

VON ARDENNE 

OPTICS VACUUM COATING EQUIPMENT & EXPERTISE



OPTICS

VACUUM COATING
EQUIPMENT & EXPERTISE

Highly productive optical coating
through precise & automated processes
with flexible equipment platforms

HIGHLY PRODUCTIVE OPTICAL COATING THROUGH PRECISE & AUTOMATED PROCESSES

The demand for optical products has increased tremendously in recent years, especially for precision optics. And recent mega-trends will additionally boost market growth such as autonomous driving, the Internet of Things and virtual reality.

An essential prerequisite for these products are high-precision coatings. They exploit the optical interference properties and thus give the precision optics their desired functions.

VON ARDENNE has gained experience in the development and production of vacuum coating systems over many decades. Therefore, our customers benefit from our deep understanding of the physical processes of vacuum coating and the knowledge gained from their use in a wide variety of applications.

We have incorporated this knowledge into the development of numerous equipment platforms. This enables our customers to cover the complete spectrum of requirements: from research and development to pilot and mass production.

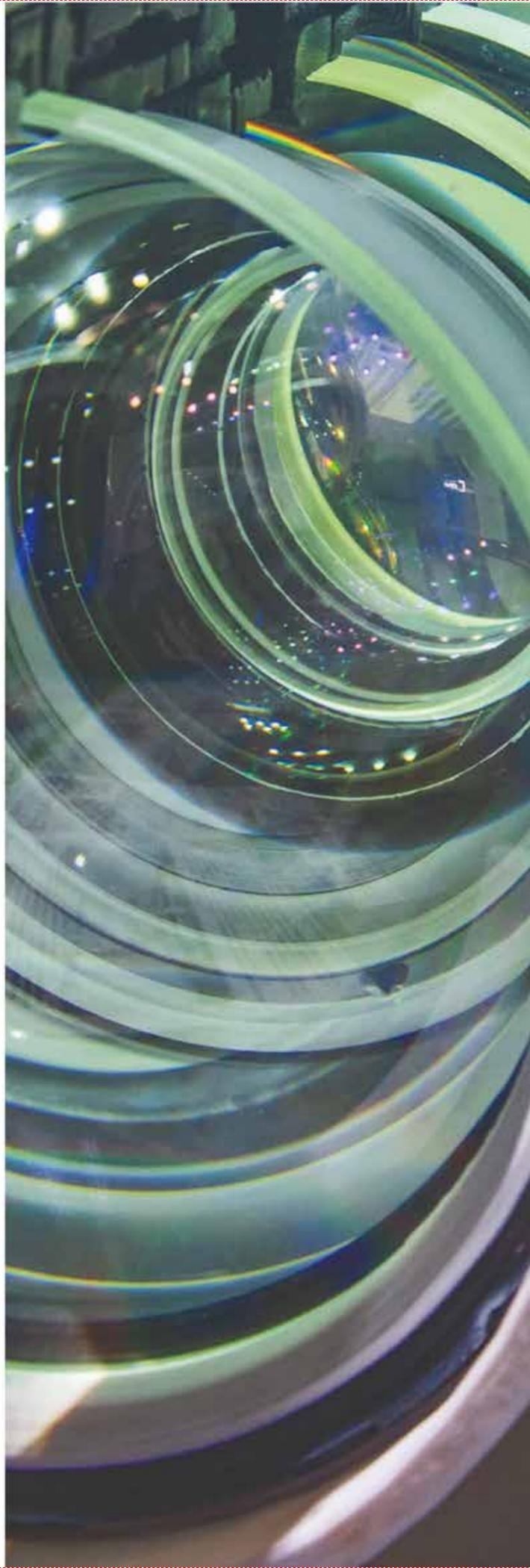
Denser & more stable coatings
for antireflection coatings & optical filters



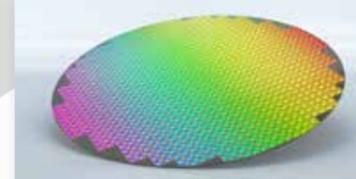
Special CARS process technology
for high-quality optical coatings



Up to 30% faster production
through simultaneous double-sided coating



High-precision coatings are a prerequisite for precision optics. They make use of the interference properties and provide the desired characteristics.

 <p>ULTRA-THIN GLASS 0.1–0.3 mm thick Ø 200 mm</p> <p>Wafer level optics 3D sensing</p>	 <p>WAFERS (Si, InP, GaAs) 0.7 mm thick Ø 4", 6", 200/300 mm</p> <p>Wafer level optics Laser diodes</p>	 <p>STANDARD 1.0–6.5 mm thick Ø 1", 2", 25/50 mm □ 50 mm x 50 mm / 100 mm x 100 mm</p> <p>Catalog optics Laser optics</p>
 <p>WEDGE-SHAPED Like standards but with nonparallel surfaces ($\Delta \ll 1^\circ$)</p> <p>Catalog optics Laser optics</p>	 <p>LARGE-AREA 2–50 mm thick Ø up to 200 mm □ up to 300 mm x 400 mm</p> <p>AV/VR/XR Automotive, HUD</p>	 <p>CUBICAL 5x5x5 mm³ up to 50x50x50 mm³</p> <p>Telecom optics</p>
 <p>SPHERICAL 5–70 mm thick Ø up to 200 mm</p> <p>Laser optics X-ray/EUV optics</p>	 <p>CYLINDRICAL up to 50 mm thick up to 200 mm wide</p> <p>Laser optics X-ray/EUV optics</p>	 <p>PRISMS Up to 50 mm edge length</p> <p>Catalog optics Periscope optics</p>



OPTICAL INTERFERENCE FILTERS

High-precision optical filters through special multilayer coatings

Lowest optical losses, preferably no absorption and scattering, high transmission in the filter passband, deep blocking in the filter stopband, steep, precise filter slopes - these are requirements for optical interference filters such as bandpass filters, dichroic filters, beam splitters, polarizing or notch filters.

The performance of cameras, projectors, telescopes and optical measurement technology is being improved continuously. This requires standardized components with improved interference optical coatings.

These multilayer coatings determine the specific component function. They also reflect light or selectively split it into partial beams. They block individual wavelengths or act as pass filters for a specific light frequency range.

With the OPTA X, we offer you a coating system for such demanding filter depositions. It enables you to reliably reproduce the highest coating requirements even on larger filter substrates and with larger batch quantities.

Highest layer thickness precision and reproducibility of deposition



Sophisticated filter deposition on two- & three-dimensional substrates



Suitable for target materials for all wavelengths from UV to IR



OPTICAL WINDOWS

Incidence of light with a high transmittance through optical coating of various substrate formats

Optical windows allow the passage of light of certain wavelengths for opto-electronic systems. At the same time, they protect them from disturbing environmental influences. The shape and size of optical windows are almost arbitrary. They are often flat glass plates, which are optimized for maximum transmission in the desired frequency range at least by an antireflective coating (AR) on both sides.

With the OPTA X, we offer you a coating system that is ideally suited for this application.

The system is suitable for a variety of geometric shapes of substrates. In addition, it offers the possibility of simultaneous and fast antireflection coating of front and back sides and the deposition of selective interference filters.

In addition, you can use the OPTA X to deposit transparent conductive ITO layers - either as a top layer or within the multilayer stack.

Furthermore, the deposited layers are climate resistant and abrasion resistant.

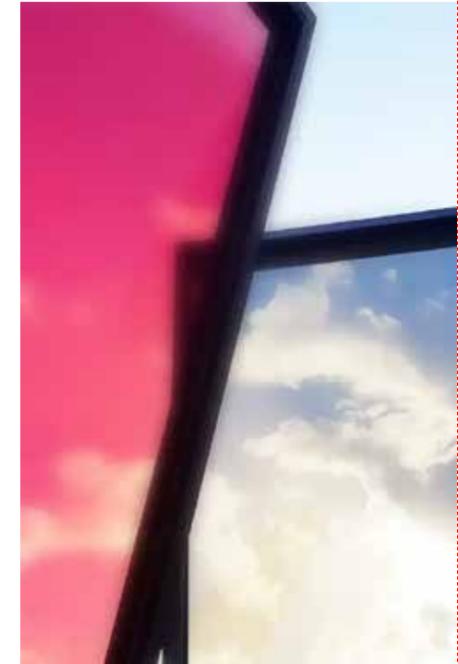
Variety of substrates can be coated by adapting the equipment to different geometries



Cost & energy savings through simultaneous double-sided antireflection coating

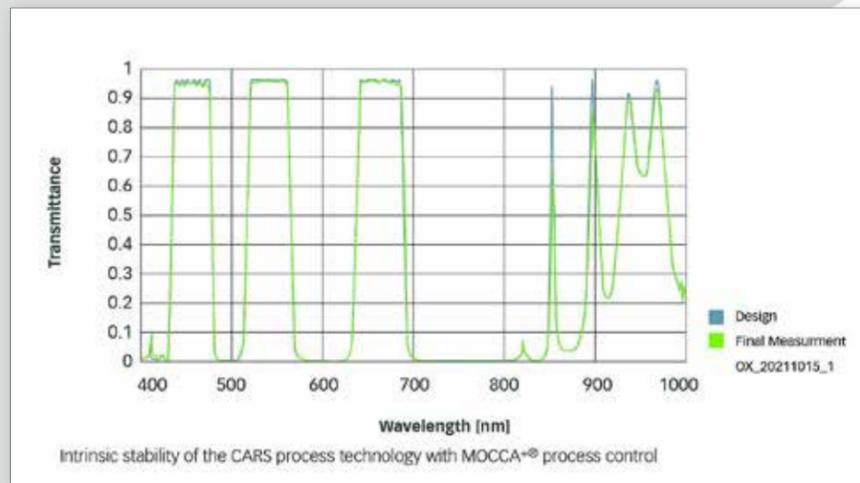


Up to 50 % less manpower required due to fully automated recipe control, carrier handling & substrate loading



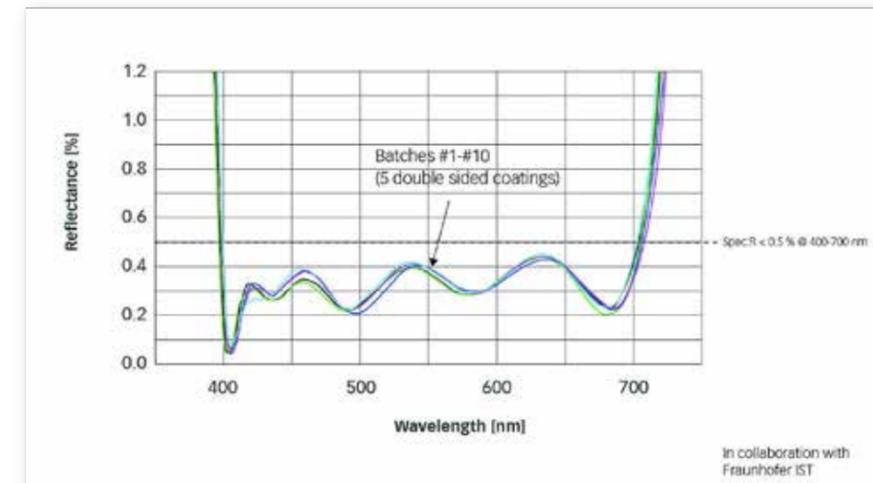
Triple Bandpass Filter

Coating Example



Anti-Reflection Coating

Coating Example



Equipment

OPTA X

Rotary Disk Coating System

VISS

Vertical Coating System

Equipment

OPTA X

Rotary Disk Coating System

VISS

Vertical Coating System





DIELECTRIC MIRRORS

Reflection with maximum efficiency through dielectric alternating layers

Optical mirrors made of dielectric alternating layers can be found in various fields of application. These include biomedical applications such as dental mirrors, material processing for guiding and directing laser beams, as efficient reflectors (Bragg mirrors) in light guides and optical resonators. They are also used in the field of AR/VR/XR as partially reflective components for projection and display applications.

Compared to metal mirrors, dielectric layer systems can be designed very application-specific. Thus, selective, narrow- or broadband behavior can be realized with regard to the wavelength. In addition, dielectric reflectors are angle-sensitive.

If you want to functionally improve dielectric mirror layers, increased deposition precision, layer quality and reproducibility are required. For this purpose, VON ARDENNE has developed the OPTA X with special CARS process technology.

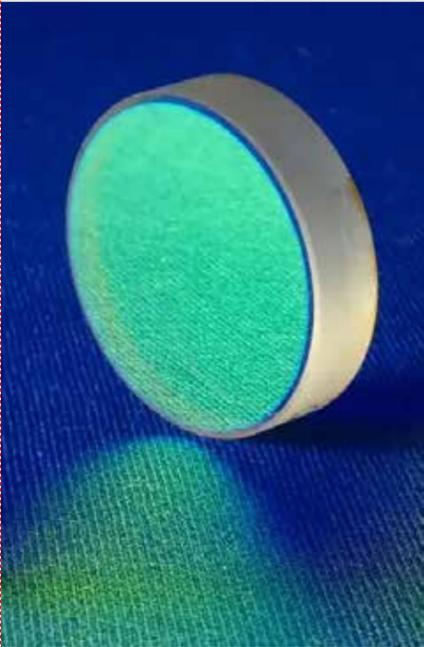
Smooth optical coatings of highest quality through special CARS process technology



Up to 50% less manpower required due to fully automated recipe control, carrier handling, substrate loading



Optical in-situ process monitoring for continuous specification control



WAFER-LEVEL OPTICS

Optics meets Semiconductors

Optical interference layers for filter-on-chip CMOS, hyperspectral sensors & spectral sensing filters

Optical filter layers deposited directly on glass or semiconductor wafers enable optical products that have a very small size and a competitive price-performance ratio. Therefore, they have found their way into various markets such as consumer electronics or the automotive industry. Due to the increasing demand for high volume production, wafer-level optics are becoming the focus of the industry.

With the OPTA X, we offer you a coating system that has been specially developed to meet the requirements in the fields of photonics and wafer level optics.

For multilayer coating of wafer-based microlens arrays, semiconductor sensors or filter-on-chip CMOS, the OPTA X provides you with fully automated, SEMI-compatible wafer handling for integration in semiconductor fabs. In addition to wafers with a diameter of 200 millimeters, the OPTA X is also suitable for wafer sizes up to 300 millimeters.

Optical filter layers directly on glass and semiconductor wafers e.g. for silicon devices



Optical monitoring of transmission or reflection directly on the wafer

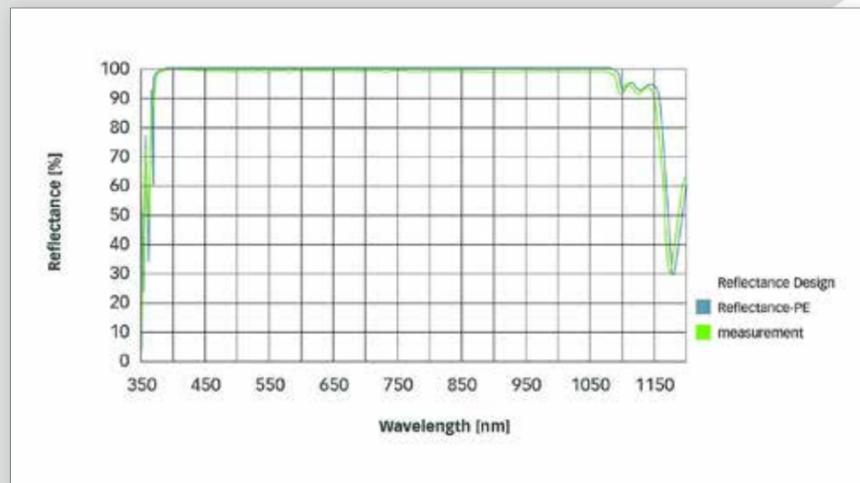


SEMI-compatible wafer handling for integration in semiconductor fabs



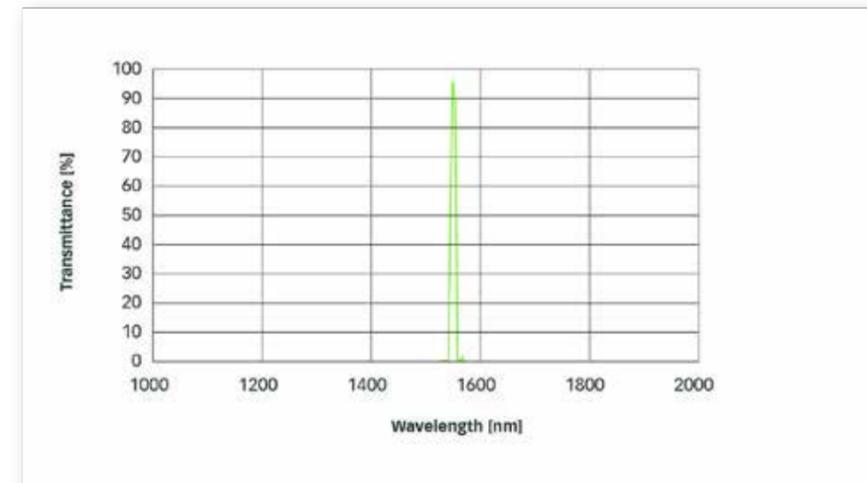
Broadband Mirrors (BBHR)

Coating Example



Narrow-Band Filter

Coating Example



Equipment

OPTA X

Rotary Disk Coating System

VISS

Vertical Coating System

Equipment

OPTA X

Rotary Disk Coating System





LARGE-AREA OPTICS

Highest precision on large optical surfaces with highest uniformity

Are you looking for coating solutions for large optical surfaces with extremely high requirements for applications such as astronomical reflecting telescopes?

Our magnetron sputtering technology offers you the precision you need.

In professional telescope construction today, single mirrors with a diameter of more than eight meters are used. Before coating, these mirror optics are polished to an accuracy of 20 nanometers. The subsequent deposition of highly reflective aluminum, gold, or silver layers must not worsen this deviation from the ideal parabolic or hyperbolic shape of the mirror. This means that it must also be coated with an accuracy of a few nanometers.

We at VON ARDENNE have built up the technology and engineering expertise required here over decades. As a result, we provide large-area and special coating systems precisely for this purpose.

Highest reflectivity & enhanced durability

through magnetron sputtering technology for metallic layers with protective coating



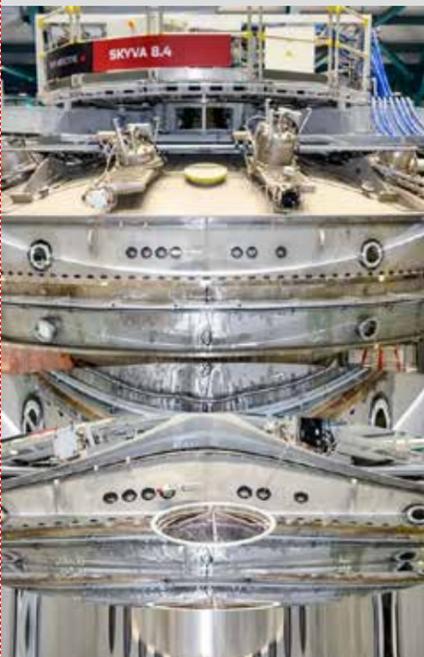
Contour-compliant deposition precision

thanks to dynamic process control



Coating of large aperture surfaces

through customized special designs



© RubinObs/NSF/AURA/T. Vučina



LENSES & OPTICAL DOMES

Broadband anti-reflection & Selective Filters through conformal coating on curved substrate surfaces

If you want to apply interference optical broadband antireflection coating or selective filter coatings to lens elements, these coatings must meet certain specifications for temperature and environmental stability.

This presents special challenges, such as uniform filtering along the curved substrate surface. Other challenges include an antireflection coating on both sides of the lens surfaces, an additional optical filter function, and a climate-resistant, mechanically stable lens coating with improved shift behavior of the filter through denser layers.

For such requirements and VON ARDENNE has developed a special coating system: the OPTA X. It is also an alternative to the conventional vapor deposition process.

Direct application of filters to lens elements

with concave & convex surfaces



Dense coatings for front lenses

with high abrasion & weather resistance



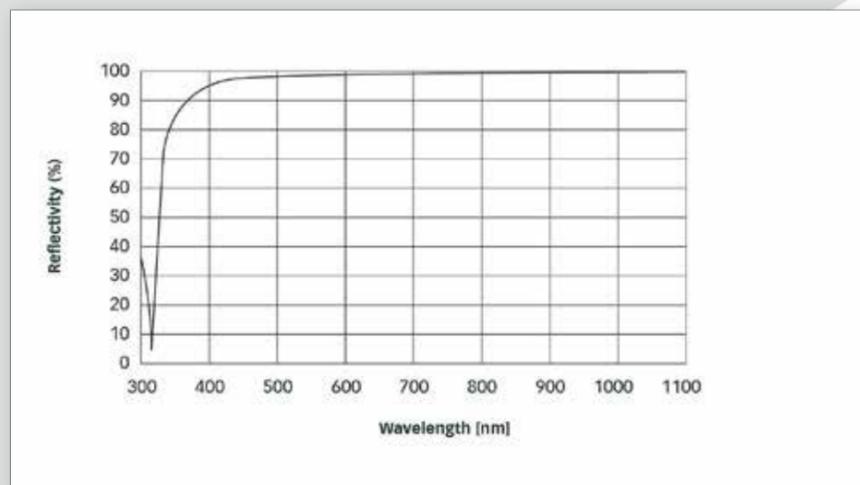
Single & double-sided coating

of heavy lenses with large diameters



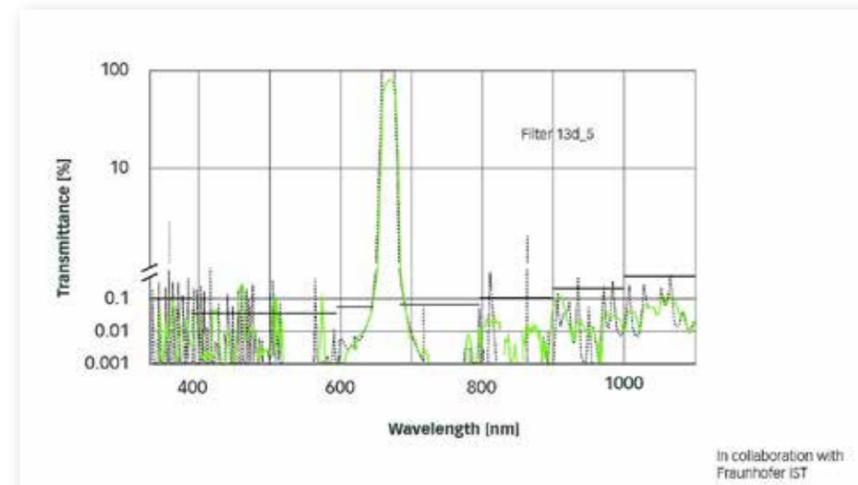
Highly Reflective Coatings

Coating Example



Bandpass Filters

Coating Example



In collaboration with Fraunhofer IST

Equipment

VISS

Vertical Coating System

SKYVA

Telescope Coating System

Equipment

OPTA X

Rotary Disk Coating System



OPTA X

HIGHLY PRODUCTIVE DOUBLE-SIDED COATING

for demanding optical layer systems

With the OPTA X, you will get a system for the most demanding optical layer systems. This is especially true for multilayer optics with high numbers of alternating layers.

The system coats horizontally. The special CARS process technology is used on the OPTA X for optimum coating. However, other process designs such as Meta Mode, reactive or non-reactive sputtering are also available.

Magnetrons and/or plasma sources can be integrated on up to five ports per coating side. In-situ measurement technology for tracking and correcting the coating progress is also available for optical monitoring.

The system has an automatic handling system with a modular design. It enables a safe loading of the OPTA X with different substrates, which are fed through the system in adaptable carriers.

Different module types can be combined depending on process and productivity requirements. Examples would be multiple magazine locks or pre- and post-treatment chambers.

In addition to substrates with a diameter of 200 millimeters, the OPTA X is also suitable for substrate sizes up to 300 millimeters.

Highest precision

through homogeneous coatings on optical components



Highest quality

through clean, low-defect optical coatings



Variable product adaptation:

layer systems & component geometry



OPTA X 300



OPTA X 200

APPLICATIONS



TECHNICAL DATA

Subject to change without notice due to technical improvement.

Substrates

Glass, polymers, metals

Coating area

Up to 200/300 mm

Deposition arrangement

DC, pulsed DC, AC, CARS, meta mode, reactive sputtering, RF

Substrate temperature

RT / 300°C

Deposition technology

Magnetron sputtering: planar, rotatable

Type of transport

Carrier or robot

System control

Siemens PLC

VISS

HIGHLY FLEXIBLE & SCALABLE INLINE SYSTEMS

FOR VERTICAL PROCESSES & MEDIUM PRODUCTIVITY

The VISS is a modular system for vertical deposition processes. It is a very good choice if you want to move from laboratory application to production.

The system is available either as a single-ended inline version or as a continuous version for continuous processes. It is well suited to scale up to substrate widths of up to 600 mm.

Substrates are transported by a carrier system that is vertically tilted by seven degrees. The system can be loaded and unloaded without touching the front of the substrates.

Scalable
through modular design



Easily adaptable to your requirements
through flexible configuration options



Loading without touching the substrate front side
due to carrier transport



[Translate to English Global:] VISS600 VolumeX



[Translate to English Global:] VISS600 PilotX



[Translate to English Global:] VISS600 LabX

APPLICATIONS



OPTICAL WINDOWS



ADVANCED PANEL-LEVEL PACKAGING



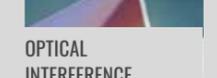
LARGE-AREA OPTICS



SEMICONDUCTORS



POWER ELECTRONICS



OPTICAL INTERFERENCE FILTERS



LIFT-OFF PROCESSES



DIELECTRIC MIRRORS



PRINTED CIRCUIT BOARDS



THIN-FILM PHOTOVOLTAICS



PIEZOELECTRIC SENSORS & ACTUATORS



TECHNICAL DATA

Subject to change without notice due to technical improvement.

Substrates

Glass, polymers, metals

Coating area

Up to 600 x 2400 mm²

Deposition arrangement

Double-sided, pulsed DC, AC, RF

Substrate temperature range

RT / 200°C / 350°C

Deposition technology

Magnetron sputtering, linear evaporation, pre- and post-treatment

Transport type

Inline, by carrier or stacker

Loading & unloading

Optional automation by robot

System control

Siemens SPS and WinCC



CLOSE TO YOU!

THERE FOR YOU AROUND THE GLOBE

Comprehensive support for your coating systems 
over their entire service life

Worldwide at your side 
with local service sites

Broad product portfolio 
so that you get everything from a single source



VON ARDENNE's claim is to be able to offer our customers worldwide fast and reliable service. We are therefore represented at seven locations in Europe, Asia and North America.

In addition to our headquarters in Dresden, Germany, our employees from the subsidiaries in China, India, Japan, Malaysia, the USA and Vietnam are there for you.

HIGHLY PRODUCTIVE OPTICAL COATING

THROUGH PRECISE & AUTOMATED PROCESSES

Sampling & Layer Development

With a wide range of equipment

In our Technology & Application Center, we work with you and for you on the next generation of your coating applications.

From the simulation of layer stacks and their functionality, to sample production on a laboratory and pilot scale, to the measurement and evaluation of coating and substrate properties, we are prepared to meet a wide range of requirements. This gives you the opportunity to test the function of the coating for your product in advance on relevant sample sizes.

Gaining knowledge through simulation 
of layer composition & properties

Sampling & qualification of properties 
from a single source

Targeted integration of coating steps 
into your value chain



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OUR STRENGTHS



IN-HOUSE TECHNOLOGY & APPLICATION CENTER

- 🔗 Sample coatings of customer applications
- 🔗 Development of customized layer stacks
- 🔗 Product & process verification and optimization
- 🔗 Testing of new technologies and components



GLOBAL PROJECT EXPERIENCE

VON ARDENNE equipment is used in over 50 countries.

We have established an installed base of hundreds of coating systems worldwide, ranging from small tools to equipment for large-area coating applications for several markets.



CLOSE PARTNERSHIP

VON ARDENNE has a network of partners for even more profound R&D work and to identify future technologies. It consists of:

- 🔗 Fraunhofer Institutes such as IPMS, FEP, IST and ISE
- 🔗 Institutes of the Helmholtz Association (Jülich, Berlin)
- 🔗 Universities (Kiel, Dresden, Sheffield)
- 🔗 Companies such as FAP GmbH, scia Systems GmbH



PROFESSIONAL SIMULATION SUPPORT

We offer professional simulation technology to ensure best process quality with regards to plasma, heat and cooling. Furthermore, our simulation tools help demonstrate, develop and improve layer properties and define or optimize processes, details and the performance of our systems.



COMPREHENSIVE SERVICE PORTFOLIO

- 🔗 VON ARDENNE service hubs around the world
- 🔗 On-site service
- 🔗 Remote access by our technology department
- 🔗 Regular technical and technological trainings
- 🔗 Spare & wear part warehouse close to customers
- 🔗 Lifecycle extension of wear parts



UPGRADES & RETROFITS

As soon as your business is growing, your VON ARDENNE equipment will grow accordingly - thanks to its modular design and the upgrades we provide. We will also supply you with the necessary technology upgrades if you decide to change your applications.

Furthermore, when your equipment is ageing, we will retrofit your systems with new components, no matter if they are VON ARDENNE or third-party machines.



PRODUCT TOPICS



PRODUCT INDEX



COMPONENTS



vonardenne.com

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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