

ELECTRON BEAM SYSTEMS

ELECTRON BEAM GUNS | VA BCOS

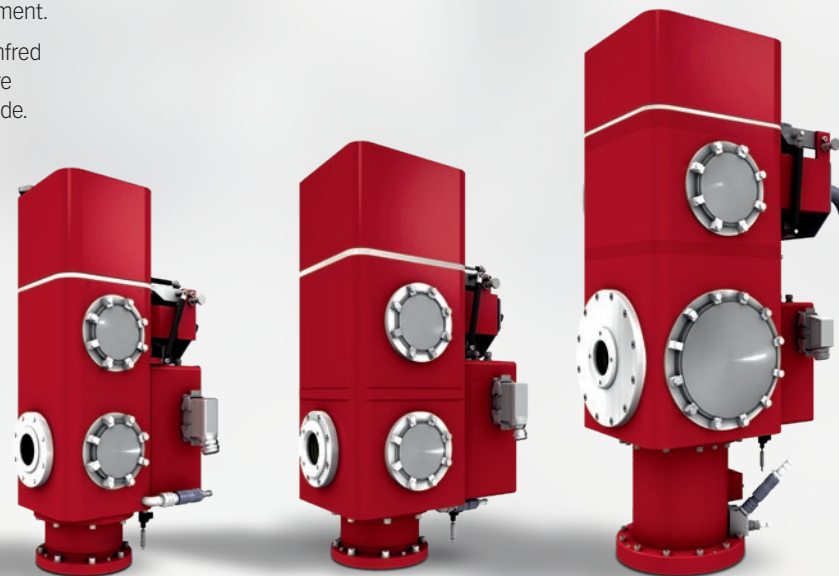
ELECTRON BEAM GUNS

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 ⁻² Pa	≈ 10 mm	≈ 15 mm	≈ 30 mm
— At process pressure of 5*10 ⁻³ 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 ³ /h	20 m ³ /h	35 m ³ /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 ³ /h	0.5 m ³ /h	2.2 m ³ /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

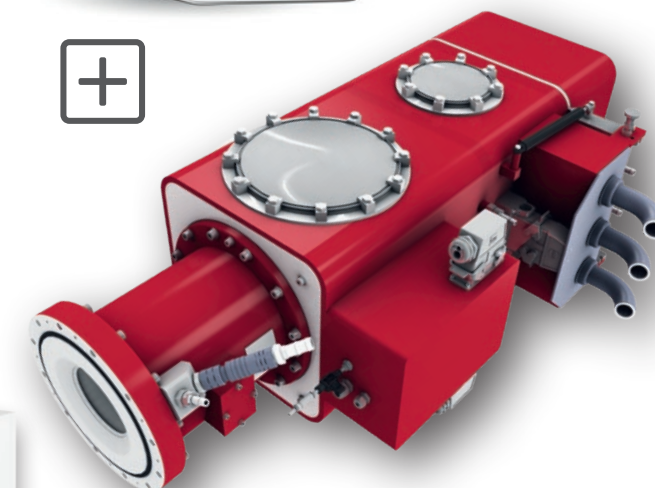
BEAM CONTROL SYSTEM

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

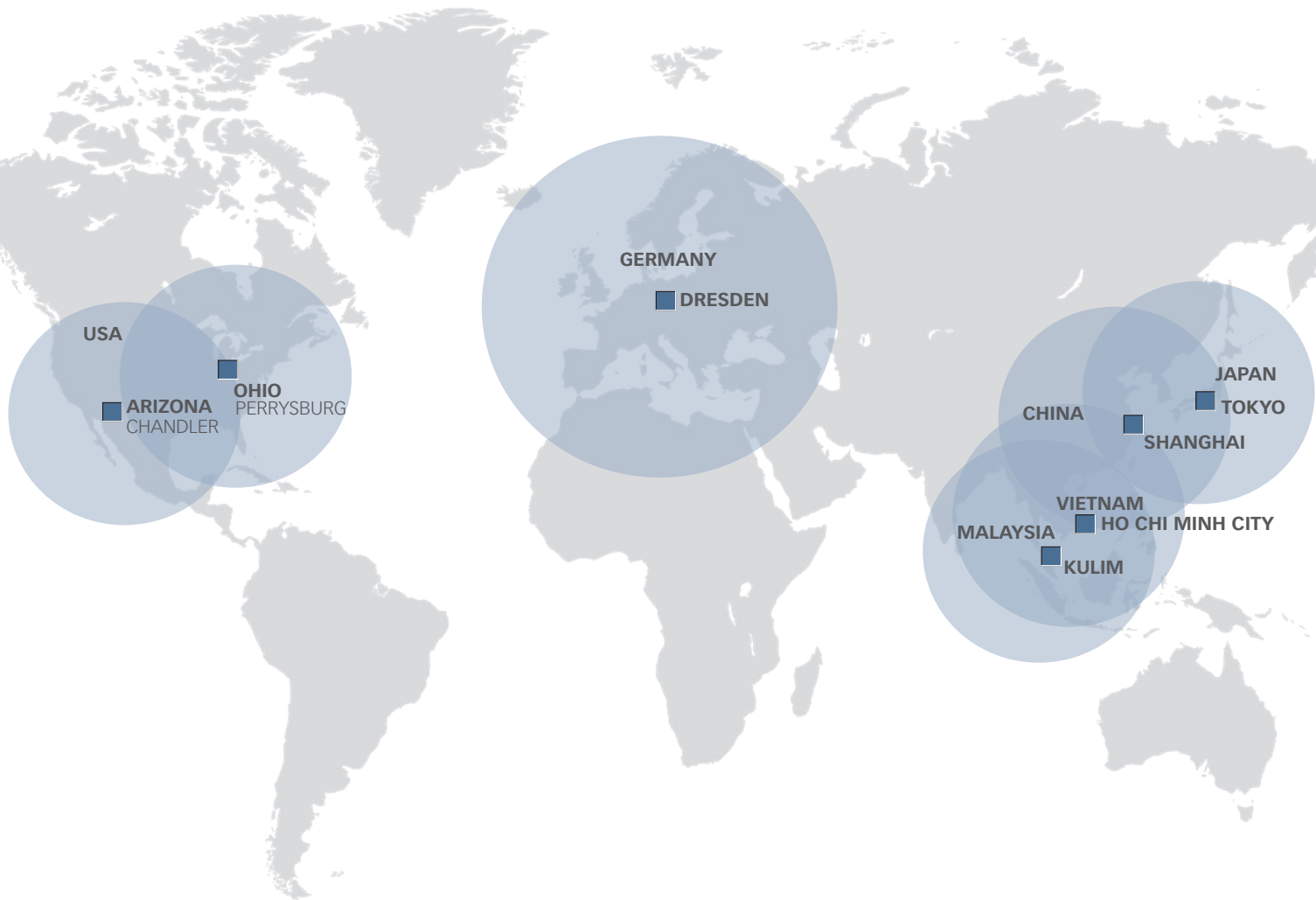


FEATURES

- ... 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 PROCESS MASTER / 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



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COMPONENTS



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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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