APPLICATIONS

VON ARDENNE is your partner of choice if you are looking for systems with a modular design that can be easily tailored to your technology and productivity requirements. These modular process systems are ideally suited to be applied in research and development as well as for volume production. Even though the applications can vary greatly from customer to customer, VON ARDENNE has proven its strength in providing tailored solutions even for sophisticated demands.

MEMS AND MOEMS

Microelectromechanical systems, or MEMS, are microscopic mechanical and electromechanical structures and devices. For customers who are active in this technology field, we offer equipment for the manufacturing of micromirror arrays for industrial applications. We also offer equipment solutions for creating micropostelectromechanical systems - MOEMS.

SENSORS

For sensor applications, conductive and active layers as well as highly capsulating barrier layers can be deposited with our systems. By using masks in the deposition step, a raw structuring would be possible too. Applications are sensor probes for position (GMR), pressure, temperature, resistance etc.

OLED

VON ARDENNE provides different systems for small-scale and mass production focusing on the deposition of the active layer with own organic evaporation sources. Furthermore, we can provide systems for metallization in combination with a mask structuring process. Beyond that, our systems can be used to create barrier systems. The major applications for OLEDs are smaller displays, digital signage and lighting.

PHOTOVOLTAICS / ARCHITECTURAL GLASS

For the photovoltaics and architectural glass industry, we offer equipment for R&D purposes and for the optimization of existing layer stacks on mass production tools. Using our modular process systems at the R&D stage facilitates the transfer to bigger VON ARDENNE production equipment for high-volume production.

PRECISION OPTICS

VON ARDENNE offers equipment solutions for the deposition of alternating layer systems with a high uniformity for wavelength-dependent functions of filters, non filters, reflectors and functional layers for anti-scratch applications.

MEDICAL APPLICATIONS

We provide coating systems that are able to coat three-dimensional objects with metallization layers or barrier systems. These machines benefit from a special substrate holder, and are suited for medical applications such as electrical contacts of heart catheters or the encapsulation of circuits.

EMERGING TECHNOLOGIES

Our modular process systems can also be used to develop and manufacture future technologies such as fuel cells, thin-film batteries and electrothermal generators. They can also be used by the automotive industry for research tasks and the development of Low-E wind shields or head-up displays.

RESEARCH & DEVELOPMENT

We also provide systems for all basic research tasks that require sophisticated vacuum coating machines, based on our long term experience as a supplier of research facilities in Germany and abroad.

OUR STRENGTHS

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.

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

CLOSE PARTNERSHIP

VON ARDENNE entertains a close 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, sol 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.

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 services hubs around the world
- On-site service (on request)
- Remote access from our technology department (if required)
- Regular technical and technological trainings offered
- 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.
Based on the experience of more than 40 years in magnetron sputtering and over 50 years in evaporation, we have incorporated a broad scope of features into VON ARDENNE modular process systems. Our modular process systems use all the important vacuum thin-film technologies. Beyond that, they can also apply various pre- and post-treatment methods. On top of that, there are many options for monitoring, handling and control. You can see all the key features of our systems in more detail below.

The success of our modular process systems is based on their highly flexible and broad configuration range, our technological experience and know-how, and on our in-house developed and manufactured key components. Depending on the required tool configuration, a VON ARDENNE system may include one or more of the listed components. Due to their modular design, the systems can also be upgraded or retrofitted with these components after the initial system installation.

### Key Features

**Pre/Post Treatment**
- Heating
- Deposition
- Etching (e-beam, glow discharge)
- Aligner

**Handling**
- Single substrate
- Magazine
- Substrate flip station
- Carrier return system
- Mask
- Automatic loading and unloading by industrial robots
- Cleanroom compatible

**Coating Processes**
- Sputtering, planar
- Sputtering, confocal
- Sputtering with rotating magnet field
- Evaporation (thermal, e-beam)
- Plasma-enhanced chemical vapor deposition (PECVD)
- Atomic layer deposition (ALD)
- Hot wire
- Other process technologies on request

**Monitoring**
- VAprocos 2
- Process emission monitor (PEM)
- Pyrometer
- Deposition rate monitoring & control
- Temperature logger
- In-situ measurement; optical layer properties

**Control**
- Manual or fully automated working
- SECS / GEM Interface
- Comprehensive process data logging
- User management

### Key Components

- Inverse sputter etcher
- Glow discharge device
- VAprocos 2 process control system
- Wicon control software
- Circular magnetron
- Rectangular magnetron
- Cylindrical magnetron
- Circular PECVD source
- Heated plate
The CS500 uses state-of-the-art coating technology—so-called high-power impulse magnetron sputtering (HIPIMS), which is able to deposit thin films with an extremely high density. It is especially designed for applications that require a high degree of precision such as coatings on glass to prevent glare or to produce more responsive smartphone screens and technology.

**Load Chamber**
- Single substrate or magazine
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

**Process Chamber**
- Metals, oxides, alloys, e.g. barrier layers for medical applications (implants)
- Unbalanced high-power impulse magnetron sputtering (HIPIMS)
- Rotatable and vertically adjustable substrate platform
- Heating or cooling system
- Gas inlet and distribution system
- Monitoring systems (e.g. pyrometer)

**Pre-treatment Chamber**
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

**Post-treatment Chamber**
- Single substrate or magazine
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

The LS500 is a true all-rounder.

**Load Chamber**
- Single substrate or magazine
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

**Process Chamber**
- Metals, oxides, alloys, e.g. barrier layers for medical applications (implants)
- Unbalanced high-power impulse magnetron sputtering (HIPIMS)
- Rotatable and vertically adjustable substrate platform
- Heating or cooling system
- Gas inlet and distribution system
- Monitoring systems (e.g. pyrometer)

**Pre-treatment Chamber**
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

**Post-treatment Chamber**
- Single substrate or magazine
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

The CS400 is especially suited for the deposition of highly reflective layer systems for MEMS and MOEMS (micro(opto)electromechanical systems). These layer systems are, for instance, micromirror arrays tailored for industrial applications. Thanks to the cluster design of the CS400, several consecutive layers can be deposited in situ, without removing the substrate from the vacuum.

The system enables coatings with exceptionally high precision with regards to layer quality. It also enables a long-term stable process and a quick sputter pressure control system.

**Load Chamber**
- Water magazine load locks
- Vacuum robot and integrated aligner and cooler

**Process Chamber**
- Metals, oxides, alloys, e.g. barrier layers for medical applications (implants)
- Unbalanced high-power impulse magnetron sputtering (HIPIMS)
- Rotatable and vertically adjustable substrate platform
- Substrate heating up to 900 °C
- Quick gas inlet and distribution system
- Monitoring systems (e.g. pyrometer)

**Pre-treatment Chamber**
- Water magazine load locks
- Vacuum robot and integrated aligner and cooler

**Post-treatment Chamber**
- Water magazine load locks
- Vacuum robot and integrated aligner and cooler

The system enables coatings with exceptionally high precision with regards to layer quality. It also enables a long-term stable process and a quick sputter pressure control system.

**Load Chamber**
- Single substrate or magazine
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

**Process Chamber**
- Metals, oxides, alloys, e.g. barrier layers for medical applications (implants)
- Unbalanced high-power impulse magnetron sputtering (HIPIMS)
- Rotatable and vertically adjustable substrate platform
- Heating or cooling system
- Gas inlet and distribution system

**Pre-treatment Chamber**
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer

**Post-treatment Chamber**
- Single substrate or magazine
- Inverse sputter etcher
- 4 locally arranged magnetrons
- DC, DC pulsed, RF processes
- Vertically adjustable, helium-cooled, rotatable substrate holder, suited for RF IBS
- Heating or cooling system
- Process emission monitor (PEM), pyrometer
The exit load lock chamber enables the unloading of the carrier without venting the process chambers of the system. Alternatively, it can be fitted with a cooling module.

The unloading station is where the system is unloaded manually or by using a robot system. Alternatively, a magazine unloading station for several carriers can be used or the station can be combined with a carrier return system.

The pre-treatment chamber can be fitted with an glow discharge device, inverse sputter etcher, LION ion source or a hollow cathode.

The entry load lock chamber allows for the loading of the carrier without venting the process chambers of the system. Optionally, it can be equipped with a heating module or a bypass to reduce pumping time. Alternatively, a combined fore-vacuum/high-vacuum load lock with integrated pre-treatment can be used.

The pre-treatment chamber can be fitted with an glow discharge device, inverse sputter etcher, LION ion source or a hollow cathode.

The available coating processes are sputtering, PECVD. Furthermore, thermal and electron beam evaporation can be applied in our horizontally configured systems. The process chambers can be used for reactive, partly reactive, and non-reactive AC, DC or DC pulse deposition processes. For that, either standard VON ARDENNE planar single magnetron sputter sources, double arrangements of planar magnetrons or rotatable magnetron sputter sources are used.

Additionally, heaters and cool traps can be integrated, or monitoring systems for controlling the process or the deposited layer behavior.

The coating chambers are modularly configured and consist of a variable number of different process stations, depending on the customer requirements. Therefore, the modules can be connected in series accordingly.

The available coating processes are sputtering and PECVD. Furthermore, thermal and electron beam evaporation can be applied in our horizontally configured systems. The process chambers can be used for reactive, partly reactive, and non-reactive AC, DC or DC pulse deposition processes. For that, either standard VON ARDENNE planar single magnetron sputter sources, double arrangements of planar magnetrons or rotatable magnetron sputter sources are used.

Additionally, heaters and cool traps can be integrated, or monitoring systems for controlling the process or the deposited layer behavior.

For the processing of larger substrates at a higher productivity, VON ARDENNE provides several inline coating systems. We have delivered and installed such inline systems both in vertical and horizontal design. They are used for medium-scale production and for layer optimization by customers running our larger coating equipment, as the resulting process parameters can be easily transferred.

This system is designed as a truly continuous system for layer development under near-production conditions. However, it can also be used as a production tool for cold and hot reactive and non-reactive deposition processes.

This system is suited for the large-area deposition of optical single or multiple metal or metal oxide layers. Thanks to its modular design, it can be equipped with a multitude of features. The substrates are transported through the system with a carrier, which is vertically tilted by 4°. This arrangement reduces the contamination with particles and enables that the substrates can be loaded without touching their front side.

This system is a production tool for manufacturing OLED (organic light emitting diodes) displays. A feature that makes this machine unique is the structured deposition with the help of two different masks. These masks are exchanged inside the vacuum. The system uses VON ARDENNE linear organic evaporation sources with inert material feed. The system is loaded and unloaded fully automatically and features a sophisticated carrier return system.

The coating process can be executed with non-moving substrates (e.g. PECVD or evaporation processes) or oscillating substrates with continuously passing carriers. The coating cycles will vary strongly depending on the processes and the chosen equipment. All modules are suitable for 24/7 operation. In order to achieve highest productivity, the systems feature automatic (un)loading of the substrates, carrier return systems as well as SECS/GEM data interfaces for fab automation.

The entry load lock chamber is where the system is loaded manually with a carrier loaded with substrates or where substrates are placed on carriers, either manually or with the help of a robot. Alternatively, a magazine loading station for several carriers can be used.

The exit load lock chamber enables the unloading of the carrier without venting the process chambers of the system. Alternatively, it can be fitted with a cooling module.

The entry load lock chamber is where the system is loaded manually with a carrier loaded with substrates or where substrates are placed on carriers, either manually or with the help of a robot. Alternatively, a magazine loading station for several carriers can be used.
Drum coating systems have several advantages. They offer a quite high productivity and a compact footprint. They are also an affordable investment. Especially for alternating multilayer deposition, these systems are very powerful tools. In combination with pre-treatment, heating and cooling features and an inline deposition monitoring, a broad scope of applications can be targeted. We have highlighted two installed versions for you below.

**UPGRADE FOR HIGHER PRODUCTIVITY POSSIBLE**
- Automatic loading/unloading
- Optical monitoring/process control
- PEM

**BS1200 SINGLE-CHAMBER DRUM COATING SYSTEM**

This system is designed as a single-chamber system for processing of up to 200 mm x 600 mm or 8-inch substrates by means of magnetron sputtering in DC processes.

The substrates are accommodated in carriers. These carriers are arranged at the outside of a cylindrical basket. The basket rotates around a vertical axis within a vacuum chamber (rotary basket).

A large door is used to load or unload the carrier with the substrates in and out of the process chamber. The door can be opened from a cleanroom while the system itself is installed in a gray room. Optionally, a loading/unloading station can be integrated. Shutter systems in front of the magnetrons allow for pre-sputtering and for quickly stopping the deposition of material onto the substrates.

**CS1200 MULTI-CHAMBER DRUM COATING SYSTEM**

The CS1200 is a 4-chamber system and enables the processing of customer-specific substrates by means of RF sputter etching, RF sputtering or unipolar DC or pulsed coating. This can be done in process mode with horizontally directed particle stream and vertically arranged substrates. The system enables hot deposition at a defined and highly uniform temperature.

The system is loaded through a magazine load lock chamber. A vacuum robot transfers the carrier automatically between each vacuum chamber of the system.

One of the applications for this system is the manufacturing of thermo-electrical generators.
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.