



# SOPHISTICATED APPLICATIONS IN PRECISION OPTICS

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# WHO WE ARE. WHAT WE OFFER.

With 60 years of experience with electron beam processes and 45 years in magnetron technology, both for industrial production and for research and development, VON ARDENNE is one of the leading providers of equipment and technologies in PVD thin-film technology and vacuum process technology. Thanks to this expertise, we have managed to supply over 500 vacuum coating systems to our customers all over the world. We are well prepared to turn your product property requirements into efficient and competitive coating solutions based on various modular assembly systems like batch, cluster, inline or drum coater configurations.

Precision optics have been in increasing demand for the last couple of years. This market will grow even further advanced by mega trends such as autonomous driving, the internet of things, virtual reality but also new solutions for communication technology, medical or measuring technology.

A crucial prerequisite for precision optics to function is high-precision coatings that make use of the interference properties and, thereby, provide the desired characteristics. Thanks to its experience in developing and manufacturing vacuum coating equipment, the VON ARDENNE Group possesses a profound understanding of the physical processes that are necessary for vacuum coating and extensive expertise in how to use them for a multitude of different applications.

This knowledge is the basis for the development of many different equipment platforms, that are distinguished by the technology they use, their productivity and flexibility. VON ARDENNE coating technology solutions cover the whole spectrum of requirements, from research and development to pilot production to mass production.

# OPTA X ROTARY DISK COATING SYSTEM

FOR SOPHISTICATED LAYER SYSTEMS



## CLASSIFICATION OF SUBSTRATES

FLAT	Ultra-thin glass	0.1 mm ~ 0.3 mm thick Ø 200 mm		wafer level optics 3D sensing
	Wafers (Si, InP, GaAs)	0.7 mm thick Ø 4", 6", 200/300 mm		wafer level optics laser diodes
	Standard	1.0 mm ~ 6.5 mm thick Ø 1", 2", 25/50 mm 50 x 50/100 x 100 mm <sup>2</sup>		catalog optics laser optics
	Wedge-shaped	Like standards but with nonparallel surfaces ( $\Delta \ll 1^\circ$ )		catalog optics laser optics
	Large-area	2 mm ~ 10 mm thick Ø 300 mm 280 x 320 mm <sup>2</sup>		laser optics space & defense
3D	Cubical	5 x 5 x 5 mm <sup>3</sup> up to 50 x 50 x 50 mm <sup>3</sup>		telecom optics
	Spherical	5 mm ~ 70 mm thick Ø up to 180 mm		laser optics X-ray optics
	Cylindrical	up to 50 mm thick up to 200 mm wide		laser optics X-ray optics
	Prisms	up to 50 mm edge length		catalog optics periscope optics



The **OPTA X** is our system for the most sophisticated layer systems, especially for optical multi-layer systems with a high number of layers. The coating is done horizontally, and different processes are available for an optimal coating: Meta Mode, CARS\*, reactive and non-reactive sputtering.

The system has five ports that can be used to integrate magnetrons and/or plasma sources. In-situ measurement technology is also available for monitoring and adjusting the coating process.

The **OPTA X** is equipped with a modular automatic handling system that enables a safe loading of the system with various substrates that are passed through the system in customized carriers.

Depending on the process and productivity requirements, different module types, such as magazine load locks or pre- or post-treatment chambers, can be combined.

## TECHNICAL DATA

Subject to change without notice due to technical improvement.

### SUBSTRATE

Material	glass, polymers, metals
Size (L x W), max.	280 mm x 320 mm
Diameter	up to 200/300 mm
Thickness	70 mm

### DEPOSITION SYSTEM

Deposition type	DC, pulsed DC, AC, CARS*, meta mode, reactive sputtering, RF
Magnetron type	planar, rotatable
Plasma source	inductively coupled
Substrate temperature range	RT / 300 °C
Substrate potential	floating
Number of independent process gases	4 (e.g. Ar, Ar/O <sub>2</sub> , N <sub>2</sub> , O <sub>2</sub> , H <sub>2</sub> )

\*Fraunhofer IST

### TRANSPORT

Type of transport	robot, carrier
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### SYSTEM CONTROL & SOFTWARE

Hardware	industry PC/ SPS module
User interface	Windows 10 with control software/ Siemens SPS
MES link	SECS/ GEM

### DIMENSIONS AND WEIGHT

Total system size (L x W x H)	at least 5 m x 5 m x 3 m
Total system weight	depending on configuration

### OPTIONAL

Optical in-situ measurement, VA PROCOS process control system, plasma treatment of substrate, substrate heating, combination with other process chambers, additional load locks, more on request

# EXAMPLES OF SOPHISTICATED LAYER SYSTEMS

## CATALOG OPTICS

The demand for optical components for devices and instruments has been growing continuously.

Driven by technological developments and improvements, the performance of cameras, projectors, telescopes and optical measuring equipment keeps improving, which makes it necessary to use standardized components with improved interference-optical coatings.

These multi-layer coatings determine the actual function of a component, they reflect the light or split it selectively into partial beams, they block individual wave lengths or act as a pass filter for a specific frequency range of light.



With the **OPTA X**, we offer a high-end sputter coating system for the whole range of catalog optics.

## FACIAL RECOGNITION & LIDAR

Three-dimensionally scanning sensors for distance control will play an increasingly important role in our everyday live. Access controls by means of facial recognition or LiDAR assistance systems for autonomous driving operate in the near infrared wavelength range.

For them to work accurately, the camera sensor is assisted by a sophisticated interference optical filter by distinguishing the reflected diode light precisely from the ambient light.

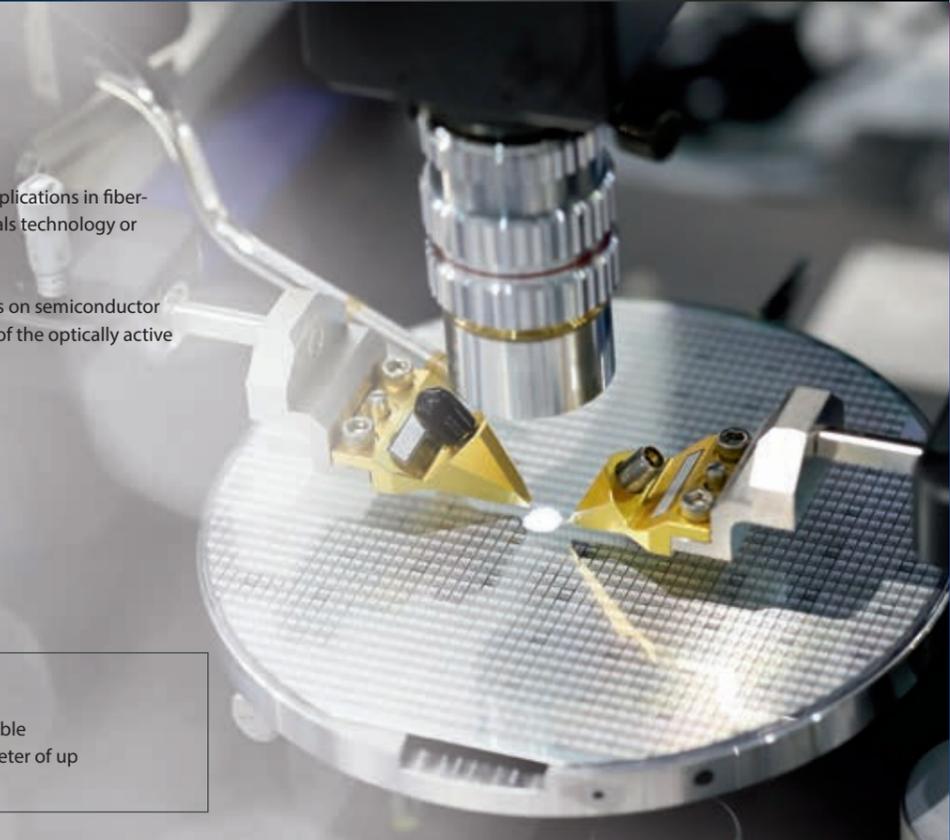


The **OPTA X** is ideally suited for the high-volume production of such filters, thanks to its high process flexibility and the safe handling of thin-glass wafers.

## LASER DIODES

The demand for laser diodes is not just driven by applications in fiber-optics data transfer. Laser diodes revolutionize signals technology or serve as light sources in the lighting industry.

They are manufactured under cleanroom conditions on semiconductor wafers. The dielectric mirror layers at the boundary of the optically active quantum film serve as a resonator for laser light.



With the **OPTA X**, we offer a cleanroom-compatible coating system for wafer-level optics with a diameter of up to 300 millimeters.

## DATA COMMUNICATIONS

For the high-speed fiber-optic communication networks of tomorrow, light will work as a broadband information carrier.

For the coupling and decoupling of the different frequency bands into or from the light wave conductor, or, respectively, the channel multiplexing of those light signals, special IR bandpass filters are used in a wavelength range between 1260 and 1675 nanometers.



The **OPTA X** offers an ideal production platform for optical filters for telecommunications as it features a monitoring system for the infrared spectral range.

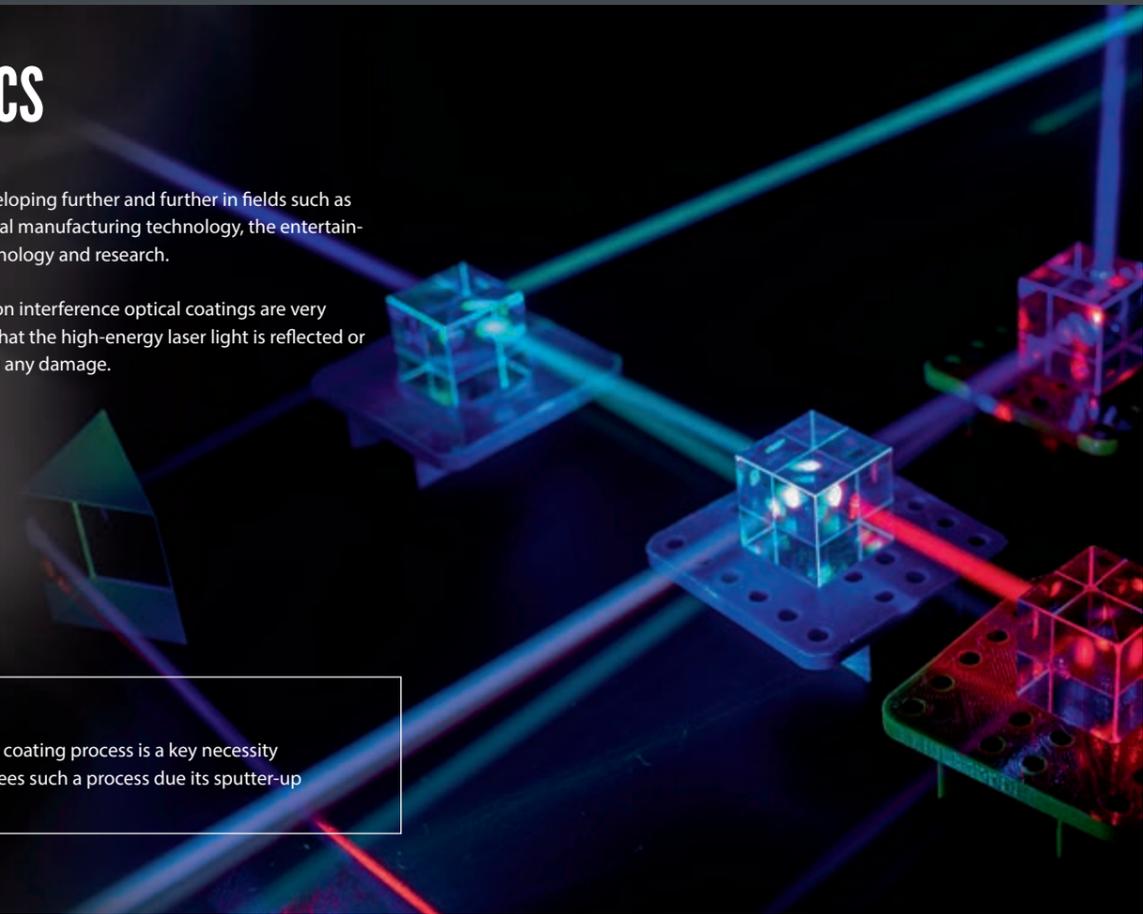
## EXAMPLES OF SOPHISTICATED LAYER SYSTEMS

### LASER OPTICS

Laser applications keep developing further and further in fields such as material processing, industrial manufacturing technology, the entertainment industry, medical technology and research.

The requirements imposed on interference optical coatings are very strict in order to guarantee that the high-energy laser light is reflected or transmitted without causing any damage.

To achieve that, a flawless coating process is a key necessity and the **OPTA X** guarantees such a process due its sputter-up configuration.



## CONFIGURATION EXAMPLES

### OPTA X FOR CATALOG OPTICS

#### LAYER STACKS (H/L)

- › Ta<sub>2</sub>O<sub>5</sub>/SiO<sub>2</sub> (CARS\*/Meta Mode)

#### PROCESS-UP CONFIGURATION

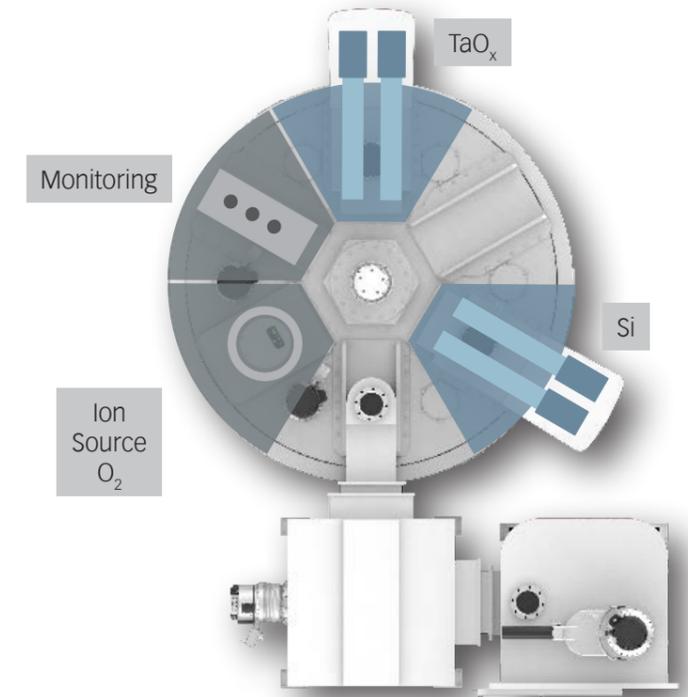
- › 2 target materials
- › 2 dual rotary cathodes
- › 1 ion source

#### PROCESS-DOWN CONFIGURATION

- › Upon request

#### FEATURES

- › In-situ adjustable magnet bars (rotary targets)



### LENS COATING

Aspherical lenses with a large diameter and large rising heights are part of many lithography and thermal imaging optics.

Coating providers are facing exceptional challenges when coating such lens elements with interference-optical broadband anti-reflection coatings or selective filter coatings, which must meet strict specifications regarding temperature and environmental stability.

With the OPTA X, VON ARDENNE enables customers to sputter filter coatings homogenously on convex and concave substrates.



### OPTA X FOR LASER OPTICS

#### LAYER STACKS (H/L)

- › Nb<sub>2</sub>O<sub>5</sub>/SiO<sub>2</sub> (CARS\*/Meta Mode)
- › HfO<sub>2</sub>/SiO<sub>2</sub> (RF/Meta Mode)

#### PROCESS-UP CONFIGURATION

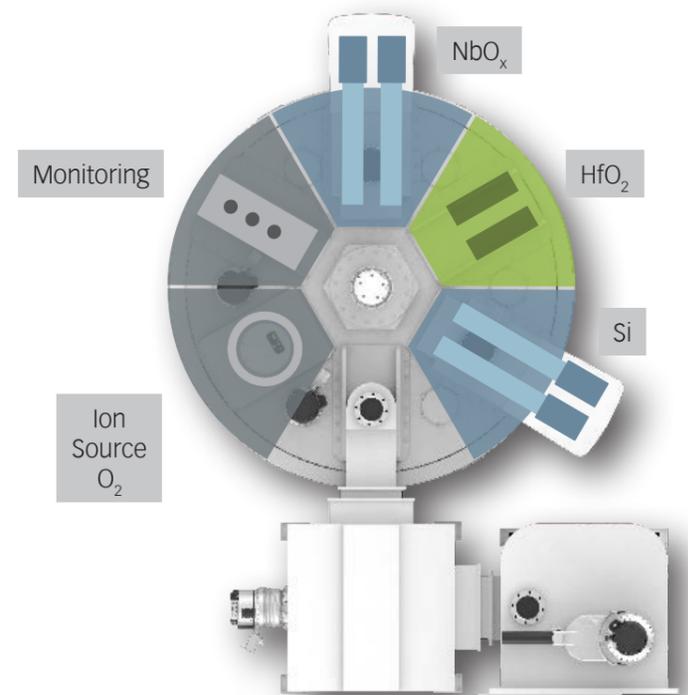
- › 3 target materials
- › 2 dual rotary cathodes
- › 1 dual planar cathode
- › 1 ion source

#### PROCESS-DOWN CONFIGURATION

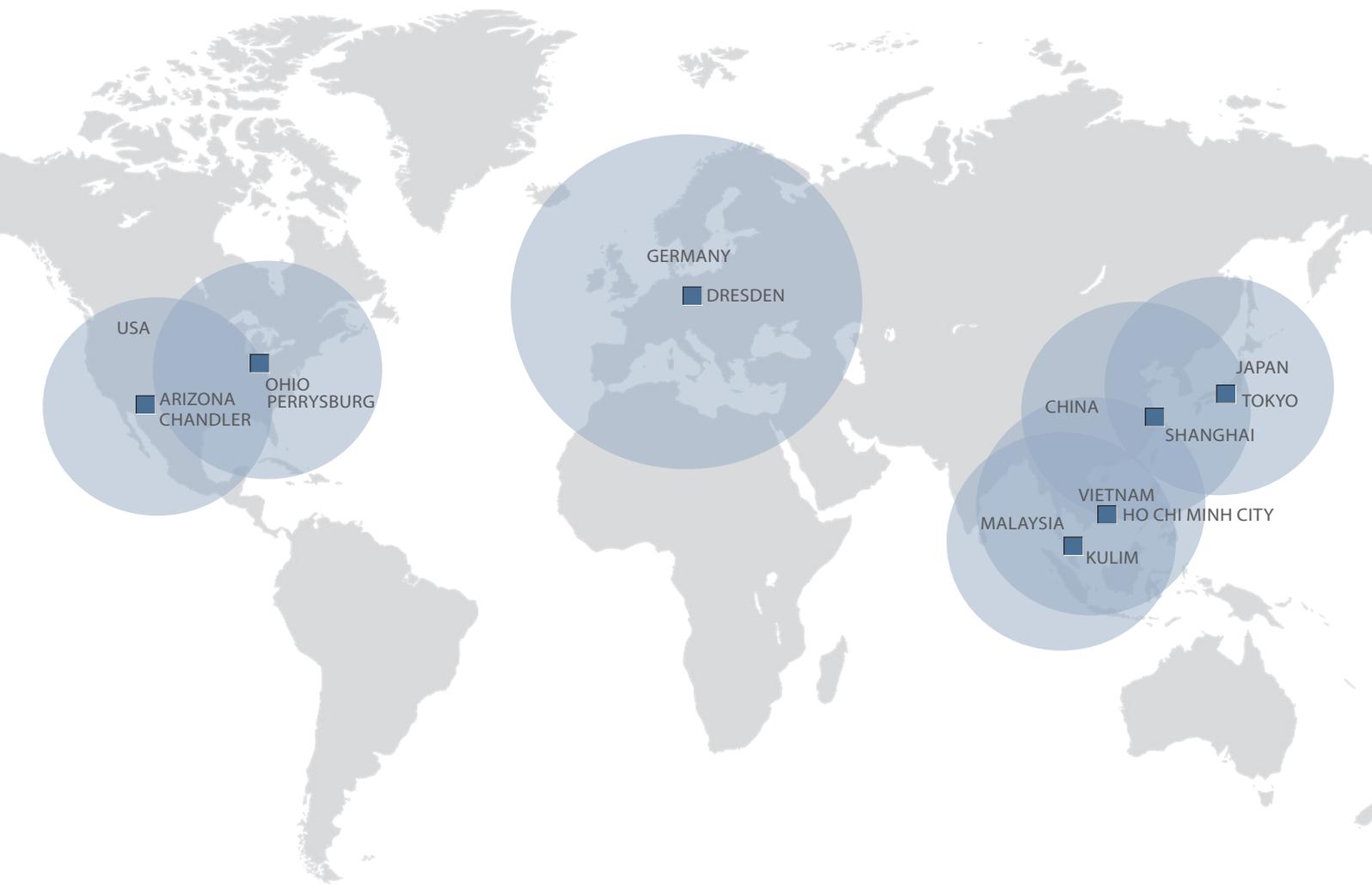
- › Upon request

#### FEATURES

- › On-carrier subrotation possible
- › In-situ adjustable magnet bars (rotary targets)
- › Exchangeable shaper



\*Fraunhofer IST



PRODUCT TOPICS



PRODUCT INDEX



COMPONENTS



[www.vonardenne.biz](http://www.vonardenne.biz)

## WHO WE ARE & WHAT WE DO

VON ARDENNE develops and manufactures industrial equipment for vacuum coatings on materials such as glass, wafers, metal strip and polymer films. These coatings give the surfaces new functional properties and can be between one nanometer and a few micrometers thin, depending on the application.

Our customers use these materials to make high-quality products such as architectural glass, displays for smartphones and touchscreens, solar modules and heat protection window film for automotive glass.

We supply our customers with technologically sophisticated vacuum coating systems, extensive expertise and global service. The key components are developed and manufactured by VON ARDENNE itself.

Systems and components made by VON ARDENNE make a valuable contribution to protecting the environment. They are vital for manufacturing products which help to use less energy or to generate energy from renewable resources.



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ENGLISH 01/2020