

## 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 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, 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 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.



PRODUCT TOPICS



PRODUCT INDEX



COMPONENTS



www.vonardenne.biz

## WHO WE ARE & WHAT WE DO

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

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

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

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



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.biz

Service: ☎ +49 (0) 351 2637 9400 | support@vonardenne.biz

VON ARDENNE Vacuum Equipment (Shanghai) Co., Ltd. | ☎ +86 21 6173 0210 | ☎ +86 21 6173 0200 | sales-vave@vonardenne.biz; support-vave@vonardenne.biz

VON ARDENNE Malaysia Sdn. Bhd. | ☎ +60 4408 0080 | ☎ +60 4403 7363 | sales-vama@vonardenne.biz; support-vama@vonardenne.biz

VON ARDENNE Japan Co., Ltd. | Tokyo office | ☎ +81 3 6435 1700 | ☎ +81 3 6435 1699 | sales-vajp@vonardenne.biz; support-vajp@vonardenne.biz

VON ARDENNE North America, Inc. | Ohio office | ☎ +1 419 386 2789 | ☎ +1 419 873 6661 | sales-vana@vonardenne.biz; support-vana@vonardenne.biz

VON ARDENNE Vietnam Co., Ltd. | ☎ +84 966 29 29 50 | sales-vavn@vonardenne.biz; support-vavn@vonardenne.biz

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ENGLISH 08/2022

VON ARDENNE

PROCESS SOLUTIONS

ELECTRON BEAM SYSTEMS

ELECTRON BEAM SYSTEMS

ELECTRON BEAM GUNS | VA BCOS



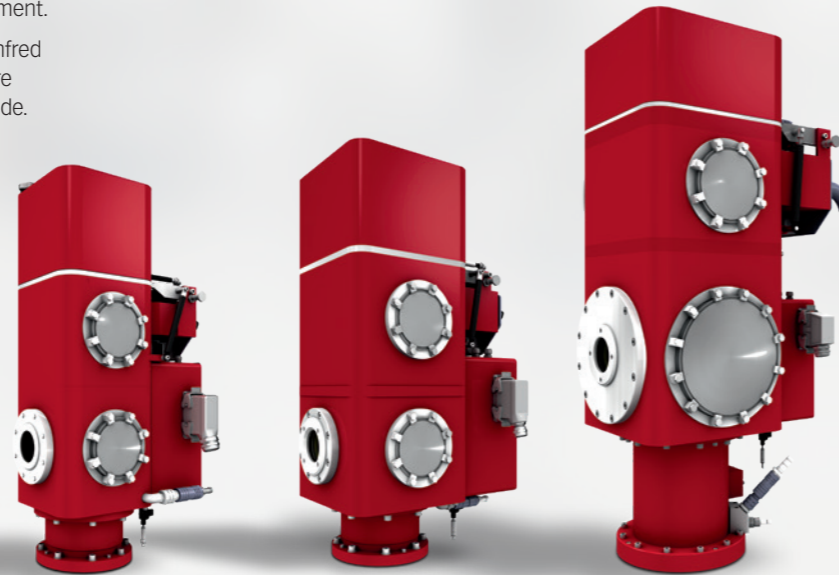
# ELECTRON BEAM GUNS

VON ARDENNE develops and manufactures electron beam systems which are used for melting, refining, evaporation or heat treatment.

The first electron beam gun was developed in 1959 at the Manfred von Ardenne Research Institute. Our 60 years of experience are reflected in over 400 electron beam systems installed worldwide.

Our current **EH150V**, **EH300V** and **EH800V** electron beam guns are the most powerful in the world.

We work on the continuous improvement of our key components at our development center for electron beam technologies. This is where we produce and test all our high-quality electron beam guns.



Electron beam gun **EH150V**

Electron beam gun **EH300V**

Electron beam gun **EH800V**

## FEATURES

- ... Power control by means of a patented VARIOCATHODE
- ... High degree of pressure decoupling
- ... Internal valve to separate EB gun from process chamber
- ... Quick and simple changing of cathode plug

## BENEFITS

- ... Easy handling and maintenance
- ... High reliability
- ... High acceleration voltage up to 60 kV
- ... Magnetically self-focusing beam

## TECHNICAL DATA

Subject to change without notice due to technical improvement.

	EH150V	EH300V	EH800V
Maximum beam power	150 kW	300 kW	800 kW
Beam power control range			
... Power control by VARIOCATHODE (space charge limited mode)	≈ 20 % to 100 %	≈ 20 % to 100 %	≈ 20 % to 100 %
... Power control by bombardment power (temperature limited mode)	0 % to ≈ 20 %	0 % to ≈ 20 %	0 % to ≈ 20 %
Max. acceleration voltage	35 kV	45 kV	60 kV
Average life time of cathodes at maximum beam power	100 h to 200 h	100 h to 200 h	200 h to 300 h
Magnetic lenses	2	2	2
Number of X/Y coils	1	1	1
Maximum deflection angle			
1 kHz system (coil/amplifier)	± 40°	± 40°	± 45°
10 kHz system	± 25°	± 25°	± 25°
20 kHz system	-	-	± 40°
Minimum spot diameter (at distance of 1 m, maximum beam power and maximum acceleration voltage)			
... At process pressure of 5*10 <sup>-2</sup> Pa	≈ 10 mm	≈ 15 mm	≈ 30 mm
... At process pressure of 5*10 <sup>-3</sup> Pa	≈ 15 mm	≈ 20 mm	≈ 50 mm
Maximum process pressure	≈ 5 Pa	≈ 5 Pa	≈ 2 Pa

	EH150V	EH300V	EH800V
Recommended size of vacuum pumps			
... Turbomolecular pump at cathode chamber	300 l/s	300 l/s	500 l/s
... Turbomolecular pump at intermediate chamber	300 l/s	300 l/s	1 600 l/s
... Roughing pump for both turbomolecular pumps	20 m <sup>3</sup> /h	20 m <sup>3</sup> /h	35 m <sup>3</sup> /h
Pump down time	< 10 min	< 10 min	< 15 min
X-ray leakage	< 1 μSv/h	< 1 μSv/h	< 1 μSv/h
Total cooling water consumption	0.5 m <sup>3</sup> /h	0.5 m <sup>3</sup> /h	2.2 m <sup>3</sup> /h
Compressed air supply (dry)	0.5 MPa	0.5 MPa	0.5 MPa
Height (with closed lid)	900 mm	1010 mm	1400 mm
Maximum radius (without vacuum pumps)	350 mm	350 mm	400 mm
Weight	150 kg	190 kg	550 kg
Connection flange of the gun	DN 160 ISO-F	DN 160 ISO-F	DN 250 ISO-F
Connection flanges for vacuum pumps:			ISO-F
... Cathode chamber	DN 100	DN 100	DN 160
... Intermediate chamber	DN 100	DN 100	DN 250

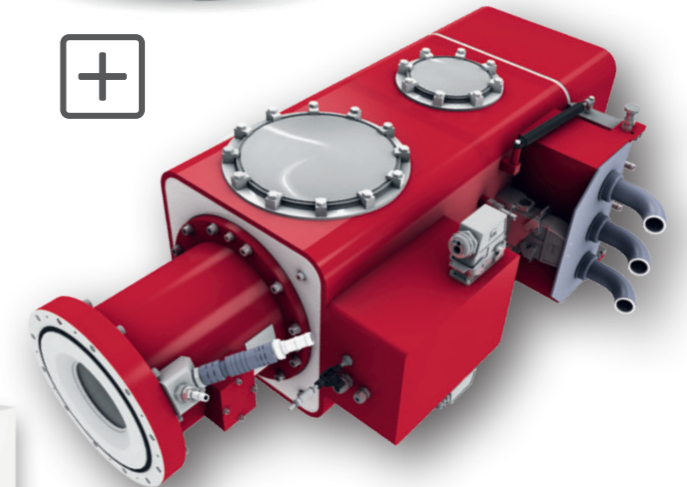
# VA BCOS Beam Control System

The beam guidance system is an electronic unit for controlling and monitoring the electron beam of an electron beam gun by means of electromagnetic lenses and deflection coils.

It consists of an industrial PC, a beam guidance base unit, a control console and associated beam guidance software.

**VA BCOS** is MS Windows-based beam guidance software and performs the following tasks:

- ... Control of max. 8 electron beam guns
- ... Generation of deflection figures to realize the electron beam distribution required at the process location
- ... Generation of deflection sequences by means of the pre-installed figure library, or based on coordinate lists generated with customary software (e.g. MS Excel)
- ... Management of technological process sequences (recipes)
- ... Continuous beam deflection with simultaneous adaptation of form, position, size and dwell time of the individual deflection figures during operation, by means of operator control actions or a connection to the automatic process control
- ... Adaptation of the electron beam focusing within the electron beam gun and at the process location, including monitoring of the focusing state by evaluating the temperature increase of the cooling water in the electron beam gun
- ... Display and data recording of all process-relevant operating parameters such as power, power distribution and acceleration voltage
- ... Data transfer
- ... Interface for external access via internet connection



## FEATURES

- ... Freely programmable time & power based beam scanning sequences
- ... Comprehensive scanning figure library
- ... Signal processor-based calculation of all dynamic functions
- ... Tracks: automatically moving scanning figures
- ... Online geometrical and dynamic correction of scanning sequences
- ... Synchronization of scanning sequences of multiple EB guns
- ... User permissions management
- ... Latest software technology and architecture
- ... Integration of various process control modules – **VA BCOR** / **VA PROCESSMASTER** / customer controllers

## BENEFITS

- ... Reliable process control for certified products
- ... Flexible adaptation to VON ARDENNE or customer machines
- ... Controlled continuous beam scan despite digital figure coordinate definition
- ... Open customer interface
- ... Easy and flexible operator interaction as well as automatic process control
- ... Implementation on standard industrial hardware components