D.I.S

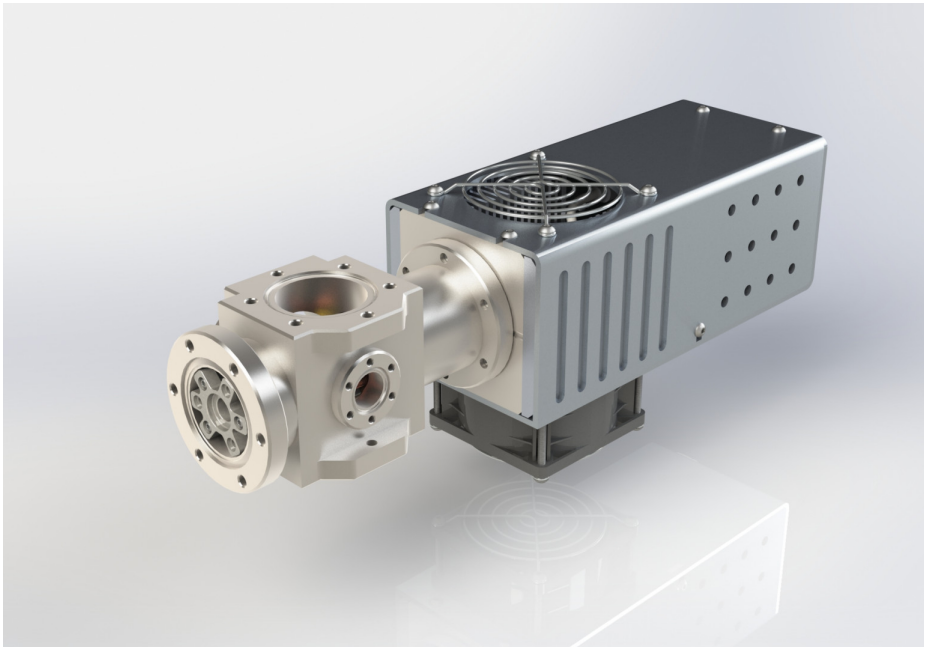
D.I.S Germany GmbH

EBIS-C1

911-S7-09-00001 / 911-S7-09-00003

The D.I.S EBIS-C1 is an electron beam ion source featuring an ultra-compact design while still being capable of producing beam currents of several hundred pA of multi-charged ions of all gaseous elements and compounds.

The modular and operator-friendly D.I.S EBIS-C1 is suitable for use in a wide variety of applications for basic research in various scientific disciplines, for teaching and training, and for technological applications.



The D.I.S EBIS-C1 with a customized multi-flange recipient.

further reading:

- *https://www.dis-eng.de/products/ion-sources/ebis/*
- *https://www.dis-eng.de/knowledge-base/ion-beam-technology/*

Special Features:

- ultra-compact, modularized electron beam ion source (EBIS) mounted on a DN 40 CF flange for easy integration in customized facilities
- beam currents of several hundreds of pA of multi-charged ions of all gaseous elements and compounds
- ion generation for ion extraction and x-ray/UV/EUV spectroscopy
- two cathode options with different diameters available according to the field of application
- Wien filter module for ion charge state and mass selection
- easily combinable with other charged particle beam related devices
- simple, cost-effective and user-friendly access to the world of highly charged ions

Please do not hesitate to contact us to find a suitable solution for your special application.

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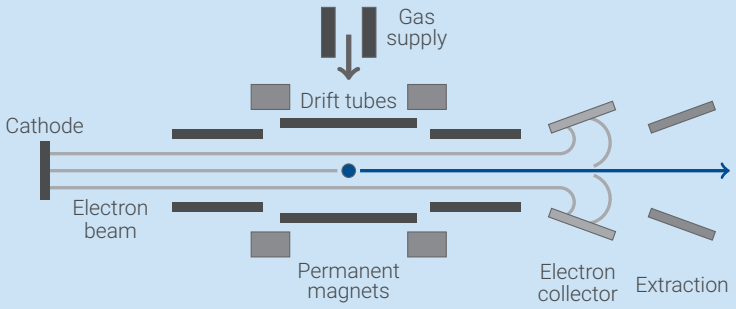
Operation principle

The operating principle of an EBIS is based on the generation of multiply charged ions by electron impact ionization. For this purpose, a mA electron beam is generated by a highly emissive cathode and the beam is then magnetically compressed in the ionization zone.



A high ionization factor is generated by an electromagnetic ion trap, which causes the necessary storage time of the ions in the ionization zone. In the ion extraction zone, the electron beam is separated from the ion beam and dumped in an electron collector, while the positively charged ions can be extracted.

The ion charge state distribution in the extracted ion beam can be changed by varying the operation parameters and by operating the ion beam source in different modes. In transmission mode, a continuous beam of ions of low and intermediate charge states is produced. In pulsed mode, the ion trap is periodically closed and opened, enabling the extraction of a pulsed beam of ions of different ion charge states.

An EBIS is capable of ionizing every gaseous medium which is introduced to the recipient. While gases can simply be introduced via a gas dosing valve, nearly every non-gaseous element and molecule can be introduced by certain techniques such as ovens or the MIVOC technique.

Optional Equipment:

- intuitive control software
- special recipient with different usable ports (see Figure on previous page)
- ion beam optics and diagnostics (e.g. lenses, deflectors, Faraday cups) up to a complete beamline or ion irradiation facility
- different injection solutions according to the desired ion species, for example gas dosing valves, ovens, or MIVOC
- Wien filter module for the separation of ion species by their charge-to-mass ratio
- high voltage power supplies
- beryllium viewport and x-ray spectrometer for spectroscopic investigations with highly charged ions
- solutions for ion acceleration and deceleration

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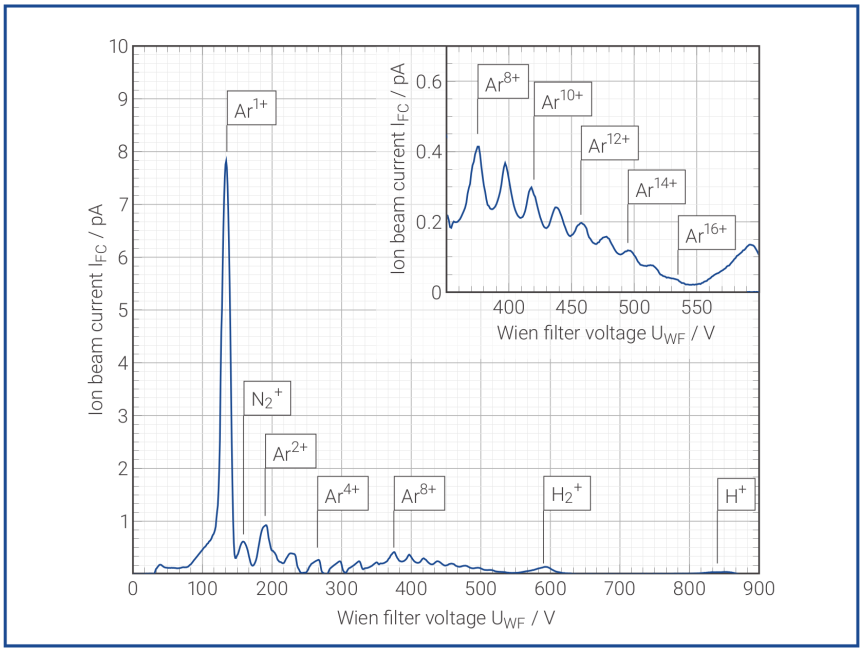
The D.I.S EBIS-C1 allows the generation of ions with low, intermediate and high ion charge states by varying the operation parameters, such as electron beam current, electron beam energy, ionization time and gas pressure. The ion charge state spectrum shown on the right was measured while operating the D.I.S EBIS-C1 in pulsed mode with an ionization time of 100 ms at a pressure of 1.7×10^{-8} mbar. The production of helium-like Ar^{16+} ions has been proven.



The righthand table shows a selection of values of extractable ions per second for different charge states of argon and xenon. These are no ultimate values, as the performace of the D.I.S EBIS-C1 depends on the selected operational parameters and on the conditioning of the ion beam source.

ION BEAM CURRENT VALUES IN PULSED MODE

Ion species	Ions per second
Ar^{1+}	$4 \times 10^8\ s^{-1}$
Ar^{8+}	$4 \times 10^6\ s^{-1}$
Ar^{16+}	$2 \times 10^4\ s^{-1}$
Xe^{1+}	$2 \times 10^8\ s^{-1}$
Xe^{8+}	$3 \times 10^6\ s^{-1}$
Xe^{13+}	$6 \times 10^5\ s^{-1}$
Xe^{18+}	$4 \times 10^5\ s^{-1}$
Xe^{36+}	$4 \times 10^3\ s^{-1}$
Xe^{44+}	$5 \times 10^2\ s^{-1}$

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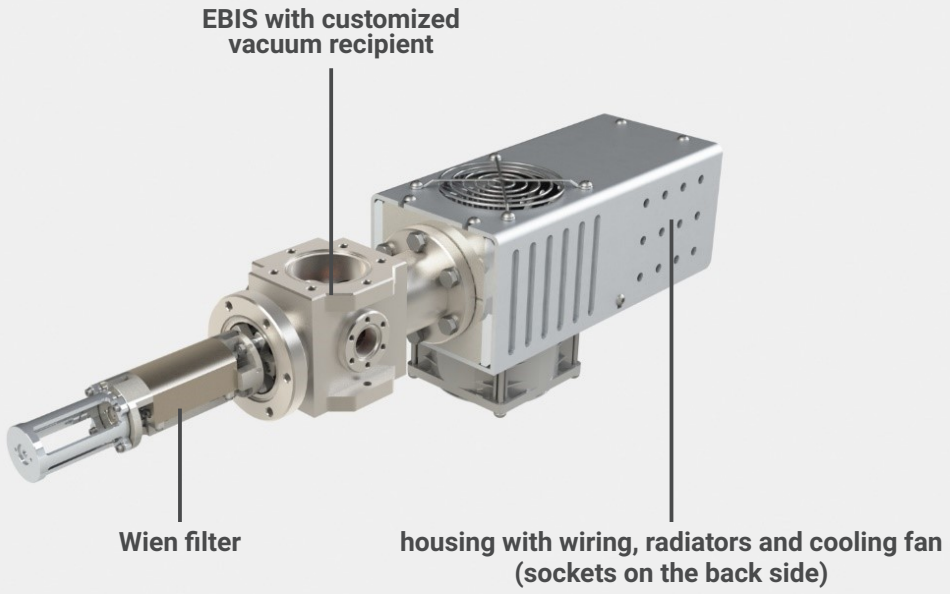

D.I.S EBIS-C1 with installed Wien filter module and customized vacuum recipient.

TECHNICAL DATA

category	ion beam sources
typical electron beam current	10 mA
cathode options	⌀ 0.5 mm cathode (911-S7-09-00001) ⌀ 1.6 mm cathode (911-S7-09-00003)
required vacuum conditions	$<1 \times 10^{-8}$ mbar or better
maximum electron energy	11 keV
maximum ion acceleration potential	10 kV
ion trap length	15 mm
magnet system	bakeable NdFeB magnets
cooling	air-cooling, radiators installed on base flange
maximum bakeout temperature	120 °C
mounting flange	DN40CF flange, inner pipe diameter at least 39 mm
spatial requirement in the vacuum chamber	140 mm (without Wien filter module) 230 mm (with Wien filter module)

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