VON ARDENNE

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BIG SCIENCE & SPECIAL APPLICATIONS

VACUUM TECHNOLOGIES & EQUIPMENT FROM A SINGLE SOURCE

Enabling Big Science From Atomic Precision to Full-Scale Execution With Advanced Vacuum Technologies & Equipment

ENABLING BIG SCIENCE

FROM ATOMIC PRECISION TO FULL-SCALE EXECUTION

Big Science refers to large-scale scientific projects that require highly specialized technologies, complex equipment, and close collaboration across multiple disciplines. We support these projects with vacuum technology, engineering expertise, and equipment solutions, from the initial idea through all project phases to final deployment and even beyond.

Our product portfolio is suited for demanding applications such as heat-flux testing, large-area mirror coating for telescopes and other optical systems, and superconducting technologies. Precisely controlled coatings can provide tailored optical, thermal, electrical, and functional properties for use under extreme conditions.

We provide complete solutions and engineering-to-order services from a single source. Our capabilities include multiphysics simulation covering electromagnetics, optics, thermal analysis, mechanics, and plasma, as well as engineering from concept to realization and project management for complex projects.

We also provide worldwide sourcing and logistics, high-cleanliness assembly under conditions of up to ISO 5 AMC, equipment testing and qualification, as well as equipment installation, commissioning, and worldwide service. Local service hubs and teams, supported by the original developers, ensure reliable long-term support wherever your project is located.

Proven track record

of full-scale Big Science projects

Excellence in project execution

from concept to deployment

Experience in the industrialization

of disruptive technologies & new products

HEAT FLUX TESTING

Testing & qualifying the thermal durability of plasma-facing components

When designing and building nuclear fusion reactors and other plasma-facing components, testing, characterizing and qualifying materials and such components for the First Wall and Divertor becomes extremely important. They need to withstand severe thermal loads and energy input. Predicting and verifying their performance ensures a safe and reliable performance of the overall system.

Electron beam (EB) high-density heat flux testing has become essential to measure how a component, a material or even a coating responds to such high-power thermal and particle loads.

Essential testing of fusion reactor modules

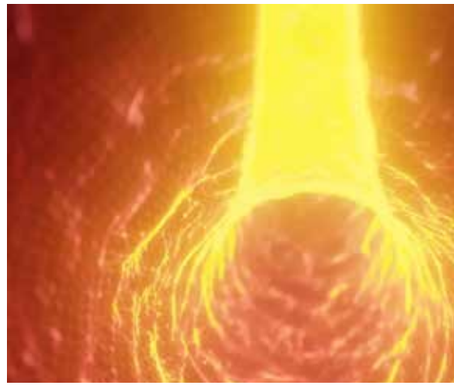
for extremely high thermal and particle loads

Validation of plasma-facing components

with energy densities over 10 MW/m²

Combination of steady-state, cyclic & peak loads

thanks to flexible electron beam control



Electron Beam Systems
for Melting & Evaporation

HIGH-TEMPERATURE SUPERCONDUCTORS

Scaling production processes for HTS tapes

In conventional metallic conductors, electrical resistance causes energy losses. This effect becomes particularly significant at high currents and poses a major challenge for applications such as power transmission, high-field electromagnets, and high-power motors and generators. Such technologies are essential for fusion reactors, wind turbines, magnetic resonance imaging (MRI) systems, magnetic-levitation trains, and electric propulsion systems.

Superconducting materials can carry electric current without Ohmic losses when operated below their critical temperature and within their critical current and magnetic-field limits. Under these conditions, conduction electrons form Cooper pairs that move through the material without electrical resistance. High-temperature superconductors (HTS) are complex oxide ceramics whose critical temperatures exceed the boiling point of liquid nitrogen. Over the past three decades, they have advanced to the point where large-scale industrial applications are becoming feasible.

Advanced PVD technologies

for depositing complex ceramic layers

High-temperature processing

with market-leading metal strip coating equipment

Proven track record in scaling

customer-specific HTS tape coating processes

MSC1250
Metal Strip Coating System

FOSA CX
Roll-to-Roll Vacuum Web Coating System

FOBA
Roll-to-Roll Vacuum Web Coating System

FOSA MX
Roll-to-Roll Vacuum Web Coating System

MSC500
Metal Strip 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, directing and splitting laser beams, 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 for highly specific applications. Thus, selective, narrow- or broadband behavior can be realized with regard to 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

VERA
Evaporation System for Optical Applications

OPTA X
Rotary Disk Coating System

CLUSTER SYSTEMS
for Research, Development & Production

VISS
Vertical Coating System

LENSES & OPTICAL DOMES

Broadband anti-reflection & selective filters through conformal coating on curved substrate surfaces

If you want to apply interference optical broadband anti-reflection 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 anti-reflection 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, we offer the OPTA X as an alternative to the 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

VERA
Evaporation System for Optical Applications

OPTA X
Rotary Disk Coating System

LARGE-AREA OPTICS

Ultra-precise optical coatings for large apertures with highest uniformity

Are you looking for coating solutions for large optical surfaces with exceptionally demanding requirements, such as astronomical reflecting telescopes, large-area laser mirrors for fusion projects, or other aerospace and surveillance applications? Our magnetron sputtering, electron-beam evaporation, and thermal evaporation technologies provide the precision you need.

Coating large optical surfaces demands exceptional precision. In telescope construction, individual mirrors can exceed eight meters in diameter and are polished to a surface accuracy of approximately 20 nanometers. When depositing highly reflective aluminum, silver, or gold layers, the coating process must preserve this accuracy and avoid distorting the mirror's ideal parabolic or hyperbolic shape. In practice, this requires nanometer-level uniformity across the entire surface.

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

SKYVA
Vacuum Coating System for Large Astronomical Mirrors

VERA
Evaporation System for Optical Applications

VISS
Vertical Coating System

ELECTRON BEAM SYSTEMS

HIGH POWER FOR HIGH QUALITY

in melting & evaporation

With the EH150V, EH 300V and EH800V electron beam guns, we offer you components for high-performance applications. This applies to melting and refining as well as evaporation of metals, alloys and composites.

As our customer, you will benefit from the comprehensive know-how we have acquired through more than 400 electron beam systems in operation all over the world. It includes beam generation, generator technology, beam focusing and digital beam deflection processes. These processes enable dedicated power distribution and timing control on the area impacted by the electron beam.

At our Electron Beam Technologies Development Center, we are striving to continuously improve our key components. Here, we also manufacture and test our high-quality electron beam guns.

Reliable & proven

as a series product in many applications

Modular design

with clear interfaces for system integration

Simple handling

and easy maintenance

SKYVA

HIGHLY REFLECTIVE COATINGS

For large-aperture mirrors

Are you looking for a coating solution for large astronomical mirrors that combines high reflectivity, nanometer-level uniformity, reproducible process control, and safe handling? SKYVA Vacuum coating systems are developed specifically for large, curved mirror substrates and can deposit homogeneous, highly reflective metal layers on mirrors with diameters of up to 8.4 meters. Different chamber sizes and customized equipment configurations enable scaling from small and medium apertures to the largest astronomical mirrors.

Coating astronomical mirrors presents a wide range of technical and operational challenges. While the sheer size of the mirrors is a major factor, it is by no means the only one. In telescope construction, individual mirrors can exceed eight meters in diameter and are polished to a surface accuracy of approximately 20 nanometers. The coating process must preserve this accuracy, avoid distorting the mirror's ideal parabolic or hyperbolic shape, and deliver excellent layer uniformity across the entire curved surface.

In practice, this requires nanometer-level process control, low particle density, and precise monitoring of the coating parameters. The requirements are even more demanding at remote, high-altitude observatories, where equipment must withstand extreme climatic and seismic conditions. At the same time, the components used must be designed for an intended service life of more than 30 years.

Highest reflectivity

on the most demanding mirror geometries

Reliable operation & mechanical stability over decades

with maximum substrate safety

Fully automatic processes

including modern control/visualization for the operator

APPLICATIONS

Large-Area Optics

MSC 500

The Perfect First Step

into Metal Strip Coating

- **Double-sided coating possible**
  due to free strip guidance in the process area
- **Easy maintenance**
  and repair
- **Short downtime**
  for coil exchange

MSC 1250

Proven system for metal strip coating

with high productivity

- **Very high productivity**
  due to leading PVD technology
- **Continuous coating process**
  with automatic coil exchange in atmosphere
- **Flexible equipment options**
  for pretreatment & coating

FOBA

Highly productive roll-to-roll coating

in excellent quality

- **Highest productivity**
  through world-leading electron beam technology
- **Outstanding product quality**
  through closed-loop process control
- **Low downtime**
  due to quick & easy maintenance

EQUIPMENT

FOSA MX

Highly productive roll-to-roll coating

With modular equipment

- **High flexibility**
  through many configuration options
- **Saves time & effort:**
  coil exchange without evacuating process chamber
- **Low downtime**
  due to quick & easy maintenance

FOSA CX

Highly productive roll-to-roll coating

with compact equipment

- **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

VISS

Highly flexible & scalable inline systems

For vertical processes & medium productivity

- **Scalable**
  through modular design
- **Easily adaptable to your requirements**
  through flexible configuration options
- **Loading without touching the substrate front side**
  due to carrier transport

EQUIPMENT

OPTA X

Highly productive double-sided coating

For demanding multi-layer systems

Highest precision & quality
through fast, clean, low-defect, homogeneous coatings

Anti-warp effect
through double-sided deposition with different materials

Variable product adaptation:
layers, layer systems & component geometry

CLUSTER

Highly flexible & scalable cluster systems

For research, development & production

Scalable
through modular design

Adapted to your needs
through flexible configuration

Helps you reduce operating costs
through flexibility

VERA

Highly Flexible & customizable coating system

for evaporation processes

Wide spectrum of technologies
from simple thermal evaporation to ion-assisted electron beam evaporation

Customer-specific chamber size
ranging from compact lab scale to high-volume production

High flexibility in substrate geometries and sizes
through different types of substrate holders

SERVICE PORTFOLIO

CLOSE TO YOU!

Available around the globe

Overview

First-class technology, quality and productivity are the key to your success and an integral part of our coating systems.

VON ARDENNE equipment is used in more than 50 countries. We have installed over 1000 coating systems 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

SIMULATION

SIMULATION

Helps you understand your process

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

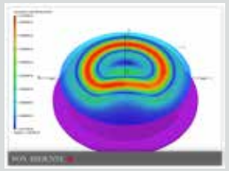
VON ARDENNE is a leading supplier of PVD coating equipment with more than 60 years of experience in electron beam processes and 50 years of experience in magnetron sputtering.

And now you can benefit from this experience.

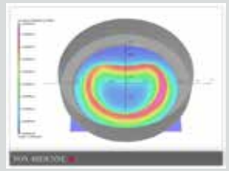
Every day you face the challenge of staying ahead in your business. You strive to become faster and more cost efficient. Our job is to support you with industry-leading technology and process experience to add value.

- **Higher productivity** and yield
- **Less effort** in engineering
- **Higher product quality** at lower cost

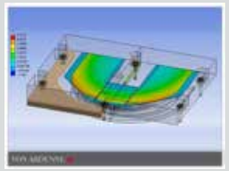
TAKE YOUR PRODUCT DEVELOPMENT TO A NEW LEVEL



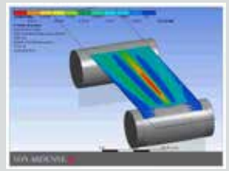
1 Electromagnetics Simulations



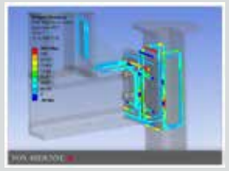
2 Plasma Simulation



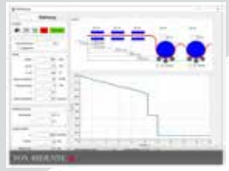
3 Static Mechanics



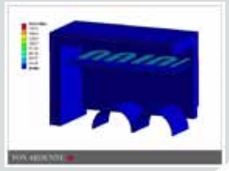
4 Dynamic Mechanics



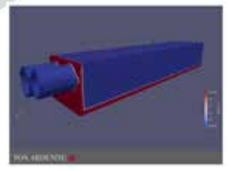
5 STRENGTH & WELD SEAMS



6 System Dynamics



7 Thermal



8 Flow (CFD) and Gas Flow (DSMC)

ENGINEERING & TESTING

CUSTOMIZED EQUIPMENT, COMPONENTS & PROCESSES

You have an idea, we develop the vision with you and turn it into reality. Benefit from our experience and competence for the realization of your ideas.

The ability to develop customized equipment concepts and components together with our customers - that is what has distinguished us for decades.

From technology, mechanical and electrical project planning, simulation and design to automation and data preparation - VON ARDENNE is your one-stop shop.

We translate your requirements for product properties into efficient and competitive individual coating solutions. These can be processes, components or even complete coating systems.

- Simulation
- Software Development
- Component Development
- Layer System Development
- Equipment Layout

JOINT TESTING, SAMPLING & IMPROVEMENT

Sampling & Layer Development

At our Technology & Application Center (TAC), we work together with you on the next generation of your coating applications.

We simulate layer stacks and their functionality, produce samples on laboratory and pilot scales, and measure and evaluate coating and substrate properties to meet diverse requirements. This allows you to test your product's coating performance on relevant sample sizes before your production equipment is commissioned.

- **Gaining knowledge through simulation** of layer composition & properties
- **Risk reduction & quicker market maturity** through industrial trials
- **Individual access to a variety** of coating materials & services
- **Optimal equipment configuration** through testing in a scalable process

Technology & Application Center Dresden

VA CLEANROOM

CLEANROOM-COMPATIBLE SAMPLING & ASSEMBLY FACILITY

FOR PRECISION OPTICS, PHOTONICS & SEMICONDUCTOR APPLICATIONS

VA CLEANROOM

Sampling & Layer Development

Our new cleanroom offers the best conditions, with ISO 5 and ISO 7 zones for the assembly and commissioning of systems for complex tasks in the fields of semiconductor technology, as well as materials science and medical technology, partially even with the highest purity requirements (ISO 5 AMC).

The cleanroom will be equipped with a new OPTA X system, which will be available from mid-2026 for joint material and device developments. Together with a top-tier team of technicians and developers, we will be able to contribute to your next generation of coating applications.

We cover the entire process, from simulating layers and their functions, through laboratory- and pilot-scale sampling, to measuring and evaluating layer and device properties. This gives you the opportunity to test the function of the coating for your product in a relevant environment or to include your entire process chain in advance.

Wafer substrate handling in ISO5 environment

for analysis at the wafer level or for further external processing

Risk minimization & faster market readiness

through industrial testing

Gaining insights through accompanying simulation

of layer processing and related properties

Individual access

to a variety of coating materials & services as well as R&D partners

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

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.

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
- Institutes of the Helmholtz Association
- Universities
- Companies

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.

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.

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.

WORLDWIDE SALES AND SERVICE

VON ARDENNE GmbH (headquarters) I Am Hahnweg 8 I 01328 DRESDEN I GERMANY
Sales: +49 (0) 351 2637 189 I sales@vonardenne.com
Service: +49 (0) 351 2637 9400 I support@vonardenne.com
VON ARDENNE Vacuum Equipment (Shanghai) Co., Ltd. I +86 21 3769 0555 I sales-vave@vonardenne.com; support-vave@vonardenne.com
VON ARDENNE Malaysia Sdn. Bhd. I +60 4408 0080 I sales-vama@vonardenne.com; support-vama@vonardenne.com
VON ARDENNE North America, Inc. I Ohio office I +1 419 386 2789 I sales-vana@vonardenne.com; support-vana@vonardenne.com
VON ARDENNE Vietnam Co., Ltd. I +84 28 6272 3189 I sales-vavn@vonardenne.com; support-vavn@vonardenne.com
VON ARDENNE India Pvt. Ltd. I sales-vaid@vonardenne.com; support-vaid@vonardenne.com

Company | Career | Applications | Products | Service

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