space instrumentation
Structural and thermal control systems for space applications
Harsh environment monitoring and control systems for aerospace applications
Remote handling systems for hazardous and radiation environments

## WHO WE ARE

Active Space Technologies is a European based company operating in Space, Big Science, Aeronautics, Nuclear and Industry.

Active Space Technologies offers bespoke electro-mechanical systems for extreme harsh environments, such as instruments and mechanisms, actuators and wireless sensing systems. Our systems are qualified for high-g, high temperature radiation environments.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Mechanical Engineering | Thermal and structural analysis, fluid dynamics, design, high precision manufacturing, integration, and testing | NA |
| Eletronics Engineering | Automation, embedded systems, digital control | NA |
| Management support services | Project management, quality assurance, systems engineering, project coordination | NA |

## KEY FIGURES

Turnover: 4M€

Employees: 40

## SOME REFERENCES

- ESA (Science and EO Missions)
- NewSpace
- Big Science (ITER, ESO, JET)

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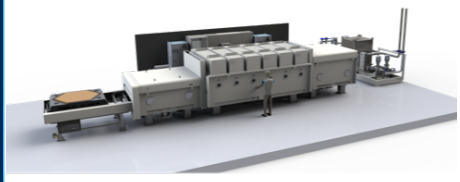
# AGC Plasma Technology Solutions

A one stop provider of vacuum coating equipment



www.agc-plasma.com

## ACTIVITY KEYWORDS

Vacuum coater, physical vapor deposition (PVD) , magnetron sputtering equipment, coatings, coating development

## WHO WE ARE

AGC Plasma Technology Solutions is the industrial coatings unit of the world's largest glass producer AGC Inc. (Asahi Glass Company) and a one-stop provider for plasma-based vacuum coating equipment. The group leverages decades of thin-film coating experience on large area glass products to innovate and develop new industrial solutions from proof-of-concept to mass production. AGC Plasma Technology Solutions operates R&D and production facilities across the US, EU, and APAC.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Astronomical mirror Coating equipment | Tailor made turnkey vacuum coating equipment including magnetron sputtering, plasma enhanced chemical vapor deposition or ion implantation. | |
| Coating development | Supporting innovative coating development with increased optical performances and superior durability | |

AGC
Your Dreams, Our Challenge

## KEY FIGURES

Turnover: 14 Bio €

Employees: 50,000


Jeroen SCHOTSAERT

Sales & Marketing

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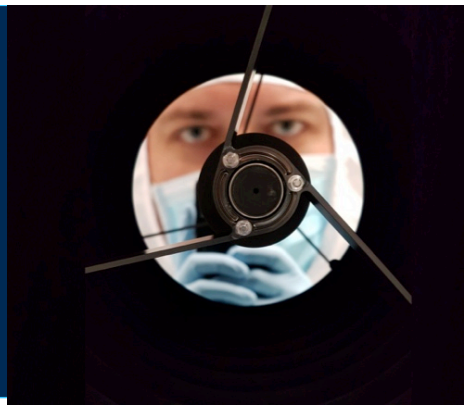
BELGIUM


## SOME REFERENCES

- ❑ Coating equipment for M1 – M5 of ELT

# ALMATECH

Creative. Flexible. Reliable.



www.almatech.ch

## ACTIVITY KEYWORDS

Almatech provides end-to-end engineering solutions in the fields of composite structures, mechanisms, thermal hardware, electrical harness and instrument sub-systems, in addition we produce and distribute mini stepper motors, SMA actuator and pointing systems for space applications among others.

## WHO WE ARE

Almatech is a privately owned Swiss company founded in 2009, with offices in Lausanne at the EPFL Innovation Park. Since its inception, Almatech has successfully contributed to several European space missions such as BepiColombo, Solar Orbiter, CHEOPS, Exomars, MetOp-SG and Sentinel-5 by providing critical flight hardware and/or engineering services. Almatech is now recognized as a reliable industrial partner by the European Space Agency, as well as by industrial leaders mainly from the space industry.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| New Optical Pointing System | Based on Almatech flexible pivot, the **NOPS** provides hemispherical pointing, 3 axis inertial decoupling with contactless dampers, 2 micro-radians pointing accuracy, use of stepper motors. | NOPS |
| Resettable SMA Actuator | **SMA actuator** operates under high temperature (actuation T> 140°C), Bi-stable, automatically resettable, Lightweight (118 gr), customizable, life time 1000 cycles. | SMA Actuator |
| Stepper Motors | **S2M2** Micro Steppers benefit from the outstanding fabrication & quality standards for high-reliability industrial electric motors. The Stepper Motors can be combined with space compatible planetary gearheads. | S2M2 |

NOPS


## KEY FIGURES

Turnover: 6,5 MCHF

Employees: 27 FTE

## SOME REFERENCES

- ESA: CHEOPS, Solar Orbiter, BepiColombo, Exomars, Biomass
- CNES: SVOM

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# ALPAO

World leader in Adaptive Optics products and systems


www.alpao.com

## ACTIVITY KEYWORDS

Adaptive Optics, optical aberrations, atmospheric turbulences, wavefront sensors, Real Time Computer, design and manufacturing

## WHO WE ARE

ALPAO designs and manufactures a complete range of adaptive optics components and systems for use in research and industry. ALPAO understands your needs and provides you with the best components: deformable mirrors, wavefront sensors and software for your application. Our products are tailor-made for various applications such as astronomy, ophthalmology, microscopy, wireless optical communications, defense and space, laser applications and microelectronics. Their unrivalled performances allow a fast recover very high-resolution images.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Deformable mirror | Based on continuous reflective surface motioned by magnetic actuators, they feature large strokes, high dynamic motion and an excellent optical quality to meet and exceed your requirements for fast and accurate wavefront correction. | ALPAO DM |
| Deformable Modal Mirror | An excellent correction of the most common optical aberrations. Each control channel corresponding to one optical mode (e.g. focus or astigmatism), the control is straightforward. It was designed to be cost-effective and easily integrated into systems. | ALPAO DMM |
| Wavefront Sensor | Based on Shack-Hartmann technology; especially designed for adaptive optics, they feature excellent performances to fit with every adaptive optics system. Sensitivity, speed and spectral range can be chosen depending on your needs. | ALPAO WFS |
| Real Time Computer | For the most demanding applications, such as atmospheric turbulence compensation, Alpao can provide a state-of-the-art Real Time Computer, a CPU linux based Real Time Computer (RTC) running up to 5kHz with RTC latency lower than 1 50>s | ALPAO RTC |

## KEY FIGURES

Turnover: 6M€

Employees: ~40

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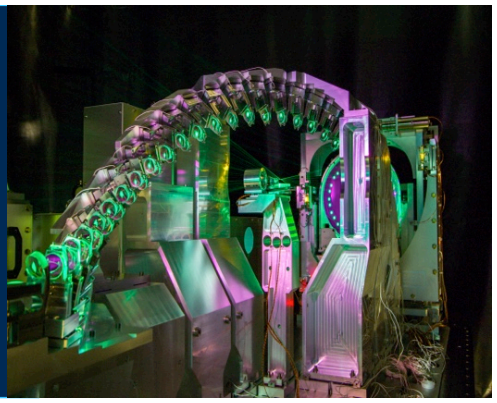
## SOME REFERENCES

- ESO
- ONERA
- CHARA
- NASA
- LAM

# ALSYMEX

We provide opto-mechanical and complex systems



www.alsymex-alcen.com

## ACTIVITY KEYWORDS

Opto-mechanics, large dimension high precision machining and welding, special assembly processes, control command systems, vacuum, cryogenics, clean room assembly, system integration, on site installation and commissioning

## WHO WE ARE

ALSYMEX is a French company specialized in the design, engineering, manufacture, assembly, on site commissioning and maintenance of multi-technology systems for defense, aerospace, energy and big science applications.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Machining and assembly | Medium to large dimension (up to 10m) machining: turning, milling, electro-erosion, ..<br>Assembly techniques : welding (TIG, e-beam, laser), hot isostatic pressing | NA |
| Opto-mechanics | Design and manufacture of opto-mechanical sub-assemblies and adaptative mirrors for the French mega joule laser (LMJ) including clean room (ISO5) assembly<br>Manufacture of metallic mirrors for a small size telescope of the CTA project<br>Design and manufacturing of an electron-laser interaction chamber for ELI-NP | NA |
| System integration | Laser amplifying and transport systems for LMJ and ELI-NP; turnkey particle accelerators; Heating systems for ITER, … | NA |

## KEY FIGURES

Turnover: 100 M€

Employees: 650


Eric GIGUET

Head of Sales & Business Development

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## SOME REFERENCES

- LMJ (French Mega Joule Laser)
- ITER
- ELI-NP
- XFEL
- ESS
- CTA
- Major synchrotron light sources worldwide

# Alter Technology

Testing, Electronic design, Optics

https://www.altertechnology-group.com

## ACTIVITY KEYWORDS

- Testing: EMC, thermal, optical, image sensors, mechanical, electronic components, radiation
- Electronics design, optics, component engineering, encapsulation, automation

## WHO WE ARE

ALTER TECHNOLOGY TÜV NORD SAU (hereafter ATN), a member company of TÜV NORD GROUP, is a quality driven company providing procurement, engineering and test services for electronic systems, equipment and E.E.E. components, within the space and harsh environment markets. ATN works in many markets including, but not limited to, Aerospace, Security, Transport, Energy, Health & Safety and Automotive.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Testing | EMC, EMC, thermal, optical, image sensors, mechanical, electronic components, radiation | |
| Opto/Electronic design | Analog, Mixed signal and Digital Design , Power Electronics, Optoelectronics, FPGA (VHDL, Verilog), PCB Design over FR4, IMS or Flex boards, RF PCB layout, Design for Manufacturing, Design for EMC | |

## KEY FIGURES

Turnover: 40 MEUR

Employees: 275


Eladio MONTOYA

Business Development Big Science

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## SOME REFERENCES

- ESA: Common Part Procurement Agency for EUCLID, PLATO, ROSETTA, PLATO, BEPICOLOMBO, JUICE
- F4E/ITER
  - 2015-2018: F4E-OMF-0555, “Support to F4E to develop internal control & compliance procedures for export control and Dual Use components”.
  - 2015-today: ITER - CFT_11268, Discharge Loop interface box (DLIB)
  - 2014-today: F4E-OMF-43, Provision of support to the F4E ITER Department
  - 2021-today: F4E-OFC-1087, Bespoke Electronics
  - 2021-today: F4E-OPE-1084, Neutron irradiation of bolometer sensors

# AMOS

Advanced Mechanical and Optical Systems

www.amos.be

## ACTIVITY KEYWORDS

optics, thermo-mechanics , servo-control, software, vacuum, cryogenics, system engineering, large mirrors, freeform optics, TMA's, hyperspectral spectrometers, mechanical structures, rotators, instruments, telescopes, solar telescopes, TCS.

## WHO WE ARE

For more than 35 years, AMOS has been a reference for the design and polishing of high-precision optics from a few centimeters to 2.6-meter size.

Meanwhile, AMOS has acquired a worldwide-recognized experience in making 2-to-4 m class ground-based telescopes. AMOS is also involved in major European space programs and world-class astronomy projects by developing innovative instruments and sub-systems.

The strength of AMOS lies in a system level approach, including optics and high-precision mechanics, in which engineering, fabrication and AIV are mastered in-house with strong multi-disciplinary teams.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optical components | Large mirrors and lenses, aspherical and freeform optics in glass ceramic, silicon carbide and aluminum alloy, gratings and freeform gratings. | AMOS |
| Optical or opto-mechanical subsystems | Telescopes, TMA's, hyperspectral compact spectrometers, vacuum-compatible test collimators, optical flats, mirror mounts, gimbals, optical test equipment, etc. | AMOS |
| Electro-mechanical subsystem | Telescope mount, instrument rotators, telescope cable wraps, telescope control systems, vacuum- or cryo-compatible mechanical systems, etc. | AMOS |
| Thermal subsystems | Thermal vacuum simulators, thermal shrouds, spaceborne instrument thermal control, etc. | AMOS |

ADVANCED MECHANICAL & OPTICAL SYSTEMS

## KEY FIGURES

Turnover: 17M EUR

Employees: 100


Xavier VERIANS

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## SOME REFERENCES

- ESO (VLT, ATS, ELT)
- ESA (Most space missions with optics inside)
- ISRO, India
- ARIES, India
- PRL, India
- CEFCA, Spain
- DAG, Turkey
- AURA, US
- NMT, US

# APCO Technologies

We take up technical challenges

www.apco-technologies.eu

## ACTIVITY KEYWORDS

Complex electromechanical systems integrator

Turn key solutions provider

## WHO WE ARE

APCO Technologies is a system/subsystem integrator and turnkey solution provider, specialized in the development of high quality mechanical and electro-mechanical equipment for the space (satellites, launchers and services), energy and naval industries, including project management, co-engineering, design, production, integration, testing, installation, operation and on-site support.

APCO Technologies is certified EN/AS 9100, ISO 9001, ISO 14001, ISO 27001 and ISO 45001.

APCO Technologies is employing 400 highly qualified people in Switzerland, USA, UK, France and French Guiana.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Ultra-Stable Structures | Composite and metallic ultra-stable structure for instruments' optimum performance in ambient and thermal vacuum conditions | Custom made |
| Thermal Control Subsystems | Integration of active and passive thermal control subsystems to ensure a precise and stable operational temperature | Custom made |
| Complex mechanisms | Development of high-end mechanism for instruments' performance in ambient and thermal vacuum conditions, with micro-vibrations management , and with high reliability | Custom made |

APCO TECHNOLOGIES


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## KEY FIGURES

Turnover: 100+ M€

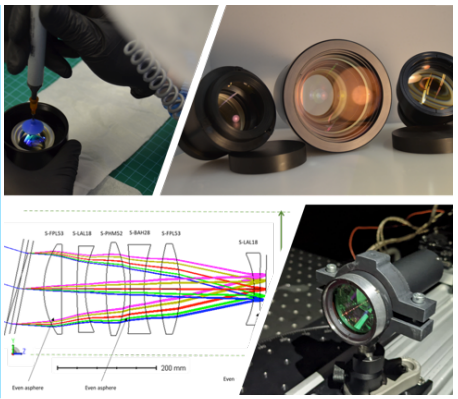
Employees: 400

## SOME REFERENCES

- ESA / NASA
- EDF Nuclear Power Plants
- ITER
- US Defense Market

# ASE OPTICS EUROPE

Optical design and engineering for fully custom integrated optical systems.



www.aseoptics.com

## ACTIVITY KEYWORDS

Optical design and engineering, optical and optronic systems, integrated laser systems, imaging systems, inspection systems.

## WHO WE ARE

ASE Optics Europe specializes in the design, engineering and development of precision optical, optomechanical and optoelectronic systems. From concept design to manufacturing, our experience and knowledge allows us to excel in optical design, engineering and manufacturing for the new systems and products development. We develop optical systems for different industries, scientific applications and projects

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optical systems design and integration | Complex optical systems custom lens, imaging systems, laser and photonic systems. Opto-mechanics, optoelectronics and software for image processing and automation | N/A |
| High-precision NDT and inspection systems | Systems for the inspection of large areas and surfaces in a non-destructive way. 3D no- destructive inspection system for microfeatures, microfluidics and microdevices. | N/A |
| Optical characterization | Wavefront, MTF and BRDF measurements, laser beam characterization, minimum resolvable contrast measurements, EFL and distortion measurements | N/A |

## KEY FIGURES

Turnover: 1.2M€

Employees: 15

Thomas Siegel

Head of R&D

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SPAIN

## SOME REFERENCES

- ESRF Synchrotron Grenoble
- Oxford University – HARMONI project
- F4E – ITER. In Vessel Viewing system
- F4E – ITER. TARMS
- Instituto de Astrofísica de Canarias (IAC)

# AVS Added Value Solutions

Leading company in the design and development of complex and critical equipment for Big Science and Space worldwide.

www.a-v-s.es

## ACTIVITY KEYWORDS

Cryostats, Opto-Mechanics, Mechatronics, Controls, Fiber Positioners, Hexapods, Vacuum Chambers.

## WHO WE ARE

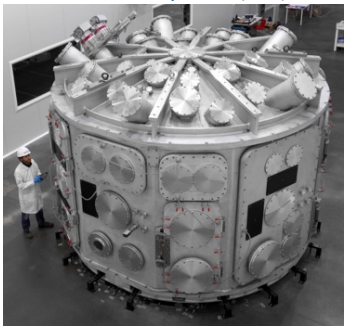
Founded in 2006, Added Value Solutions (AVS) is an engineering company that develops mechanisms, instrumentation and turnkey systems for various areas of science. Currently the company works in seven fields: Astrophysics, Accelerators, Fusion, Synchrotrons, Neutrons, Lasers and Space. AVS has employees in Spain, France, and its subsidiaries in the United Kingdom (AVS UK) and the United States (AVS US).

AVS's main mission is to offer effective design services and solutions to engineering problems in large scientific facilities, using the most modern design techniques and extensive and proven experience. AVS covers each and every one of the stages that a development entails, from the conceptual design to a turnkey project, involving tasks such as detailed design, tolerances, processes of manufacturing, quality control, assembly and testing.

The experience and know-how acquired as a result of the most modern and precise manufacturing processes are applied to the mechanical design of all the components, optimizing the processes to the maximum to save costs and guaranteeing their manufacturability. This is achieved through the direct connection between the design department and the manufacturing department during the detailed design phase.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Critical Mechanisms | Deployment mechanisms of the wind sensors for MEDA instrument (NASA MARS ROVER 2020) | AVS |
| Precision Mechanics & Controls | Fiber Positioners, Controls Engineering & Integration in MEGARA MOS (GTC | AVS |
| Large Vacuum Chambers | ESA SWIR Cryostat, EMIR Cryostat (GTC), QUIJOTE TMS Cryostat (IAC) | TVP |

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## SOME REFERENCES

- IAC
- NASA
- ESA
- Virgin Orbit
- CSIC
- ITER
- F4E
- ESS
- ESRF
- ILL
- IPP
- ELI
- And more

# AWGE Technologies, S.L.

Transforming ideas into high tech scientific realities within the most demanding quality standards and timely.

www.awge.es

## ACTIVITY KEYWORDS

Based firmly on our know how in Cryogenics, Ultra High Vacuum, Vacuum, Radiation, Precision, Large and Micro Mechanics, Radio Frequency, Microwave and Assembly we design, develop and deliver instruments and components in the accelerator, astrophysics, fusion, synchrotron, neutron, space and defense areas.

## WHO WE ARE

AWGE Technologies, S.L. is a technology-based engineering company that bases its activity on the applications of new technologies and other scientific discoveries in the field of applied physics for generating solutions for the product improvements, processes or services.

Our aim is to transform ideas into high tech scientific and commercial realities within the most demanding quality standards and timely. We are aware of our final user's time so we have developed an own design management system to accomplish with schedule necessities on time and always with the closest and constant progress report of our activities.

Our range of works goes from the calculations, detailed design and drafting to the manufacture, assembly, integration, verification and test including the project management of the entire process when needed.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Flexible Waveguide (FH, HH) | Flexible, rectangular waveguides straight sections size WR2300 and 1150 both full height (FH) and half height (HH). | AWGE FWR 2300 & 1150 (FH & HH) |
| Waveguide products and accessories | Rectangular, dual directional coupler, taper FH-HH, magic t, phase shifter, 45° coupler, straight coupler … in size WR2300 and 1150 . | AWGE *TYPE* WR 2300 & 1150 |
| Cryostats | Comprehensive line of cryostats and cryogenic systems from laboratory test cryostats up to large cryostats and custom build systems up to 4K. | AWGE |

## KEY FIGURES

Turnover: 800.000 €

Employees: 7


Constantino RUIZ MATANZAS

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## SOME REFERENCES

- **Development, Manufacture and test of different RF&MW modules for the Frigate F-110** . INDRA (Spain). 2018.
- **Design, Fabrication and Supply of the HARMONI pre-optic test cryostat**. Instituto Astrofísico de Canarias (Spain). 2018.
- **Detailed Design and Supply of the Waveguide Components for the RF Distribution Chains for the RFQ and DTL of the ESS-ERIC Accelerator (Lund, Sweden)**. ESS Bilbao. 2019.
- **Detailed Design, manufacture and Supply of the Shaft Rotatory Feedtrough for the ESS Target Station at ESS-ERIC Accelerator (Lund, Sweden)**. ESS Bilbao. 2020.

# BILFINGER NOELL GMBH

BILFINGER NOELL, AS AN EXPERT FOR HIGH-TECH SPECIAL MACHINES AND SPECIAL SOLUTIONS, IS SUCCESSFULLY ACTIVE ON THE MARKET WORLDWIDE IN A WIDE RANGE OF INDUSTRIES THANKS TO ITS HIGHLY SPECIALIZED ENGINEERING COMPETENCE AND EXPERIENCE.

www.noell.bilfinger.com

## ACTIVITY KEYWORDS

Special engineering, high-tech special machine constructions, structural design, calculation, superconducting magnets, cryogenic, fusion, vacuum technologies, nuclear technologies, remote handling, ARIANE, containment NPP

## WHO WE ARE

**Worldwide activity of Bilfinger Noell in the fields of special engineering, high-tech special machine constructions, nuclear service, nuclear technology and magnet technology**

**Others promise the future ... we work on it.**

Bilfinger Noell headquartered in Würzburg (Germany) is a Bilfinger SE company and has about 300 employees who mainly work in the engineering sector. With its highly specialized engineering competence and experience in a wide range of industries, it is successfully active on the market as an expert for high-tech special machine constructions and custom made solutions. Additionally, we are active in most large European research projects like ITER, FAIR, EuXFEL, W 7-X and research reactors. Bilfinger Noell implements innovative solutions by using efficient technologies, when it comes to research, nuclear technology applications and instruments for meteorology. The focus is on applications in nuclear, fusion, cryogenic, magnetic, vacuum and superconducting technology. The range of services extends from development and planning over delivery and commissioning to the operation of the supplied systems and their equipment.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Engineering | Design, calculation, studies, FE-analysis, pressure vessel regulations, welding certificates acc. EN-1090-1 | |
| Manufacturing | Three workshops with 4.600 sqm, | |
| Cryo- & vacuum technology | Cryogenic test facilities, large vacuum vessels, | |

## KEY FIGURES

Turnover: ~ 40 m € acc. IFRS

Employees: Approx. 300

BILFINGER NOELL GMBH

Michael Gehring

Head of Business Development & Sales, Magnet Technologies

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## SOME REFERENCES

- Ariane 5 European rocket, SNPE / France
- W 7-X, IPP Garching / Germany
- ITER PF Tools, Retractable Supports, Elytt Madrid / Spain
- FAIR, GSI Darmstadt / Germany
- PINE Cloud Chamber Uni Leeds / UK
- Containment NPP Olkiluoto (OL3), AREVA / France

# CADINOX, S.A.

Welded solutions for complex and unique installations

www.cadinox.com

## ACTIVITY KEYWORDS

Welding, Machining, Vacuum Test, Helium Test, High precision machining, High Vacuum chambers, Large structures, final test and assembly. Aluminum, Stainless Steel welding.

## WHO WE ARE

We are a welding and machining company, focused on large and high precision parts like vacuum chambers and large, complex structures. We have been working for the industry for over 60 years and we have over 20 years of experience in the Big Science Industry.

We are high performance welders with latest welding technologies for Aluminum, stainless steel and carbon steel welding. We have up to 18 meters of lineal machining capacity, and 8 meter in diameter vertical lathe.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Vacuum Chambers | Aluminum, Stainless Steel and Carbon steel high Vacuum chamber, up to 6 meters of diameter. | Cadinox |
| 3 Clean Areas | 3 separate rooms of 300 m2 each to work exclusive Big Science project. | Cadinox |
| Testing capacities | Vacuum , Helium Test, Final NDT and assemblies capacities within the same location with more than 9000 $m^2$ covered premises | Cadinox |

## KEY FIGURES

Turnover: 12 M€

Employees: 82


Peio Lakarta

Commercial Manager

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## SOME REFERENCES

- CERN
- ILL
- ESRF
- CLPU
- CIEMAT
- Lulli-Cnrs

# Cambridge Consultants

Technology developers

www.cambridgeconsultants.com

## ACTIVITY KEYWORDS

Design services, product developers, technology consultants, sensors, robotics, algorithms, ML,

## WHO WE ARE

We develop breakthrough products, systems and services for ambitious companies in a wide range of industries. We have a large engineering team and facilities to design, build and test complex systems. We were formed in 1960 and have worked with many household names to help transform their businesses by using latest technologies to develop their next-generation product, delivering competitive advantage and world-firsts. We also provide technology consultancy from a position of direct experience. We are independent, therefore select the most appropriate technologies to meet our clients' needs. Client owns the arising IP.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Comms | We develop wireless systems for major telecoms companies, and for industrial, consumer and scientific applications. We wireless-enable a wide range of products and systems and develop associated digital services. | |
| Sensors | We develop wireless (radar), optical, ultrasonic and magnetic sensors, including supporting electronics, algorithms and software. We have a wide range of algorithmic techniques, including classical DSP and AI. | |
| Robotics | We develop innovative robotic systems that are augmented with smart payloads such as SLAM, vision systems, handling systems and ML to carry out complex tasks. | |


Gary Kemp

Programme Director

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UK


## KEY FIGURES

Turnover: 120M GBP

Employees: 900+

## SOME REFERENCES

- SKA (LFAA radio telescope)
- IRIDIUM (Satellite telephone systems)
- OCADO (robotic warehousing system)
- Stratospheric Platforms Ltd (airborne cellular comms)

# Centre Spatial de Liège, Belgium

We do optical coatings, we measure optical performance under cryogenic environmental (<10K)

CENTRE SPATIAL DE LIÈGE

**www.csl.uliege.be**

## ACTIVITY KEYWORDS

Vacuum, Space Optics, Cleanliness and contamination analysis

Coating, Cryogeny and Environmental Testing

## WHO WE ARE

Active in space instruments and space systems engineering since the 60's, CSL is recognized worldwide as an Optic Center of Excellence

ESA-recognized Test Centre

CSL employs about 95 (FTE) highly skilled employees including 60% of Engineers, Master of Science and PhD's

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optical coatings | Dedicated coatings for specific space applications with optimized reflectivity/ transmissibility behavior under extreme environment | N/A |
| Cryogeny | Closed loop system for cooling down items to 4.2K. Small, Medium and Large Optimized test set-up for cryogenic applications. | LINDE and KOCH |

CENTRE SPATIAL DE LIÈGE

Christophe Grodent

Commercial Director

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## KEY FIGURES

Turnover: 16M€

Employees: 95

## SOME REFERENCES

- Science ESA, Ariel, Plato, Cheops, Solar Orbiter, Euclid, GAIA, Planck, Herschel
- Earth Observation, Sentinels, MTG, Metop SG
- International projects (India, South Korea, US, Canada, China)

# CoRES HES-SO//Genève

Research activities in collaboration with both industrial and academic partners. The expertise and research of the group include embedded systems for astronomy, space, IoT, biomedical devices, and reconfigurable computing architectures.

Hes·SO//GENÈVE
Haute Ecole Spécialisée de Suisse occidentale

CoRES

***www.hesge.ch/hepia***

## ACTIVITY KEYWORDS

Embedded Systems, Reconfigurable Computing, FPGA, SoC, IoT, Communication Systems.

## WHO WE ARE

The Communicating, Reconfigurable, Embedded Systems group (CoRES) is a research group from the HES-SO in Geneva. Our research activities are driven by mandates, Innosuisse projects, SNF funding among others. We work in collaboration with public research institutions EPFL, ETHZ, UniGe, PlanetS, Space Innovation, ESA, etc… as well as private companies and start-ups. The applications span from earth to exoplanet observation, including security and reliable systems. A recent project, for example, focuses on creating efficient and reliable dynamically-reconfigurable solutions for post-quantum cryptography (PQC) for nanosatellites. Part of the system has been launched in orbit on Falcon 9 (B1058.10) from SpaceX, along with 105 microsatellites.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Earth Observation | Design and implementation of image compression FPGA IP core for high-resolution earth-observation systems. Increasing performance and reducing costs each by a factor 2x to 5x compared to the state-of-the-art. | |
| Scaling Intensity interferometry | Design the correlation for intensity interferometry on a reconfigurable SoC with an integrated radio-frequency front-end. This cutting-edge technology improves the acquisition speed, allowing higher sampling rates than today's specialized acquisition systems up to 4GS/s, and enabling to scale-up the system to more than two telescopes. The prototype is currently installed in MAGIC (Major Atmospheric Gamma Imaging Cherenkov), in La Palma. | |
| Real-time Computer for Adaptive Optics | Feasibility study and design of the RTC for next generation of AO, able to execute the correction algorithm in less than 50us and control up to 4'000 actuators in a closed loop. To meet the hard real-time constraints, an FPGA-based custom computer with a high parallel-computation capacity has been deployed. | |

## KEY FIGURES

Turnover: -

Employees: 20+

CoRES

Andrea Guerrieri

Research Fellow

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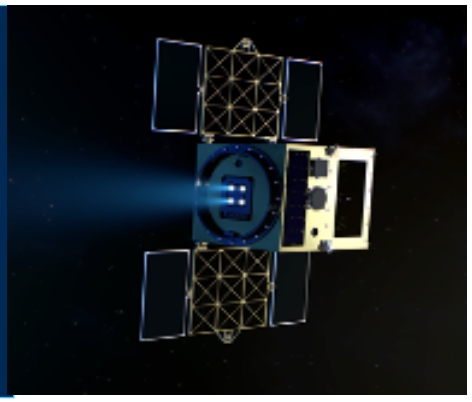
## SOME REFERENCES

- ❑ EPFL
- ❑ ETHZ
- ❑ UniGe
- ❑ PlanetS
- ❑ Space Innovation
- ❑ ESA

# Creotech Instruments S.A.

Space is open for us

creotech



www.creotech.pl

## ACTIVITY KEYWORDS

Space platforms and subsystems, **control and measurement systems** for quantum physics, research infrastructures and Big Science projects, **cameras**, contract manufacturing.

## WHO WE ARE

Creotech Instruments SA (CTI) is a Polish SME, established in 2012, specializing in the design, development and manufacturing of electronics and systems for Space and scientific instrumentation as well as scientific cameras for astronomical purposes. The company has a significant heritage in Space projects (for ESA and private sector clients) and in the development and supply of key electronics for all major Big Science experiments (CERN, DESY, Sirius in Brazil, GSI in Germany). Creotech is also one of the main contributors to the Sinara/ARTIQ open source ecosystem designed for use in quantum physics experiments, developed by a collaboration including M-Labs, QUARTIQ, Warsaw University of Technology, US Army Research Laboratory, the University of Oxford, the University of Maryland and NIST Boulder.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Space | HyperSat - our own design - modular, universal satellite platform. | HyperSat, CreoDIAS. |
| Science | MTCA real time systems and White Rabbit - sub-nanosecond time synchronization technology. Deterministic Ethernet-based network for data transfer for high frequency RF applications. State of the art CCD and sCMOS astronomical cameras with edge processing. Quantum physics ecosystem - Sinara/ARTIQ | White Rabbit, MTCA, Cameras with sCMOS, Sinara & ARTIQ. |
| Contract Manufacturing | Comprehensive services of assembly, integration and testing of electronic and optoelectronic devices in cleanrooms (ISO 6-8). In compliance with ISO9001, ECSS (ECSS-Q-ST-70-08, ECSS-QST-70-28, ECSS-Q-ST-70-38, category2&3) and IPC standards. | Space and Science Grade Electronics. |

## KEY FIGURES

Turnover: EUR 9,2M (2021)

Employees: 150

creotech

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## SOME REFERENCES

- ESA
- CERN
- GSI (Germany)
- University of Oxford
- UK National Quantum Technologies Programme

# Cryoworld B.V.

Advanced cryogenics

“We like to boldly go where no one has gone before”

www.cryoworld.com

## ACTIVITY KEYWORDS

Innovative cryogenics solutions, liquid helium - hydrogen - nitrogen cryostats and systems, process engineering, flexible concepts, low vibration cooling.

## WHO WE ARE

Cryoworld presents itself as the Dutch supplier for innovative cryogenic solutions strongly focusing on high-tech cryogenic systems and products.

We like to solve your cryogenic issues you currently experience when dealing with extremely cold environments. It is our philosophy that cryogenic project execution cannot be performed properly without an experienced engineering and manufacturing team. With our vast experience, unique knowledge and proven expertise Cryoworld will be your full range creator of cryogenics from the Netherlands.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Cryostats | Special cryostats for scientific experiments and accelerators; helium, nitrogen or actively cooled | Cryoworld |
| Flexible lines | High performance vacuum insulated flexible transfer-lines for cryogenic fluids and flexible cryostats for superconductive cables | Cryoworld/KESMA |
| Conditioning equipment | Phase separators, sub-coolers, control valves, heat-exchangers and keep cold devices, all for conditioning of cryogenic fluids | Cryoworld/KESMA |

## KEY FIGURES

Turnover: 4mln €

Employees: 30

10 YEARS 2012-2022 cryoworld advanced cryogenics

Marcel Keezer

CTO

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Wieringerwerf | the Netherlands

## SOME REFERENCES

- CERN
- GSI
- HZB
- Research Instruments RI
- ITER
- Linde Kryotechnik AG
- Air Liquide

# Cryo Diffusion

The perfect match in cryogenics!

www.cryodiffusion.fr

## ACTIVITY KEYWORDS

Cryogenics, liquid nitrogen, liquid helium, liquid hydrogen, vacuum insulated lines, Dewar, cryostats, pressure vessels, cryogenic containers, valves boxes

## WHO WE ARE

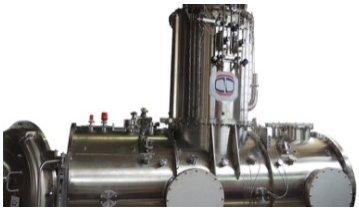
Cryo Diffusion, founded in 1965, has developed a reputation for the design of high-performance vacuum super insulated cryogenic equipment. Following acquisition by Chart in 2018, the company is focused on high quality engineered products for liquid helium and hydrogen and other specialty items that complement and extend Chart's cryogenic equipment portfolio.

Headquarters and manufacturing plant are in Léry, France, and comprise 15,000m2 of production and office space.

Through its skilled technicians Cryo Diffusion provides a full spectrum of after-sales cryogenic services including turn-key projects, installations, commissioning, routine service, maintenance, on-site calibrations, diagnostic and repair, refurbishment, upgrade and de-bottlenecking.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Vacuum Insulated Lines | Cryo Diffusion offers a complete range of tailor-made vacuum superinsulated rigid and flexible transfer lines / single or multilines, for all liquefied gases | Cryo Diffusion SIVL |
| Dewars, mobile tanks, containers | Of an exceptional reliability, these vessels respond perfectly to Research needs. They combine robustness, performance, non-magnetic rate and wide range | Cryo Diffusion MSB, CTH, XRP, NMH… |
| Cryostats | Cryogenic equipment for 'big science' with principal products comprising horizontal and vertical cryostats acc. to specification | Cryo Diffusion |




Adrien STRIEBIG

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## KEY FIGURES

Turnover: 10M €

Employees: 70

## SOME REFERENCES

- ❑ CERN
- ❑ ESO
- ❑ CEA
- ❑ CNRS
- ❑ ESS

# CSEM SA

## Scientific Instrumentation at CSEM

*Technologies that make the difference*


Keck Observatory Photo: LaurieHatch.com

**www.csem.ch**

## ACTIVITY KEYWORDS

High-precision mechanisms, compliant systems in opto-mechatronics, hexapods, fast steering mirror mechanisms, tip-tilt mirrors, micro-vibration isolation, flexures technology, vacuum, optics, cryogenics, additive manufacturing, photonics

## WHO WE ARE

CSEM is a research and technology organization (RTO), we champion industrial innovation and aim to help industry and society to prepare for the future. Our mission is to support scientists all over the world to develop and enhance their instruments with pioneering revolutionary designs.

Scientific instruments are now more intricate than ever and are increasingly created with precise, complex, multi-tech systems made from distinct physical layers. Keeping its partners at the forefront of this advancing scientific knowledge is CSEM.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| CSU for MOSFIRE | Configurable Slit Mask Unit for cryogenic MOSFIRE instrument on the Keck Observatory | |
| SOFIA Secondary Mirror Mechanism | 6 DoF Hexapod and 2 DoF chopper stage for the M2 mirror of the 2.5m airborne SOFIA telescope | |
| NAOS Field Selector Mechanism on VLT | Tip/Tilt-Piston controlled mirror to select a sub-pupil of the ESO-VLT field-of-view with extreme resolution and absolute precision | |

## KEY FIGURES

Turnover: 90M CHF

Employees: 525

## SOME REFERENCES

- Keck Obeservatories
- ESO - VLT


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DAL BEN S.p.A.

Design and construction of mechanical equipment

www.dalbenspa.com

## ACTIVITY KEYWORDS

Construction of custom mechanical equipment, vacuum chambers, parts of telescopes, equipment for nuclear plants, research equipment, helium leak test, NDT tests

## WHO WE ARE

Dal Ben S.p.A. is a fully Italian joint-stock Company located in the Northern-East of Italy, with 35 years of manufacturing experience, operating in national and international markets.

Dal Ben S.p.A. designs and builds machines and plants for the mechanical industry, sold worldwide.

Main sectors are steel production, hydroelectric power, energy and Research-Big Science.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Vacuum chambers | Vacuum chambers for UHV and helium leak test | Fully in house processing |
| Research equipment | Mechanical groups for special applications | Fully in house processing |
| Construction and Welding specialists | Carbon steel, stainless steel, alloy steel, weld cladding, aluminum, copper | Fully in house processing |

## KEY FIGURES

Turnover: 22 million Euro

Employees: 110

## SOME REFERENCES

- Instituto de Astrofisica De Canarias
- ASG Superconductors
- Forschungszentrum Jülich
- INFN
- ETH ZÜRICH
- F4E/ITER

Lorenzo Odorico

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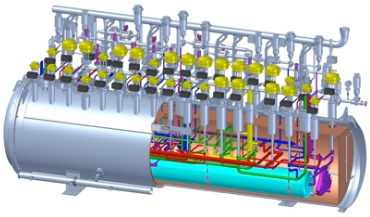
Italy

# DEMACO HOLLAND B.V.

**Your partner for any cryogenic solution**



https://demaco-cryogenics.com/

## ACTIVITY KEYWORDS

Cryogenics, vacuum, engineering, manufacturing, installation, distribution boxes, single and multiple vacuum insulated transfer lines, phase separators, subcooler, cryogenic valves, cryostats, liquefier, helium, hydrogen, nitrogen, oxygen, and much more cryogenic products.

## WHO WE ARE

### Specialist in cryogenics

Demaco is an expert in the field of cryogenic technology. We build infrastructures to facilitate the transport and application of industrial gases at extremely low temperatures. Since we work on both standard and highly advanced projects, we have built up a vast experience. Consequently, no cryogenic issue is too ambitious; we tackle every new challenge with equal enthusiasm.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Vacuum Insulated Piping | The Vacuum Insulated Pipe, also known as VIP or SIVL, is used to transfer liquefied gases at extremely low temperatures, keeping thermal heat losses to a minimum. This rigid pipe in combination with a slim design results in an ideal and attractive alternative for non-insulated or conventional insulated piping. | DEMACO |
| Phase Separator | Our vertical vacuum insulated phase separator is used to condition 2-phase boiling cryogenic liquefied gasses by separating gas from liquid while regulating the outlet pressure. A complete integrated modular design basis with all standardized components, provides the possibility to cover wide ranges of use against short delivery times. | DEMACO |
| Cryostats / Distribution boxes / Multiple Helium Transfer Lines | Vacuum insulated equipment with very low heat load requirements. The main purpose is to transfer cryogens (helium, nitrogen, hydrogen, or others) from point A to B with a design that considers minimum heat inleak and the effect of thermal contraction of different process piping in the valve box, cryostat, or multiple helium transfer lines. | DEMACO |

## KEY FIGURES

Turnover: 18 MM EUR

Employees: 115


Rossi DEKKER

Sales Manager

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## SOME REFERENCES

- CERN, SWITZERLAND
- PSI, SWITZERLAND
- ESO, GERMANY
- GSI, GERMANY
- DESY, GERMANY
- ETH, SWITZERLAND
- HZB, GERMANY
- ESS, SWEDEN
- DLR, GERMANY
- ESA, NETHERLANDS

# Demcon Advanced Mechatronics

DEMCON imagine tomorrow. challenge today.

www.demcon.com

## ACTIVITY KEYWORDS

High-tech opto-mechatronic products, design & development, production

## WHO WE ARE

Demcon is all about high-quality technology for our future. We are working on solutions to social challenges in the areas of aerospace, agri & food, defense & security, energy, high-tech systems & materials, life sciences & health, smart industry and water & maritime.

We do this by developing, manufacturing and supplying high-quality technology and innovative products, like Laser Projection Subsystem modules for the ESO ELT.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| High-end engineering services | From ideation via prototype manufacture, integration and test to series production | Demcon |
| Fine Steering Mirror (FSM) | The FSM product is specially designed for laser communication to enable the required level of precision pointing. | Demcon FSM |


Gerold de Valk

Business developer

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Delftechpark 23
2628 XJ Delft, The Netherlands


## KEY FIGURES

Turnover: 100 M euro

Employees: 900

## SOME REFERENCES

- ESO
- ELT
- ESA

# EIE GROUP Srl

Italian *EPCC Company* globally operating for more than 32 years in Astronomy, Aerospace and Big-Science.

**www.eie.it**

## ACTIVITY KEYWORDS

Systems Engineering, Management & Contracting, Engineering & Design, Production & Services, Opto-mechanics, Analyses, Scientific Instrumentation, Manufacturing, Pre-Assembly, Testing and Erection on site.

## WHO WE ARE

EIE's core business is focused in the fields of Astronomy, Aerospace and Big Science, designing and developing some of the biggest Telescopes, Radio-Telescopes, Domes, Astronomical Observatories & Instrumentation around the world. EIE's expertise has been developed through a multi-decennial working history with the most important customers, suppliers, scientific institutions, and industrial groups of the word. Over the years EIE has participated to multiple projects. Among all, NTT, VLT, VISTA, LBT, ALMA, THEMIS, ASTRI, ELT, MROI, DAG, and Vera C. Rubin Observatory.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Telescopes & Radio-Antennas | EIE offers complete and integrated engineering turn-key solutions: from the design activities to purchase, from the production, to the mounting and testing activities, to post-sales services. | EIE GROUP Srl |
| Astronomical Observatories | Detail Design, Pre-Assembly, Packing &Transport, Erection on Site, Commissioning and Testing activities | EIE GROUP Srl |
| Instrumentation | Models, Analyses, Industrialization, Prototyping, Optimization, Construction, Testing | EIE GROUP Srl |

EIE GROUP

Massimiliano Tordi – Mattia Scomparin

CTO – CMO of EIE GROUP Srl

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30172 Venezia-Mestre (VE). ITALY

## KEY FIGURES

Turnover: 5.2M

Employees: 40

## SOME REFERENCES

- European Southern Observatory (ESO);
- European Space Agency (ESA);
- Istituto Nazionale di AstroFisica (INAF);
- Association of Universities for Research in Astronomy (AURA);
- SKA Observatory (SKAO);
- Cherenkov Telescope Array (CTA).

# ENSA

Passion for improvement

www.ensa.es

## ACTIVITY KEYWORDS

Multi-system supplier of big components, engineering and design, fabrication, advanced technology center, in-plant services, machining, advanced welding techniques, precision structures, automation, etc.

## WHO WE ARE

Ensa more than 45 years supplying components for the Nuclear Power Plants & Big Science Market:

-ITER -JHR

-ESS -MAX PLANCK

-CERN -ASTRID

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| STRUCTURES | Metallic structures | ENSA |
| PRESSURE EQUIPMENT | Pressurizers, tanks | ENSA |
| EXCHANGERS AND STEAM GENERATORS | | ENSA |

## KEY FIGURES

Turnover: 74.2,4 M EUR

Employees: 503

RUBÉN MORENO ZUBELZU

Marketing and Sales Manager

ruben.moreno@ensa.es

618219667

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## SOME REFERENCES

- ESO
- ELT
- ITER
- ESS
- CERN
- MAX PLANCK
- ASTRID
- JHR

# FIRST LIGHT IMAGING

Make the invisible visible

www.first-light-imaging.com

## ACTIVITY KEYWORDS

High speed / low light scientific cameras in visible and SWIR. Dedicated to Astronomy, life sciences, research and high end industry.

## WHO WE ARE

First Light Imaging offers advanced imaging solutions for extremely low light environment and real time applications, to the world's scientific and industrial communities. Every day, First Light Imaging innovates for science and designs the right solution to your visible and infrared imaging needs.

Our technology is currently in the heart of many Adaptive Optics systems of the biggest astronomical programs all over the world.

We are delivering scientific visible and infrared cameras using the most advanced low noise detector technologies like EM-CCD, SWIR e-APDs of various formats, InGas VGA cameras with extended wavelength range and advanced CMOS.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| SWIR MCT scientific camera | SWIR e-APD, Sub electron MCT camera, 3500 fps, 320x256 | C-Red One |
| SWIR InGaAs camera | SWIR, VGA, 600fps, RON<30e, available in 1,7µm, 1,9µm and 2,2µm. | C-Red 2, C-Red 2 ER |
| Visible EMCCD camera | XAO NGS wavefront sensing, 240x240 pixels sub electron 2000fps EM-CCD. | OCAM2K |
| Visible CMOS camera | LGS wavefront sensing, 0,5 MP, global shutter, 1594 fps, RON 2,35e. | C-Blue One |

## KEY FIGURES

Turnover: 7M€

Employees: 30


Philippe FEAUTRIER

CTO

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Europarc Bat 5
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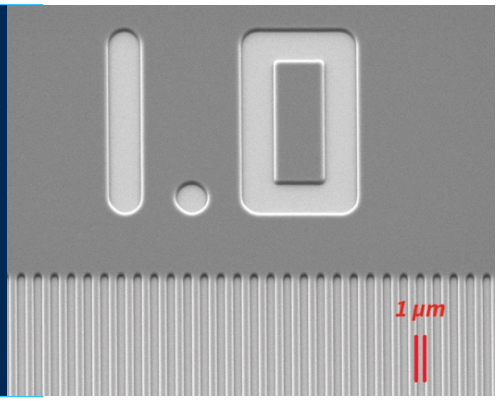
13590 Meyreuil - France


## SOME REFERENCES

- ESO
- NASA-JPL
- GMT
- LBT
- Subaru Telescope
- Keck Telescope

# Heidelberg Instruments

The power of direct writing




heidelberg-instruments.com

## ACTIVITY KEYWORDS

microelectronics, microfabrication, nanofabrication, maskless laser lithography, maskless aligners, photomasks, direct write technology, 3D lithography, two-photon polymerization (TPP), micro-optics, quantum devices

## WHO WE ARE

Heidelberg Instruments is a world leader in the development and production of high-precision maskless laser lithography systems and nanofabrication tools. Our systems are installed in industrial and academic facilities all over the world. These are used for direct writing and photomask production in various areas of MEMS/NEMS – for Semiconductors, Quantum Computing, Flat Panel Displays, Photonics, 2D Materials, IOT and many other related applications.

With over 35 years of experience and more than 1,000 systems installed worldwide, we can provide lithography solutions specifically tailored to meet all your micro- and nanofabrication requirements – no matter how challenging.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Maskless Laser Lithography | The maskless technology uses a Spatial Light Modulator which essentially acts like a dynamic mask. It offers the flexibility to structure the most challenging substrates, allowing per die pattern corrections (e.g. to react to distortions or process variations), and employs a real-time autofocus to follow substrate warp or corrugations. The non-contact exposure gives the system an unmatched durability and reliability. The overheads and expense associated with the procurement of masks, and their handling, cleaning, and storage are also eliminated. | MLA 300 |
| Two-Photon Polymerization (TPP) | Two-Photon Polymerization (TPP) is a maskless direct laser writing technology. With TPP, the light-matter interaction only takes place within the volume of a focused laser spot. The laser focus can be moved through the volume of the photoresist along all three spatial dimensions. Complex 3D structures are written along the laser's trajectory, using light like a brush. | MPO 100 |
| Thermal Scanning Probe Lithography (t-SPL) | In Thermal Scanning Probe Lithography (t-SPL), the resist is directly evaporated by an ultra-sharp heated scanning probe tip. The heated tip creates high-resolution nanostructures by local sublimation of resists. That way, complex nanostructures can be written and simultaneously inspected. | NanoFrazor® |

HEIDELBERG INSTRUMENTS
The power of direct writing

## KEY FIGURES

Turnover: > 50M €

Employees: approx. 300

Wolfgang Meixner

Technical Sales Manager

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Heidelberg Instruments Mikrotechnik GmbH
Mittelgewannweg 27
69123 Heidelberg, Germany

## SOME REFERENCES

Worldwide customers from industry and academic facilities with focus on micro and nanofabrication for applications in photonics, micro-optics, advanced packaging, micro-electronics, sensor technology, microfluidics,…

# HEIG-VD Institute for Industrial Automation

ADAPTIVE OPTICS AND
HIGH PRECISION OPTO-MECHATRONICS

http://optolab.iai.heig-vd.ch

## ACTIVITY KEYWORDS

Adaptive optics and high precision opto-mechatronics

Systems engineering and end-to-end modeling of astrophysical instruments

## WHO WE ARE

The Institute for Industrial Automation of the HEIG-VD has been involved in astrophysical projects since 2005.

Applying century-long Swiss expertise and experience in high-precision and micro mechanics to the requirements of the most modern astrophysical instruments.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION |
|---|---|
| Adaptive optic | Systems engineering, design and production of complete AO instruments |
| High precision opto-mechatronics | Active optics actuators, Nasmyth derotator, precision actuators for hexapods |
| End-to-end modeling | Comprehensive end-to-end (E2E) models: structural, dynamic, optical, thermal, active control effects concurrently evaluated for optimal systems engineering |

## KEY FIGURES

Turnover: 2.7 M CHF

Employees: 52

Laurent JOLISSAINT,

Professor

laurent.jolissaint@heig-vd.ch

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CH-1401 Yverdon-les-Bains
Switzerland

## SOME REFERENCES

- 4-m DAG telescope & instrumentation design, adaptive optics, optical derotator
- Advanced (fast) active optics actuators
- ELT M2-M3 end-to-end modeling
- ClearSpace-1 satellite: LED illumination system
- KECK and GEMINI: PSF reconstruction

# Heraeus Conamic

HELPING TO EXPLORE THE UNIVERSE


**www.Heraeus-Conamic.com**

## ACTIVITY KEYWORDS

Fused silica, quartz, glasses, optics, optical components, mirror substrates, spectroscopy, reflectors, UV, VIS, IR, telescopes, LIGO, MOONS, space telescopes, laser applications, laser optics

## WHO WE ARE

Heraeus counts itself among the technology leaders and materials specialists for the manufacturing and processing of high-purity fused silica especially for optical applications in science & research: astronomy, space, high energy laser systems.

With over 100 years of expertise in innovating quartz and fused silica solutions, Heraeus provides breakthrough solutions for the world's most challenging applications in the semiconductor and photonics industry.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optics, lenses, windows, prisms, retro reflectors | Suprasil is a high purity synthetic fused silica used for optics requiring high transmission, low absorption from UV to IR combined with excellent physical properties | Suprasil® |
| Optics, lenses, mirror substrates, windows | Infrasil is a natural quartz glass grade with excellent physical properties and very good optical characteristics, especially in the IR and VIS wavelength range. | Infrasil® |
| Mirror substrates, ferrules | Black fused silica with special optical properties for applications where a high degree of absorption is required, e.g. to suppress unwanted reflections. | Nerasil® |

## KEY FIGURES

Turnover: ~ 440 million € (2020)

Employees: Approx. 2200 (2020)

Eduard Klett

Sales Manager Science & Research Optics EU

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Heraeus Quarzglas GmbH & Co. KG
Reinhard-Heraeus-Ring 29
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Germany

## SOME REFERENCES

- ❑ **ESO VISTA Telescope**
- ❑ **ESO MOONS Attachment**
- ❑ **ESA LISA Pathfinder**
- ❑ **ESA EUCLID**

# Hexagon

Empowering a sustainable and autonomous future


https://www.hexagonmi.com/

## ACTIVITY KEYWORDS

Solutions from Design and Engineering to Production, Metrology and Inspection

## WHO WE ARE

**Committed to innovation**
With **nearly 4,000 employees in R&D and more than 3,700 active patents** our technology leadership is clear

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Lasertrackerss | Highly portable precise optical large Volume inspection systems | Leica-Geosystems |
| CMM | PMM-G | Leitz |

## KEY FIGURES

Turnover: **€3,7 billion** in 2020

Employees: 21’000

Nik Suter

Sales Manager Lasertracker

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## SOME REFERENCES

- ESO
- ELT
- Airbus
- Boeing
- VW
- GE
- CERN
- ITER

# IDOM

ENGINEERING SYSTEMS
FOR SCIENCE & TECHNOLOGY


www.idom.com/ada

## ACTIVITY KEYWORDS

Engineering Systems for Science, Optics, Mechanics, Electronics, Cryogenics, Optomechatronic Systems, Scientific Instruments, Astronomy, Space, Nuclear Research.

## WHO WE ARE

IDOM develops and supplies complete engineering systems involving optics, mechanics, electronics and control for Astronomy, Space and Nuclear Research among other fields.

Our products include complete telescopes and telescope subsystems, imaging cameras, scientific instruments, test facilities and metrology systems.

Our client portfolio includes ESO, IAC, ING, AURA, TMT, GMT, ITER, CEA and VTT among others.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optomechatronic Systems | As the ELT Prefocal Stations (which includes ELT M6C/M6N Mirror Units and ELT NGS Adapter) and the Dynamic Optical Relay System (DORS) for Tracking EO/IR Detector Testing. | IDOM |
| Scientific Instruments | As the QUIJOTE CMB Multifrequency Instrument (MFI), FastCam and PlanetCam Imaging Cameras, ITER Core Plasma Thomson Scattering (CPTS) Diagnostic for ITER. | IDOM |
| Optical Metrology Systems | As the ELT M1 Local Coherencer for mirror segment phasing with an accuracy below 100nm. | IDOM |

## KEY FIGURES

Turnover: 324 M€ (2021)

Employees: 4300

IDOM

Gaizka MURGA

Astronomy & Space Director

gzk@idom.com

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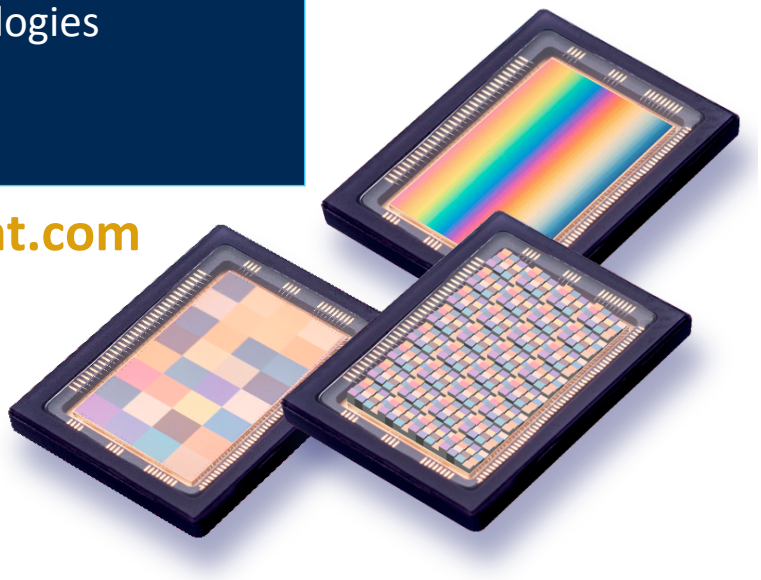
## SOME REFERENCES

- ESO/ELT,
- AURA/DKIST,
- IAC/GTC & ING/WHT,
- TMT, GMT & CFHT/MSE,
- F4E/ITER,
- ESS,
- VTT & CEA among others

# imec

R&D hub for nano- and digital technologies

www.imec-int.com



## ACTIVITY KEYWORDS

Micro- and nanoelectronics

Digital technologies

## WHO WE ARE

Imec is the largest independent research institute on nano- and digital technologies in the world.

We offer research and development as well as solutions, including small volume manufacturing of specialty components.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Photonics and MEMS technology | Photonic integrated circuits (PICs), detectors/imagers, miniaturized sensors/ actuators | N/A |
| High performance electronics | Circuit design in and access to advance nano-electronics | N/A |

imec

## KEY FIGURES

Turnover: 678 MEuro

Employees: 5000


Piet DE MOOR

Business Manager

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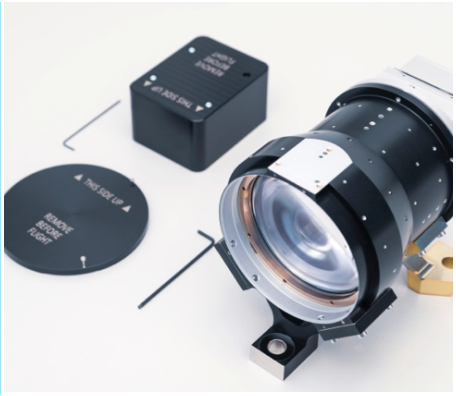
Belgium


## SOME REFERENCES

- European Space Agency (ESA)
- International semiconductor industry

# Institute of Plasma Physics of the CAS – TOPTEC

TO LISTEN · TO THINK · TO IMPLEMENT



www.toptec.eu

## ACTIVITY KEYWORDS

R&D of special optics and advanced systems; design;

precise measurement

## WHO WE ARE

Institute of Plasma Physics of the CAS - TOPTEC is engaged in the R & D of unique and application-specific systems, development of ultra-precise mechanical components for optical systems, and development of thin films and measurement methods, all for scientific and industrial purposes.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optical elements and machining processes | R & D of machining processes for precise spheric, aspheric, as well as free-form elements, and in the fabrication of such optical components | |
| Thin films | designing and depositing thin layers with unique features, development of instrumentation and methods for controlling the deposition process | |
| Metrology | interferometric, holographic or microscopic methods for measuring nonstandard quantities in the fields of material engineering, heat and mass transfer, etc. | |

## KEY FIGURES

Turnover: 15,3 mil. EUR

Employees: 235


Lukas Steiger

Technical Officer

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## SOME REFERENCES

- ESA ESTEC (METIS telescope)
- OHB Italia S.p.A (Neostel telescope)
- Micos Engineering GmbH (FLEX FLORIS)
- ELCOM, a.s. - Virtual Instrumentation Division (automotive)
- PRECIOSA, a.s.(deposition methods, measurement)

# Institute of Scientific Instruments of the CAS

We are pushing the limits of exploring the macro- and nano-worlds.

Institute of Scientific Instruments
The Czech Academy of Sciences

www.isibrno.cz

## ACTIVITY KEYWORDS

magnetic resonance, electron microscopy and microanalysis, utilization of lasers, acquisition and processing of biosignals, construction of scientific instruments and their parts, cryogenics, improvement and utilization of special technologies. microelectronics, vacuum, optics, coatings

## WHO WE ARE

Institute of Scientific Instruments of the CAS, v.v.i. (ISI) is a public research institution upon Act No. 341/2005 Coll.

ISI goals are to perform scientific research, contribute to the utilization of its research and provide research infrastructure.

Our activities: contributes to raising the level of knowledge and education, contributes to the utilization of the results of the scientific research, acquires, processes and disseminates scientific information, issues scientific publications, provides scientific assessments, professional opinions, and recommendations, provides consulting and advisory services.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| microendoscopy | multimode fiber optic microendoscopy allows chemicalmicroscopic resolution imaging through minimally invasive fibersprobe. | |
| subnanometrology | we develop laser systems and standards for very precise measurements (eg for AFM) | |
| heat transfer measurement | far and near field of thermal radiation in experiments studying heat transfer by natural convection at room and cryogenic temperatures | |

Institute of Scientific Instruments
The Czech Academy of Sciences

## KEY FIGURES

Turnover: 10M EUR

Employees: 245

Josef LAZAR

director

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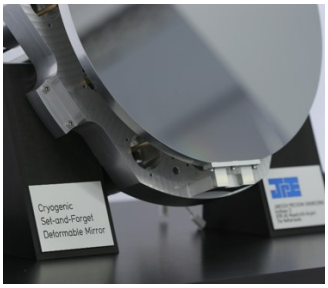
## SOME REFERENCES

- Carl Zeiss SMT
- Frentech Aerospace
- Thermo Fisher Scientific
- TESCAN
- Max-Planck
- MESIT holding
- MEOPTA

# JPE

We really do COOL instrumentation for you!




**www.jpe.nl**

## ACTIVITY KEYWORDS

Positioning in cryogenic environment

## WHO WE ARE

We are a leading center of expertise in precision engineering.

Specialized in positioning in cryogenic environment.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| System engineering | Precision engineering and mechatronics in vacuum and cryogenic environment | NA |
| Cryogenic positioners | Off the shelf cryogenic positioners | JPE Cryo Products |

JPE

Driven by innovation

## KEY FIGURES

Turnover: 3 M Euro

Employees: 25

Huub Janssen

Founder & CEO

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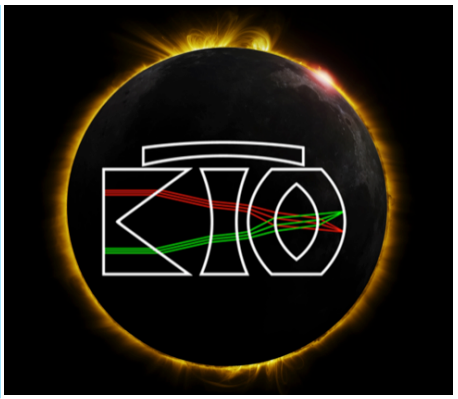
6199AG, Maastricht-Airport
The Netherlands

## SOME REFERENCES

- ESO
- Big Science

# Kampf Telescope Optics GmbH

**Your partner for demanding optical systems**



www.ktoptics.de

## ACTIVITY KEYWORDS

Optical (sub-)systems for instruments and diagnostics, optical test equipment

Engineering services for optical design, analysis, MAIT & commissionning

## WHO WE ARE

Kampf Telescope Optics (KTO) is a German based company specialized in the management, design and realisation of innovative and sophisticated optical systems and subsystems for application in challenging environments like ground-based astronomy, fusion and space industry.

Together with our customers we define/develop a system concept which is stable in terms of feasibility, technical maturity and costs. We can support you throughout any phases of your project.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optical system | Gravity CIAO: optical performance assessment – customer MPIA | N/A |
| NIR instrument | MICADO: system alignment & optical Consulting – customer MPE | N/A |
| Mid-infrared instrument | VISIR flange module: System design & MAIT incl. commissioning – customer Breakthrough Initiative / ESO | N/A |

## KEY FIGURES

Turnover: 2.1 M€

Employees: 15

## SOME REFERENCES

- ITER
- ESA
- ESO
- IDOM
- Airbus Defense & Space
- OHB
- Bertin Technologies


Nancy AGEORGES

AIT engineer

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Kampf Telescope Optics
Alois-Gilg Weg 7
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# Manufax & Nelson Group

Precision engineering for over 65 years, offering Design, Manufacture, and Metrology.

https://manufax.co.uk/

## ACTIVITY KEYWORDS

Design, Manufacture, Metrology, jigs, fixtures, and bespoke machinery.

## WHO WE ARE

Having established an enviable reputation for supplying a complete, responsive precision engineering service to the aerospace, nuclear, automotive, space, and agricultural industries. We have grown to become one of the biggest sub-contract precision engineering companies in the UK. Within our group, we offer not only manufacture but a specialist design division focusing on the design of cutting-edge solutions for a range of business sectors, including, Space, Gas turbines, aerostructure, nuclear, rail and energy. To complete the package, we have our metrology division operating in-house and globally.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Design | We can provide design services for all or part of the design process, from specifications through to detailed manufacturing drawings, including FEA. | Leading Edge |
| Manufacture | From CNC lathes to multi-axis CNC machining centers, we have the capacity to deliver solutions of all sizes while working to the tightest tolerances. | Manufax & Nelson Tool |
| Metrology | Metrology engineers are specialists in measurement services for reverse engineering, recertification of equipment, component inspection, and installation. | In house & globally Metrology |

## KEY FIGURES

Turnover: 18milon Euro

Employees: 100+


Simon Kelly

Sales Director

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United Kingdom

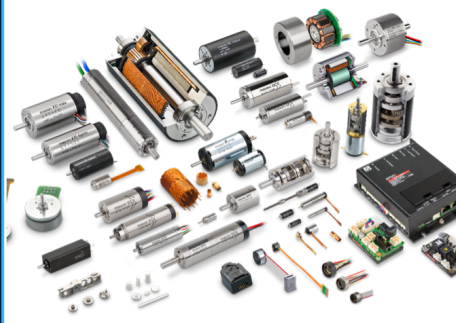

## SOME REFERENCES

- ❑ Rolls Royce
- ❑ BAE SYSTEMS
- ❑ Airbus Space and Defense
- ❑ Nelson Tool
- ❑ Leading edge
- ❑ Manufax Engineering

SCAN ME

# maxon

High precision electric drives systems



www.maxongroup.com

## ACTIVITY KEYWORDS

High-quality micromotors, gearheads, encoders, controllers, mechatronic systems – including battery management systems and master controllers.

## WHO WE ARE

At maxon, we develop and build high precision electric drive systems that are among the best in the world. Our brushed and brushless DC motors are leading the industry worldwide. They are used wherever requirements are high, and engineers cannot afford compromises: maxon actuators are inside NASA's Mars rovers. They are installed in insulin pumps and surgical power tools. You can find them in humanoid robots and in high-precision industrial applications, in tattoo machines, passenger aircraft, camera lenses, race cars, and cardiac pumps.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Electric drives | DC and BLDC motors, gearheads, screw drives, encoders | |
| Electric controllers | Servo controllers, positionning control, motion controllers | |
| Ceramic parts | CIM process, compression molding and additive manufacturing | |

## KEY FIGURES

Turnover: 554M CHF

Employees: 3,060

## SOME REFERENCES

- ESA, NASA space projects


Olivier CHAPPUIS

Innovation Lab Manager

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# MICRO-EPSILON MESSTECHNIK

**More Precision. Sensors, Systems & Solutions.**

MICRO-EPSILON

www.micro-epsilon.com

## ACTIVITY KEYWORDS

Sensors for Displacement, Distance, Length and Position, 2D/3D Sensor Systems, Laser Line Profile Sensors, Optical Micrometers, Color Sensors, Technical Endoscopes, Temperature Sensors, Thermal Imagers, Sensor Inspection Systems, Thickness Measurement, Actuator-Sensor-Systems, Fast Steering Mirrors

## WHO WE ARE

MICRO-EPSILON is among the worldwide leading manufacturers of precision sensors and measuring systems. For more than 50 years, we have offered reliable, high performance and high precision measurements, with a wide product range covering sensors for displacement and distance measurements, 2D and 3D sensors, sensors for IR temperature measurement and color detection, as well as systems for dimensional measurement and defect detection. Due to our extensive knowledge and experience in R&D and industrial series production of sensors and mechatronic systems, numerous customers from high-tech industries, such as semiconductors and aerospace, rely on products and solutions from MICRO-EPSILON.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Precision Sensors | High precision for distance and displacement: Capacitive and eddy current sensors, white light interferometer, confocal chromatic sensors, laser triangulation sensors | |
| 2D/3D Sensors | Dimensional measurement of surface and geometry using 2D sensors (Linescanner, Profile Scanner) and 3D sensors (Deflectometry, Fringe Projection) | |
| Actuator-Sensor Systems | Mechatronic systems including sensor and actuator (Fast Steering Mirror) | |

## KEY FIGURES

Turnover: 170 Mio. EUR

Employees: 1180


Dipl.-Phys. Günter Schallmoser, MBA

Head of Patents & Contracts

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## SOME REFERENCES

- ESO
- Carl Zeiss SMT
- ASML
- CSEM
- VDL
- RUAG

# MPS Microsystems

Experts in custom-made microsystems for telescope instrumentation

www.mpsag.com

## ACTIVITY KEYWORDS

Astronomy, Theta/Phi fiber positioner, microsystems, linear systems & actuators, telescope instrumentation, optomechanical systems,

## WHO WE ARE

With our expertise in electromechanical microsystems and our diversified skills in development, machining and assembly, we design custom products and solutions that stand out for their reliability, high precision and small size.

MPS makes its unique expertise in very high precision electromechanical systems available to scientists around the globe. We now have become an essential partner in developing and manufacturing optical fiber positioners to be installed by thousands in astronomical telescopes.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Modular Theta/Phi fiber positioner | Scalable Theta/Phi fiber positioner for Multi-Object Spectrographs. Adapts to any Multi-Object Spectrograph, which requires precise positioning of optical fibers. Scalable design in size, length, and shape. | MPS Microsystems |
| Theta/Phi fiber positioner for the SDSS-V survey | SDSS-V is an all-sky, multi-epoch spectroscopic survey that will yield over 6 million objects during its five-year observing-time. SDSS-V will use a new, custom-built robotic positioning system co-designed by EPFL and MPS, and manufactured by MPS. | MPS Microsystems |
| Optical fiber positioner for the MOONS survey | With an outside diameter of 25 mm, the positioners consist of 2 parallel axes driven by FAULHABER 8mm stepper motors. Zero backlash reduction gearheads guarantee X-Y positioning accuracy of less than 20 µm. | MPS Microsystems |


Stefane Caseiro

Project Manager

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## KEY FIGURES

Turnover: CHF 75M

Employees: 450

## SOME REFERENCES

- DESI
- MOONS
- VLT
- SDSS-V
- EPFL

# NYFORS Teknologi AB

Optical fiber processing tools designed for the highest demands

www.nyfors.com

## ACTIVITY KEYWORDS

$CO_2$ laser glass splicing and shaping, Fiber and ferrule end face interferometric inspection, Fiber Cleaving, Fiber Stripping, Fiber Recoating, Proof testing, Consulting and Custom solutions.

## WHO WE ARE

NYFORS is your innovative supplier of advanced glass processing and preparation equipment for specialty optical fiber splicing operations. Our highly automated tools lead to consistent, high yield production for both high and low volume. Our portfolio includes $CO_2$ laser splicing and glass shaping equipment, automatic systems for fiber preparation, fiber-end and window stripping, high precision cleavers, optical fiber recoaters, proof testers and end face inspection interferometers. NYFORS also offers custom work cell automation solutions.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Laser fusion splicing | Versatile contamination-free ring-shaped $CO_2$ laser processing for fiber-to-fiber, fiber-to-end cap splicing and tapering, but also fiber array splicing, ball lensing and more. | SMARTSPLICER™ |
| Fiber recoating & prooftesting | Fast and advanced recoaters for different high and low index recoating applications with flexible silicone mould technology to easily change the recoat parameters. | AUTOCOATER™<br>MINICOATER™ |
| Automatic fiber cleaving | Comprehensive product platform for cleaving standard, large diameter and specialty optical fibers, all based on our proven and patented tension and scribe cleaving process. | AUTOCLEAVER™<br>MINICLEAVER™ |

## KEY FIGURES

Turnover:

Employees:


Erik Böttcher

CEO

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## SOME REFERENCES

- ELT - processing for multimode coupling with low Focal Ratio Degradation
- Optical gyroscopes
- Submarine optical fiber recoating
- High precision cleaving with < 0.3° angle
- Standard fiber to low melting temperature material splicing

# Observatory Sciences Ltd

Astronomy Software Specialists

www.observatorysciences.co.uk

## ACTIVITY KEYWORDS

Software – all technologies (software stacks), framework training ESO VLT, ESO VLTI

## WHO WE ARE

Observatory Sciences Ltd (OSL) is a UK company specializing in control software development for astronomical and accelerator facilities.

Since 1998 we have been working with astronomical observatories to provide the software to control the hardware delivering their science.

Since 2017 we have been contracted by ESO to provide support maintaining the VLT/VLTI software infrastructure.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Software | **ESO: Maintenance of the VLT/VLTI Software Infrastructure**<br>• Working with ESO engineers to ensure the software powering ESO's telescopes and instruments continues to be world class<br>• E.g. Instrument & technical detector control software migrated to open-source libraries – increased hardware compatibility providing greater choice of detector manufacturers | Bespoke Software |
| Software | **Square Kilometre Array Observatory (SKAO)**<br>• Framework contract to provide software effort for the SKA Monitoring, Control and Calibration System (MCCS). | Bespoke Software |

QMS ISO 9001 : 2015 REGISTERED

Certificate No:378442021

## KEY FIGURES

Turnover: 1M Euros

Employees: 16


Alastair Borrowman

Software Team Leader

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UK


## SOME REFERENCES

- ESO
- SKAO
- LSST
- Diamond Light Source
- BESSY

# Officina Stellare Spa

Design, manufacturing and commissioning of complex opto-mechanical systems for Ground and Space-based applications.

www.officinastellare.com

## ACTIVITY KEYWORDS

Officina Stellare develops full in-house solutions, with remarkable cost and development time savings for our end-customers. The Company gathers together professionals stemming from a variety of engineering domains, from aerospace to mechanics, from optics to electronics, computer sciences and astronomy.

## WHO WE ARE

Officina Stellare S.p.A. is a leader in the design, development and delivery of complex opto-mechanical systems and instrumentation for both Ground and Space-based applications. The company operates as a vertical integrator where precise, state of the art designing, manufacturing, integration and testing are performed in-house with granular accuracy. We are based in Sarcedo (VI), Italy, and are listed on the Euronext Growth market of the Italian Stock Exchange.

The Company stands out from the international panorama for the entirely in-house availability of the know-how and processes necessary for the design, manufacturing and commissioning of its products and systems for both series and full custom solutions.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Optical telescopes | 0.2-1.5 m aperture standard and customized telescopes (Ritchey-Chrétien, Dall-Kirkham, catadioptric astrographs, prime focus, …) | |
| Optical components manufacturing | Large optical mirrors and lenses (<1.6-m), spherical, aspherical, free-form, off-axis; in-house light-weighting by ultrasonic CNC up to 1.2-m; coatings | |
| Opto-mechanics | FEA optimized mirror and lens mounts for ground and space environment; TVAC and vibration platform in-house | |

## KEY FIGURES

Turnover: 5.7M EURO

Employees: 50


Gino Bucciol

Co-Founder, Business Development Director

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Via della Tecnica 87-89
Sarcedo – VI – 36030 ITALIA


## SOME REFERENCES

- UKATC/ESO (projects: ERIS, MOONS)
- Gemini (projects: SCORPIO, LGS LLT)
- INAF/ESO (projects: ERIS, SOXS)
- SALT (projects: ADC passband upgrade)
- NASA (projects: SOFIA, SuperBIT, EXCITE)
- AIRBUS D&S
- NARIT (Planetary imaging telescope)
- Aarhus University (prj: SONG optics)

# OIP Sensor Systems

Your partner for mission critical visualization solutions

www.oip.be

## ACTIVITY KEYWORDS

Cameras, spectrometers, instrumentation

## WHO WE ARE

With a century of experience, OIP is a leader in the field of design, development & production of electro-optical systems for Defence, Space, Homeland Security and High-end Industrial markets, serving a variety of different applications.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Spectrometers | Multi-spectral and hyper-spectral imagers for planetary observation and atmospheric analysis, scientific instrumentation | PROBA-V, CLIM, NOMAD, ALTIUS, MIRI, … |
| Cameras | Monitoring and navigation cameras, high-resolution cameras | VMC, VTS, HRC, PILOT, … |
| Night vision and thermal imagers | Mounted and portable night vision equipment, thermal imaging equipment, target acquisition and ranging equipment | LORIS, TIGRIS, EOPTRIS, VINIRIS, HELIMUN, … |

## KEY FIGURES

Turnover: ~50 M€

Employees: 100+

OIP Sensor Systems

Bart Desoete

Business Development Manager Space

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Belgium

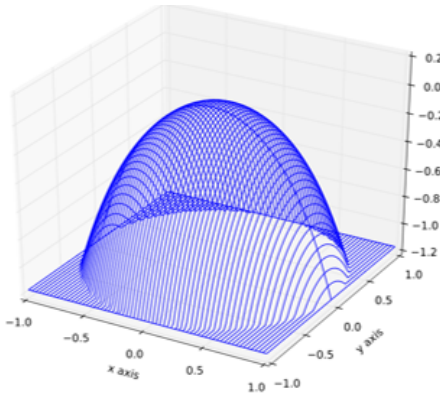
## SOME REFERENCES

- ESA
- Airbus D&S
- TAS
- Various MODs

# OPTICAL-CALCULATION.COM

By CLAVIS company

Online photonics software




**WWW.OPTICAL-CALCULATION.COM**

## ACTIVITY KEYWORDS

Optical software – Photonics calculations – Optics – Laser – Optoelectronics - Fiber optics - Radiometry – Photometry - Optical instrumentation – Optical sensing – Research and Development

## WHO WE ARE

CLAVIS has been created in 2001. It was initially a start up in optical communication. Since 2004 it has moved into R&D service for optical instrumentation. Its customers operate in various fields (microelectronics, telecommunications, green industry, automotive, security, nuclear, space, medical, research, etc.). Taking advantage of its numerous missions (with more than 40 customers), CLAVIS has recently launched an online software (**www.optical-calculation.com**) dedicated to engineers, technicians and researchers in photonics. This tool has been developed for experts as well as beginners. It is well suited for realizing a feasibility study, a conceptual design, an experimental bench or a prototype design, for carrying out a reverse engineering study, for explaining/justifying experimental results...

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Online photonics software | **OPTICAL-CALCULATION.COM** contains two modules that can be used simultaneously.<br><br>The first one, "ADVANCED CLCULATIONS", is an online optical software enabling to analyze a large variety of optical systems that can include non spherical surfaces, tilted surfaces, etc. Many analysis features are available as well as numerous calculation and display options.<br><br>The second one, "HANDY CALCULATIONS", offers many user-friendly pages for quick computation. It addresses a wide field of photonics including geometrical optics, lasers, fiber optics, optoelectronics, radiometry,etc. Both modules include contextual support and numerous tutorials. | www.optical-calculation.com |

## KEY FIGURES

Turnover: NA

Employees: NA

Gilles Passedat

General Manager

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CLAVIS
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## SOME REFERENCES

- ITER
- TOTAL
- CNRS
- TELEDYNE
- HORIBA medical
- PELLENC ST
- CNRS

# Optocraft

Know your quality!
Precision metrology for optics and lasers.

www.optocraft.de

## ACTIVITY KEYWORDS

Testing & alignment of telescopes, alignment and characterization of optical systems for satellites and of laser guide stars, wavefront measurement in free space communication

## WHO WE ARE

Optocraft develops and manufactures Shack-Hartmann wavefront sensors and system solutions for testing optics and lasers.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Wavefront metrology | Shack-Hartmann wavefront sensor | Optocraft |
| Wavefront metrology | Turn-key solutions for optics testing, based on wavefront sensor | Optocraft |

## KEY FIGURES

Turnover: 3,000,000 EUR

Employees: 29

## SOME REFERENCES

- Airbus Defense & Space
- Leica Camera
- Qioptiq

Christian Brock

Sales engineer

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Germany

# Physik Instrumente (PI)

Solutions for Precision Motion and Positioning

www.physikinstrumente.com

## ACTIVITY KEYWORDS

Piezo Technology | Nano Positioning | Performance Automation

## WHO WE ARE

PI (Physik Instrumente), headquartered in Karlsruhe, is the market and technology leader for high-precision positioning technology and piezo applications in the semiconductor industry, life sciences, photonics, and in industrial automation. In close cooperation with customers from all over the world and for 50 years now, PI's specialists (approx. 1,300) have been pushing, again and again, the boundaries of what is technically possible and developing customized solutions from scratch. More than 350 granted and pending patents underline the company's claim to innovation. PI has nine production sites and 15 sales and service offices in Europe, North America, and Asia.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Hexapods | Hexapods provide motion in six degrees of freedom in the most compact package. In combination with absolute measuring sensors, software and motion controllers that make the most complicated motion profiles easy to command, PI hexapods answer industrial requirements. All drive types can be matched to meet the conditions of the individual application. | H-811; H-840 etc. |
| Piezo Technology | In the case of PICMA® piezo actuators, the actual piezo ceramic is protected by an all-ceramic insulation layer against humidity and failure due to increased leakage current. The monolithic piezo ceramic block of a PICMA® actuator achieves excellent reliability, even under extreme ambient conditions, and thus extends the lifetime by several orders of magnitude. | PICMA® |

## KEY FIGURES

Turnover: 240M €

Employees: 1,400

## SOME REFERENCES

- ALMA-Array
- Drive Technology for the ELT
- Curiosity Mars Rover


Christian Bertlein

Field Sales Engineer

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Auf der Roemerstrasse 1
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Germany

# RFR Solutions AB

## Stainless steel excellence

Developing and manufacturing systems and components in stainless steel for customers who require high quality.

www.rfrsolutions.se

## ACTIVITY KEYWORDS

Stainless steel, vacuum chamber, cryostat, licensed welding, PED,

## WHO WE ARE

### From idea to finished product

We help you develop and manufacture solutions in stainless steel and offer full support throughout the entire process from design and development of prototypes to production, assembly, quality controls and installation. Our engineers are often a part of our customers' project teams from an early stage, and assist with material expertise, design and product optimization. RFR Solutions is one of few suppliers who offer a complete production facility free from carbon steel.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Stainless steel manufacturing | Manufacturing of systems and components for high-vacuum chambers, cryostats, framework, media penetrations, and auxillliary systems | |
| Test and validation | NDT tests, X-ray, dimensional control, Helium leak test, pressure test | |
| Design for manufacturing | Design support for optimization for manufacturing and quality | |

## KEY FIGURES

Turnover: 7 M€

Employees: 48

RFR SOLUTIONS
Stainless Steel Excellence


Benny BJÖRKANDER

CEO

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Sweden


## SOME REFERENCES

- ESS; Lund Sweden
- CERN, Switzerland
- MAX IV, Lund Sweden

# S2Innovation Sp. z o. o. [ltd.]

Control Systems and Software for (Big)Science

https://s2innovation.com

## ACTIVITY KEYWORDS

software, control system, alarms management, Tango, EPICS, PLC, device servers, IOCs, GUI, integration

## WHO WE ARE

We collaborate on software and control systems.

We do not simply write a code – we deliver solutions!

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Controls Systems Software | Equipment integration with Tango, EPICS and custom control system framework. GUI and contro system apllication | Tango, EPICS, … |
| PLC | PLC system design and fabrication. PLC systems programming. | Siemens, Beckhoff |
| Alam Management Systems | Web application for alarms management for thousands of devices, multiple control systems. Deployment, training and and consultancy ANSI/ISA-18.2/ IEC 62682 | IC@MS |

## KEY FIGURES

Turnover: 550kEUR

Employees: 15

Piotr GORYL

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## SOME REFERENCES

- MAX-IV
- ESRF
- ESS
- Cosylab
- SOLEIL
- SOLARIS

# Safran Reosc

Safran Reosc designs innovative instruments dedicated to Astronomy. Our opto-mechanical components (segmented mirrors, thin shells, large mirrors, TMA, lenses assemblies) meet the most demanding requirements of international scientific programs such as the ELT.

www.safran-group.com/companies/safran-reosc

## ACTIVITY KEYWORDS

Segmented mirrors, very large mirrors, adaptive thin shells, large test optics, mirrors & lens assemblies, coating for small and large lenses or beam separator, space optics for astronomy projects in Space!

## WHO WE ARE

Safran Reosc is the European leader in opto-mechanical systems for Space & Astronomy. We design, manufacture, assemble and test them in our Safran Reosc plants in France. As an example, we are producing the main optics of the ELT: ELTM1 segmented mirrors, ELTM2 4-m mirror, ELTM3 4-m mirror, ELTM4 thin shells, and the ELTM5 mirror.

We polish, control and coat high precision optics (plane, spherical, aspherical or free-form) to the nanometer accuracy, with a significant differentiating factor for large-size products (capacity up to 4 meter diameter).

We also provide thin-film optical coatings adapted to high-energy laser, space, astronomy, defense and semiconductor applications from micro coating to coating of large optics.

Finally, we assemble, integrate, bond, clean, and test high precision opto-mechanical systems in our class 100 room.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Thin Shells | We offer thin shell optics, down to 2mm thickness, with a SFE down to 8nm RMS, for diameter up to 1,5m. | |
| Free Form mirrors | We offer free form mirror down to a SFE of 10nm RMS in ceramic, SiC or glass, for mirrors up to 4 meter diameter, with multiple coating possibilities. | |
| Mirror & Lens assembly | We offer integrated mirrors or lens assemblies for instrument purposes, that works in extreme environments (cryogenic, space environments), , with multiple coating possibilities. | |


Emmanuelle HAREL

Sales Manager

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## KEY FIGURES

Turnover: 35M€ in 2021

Employees: 170

## SOME REFERENCES

- ELT: M1, M2, M3, M4, M5
- VLT M2
- GTC M1 segments
- GMTO thin shell
- Gemini M2

# SCHOTT AG

United by a passion for glass.

#GLASSLOVERS

www.schott.com

## ACTIVITY KEYWORDS

Optical components, optical color filters, interference filters, IR materials, large optics, ZERODUR®, CNC-machining, polishing, coating

## WHO WE ARE

**SCHOTT** Advanced Optics, with its deep technological expertise, is a valuable partner in developing products and customized solutions for applications in optics, lithography, astronomy & space, opto-electronics, augmented reality, life sciences, and research. With a product portfolio of more than 120 optical glasses, special materials and components, we master the value chain: from customized glass development to high-precision optical product finishing, coating and metrology. Your Partner for Excellence in Optics.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Coatings and optical color filters | Interference filters from 200 nm up to 6000 nm, more than 150 layers, dielelectric, metals, ITO, narrow band filters, notch filters etc. Customized designs in combination with a broad portfolio of more than 60 color filter glass types. | |
| Precision components | Aspheres from 10 – 200 mm with RMSi up to 30 nm. Polished prisms and plano components up to 700 mm. Fused silica and sapphire components. | |
| Optical glasses | More than 120 optical glasses, tightest optical tolerances, high index homogeneity up to meter sizes, high transmittance and low aberration for hyperspectral designs, radiation resistant glasses | SCHOTT N-BK7® |
| IR materials | IRG Chalcogenide Glasses: High transparency 3-5 µm and 8-12 µm, partly down to 0,7 µm. Low dn/dT and dispersion . Low density , good processability. Varity for customized optical lens design. | IRG 22, 24, 25, 26, 27 |
| ZERODUR® mirror substrates | Extremely low thermal expansion that can be optimized for arbitrary operating temperature ranges down to 0 ± 7 ppb/K. Homogeneous throughout the volume up to formats of 4.25 m diameter. | SCHOTT ZERODUR® |

## KEY FIGURES

Turnover: 2.52 billion EUR

Employees: 17,300


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European Sales Manager Astro & Space

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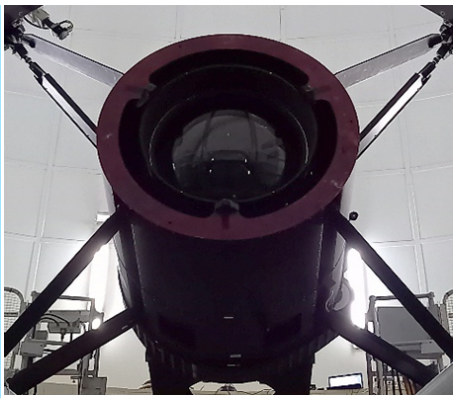
## SOME REFERENCES

- ❑ CEFCA (Javalambre Telescope)
- ❑ SCORPIO (GEMINI Observatory)
- ❑ TNO Guide-Star Laser
- ❑ ATLID instrument (Sentinel-5)
- ❑ METImage (EUMETSAT Polar System II)
- ❑ ESO ELT
- ❑ …. further instruments for telescopes

# SENER Aeroespacial

Custom opto-mechanical systems
and large mirror Cells



www.aerospace.sener

## ACTIVITY KEYWORDS

Mechanisms, mirror cells, tip-tilt systems, hexapods, shape actuators, rotators, optical correctors, filter wheels, optical AIV

## WHO WE ARE

SENER is a private engineering and technology group founded in 1956. It seeks to offer its clients the most advanced technological solutions and enjoys international recognition. SENER Aeroespacial is the company inside the group for Space, Defense and Science markets with long tradition in mechanical systems and radio-frequency systems with the incorporation of Tryo Group. In the field of large telescopes, SENER Aeroespacial has more than 22 years' experience and it is recognized for its capability to perform multi-discipline projects in opto-mechanics, optical instrumentation, mechanics, electronics and SW and large mobile structures, actuators and control infrastructures.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Mirror Cells | Specialist in large mirror (up to 4 m) cells/supports, using different technologies like whiffle-tree supports or shape actuators for optical surface error correction. | |
| Tip-tilt Systems | Fast image correction for large mirrors (up to 3m) with custom piezo-actuation with up to 20Hz bandwidth | |
| Instrumentation Mechanisms | Several large mechanisms (rotators, filter wheels, optical correctors, linear actuation) with micrometric precision for telescopes and instruments. | |

## KEY FIGURES

Turnover: 120 M€

Employees: 800


Joan-Manel CASALTA

Science Department Director

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08290 Cerdanyola del Vallès- Barcelona ES

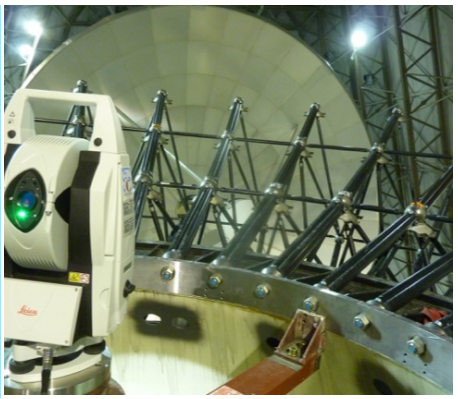

## SOME REFERENCES

- ESO: VLT-GRAAL, VISTA-M2, ALMA-ACD
- ESO: ELT M2-M3 Cells, M5 Cell, M1 M
- IAC: GTC-M2, WHT-PFC, EST-M1
- ESA: ARIEL-M2, ROSETTA, SO-PHI, JANUS,…
- ALBA
- ESRF
- F4E

# SETIS

## Your 3D Metrology Expert

The precision of specialists to assist your projects on demand



www.groupe-degaud.com

## ACTIVITY KEYWORDS

3D Metrology, 3D Metrology-Assisted assembly, 3D scan, 3D Inspection process design, On site 3D inspection

## WHO WE ARE

Specialists in 3D measurement in challenging industrial sectors, we are a major player for these cutting-edge companies. Our broad skills and knowledge enable us to carry out projects with high strategic stakes.

Aeronautics, Space, Energy, Nuclear industry, Automotive industry, Mechanical industry, Research, Robotics, Foundry, and Steel industry are all fields where we bring our expertise in very high precision dimensional measurement.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Laser tracker | Large volume 3D metrology inspection (uncertainty 15µm+6µm/m) | Leica AT960, AT403, ATS600 |
| 3D Scanner | Precise 3D scan of mechanical parts (uncertainty 50µm) | Leica T-Scan 5, Hexagon RS6 |
| 3D Scanner | Terrestrial LIDAR for 3D digitalization (uncertainty up to 1mm) | Z+F 5016, Leica BLK2GO, Pegasus |

## KEY FIGURES

Turnover: 7.9M €

Employees: 85

SETIS Groupe Degaud

Gaël ARCHAMBEAU

Metrology Business Unit Manager

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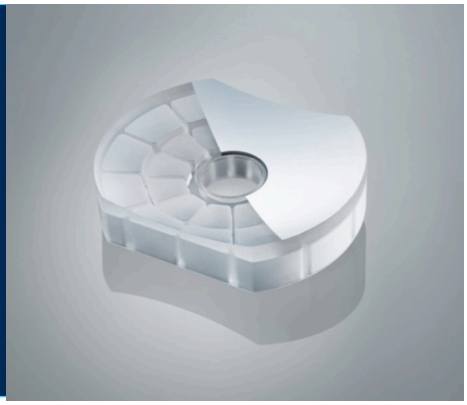
38100 GRENOBLE
FRANCE

## SOME REFERENCES

- ESO: ALMA Project
- ESO: Very Large Telescop (VLT)
- IRAM : NOEMA
- ASIAA : Greenland Telescop Project
- ITER
- CERN
- Nuclear Power Plant (France, Finland,…)

# SwissOptic AG

Convincing Solutions for Your Ideas.



www.swissoptic.ag

## ACTIVITY KEYWORDS

Opto-Mechatronical Assemblies, Objectives, Telescopes, Mirrors, Lenses, Prisms, Coatings

## WHO WE ARE

SwissOptic AG designs and manufactures high-end optics for demanding applications in the photonics industry, with the highest precision.

We design and manufacture a wide range of precision optical components, assemblies and systems. We are your competent partner along the entire value chain, from concept to series production. Our knowledge and many years of experience in a wide range of applications for optical systems enable us to solve your specific challenges with a custom-made design.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Opto-Mechatronical Assemblies | Manufacturing, assembly and Integration of custom made opto-mechatronical assemblies with electronical components e.g. objectives, telescopes | NA |
| Light-Weight Mirrors | Light-weight mirrors with aspherical, spherical and free forms made of optical glasses and ceramics | NA |
| Coating | Custom made optical coatings, developed, designed and qualified fully in-house. | NA |

SWISSOPTIC
A member of the JENOPTIK Group

## KEY FIGURES

Turnover: ~

Employees: 310


Peter Bauer

Head of BU Photonics Solutions

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Switzerland


## SOME REFERENCES

- ESA

# SYDERAL SWISS SA

Electronics and Software

www.syderal.swiss

## ACTIVITY KEYWORDS

Space Equipment system engineering, Embedded software development, Digital & analogue electronics design, FPGA/ASIC development, electronics production capability

## WHO WE ARE

Syderal Swiss SA has been designing, producing and qualifying on-board electronic equipment for space applications for more than 25 years and has participated in more than 50 missions without any failures, for customers such as ESA, NASA, Airbus Defense and Space and Thales Alenia Space.

The company has end-to-end engineering competencies in digital and analogue electronics as well as software solutions and has extensive in-house production facilities, especially qualified to ESA standards. The Syderal group's areas of expertise include Instrument Control Units, Mechanism Drive Electronics, Data Management and Processing, Quantum Entanglement Controllers and Payload Interface Units.

Syderal Swiss headquarters is located in Neuchâtel, Switzerland and the company has a subsidiary in Poland, Syderal Polska Sp. Z.o.o.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| sMDE | Syderal Swiss is developing a Standard Mechanism Drive Electronics (sMDE), which could be used on various type of missions, with the main objective to reduce the development costs and lead-time while mitigating technical and schedule risks. | NA |
| Tailored Solutions | SYDERAL SWISS has a long heritage of design, production and qualification of specific, reliable and complex electronics. | NA |

## KEY FIGURES

Turnover: 10M CHF

Employees: 55

Grégory Moura

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## SOME REFERENCES

- ESA
- Airbus Defense and Space
- Thales Alenia Space
- OHB
- CNES
- NASA

# SYMETRIE

The hexapod company


**www. symetrie.fr**

## ACTIVITY KEYWORDS

Hexapods, 6 DOF precision positioning systems

## WHO WE ARE

SYMETRIE specializes in hexapods, parallel kinematics systems used to position an object in 6 degrees of freedom with high accuracy, resolution & stiffness.

We offer ready-to-use hexapods with ergonomic control software for applications in optics, space, defense, research, semiconductor & synchrotrons.

We have a large range of standard products and we can also provide customized solutions.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Positioning hexapods | High precision positioning systems. Resolution from 50 nm to a few µm. Payload from a few kilos to 30 tons | SYMETRIE |
| Motion hexapods | Motion simulators, dynamic testing systems. Speed up to 2 m/s, acceleration up to 1g. Payload from a few kilos to 10 tons | SYMETRIE |

Symétrie

## KEY FIGURES

Turnover: 7 M €

Employees: 40

Anne Duget

Marketing and Sales Manager

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FR-30000 Nimes

## SOME REFERENCES

- ESO (ELT)
- ESA
- AMOS
- IRAM
- SAFRAN REOSC
- TNO

# TECPA

FEELING FOR DETAIL AND PRECISION

FEELING FOR DETAIL AND PRECISION

www.tecpa.eu

## ACTIVITY KEYWORDS

vacuum, devices, instrumentation, electron microscopy, detectors, chambers, technology, precision, machining, LBW, TIG, welding.

## WHO WE ARE

Tecpa s.r.o. is a traditional progressive Czech company. We are focused on providing comprehensive services in the field of precise engineering manufacturing (individual items and small series production).

We offer a complex service from the begginig (consultation, engineering design, simulations, technological aspects) to the final process (manufacturing, quality inspection, functional tests, export). For this type of service we use a cutting edge CAD/CAM software and production technologies.

Our specialization is manufacturing and machining of precise components made of stainless steel, titanium, aluminium and copper alloys, molybdenum, tungsten, graphite, glass ceramics (MACOR) and various types of plastics. After that we assemble these parts into variable dimensions and applications.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Electron microscopy | Our primar production is focused on modification, optimisation and manufacturing of vacuum pipe systems, chambers, specimen holders, BSE detectors and mechanics. | Tecpa |
| Vacuum applications and devices | We also produce fully customizable HV/UHV chambers, ion traps, tech. instruments and devices at the request of customers to machinery or medical industry. | Tecpa |
| Research and development | We are leaders of R&D groups focused on mechanical parts of detection systems, vacuum devices or diagnostic instruments to magnetic resonance. | Tecpa |

## KEY FIGURES

Turnover: 1,3M EUR

Employees: 25

Tecpa s.r.o.

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## SOME REFERENCES

- Tescan Orsay Holding
- ThermoFisher Scientific
- Hitachi High-Tech
- ABB
- Georadis
- Institute of Scientific Instruments (CAS)

# Teledyne SP Devices

High-Speed Data Acquisition Systems

FPGA-Based Digitizers

https://spdevices.com

## ACTIVITY KEYWORDS

DAQ, data acquisition, electronics, digital signal enhancement, signal processing, signal generation, wideband,

## WHO WE ARE

We design and manufacture world-leading modular data acquisition and signal generation instruments. Our products utilize patented calibration logic, the latest data converters, and FPGA technology resulting in an unrivaled combination of high sampling rate and resolution. We specialize in real-time signal processing.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Digitizer | 4-channel digitizer, 2.5GSPS (interleaved to 2ch at 5GSPS), 2.5GHz bandwidth, 12bit resolution, FPGA development kit available, PXI Express interface | Teledyne ADQ36 |
| Digitizer | 2-channel digitizer, 5GSPS (interleaved to 1ch at 10GSPS), 2GHz bandwidth, 14bit resolution, FPGA development kit available, PCIe, PXIe, USB, MTCA interface | Teledyne ADQ7DC |
| Digitizer | 8-channel digitizer, 1GSPS, 500MHz bandwidth, 10bit resolution, FPGA development kit available, PXIe, MTCA interface | Teledyne ADQ8 |

## KEY FIGURES

Turnover:

Employees:


Kacper MATUSZYNSKI

Sales Manager

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## SOME REFERENCES

- ❑ DESY
- ❑ Onsala Space Observatory
- ❑ MPI IPP – Wendelstein 7X
- ❑ DLR (German Aerospace Center)

# Thales SESO

Accurate optics manufacturer


http://www.seso.com/

## ACTIVITY KEYWORDS

Large coated optics, aspherical, conical, free-form, visible, space qualified, astronomy, polishing, zerodur, silicon, spectrograph, camera, nanometer level, optical and mechanical designing, design-to-cost, coating, grinding, light-weighting,

## WHO WE ARE

World leader in large precision optics and systems for Space, Laser, EUV & X-rays and Astronomy.
Thales SESO masters all the manufacturing steps with a wide range of grinding, light-weighting, polishing and coating machines and robots. It enables to adapt to the most stringent customer specifications.
Shape: aspheric, elliptic, parabolic, hyperbolic, toroid, free-form.
Size: from 15 cm to 2 m.
Material: Glasses, Ceramics, Semiconductors.
Coating: Aluminum, Gold, customs, space and high power laser qualified.
Precision: to the extreme (nanometer level).
Mirror lightening: up to 85 %.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Astronomy instrument | Large coated lenses for wide field corrector, filters, vacuum interface. Also possibly with the mechanical interface. | Thales – SESO® optics |
| Astronomy instrument | Large coated cameras (as opto-mechanical systems) for spectrographs, possibly passively athermalized | Thales – SESO® optics |
| Astronomy instrument | Lightweigthed coated mirrors for telescopes and instruments. Any optical and mechanical shapes. | Thales – SESO® optics |

## KEY FIGURES

Turnover: 20 M€

Employees: 120

Julien Fourez

Technical Sales engineer

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**THALES SESO**
Pôle d'Activités des Milles
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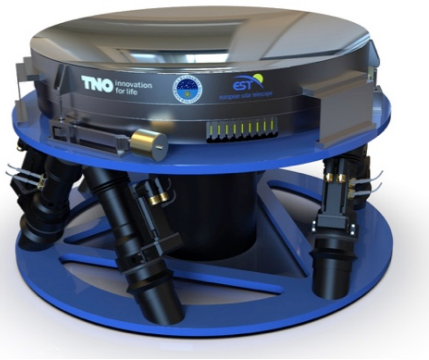
13593 Aix-en-Provence Cedex 3 – France

## SOME REFERENCES

- ESO for VLT instruments ( UVES , Graal Galacsy)
- LLNL for LSST (Filters, opto-mechanical vacuum interface)
- John Hopkins University for SDSS (wide field corrector)
- Cambridge University for HARPS 1 and 3
- Max Planck Institut für Astronomy for LBT
- Laboratoire des Matériaux Avancés for VIRGO (future very accurate critical mirrors)
- Fermilab for DES (wide field corrector)
- Instituto de Astronomia de Canarias for Grantecan
- ISRO - PRL in India for accurate spectrographs

TNO innovation for life



https://www.tno.nl/astronomy

## ACTIVITY KEYWORDS

Nanometer precision opto-mechatronic instrumentation for space and science, including deformable mirrors, precision actuated structures, laser projection systems, spectrometers, up to full optical benches.

## WHO WE ARE

TNO is the Netherlands Organization for Applied Scientific Research. TNO connects people and knowledge to create innovations that boost the sustainable competitiveness of industry and well-being of society.

TNO's work in space and scientific instrumentation includes over 50 years of heritage with 100% reliability for ESO, ESA, NASA and others; from the first spectrometer (S59) flown by ESA in 1970 to the VLT laser launch telescopes currently in operation, to design of the ELT M1 supports with 20nm precision. Our latest breakthrough is a deformable mirror technology with unmatched reliability, power efficiency, linearity, force density and serviceability.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Deformable Mirrors (VDL, Hyperion, UH, UCSC) | Design scales from 100 to 3000 mm diameters, 17 to 2000+ actuators, 5-20+ mm pitch. Functional in cryo conditions – extreme power efficiency reduces need for cooling. | Custom |
| Large Mirror Support Structures (VDL, NOVA) | Proven, low-cost ELT-M1 supports, with whiffle-tree and warping harness, maintains ~20nm precision in all gravity vectors and thermal conditions, scalable 250-3000+ mm. | Custom |
| Laser Guidestar Systems (with Demcon) | VLT Laser Launch Telescope heritage expanded in pointing angle range, and incorporating Beam Conditioning and Diagnostics for the ELT-LPS | Custom |

TNO innovation for life

## KEY FIGURES

Turnover: 500+ M Euro

Employees: 3400+

Matthew Maniscalco

Business Developer

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## SOME REFERENCES

- ESO, ESA, NSO
- GA, ITER
- TMT, NASA
- NOVA, IAC
- UH, UCSC

# TOPTICA Projects GmbH

Guide Star Laser and Specialty Laser Systems

www.toptica-projects.com

## ACTIVITY KEYWORDS

Guide Star Laser, Specialty Lasers
Diode laser, Ultrafast Fiber Laser, THz Systems, Frequency Combs, Laser Rack Systems

## WHO WE ARE

TOPTICA Projects (PRO) is a spin-off of TOPTICA Photonics AG (TPA), founded in 2016. PRO's main product line is the laser guide star business (product line SodiumStar). PRO have proven their unique expertise in design, manufacturing, assembly, testing, and verification of high-precision photonics, opto-mechanical, and electro-mechanical systems.

TOPTICA Photonics AG (TPA) develops and manufactures high-end laser systems for scientific and industrial applications. The portfolio includes diode lasers, ultrafast fiber lasers, terahertz systems and frequency combs. OEM customers, scientists, and over a dozen Nobel laureates all acknowledge the exceptional specifications of TOPTICA's lasers, as well as their reliability and longevity.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Guide Star Laser | The SodiumStar system is a high-power "guide star" laser designed for adaptive optics control in ground-based telescopes. | SodiumStar |
| Diode Laser | Tunable, single-frequency lasers from 190 nm to 4000 nm | DL-pro, CTL, TA pro, SHG pro, FHG pro |
| Fiber Laser | Ultrafast Fiber Laser, Frequency Combs, High-Power Fiber Lasers | FemtoFiber pro/ultra, FemtoFErb, FemtoFYb, DFC CORE+ |

## KEY FIGURES

Turnover: 4 M€ (TPA 85 M€)

Employees: 18 (TPA 400)


Lison, Frank

Managing Director, CEO

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## SOME REFERENCES

- ESO VLT & ELT
- W. M. Keck Observatory
- Gemini Observatory (South & North)
- Subaru

# VDL

Strength through cooperation

www.vdlgroep.com

## ACTIVITY KEYWORDS

VDL high-end contract manufacturing:  vacuum, positioning, and andling solutions – from parts manufacturing to complete systems (design, assembly, integration, qualification)

## WHO WE ARE

VDL is a large Dutch family-owned industrial conglomerate. Next to bus and car assembly, we are a high-end contract manufacturer who serves the major players in the semiconductor, health, and analytical markets.

As VDL Science & Technology we continuously invest in new technology and are exploring new markets: astronomy (eg M1, instruments), accelerators (Xband, normal conducting), and optical communication & earth observation.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Astronomy | M! frames ELT | ESO et al |
| Astronomy | Deformable mirror | University Hawaii |

## KEY FIGURES

Turnover: 6B Euro

Employees: 16,000

## SOME REFERENCES

- ESO
- University of Hawaii
- NOVA, SRON
- TNO
- MSE, TMT

Hans Priem

Business Manager

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De Schakel 22
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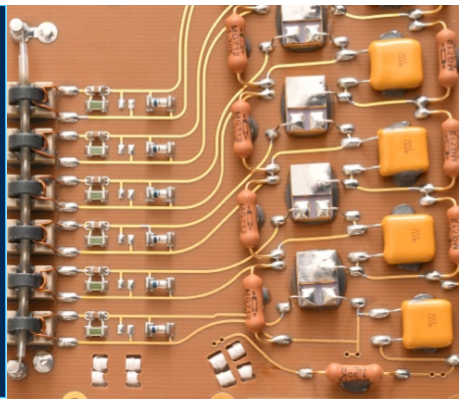
# von Hoerner & Sulger GmbH

We love Space!



https://vh-s.de

## ACTIVITY KEYWORDS

Scientific Space Instruments, Custom Electronics System Design, Sounding Rocket Instruments, High Performance Image Sensor Readout Electronics, Plasma Sensors, Analog Sensor Electronics, High Voltage Supplies, Custom Evaluation Systems, Ground Support Equipment

## WHO WE ARE

Since 1971 the core business of SME vH&S is the design and realisation of high reliability instrumentation for Space and Earth. Our advantage is in fast and efficient understanding of customers' needs and rigid fulfillment of specifications. Cost-efficient and pragmatic solutions are our main focus. We cover all project aspects from the initial design phase through manufacturing and integration supported by strong quality assurance.

Our key expertise is the development of mixed signal and analog electronics for Satellites and laboratory applications. This includes low noise, high performance frontends for state of the art image sensors (VIS, NIR, SWIR) and readout and instrument control by FPGA/CPU. We also develop custom electrical and optical calibration sources. The in-house facilities include a cleanroom and fully equipped developer laboratories.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Image Sensor Readout | Eight channel low noise readout and control electronics for the SWIR ROIC. Development for the German EnMAP Satellite. | SWIR-DCE |
| Optical Calibration Source | Multispectral LED based Infrared calibration source for the NISP Instrument on the ESA Mission EUCLID. | NICU |
| Dust Spectrometer | The COSIMA instrument analyses organic and inorganic composition of cometary dust grains. It is part of the ROSETTA mission to the 67P/ Churyumov Gerasimenko. | COSIMA |

## KEY FIGURES

Turnover: 3M €

Employees: 26


Dr. Hartmut Henkel

Managing Director

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## SOME REFERENCES

- ESA
- DLR
- NASA / JPL
- OHB
- Airbus
- AIM Infrarot-Module
- Max-Planck-Institut für Astronomie
- Institut für Raumfahrtsysteme Stuttgart
- Christian-Albrechts-Universität zu Kiel

# Winlight System

Design & manufacturing of high-performance optical components

https://www.winlight-system.com/

## ACTIVITY KEYWORDS

Astronomy, Space, Defense, Synchrotrons

## WHO WE ARE

Winlight System is a French company that designs and manufactures high-performance optical systems and components.

We primarily operate in the space, defense, astronomy and “big science” sectors. Winlight System’s technical expertise in the design and construction of state-of-the-art optical systems is recognized worldwide, including proprietary polishing technologies (molecular adhesion, high-precision polishing), as well as assembly and testing.

## PRODUCTS / TECHNOLOGY DETAILS

| CATEGORY | DESCRIPTION | BRAND |
|---|---|---|
| Astronomy | Spectrographs, mirrors, lenses, IFUs (Integrated Field Units ) | |
| Space | Space optical components & subsystems, OGSE (Optical Ground Support Equipment) | |
| Defense | Onboard optronics, hardened optical subsystems, test benches & tools | |

## KEY FIGURES

Turnover: 7M€ (2020)

Employees: 50

## SOME REFERENCES

- Mars 2020 mission
- VLT – BlueMUSE
- Keck – KCWI
- SOLARNET
- DESI

Sacha PLUSKWA

Sales engineer

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Registration and event website: https://indi.to/ELTInstruments2022