

VON ARDENNE 

ARCHITECTURAL & VEHICLE GLASS VACUUM COATING EQUIPMENT & EXPERTISE

# ARCHITECTURAL & VEHICLE GLASS

VACUUM COATING  
EQUIPMENT & EXPERTISE

Energy-Saving Coatings on Glass  
for Buildings & Vehicles

# ENERGY-SAVING COATINGS ON GLASS FOR BUILDINGS & VEHICLES

Buildings and vehicles account for a high proportion of our society's energy consumption. However, glass offers a great potential for improving their energy balance - through functional coating.

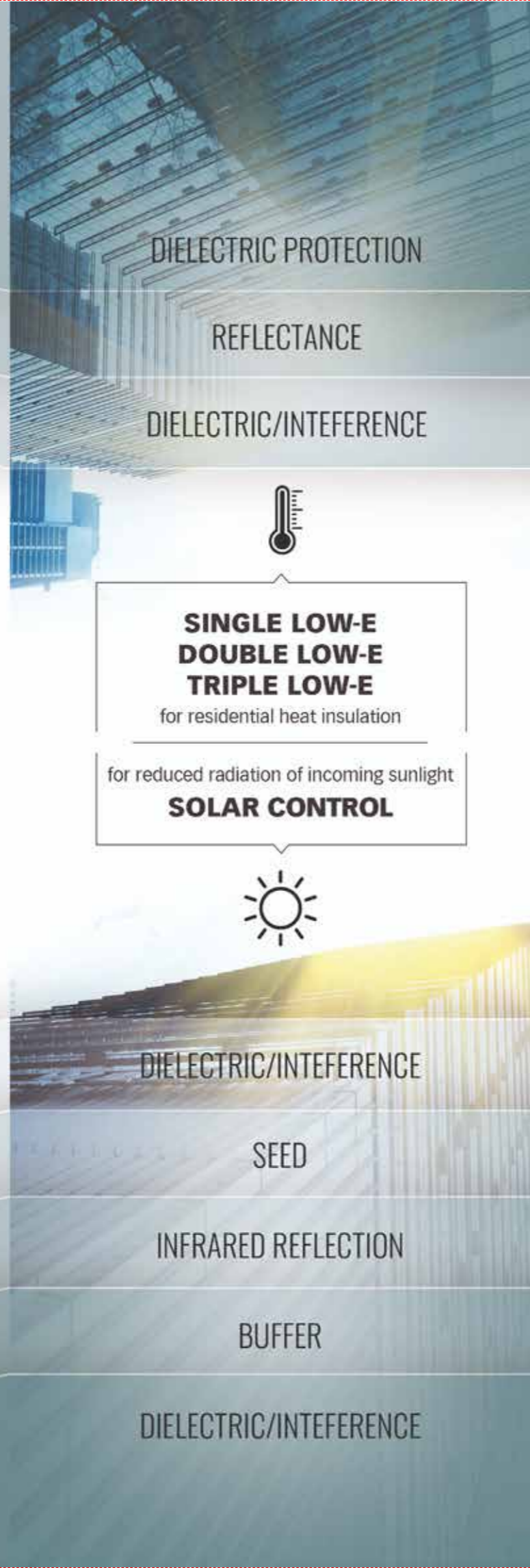
Coated glass reduces the energy consumption of buildings and vehicles and enables efficient thermal and solar control. It also offers modern aesthetics, daylight and transparency.

We provide our customers with coating systems and technologies that enable them to manufacture these products. And we ensure that productivity and quality remain very high over a long period of time.

The world's leading manufacturers of architectural and automotive glass work with VON ARDENNE equipment and process solutions. They can adapt our modular glass coating systems to their needs. And the equipment allows for necessary changes during the course of its long service life.

To guarantee the reliability and durability of the systems and components, our customers can rely on comprehensive and conscientious service. And with a portfolio of digital products, we support our customers on the road to the smart factory.

- Highest productivity**   
at high quality with sustainable equipment
- Best technological performance**   
through experience, expertise & service
- software-based support**   
for processes and operation of the systems



## WINDOWS & FACADES

Reliable coating of architectural glass meeting the highest demands for efficiency & aesthetics






As a manufacturer or coater of architectural glass, you have to master production processes at the edge of what is technically possible. And it is important that the ratio between costs, quality and delivery time is right.

With our glass coating equipment, we offer you stability for the production of a high-quality product portfolio of architectural glass for all global markets.

We offer comprehensive system solutions from a single source. This ranges from the equipment, magnetrons and optical measurement technology to software and service.

No matter if it's solar control, single, double or triple Low-E coatings: With our equipment, you will achieve the desired visible transmittance and infrared reflectance, as well as the best optical performance.

- Homogeneous color effect of the glazing**   
due to high process stability
- Low product costs**   
due to highest productivity & availability
- System solution from a single source**   
from equipment to magnetrons & measuring technology to software & service



## WINDSHIELD & SUNROOF




Reliable coating of automotive glass meeting the highest standards of efficiency & aesthetics



As a manufacturer or coater of architectural glass, you have to master production processes at the edge of what is technically possible. And it is important that the relationship between costs, quality and delivery time is right. Moreover, you must achieve these goals with limited resources over the entire service life of a coating system. You expect for your equipment to assist in adjusting the process.

With our durable glass coating systems, we offer you stability for the production of a high-quality product portfolio. For flat glass, the GC254H glass coating system is a suitable platform.

We also offer the leading system solutions for coating films laminated with automotive glazing and window films.

- Homogeneous color effect of vehicle glazing**   
due to high process stability
- Outstanding product properties**   
even for the most demanding layer systems due to advanced process control concepts
- System solution from a single source including expert support**   
for the coating process & the entire coating line






## SMART GLASS


Reliable coating of switchable glass at highest uniformity




As a manufacturer or coater of switchable glass, you need coating equipment that is adapted to your process. This also applies to processes with heated substrates. Here, it comes down to the best technical solution to ensure a consistent process with low energy requirements.

We offer coating systems tailored to your needs, with which you can apply transparent conductive oxide (TCO) coatings. An example of such coatings is indium tin oxide (ITO), which enables dynamic switching of an applied electrical voltage.

**Market-leading experience**   
with equipment for coating heated glass substrates

**Expertise for transparent conductive oxides**   
especially ITO

**Flexible equipment platform for vertical coating**   
with & without carrier




## BUILDING-INTEGRATED PHOTOVOLTAICS


Turning buildings into generators with functional layers for integrated solar cells




With integrated photovoltaics, the building envelope performs two functions: Protecting the building and generating electricity. However, the design freedom for architects should not be lost in the process. For this reason, the requirements for the cell and the front glass of the solar module are extremely high.

We offer vacuum coating systems that enable you to meet these requirements. Our systems ensure your production process, both for cell production and for glass coating. With extremely precise layer distribution of our deposition processes, even the highest demands on aesthetics can be met. In addition, you can also produce chromatic layers according to your specifications. The optical result is reproducible at any time with our equipment.

**Aesthetic surfaces**   
due to extremely high coating

**Lower material costs**   
due to high target utilization

**High reproducibility**   
of the different layers




## AUTOMOTIVE DISPLAYS


High-quality coatings for durable displays with flexible & highly productive equipment




As a manufacturer of displays for vehicles or of display cover glasses, you are looking for coating systems that can deposit very homogeneous layers over long production cycles. In addition, these coatings must ensure that the displays meet high requirements over many years.

We offer coating systems tailored to your requirements, such as the GC120VCR. This enables you to deposit a wide variety of functional layers that are needed for applications in vehicles.

**Highly productive equipment**   
through short tact times

**Excellent coating layer uniformity**   
throughout production campaigns

**Modular equipment design**   
for various customer requirements




## DISPLAYS FOR CONSUMER ELECTRONICS


Coatings for displays in best quality with flexible & highly productive equipment




As a manufacturer of displays for consumer electronics, you need flexible coating equipment that can keep pace with ever shorter innovation cycles. You also require maximum productivity and low coating manufacturing costs to be globally competitive.

With VON ARDENNE, you have a partner who meets these requirements. We offer coating systems tailored to your needs, such as the GC120VCR. This allows you to apply transparent conductive oxide (TCO) coatings. Further applications are metal mesh, scratch protection and anti-reflection.

**Highly productive equipment**   
through short tact times

**Excellent coating layer uniformity**   
throughout production campaigns

**Modular equipment design**   
for various customer requirements



# GC330H, GC280H & GC254H

## HIGHLY PRODUCTIVE MULTI-TALENTS

for industrial glass coating

With the GC330H, GC280H and the GC254H, we offer you coating systems for the production of high-quality architectural and automotive glass for all markets in the world. More than 70 of these systems are currently in operation with our customers worldwide.

VON ARDENNE GC330H, GC280H and GC254H have a modular design. They can be flexibly configured to meet all your requirements with process components from a single source.

These inline systems are suitable for all common glass formats, including 100 inch, jumbo and super jumbo.

In addition, we offer market-leading Industry 4.0 solutions for data analysis, process control and operational optimization with the VA INDIGO software product family.

**Fast adaptation to new requirements & shift stacks**

through flexible configuration at any time



**Easy to maintain & short downtimes**

due to easily accessible maintenance concept



**Stable product quality**

and fast reproducibility during product changes



## APPLICATIONS



BUILDING-INTEGRATED PV



WINDSHIELD & SUNROOF



WINDOWS & FACADES



## TECHNICAL DATA

Subject to change without notice due to technical improvement.

### Substrate

Material: flat glass

Thickness: 2 mm to 19 mm

### Coating area

GC330H: up to 3300 mm x 7800 mm (Super Jumbo)

GC280H: 2800 mm x 5000 mm

GC254H: 2540 mm x 3810 mm

### Tact time

GC330H / GC280H / GC254H: < 20 s

### Base pressure in sputter chamber

≤ 5 x 10<sup>-6</sup> mbar

### Utilities & supply

Utility requirements: between 0.5 and 5 MVA, depending on application and throughput

Mains connections: 400 VAC, 50 Hz or 480 VAC, 60 Hz

# GC120VCR

## PROVEN COATING SYSTEM FOR DISPLAYS

With high productivity

With the GC120VCR, we offer you a reliable system for the deposition of thin metal and oxide layer systems on flat glass or substrates made of other materials.

The substrates are guided vertically through the system in a carrier. After coating, the carrier is transported back to the start by a return system. This saves you time and manpower.

VON ARDENNE is a leader in the development and manufacture of large area coating lines. Therefore, we were able to incorporate our extensive knowledge and experience with PVD technologies into this platform. The reliability of the system has been proven and confirmed in the display industry.

### High productivity

due to scalability, modular design & short cycle times



### Small foot print

due to vertical chamber orientation



### Low defect rates

due to vertical orientation



## APPLICATIONS



AUTOMOTIVE DISPLAYS



DISPLAYS FOR CONSUMER ELECTRONICS



THIN-FILM PHOTOVOLTAICS



SMART GLASS



## TECHNICAL DATA

Subject to change without notice due to technical improvement.

### Substrate

Material: Glass  
Thickness: 0.5 mm to 4 mm (others on request)  
Pre-treatment: lineare ion source or plasma glow discharge

### Coating area

Up to 1280 mm x 1650 mm

### Tact time

30 s

### Transport

Method: inline, carrier-based  
Orientation of substrate:  $-7^\circ / 0^\circ / +7^\circ$  vertical, LEL, SEL  
Speed:  $\leq 3.5$  m/min

### Loading & unloading

Optional automation by robot

### System control

Siemens SPS and WinCC

# 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

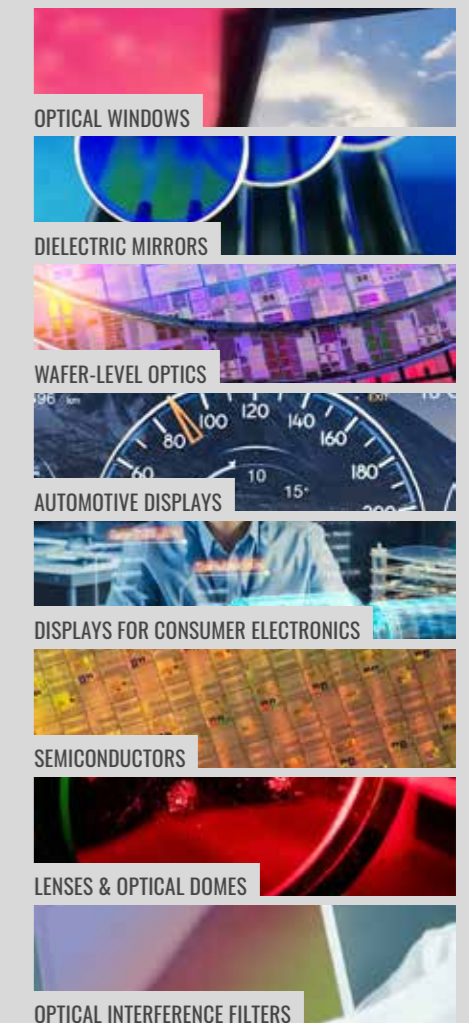


OPTA X 300



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

### Transport type

Carrier or robot

### System control

Siemens SPS

# XEA|NOVA® L

## HIGHLY PRODUCTIVE & HIGHLY PROFITABLE

Double-sided coating on large areas

If you are looking for a highly productive and flexible production system combined with proven technology and design, the XEA|nova L is the perfect choice for you.

The inline coating system is based on our patented coating technology for large substrate areas. The system is wide and can therefore process many substrates simultaneously. Therefore, it is particularly suitable for applications with high productivity at very low costs. With the XEA|nova L, you can coat silicon wafers or other small substrates. It is also suitable for very thin substrates.

Thanks to its modular design, the XEA|nova L can be equipped with magnetrons with rotating targets for sputter deposition of high performance TCO layers or various other materials such as metals and metal oxides. It can also be adapted for other deposition technologies. Substrates can also be pre-treated in the system by cleaning or etching, either under vacuum or before entering vacuum.

**Exceptionally productive** ✓  
due to large width

**Easily adaptable to new processes & requirements** ✓  
due to flexible & modular design

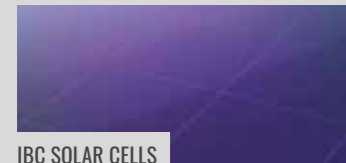
**Low downtime** ✓  
due to quick and easy maintenance



### APPLICATIONS



METALLIC BIPOLAR PLATES



IBC SOLAR CELLS



BUILDING-INTEGRATED PV



TOPCON SOLAR CELLS



HETEROJUNCTION SOLAR CELLS



PEROVSKITE TANDEM SOLAR CELLS



## HIGHLY PRODUCTIVE ROLL-TO-ROLL COATING

with compact equipment

With the GC120VCR, we offer you a reliable system for the deposition of thin metal and oxide layer systems on flat glass or substrates made of other materials.

The substrates are guided vertically through the system in a carrier. After coating, the carrier is transported back to the start by a return system. This saves you time and manpower.

VON ARDENNE is a leader in the development and manufacture of large area coating lines. Therefore, we were able to incorporate our extensive knowledge and experience with PVD technologies into this platform. The reliability of the system has been proven and confirmed in the display industry.

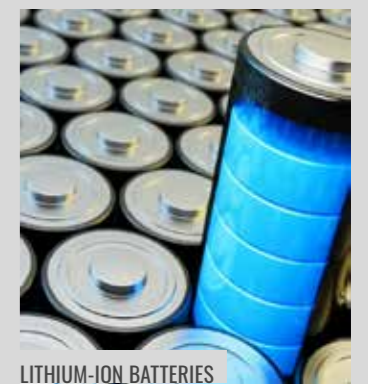
**Saves floor space** ✓  
due to compact single-chamber design

**Selection of cooling drums available** ✓  
depending on the application

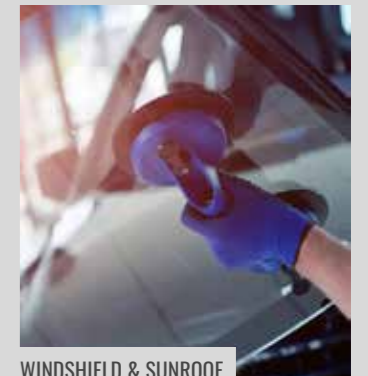
**Low downtime** ✓  
due to quick & easy maintenance



### APPLICATIONS



LITHIUM-ION BATTERIES



WINDSHIELD & SUNROOF

# FOSA CX

## COMPONENTS FOR SPUTTER PROCESSES

From individual components to complete magnetrons

If you are using thin-film coating for your production, two questions are crucial: How high is the productivity and how good is the quality of the product? In the end, they determine the achievable revenue and the success of your company.

Our coating components can help you answer both questions with "very good".

Increase the availability of your equipment: Use industry-proven components with long uptime, high reliability and maximum utilization of coating materials.

And improve your product quality by using coating sources that give you excellent coating properties. We can help you find exactly the right components for your application.

**Industry-leading layer uniformity & target utilization**  
in rotatable and planar magnetrons



**Highest reliability & experience**  
from thousands of installations worldwide



**Comprehensive technology solutions**  
from individual components to complete magnetrons



### BOOST YOUR YIELD

when sputtering with planar targets



### HIGH-UTILIZATION PLANAR CATHODE

**Long uptimes**  
due to highest possible target utilization

**Best coating uniformity**  
in the market

**Low target costs compared to cylindrical cathodes**  
through easier manufacturing method

### BOOST YOUR YIELD IN SPUTTERING

through longer target lifetime



### ROTATABLE MAGNETRONS

**Longer production time**  
due to extended target lifetime

**High process stability**  
due to low redeposition zone

**Best coating results**  
in terms of rate & layer uniformity

### HIGH THROUGHPUT - MINIMAL HEAT EXPOSURE

for homogeneous layers



### LINEAR EVAPORATOR

**Inline processing of organic devices**  
at high throughput

**Minimizes heat impact on evaporant & substrate**  
when processing sensitive materials

**Superior homogeneity & stability**  
of the layers

### END BLOCKS YOU CAN RELY ON

with long uptimes & low costs



### X-SERIES END BLOCKS

**Long uptime**  
through use of proven technical solutions

**Low operating costs**  
due to low maintenance requirements & low-wear materials

**Quick & safe maintenance procedures**  
due to plug & play cartridge design

### ALWAYS UP TO DATE

with long uptimes & low costs



### Y-SERIES END BLOCKS

**Long uptime**  
through use of proven technical solutions

**Low operating costs**  
due to low maintenance requirements & low-wear materials

**Quick & safe maintenance procedures**  
due to plug & play cartridge design



## BOOST YOUR YIELD

when sputtering with rotatable targets



## MAGNET BARS

**Long campaign duration**  
due to maximum target utilization

**Best coating uniformity in the market**  
due to optimally designed magnetic field

**Selectable magnetic field strength**  
for optimum coating properties

## COATING AT HIGH DEPOSITION RATES

with long uptimes



## DAS

**Long uptime - even with insulating layers**  
due to cyclic cleaning of the anode

**Flexible arrangement for your system**  
due to scalable design

**Patented technical solution for innovative operation**  
and for differentiation from market participants

## BOOST YOUR YIELD

in Reactive Sputtering



## VA PROCOS 2

**Reliable & ndustry-proven control**  
for reactive sputtering of all common layer systems

**Easily configurable with external components**  
for all reactive sputtering applications

**Continuous quality assurance**  
and parameter control



## DIGITALIZE YOUR WORKFLOWS

WITH DIGITAL SERVICES & PRODUCTS

With **VA INDIGO**, we support you in digitalizing your workflows regarding machine operation - from installation and training to operation, maintenance and troubleshooting to service and support.

The world is getting more and more digital and the industry with it. An important aspect of this development is the digitalization and networking of machines, logistics, periphery systems and resources based on collecting, analyzing and transferring data. This will enable the optimization of not just one production step but a complete value chain. Furthermore, it will open new ways of providing products and services.

Based on this global development, we will help you meet future requirements such as autonomy, connectivity, productivity, predictability and flexibility. And we will help you launch into the next era of production.

**Optimized use of resources**  
through automated processes



**Higher yield & lower costs**  
for quality & damage management



**Enables larger product portfolio**  
with more profitable products



## OUR PORTFOLIO



### PROCESS SUITE

Automation  
& Monitoring



### ANALYSIS SUITE

Data Review  
& Analysis



### SERVICE SUITE

Smart Services

# CLOSE TO YOU! THERE FOR YOU AROUND THE GLOBE



First-class technology, quality and productivity are the key to your success and an integral part of our plants. VON ARDENNE equipment is used in more than 50 countries. We have installed over 550 coating lines worldwide and support them from our local service locations or our headquarters in Dresden. For questions or issues of any kind, we assist you by phone, personally on site or by remote support.

- 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



## AT OUR SERVICE LOCATIONS WE OFFER:

- Local service hotline & Qualified service personnel** [up to 24/7]
- Service sales**
- Spare parts management**
- Inspection & maintenance service**
- Upgrades & retrofits**
- Technical training**
- Customer training center at our headquarters in Dresden**

# JOINT TESTING, SAMPLING & IMPROVEMENT



## FROM SIMULATION TO PILOT PRODUCTION

### 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



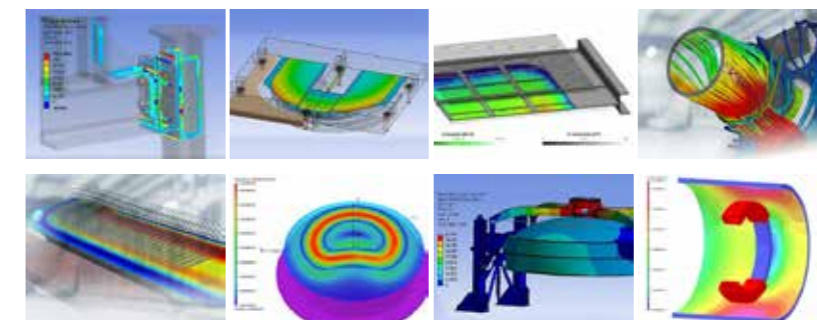
### Simulation

#### Helps You Understand Your Process

You want to accelerate your product development. And you know that the answer is multi-physical simulation and modeling. You want accurate results. But which solution is right for you?

We can accelerate your product development and upgrade process by reducing engineering effort with state-of-the-art modeling and simulation. This allows you to design your custom vacuum solution or perform feasibility studies for upgrading a running system.

We have outstanding expertise in multiscale simulation and have leveraged it to ensure highly optimized system performance and best process quality.



# 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.



SALES CONTACTS



SERVICE CONTACTS

## WORLDWIDE SALES AND SERVICE

**VON ARDENNE GmbH** (headquarters) | Am Hahnweg 8 | 01328 DRESDEN | GERMANY

Sales: ☎ +49 (0) 351 2637 189 | [sales@vonardenne.com](mailto:sales@vonardenne.com)

Service: ☎ +49 (0) 351 2637 9400 | [support@vonardenne.com](mailto:support@vonardenne.com)

**VON ARDENNE Vacuum Equipment (Shanghai) Co., Ltd.** | ☎ +86 21 3769 0555 | 📠 +86 21 6173 0200 | [sales-vave@vonardenne.com](mailto:sales-vave@vonardenne.com); [support-vave@vonardenne.com](mailto:support-vave@vonardenne.com)

**VON ARDENNE Malaysia Sdn. Bhd.** | ☎ +60 4408 0080 | 📠 +60 4403 7363 | [sales-vama@vonardenne.com](mailto:sales-vama@vonardenne.com); [support-vama@vonardenne.com](mailto:support-vama@vonardenne.com)

**VON ARDENNE Japan Co., Ltd.** | Tokyo office | ☎ +81 3 6435 1700 | 📠 +81 3 6435 1699 | [sales-vajp@vonardenne.com](mailto:sales-vajp@vonardenne.com); [support-vajp@vonardenne.com](mailto:support-vajp@vonardenne.com)

**VON ARDENNE North America, Inc.** | Ohio office | ☎ +1 419 386 2789 | 📠 +1 419 873 6661 | [sales-vana@vonardenne.com](mailto:sales-vana@vonardenne.com); [support-vana@vonardenne.com](mailto:support-vana@vonardenne.com)

**VON ARDENNE Vietnam Co., Ltd.** | ☎ +84 966 29 29 50 | [sales-vavn@vonardenne.com](mailto:sales-vavn@vonardenne.com); [support-vavn@vonardenne.com](mailto:support-vavn@vonardenne.com)

**VON ARDENNE India Pvt. Ltd.** | [sales-VAID@vonardenne.com](mailto:sales-VAID@vonardenne.com); [support-vaid@vonardenne.com](mailto:support-vaid@vonardenne.com)