Kreß GmbH
Sondermaschinenbau

We build machines the like of which the world has never seen

Company Profile

Particle Accelerators
UHV-Technology

The UHV components, special machines and devices from Kreß are unique: They are produced to the highest level of quality in accordance with individual requirements from industry and research and delivered ready for installation.

Company

Family business with passion
Kreß GmbH was founded in 1998 and since 2004 has its headquarters in Biebergemünd-Wirtheim. The company has been successfully led into the 2nd generation by Wolfgang Kreß and his son Andreas Kreß. Quality, reliability and taking an active part in dealing with customers and in projects denote the very essence of Kreß. We follow this concept both externally and internally.

This is apparent from the longstanding cooperation with customers as well as the longstanding company loyalty of our 22 first-class, trained and motivated employees. They are primarily specialist workers, master craftsmen, engineers and physicists. Their loyalty to the company is of genuine value. In the end, extensive experience, established processes and short paths are the key for projects to run smoothly.

Progressive in technology - open-minded in thought
Despite these conservative values, in practice, progressive technology and open-minded thought are paramount. Regular investment in the modernisation of our machinery or the expansion of the production areas are just as important, as well as pragmatic approaches in projects. These characteristics are appreciated by Kreß customers. And have been for more than 15 years.

We make ideas into special machines
In our engineering department we design all necessary components in CAD. A development team allows design and manufacturing knowledge to flow together. In this way, we can ensure that a special machine not only fulfils all the requirements in terms of function and quality. Due to the fact that we continually check and optimise the purchase of third party components, procurement, logistics and feasibility in production, in the end, the result is special machines with a high degree of efficiency.

Usually, the UHV components, special machines and devices are integrated into existing systems and plants by Kreß. We therefore integrate pneumatic systems, sensor technology and measuring technology into the design and ensure communication capability with the customers' existing control electronics. In this way, our extensive experience in the most varied areas of application and conventional systems of plant automation are incorporated together.

We operate a quality management system in the design department which is certified in accordance with ISO 9001 : 2008. We work with the following systems:

3 positions (mechanical design) / Solid Edge and ProEngineer
1 position (electrical engineering) WSCAD for PLC systems S7-1200, S7-1500 and LOGO

Testing technology equipment

3D measurement:

Romer mobile measuring arm for measuring volumes with ø up to 2500 mm
This measuring arm enables precise measurement of a workpiece. When doing this the 3D model produced from the design will be read into the computer of the measuring arm and the measuring points on the workpiece are scanned. The computer for the measuring arm then determines the exact dimensional deviation between the target values of the 3D model and the target values of the workpiece. All measurements are documented in a detailed measurement log.

2D measurement:

TESA micro-hite plus M600
This digital measuring device can measure lengths up to 615 mm and has a measuring accuracy of less than 3µm. Through the modular concept, length measurements can be taken in the form of external, internal, height, depth and distance measurements on geometric elements with flat, plane-parallel and circular cylindrical surfaces in one or two coordinate directions.

Helium leak test:

Pfeiffer Vacuum SmartTest HLT 560, booster pump Pfeiffer Vacuum DUO 008
The detection rate for vacuum leaks is 5×10^{-12} mbar l/s. The HLT 560 He leak tester has an internal rotary vane pump and an He test leak for calibration. For leak detection on recipients with larger volumes an additional rotary vane pump with a pumping speed of 8 m^3/h is used. For leak testing on smaller volume parts devices are used which have been specially developed by us.

Products and Services

The most modern test facilities as well as a certified quality management system ensure that, from design through to commissioning, the end result is special machines with high-class German workmanship.

At Kreß, engineering means: Small, flexible teams from the applications, design, production and assembly departments bring their own ideas and experiences. Short paths and rapid feedback within the project team help to keep up the pace in the development process. In production modern machines and plants for CNC turning and CNC milling ensure the required quality and precision. Highly trained employees and welders who are certified for various processes are also a contributory factor. 3D measurements of workpieces and Helium leak test on UHV components support the development process and in production they help to ensure quality and proper operation.

The range of products:

- Automotive Devices
- CAD Design
- Contract Manufacturing
- Special Machines
- Particle Accelerators
- UHV-Technology

The range of services offered by Kreß GmbH includes:

- CNC milling
- CNC turning
- Conventional milling
- Conventional turning
- Welding of different materials such as Aluminium / VA / Titanium / ST material in accordance with MIG-MAG, WIG, E and autogenous
- Assembly
- 3D measurement
- Helium leak test
- 3D-CAD design with Solid Edge and Pro/Engineer
- Electrical design with WSCAD for PLC systems S7-1200, S7-1500 and LOGO

RFQ-Accelerators

Compact, greater performance, greater flexibility – RFQ accelerators from Kreß

RFQ accelerators

An RFQ accelerator (Radio Frequency Quadrupole) is a special type of particle accelerator which is used for the acceleration of particles at low velocity and usually from behind an ion source. The RFQ high-frequency structure has three essential functions: It takes over the transversal and longitudinal focusing for a high efficient RF acceleration.

Kreß primarily develops and manufactures 4-rod RFQ accelerators (RFQ = Radio Frequency Quadrupole). These plants developed by Professor Dr. A. Schempp at the University in Frankfurt offer a special benefit: They are significantly cheaper than conventional 4-vane RFQ, giving greater flexibility. In this way on one hand, the 4-rod RFQs allow adjustment of the high frequency during operation. On the other hand the modulated electrodes are interchangeable.

New RFQ accelerators: higher beam currents and compact size

In recent years, together with the Goethe University in Frankfurt, Kreß has developed and manufactured several RFQ accelerators. These are increasingly replacing the older high voltage injectors, as they allow higher beam currents. At the same time the machines have more compact dimensions. For some years now, RFQ accelerators with downstream IH accelerators are being increasingly used in medical technology, in particular in tumour therapy using ions. Recently, large therapy centres for tumour therapy with ions have been established in Heidelberg, Marburg, Shanghai, Mailand and in Wiener Neustadt.

Improved RFQ accelerators for the MedAustron therapy centre

Working with the University of Frankfurt, Kreß has developed a new RFQ concept for the MedAustron therapy centre in Wiener Neustadt. These advanced RFQs have a rectangular cross section and are based on a modular design. Once assembled, the electrodes no longer need to be adjusted. A further benefit: The highly critical buncher system was removed from the RFQ resonator and relocated to a position behind the RFQ tank.

Innovative 4-rod RFQ from Kreß

Lots of ideas from Kreß have caught on over recent years. The first 4-rod RFQ with a tank made entirely of aluminium features excellent thermal conduction and extremely good vacuum characteristics. This has been possible through the production of a single milled aluminium block. Also the entire cooling concept of the accelerator structure has been improved and an innovative way to fix the tuning plates to the electrode stems has been found. This system is protected by copyright law.

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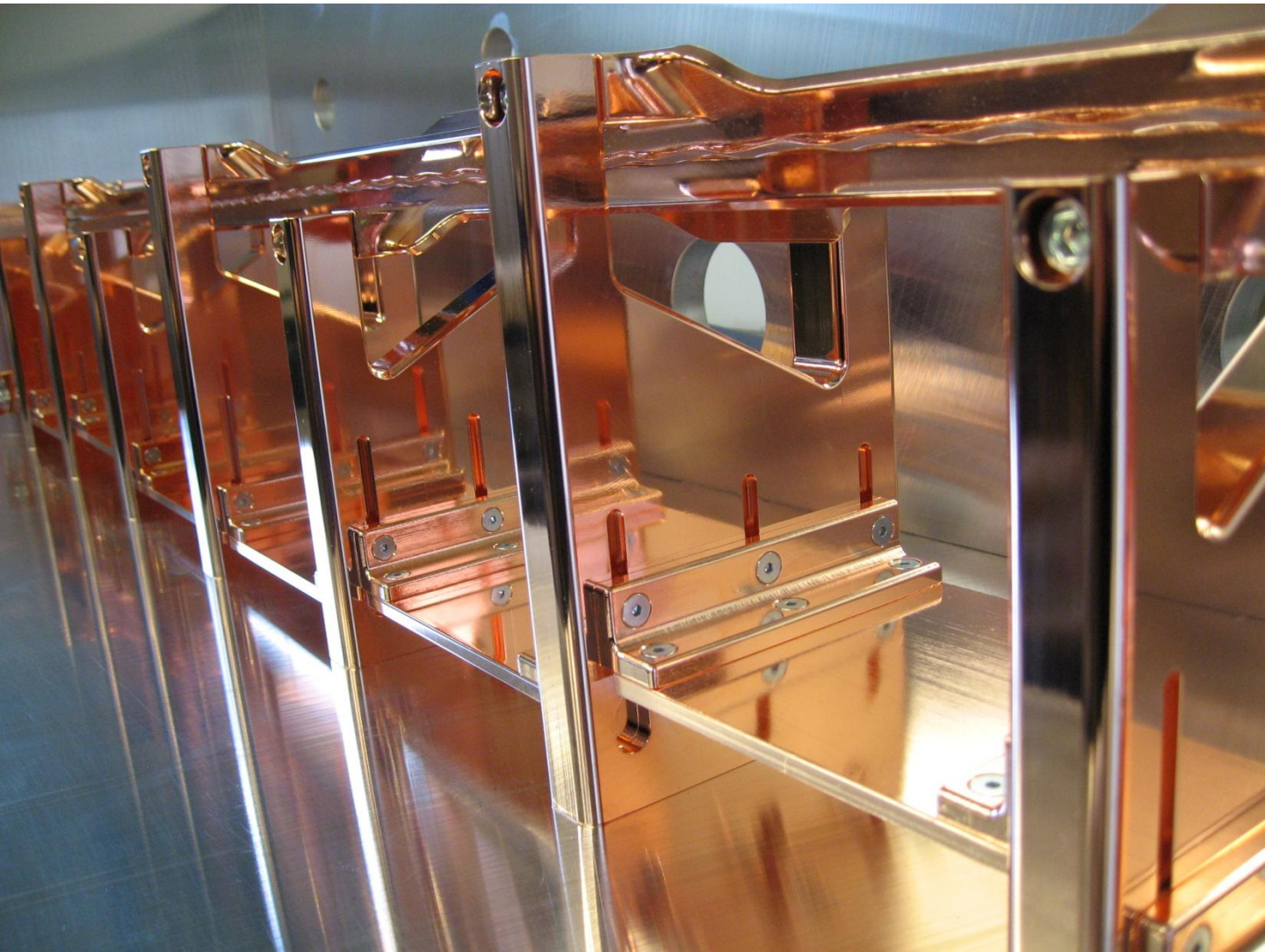
RFQ-Accelerators

New tuning plates for 4-rod RFQ

Kreß GmbH has developed new electrode stems and tuning plates for a new generation of RFQ accelerators for high-performance applications with high beam currents and RF continuous operation (CW). These stems and tuning plates have already been used in the proton RFQ which Kreß GmbH built for the LANSCE project in the Los Alamos National Laboratory.

Calculations with CST Microwave Studio and ANSYS at the Los Alamos National Laboratory have shown that the new tuning plates ensure an excellent electrical and thermal contact between the tuning plates and stems. In addition on this new system, no forces have an effect on electrode stems. With conventional systems these can have a negative effect on the electrode geometry and on the beam dynamics.

The design of the tuning plates is the intellectual property of Kreß GmbH and is protected as a registered design.



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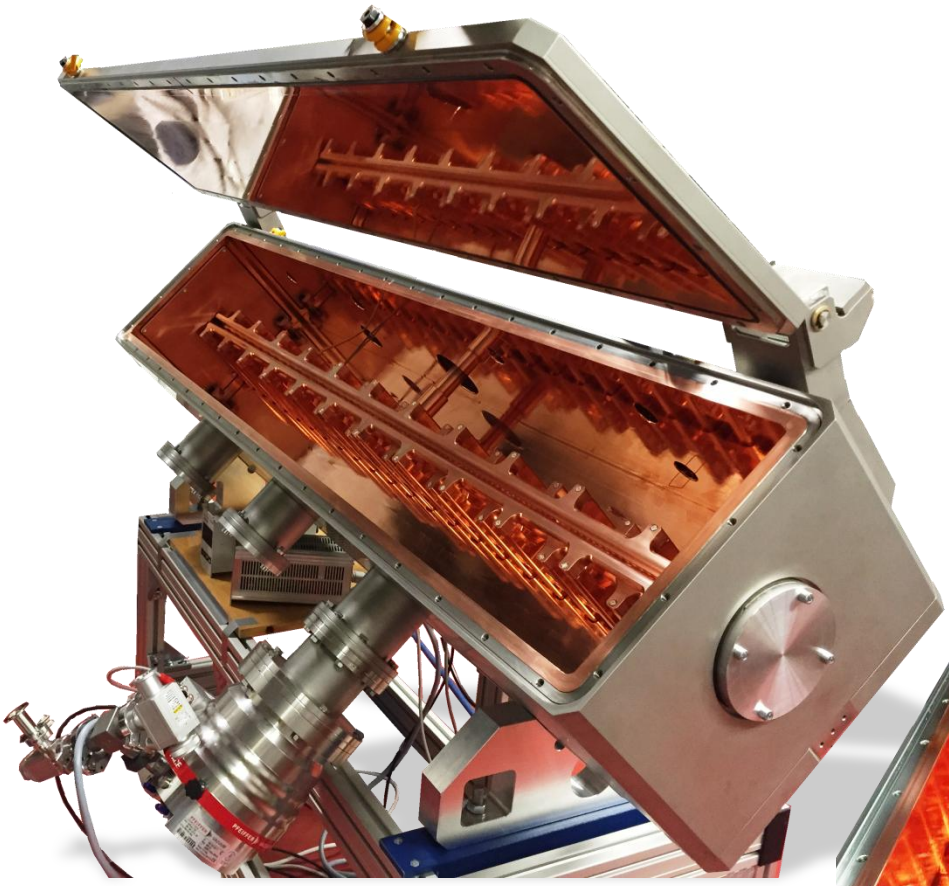
Particle Accelerators

RFQ for LANSCE Project at Los Alamos National Laboratory (LANL, USA)

This 4-rod RFQ will be used for accelerating protons in the injector for the LANSCE accelerator at the Los Alamos National Laboratory (LANL). The RFQ will replace a 40 year old Cockcroft-Walton accelerator. The calculations of the electric field distribution, the beam dynamics and the thermal loads were carried out by Goethe University and LANL. The mechanical design and the CAD design was carried out on our premises, working closely with both institutions. The RFQ accelerator was fully manufactured in our workshop. Carrying out all production steps in just one production operation guarantees the required high level of quality.



Data

Resonance frequency:	201.25 MHz
Particle energy:	35 – 750 MeV/u
Electrode voltage:	50 kV
Length:	2000 mm
Cross section:	400 x 420 mm

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Particle Accelerators

RFQ accelerator for MedAustron (medical application, cancer therapy)

Over recent years tumour therapy with protons and carbon ions has become increasingly important in the medical field. This RFQ accelerator was newly developed and constructed for the “MedAustron” plant in Wiener Neustadt.

The accelerator has a rectangular cross section and consists of three basic elements (base plate, frame and cover). This construction enables simple and quick assembly of the parts. The accelerator structure is entirely installed on the base plate and means that subsequent adjustment after assembly is unnecessary.

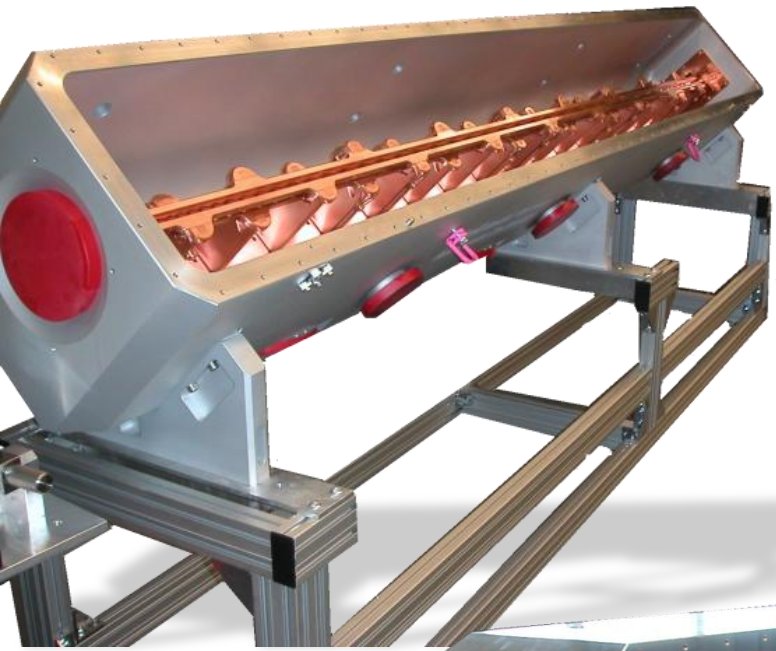
Data

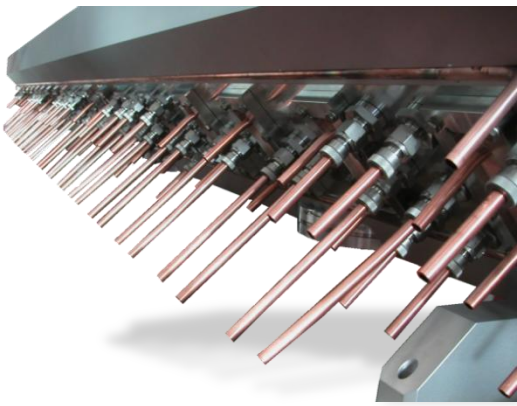
Resonance frequency: 216.8 MHz
Particle energy: 8 – 400 keV/u
Electrode voltage: 70 kV
Dimensions (LxWxH): 1330 mm x 420 mm x 380 mm

Particle Accelerators

Radio Frequency Quadrupole (RFQ) Particle accelerator / Michigan State University

This RFQ accelerator is the first “4-rod type RFQ” with rectangular cross section, which is milled out of a block of aluminium. The accelerator structure itself (electrodes, stems and tuning plates) are made of OFHC copper.
All standard flanges are ConFlat (CF) flanges. Due to an innovative concept for fixing the electrodes and the electrode supports, it is no longer necessary to adjust the electrodes. In addition it is not necessary to galvanically copper plate the internal surfaces of the tank which is time-consuming and costly.





Data

Resonance frequency:	80.5 MHz
Particle energy:	12 – 600 keV/u
Electrode voltage:	86.2 kV
Dimensions (LxWxH):	3500 mm x 500 mm x 500 mm

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Particle Accelerators

325 MHz Prototype Ladder-RFQ

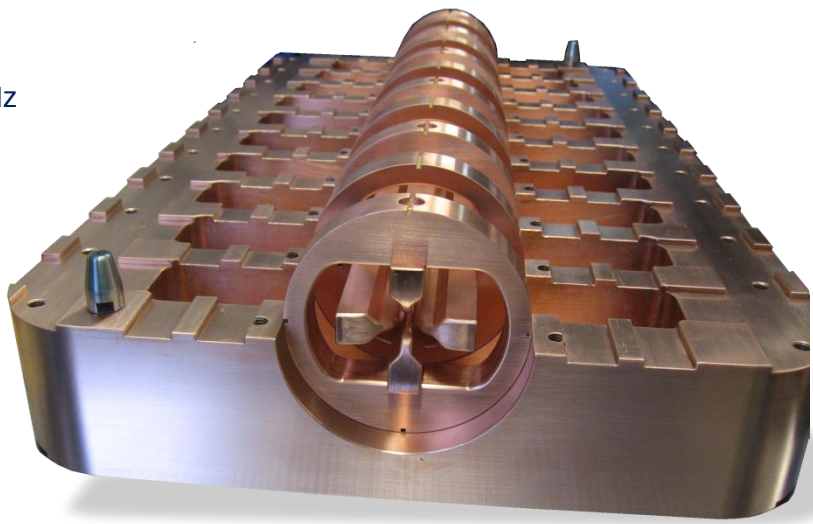
Very often a high-frequency quadrupole accelerator (RFQ) is used to accelerate protons. This prototype is a 4-rod RFQ which here works as a Ladder- RFQ.

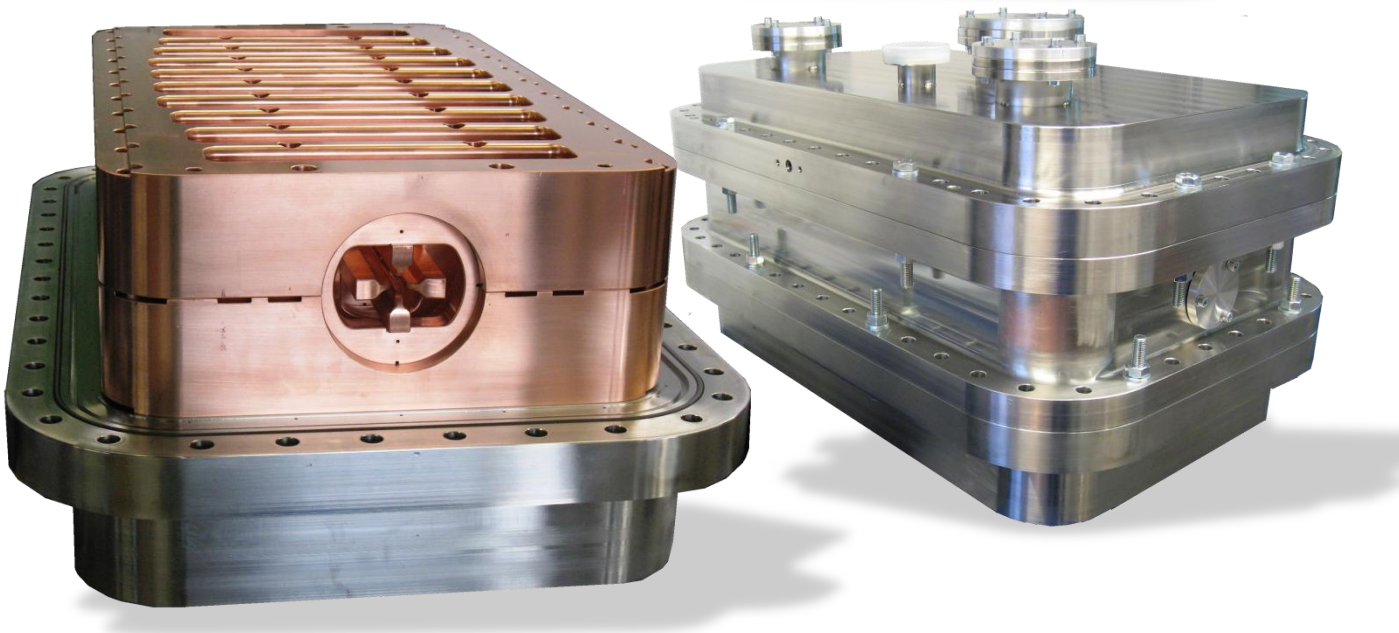
The Ladder-RFQ is a development from the Goethe University in Frankfurt for the proton injector for the FAIR project at GSI in Darmstadt.

The benefits of this RFQ are the negligible dipole components even at high frequencies and the simple and cost-effective production in comparison with a conventional 4-vane RFQ.

Feature
The exact position of the rings with the electrodes mounted requires precise machining of all parts with an accuracy of 1/100 mm, so that all components fit perfectly and you therefore achieve the best level of electrical contact.

Data
Resonance frequency: 325 MHz
Number of cells: 11





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Particle Accelerators

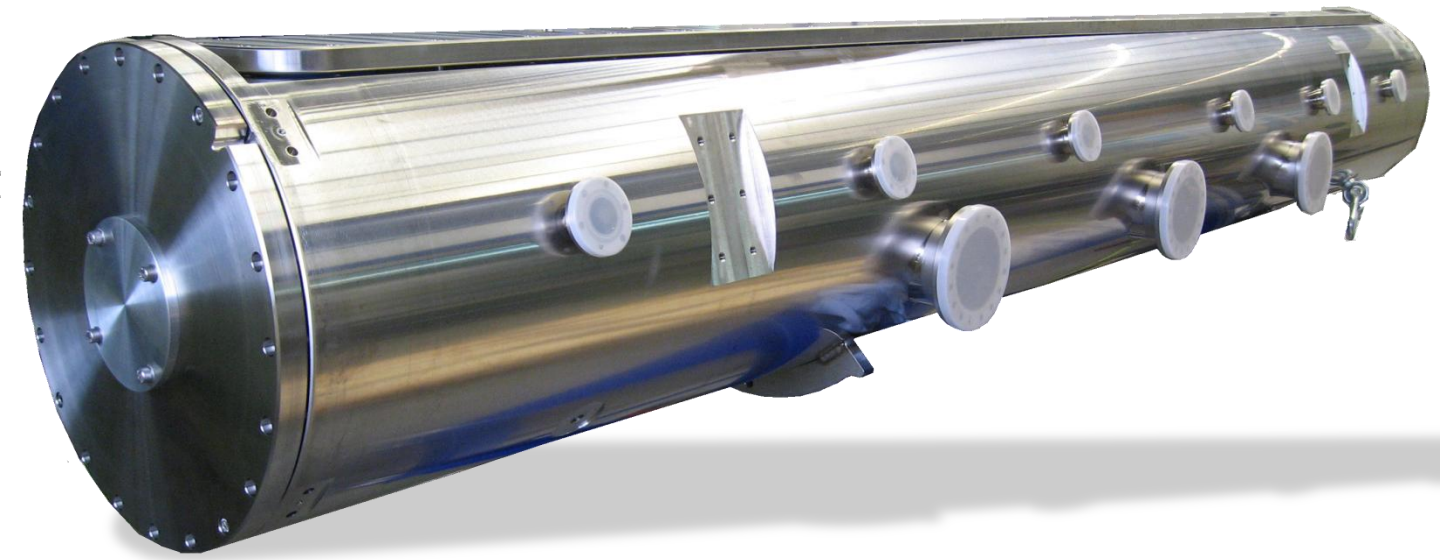
RFQ-NICA Project Dubna

This 4-rod RFQ is a conventional RFQ accelerator, where the accelerator structure is located in a cylindrical tank. Access to the accelerator structure is through a long, removable cover.

The RFQ was developed by BEVATECH OHG in Frankfurt for the Nuclotron-based-Ion Collider facility (NICA) in Dubna, Russia and produced by Kreß GmbH.

Data

Resonance frequency:	100.625 MHz
Particle energy:	17 – 300 keV/u
Electrode voltage:	80 kV
Length:	3160 mm
Diameter:	450 mm



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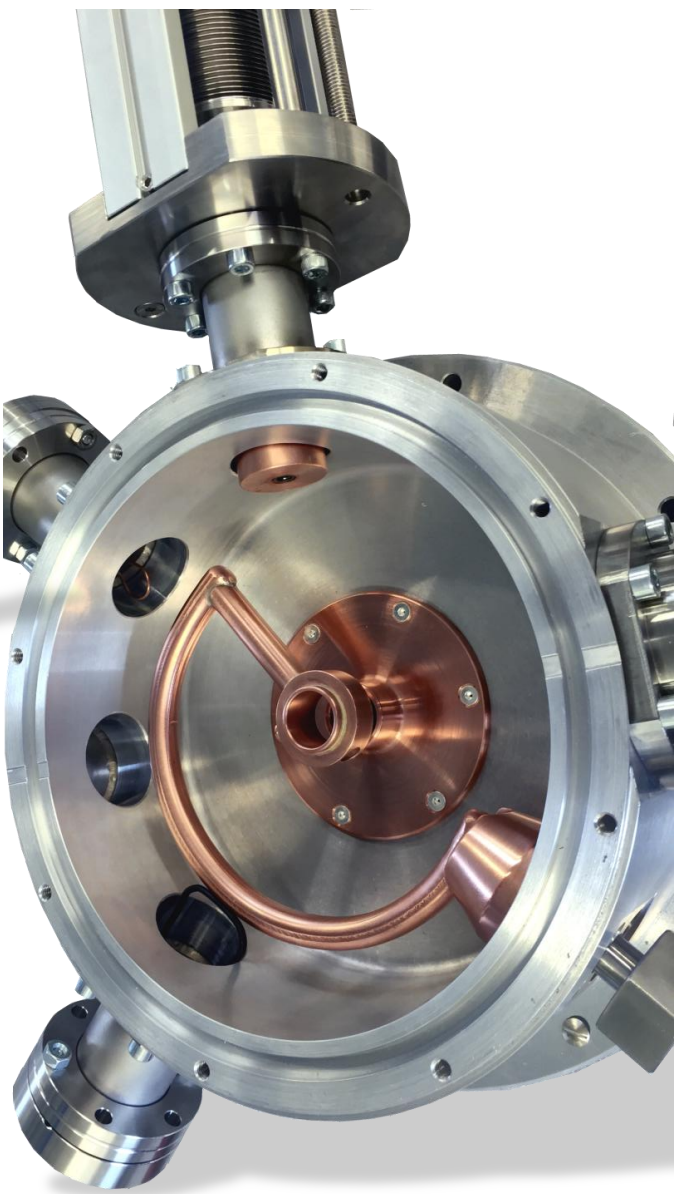
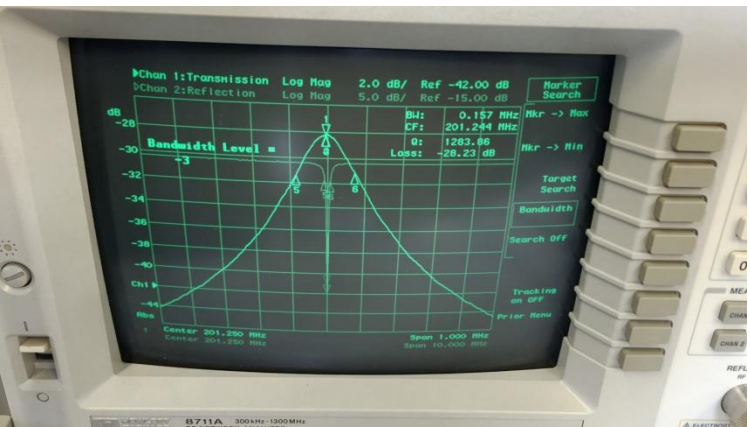
Particle Accelerators

ECU (Energy Correcting Unit) for LANSCE RFQ at LANL

This spiral resonator is fitted directly onto the beam output of the RFQ proton accelerator at the Los Alamos National Laboratory (LANL). In this way, the beam energy of 750 keV/u at the output of the RFQ accelerator can be precisely adapted to the subsequent accelerator. The high-frequency performance required for this will be decoupled from the RFQ accelerator and fed into the spiral resonator.
The resonator is made from an aluminium block which guarantees good thermal and electrical conductivity. The spirals and both drift tubes are made of SF-Cu.

The screen of the network analyser shows the resonance frequency of 201.25 MHz and a reflected RF power less than -40 db. Furthermore you can read off the loaded quality factor Q.





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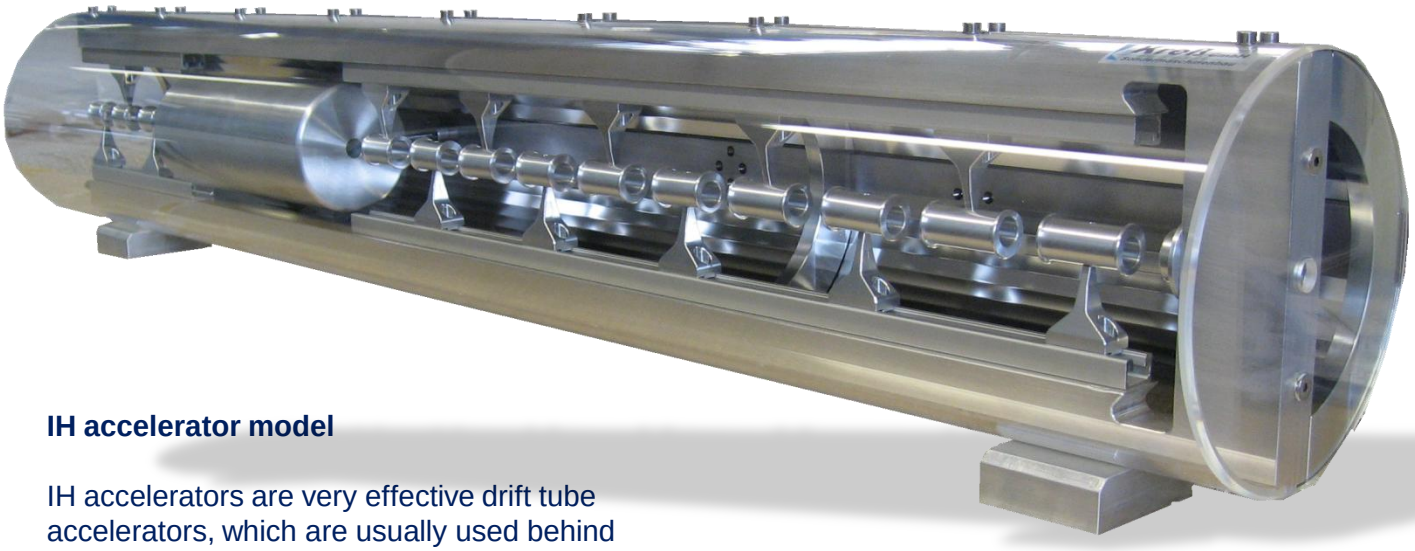
Particle Accelerators



IH accelerator model

IH accelerators are very effective drift tube accelerators, which are usually used behind RFQ accelerators and accelerates the particles to higher energy. This IH accelerator is a display item, which was produced for the Institute of Theoretical Physics at Goethe University in Frankfurt.

Data

Length:	2510 mm
Diameter:	100 mm

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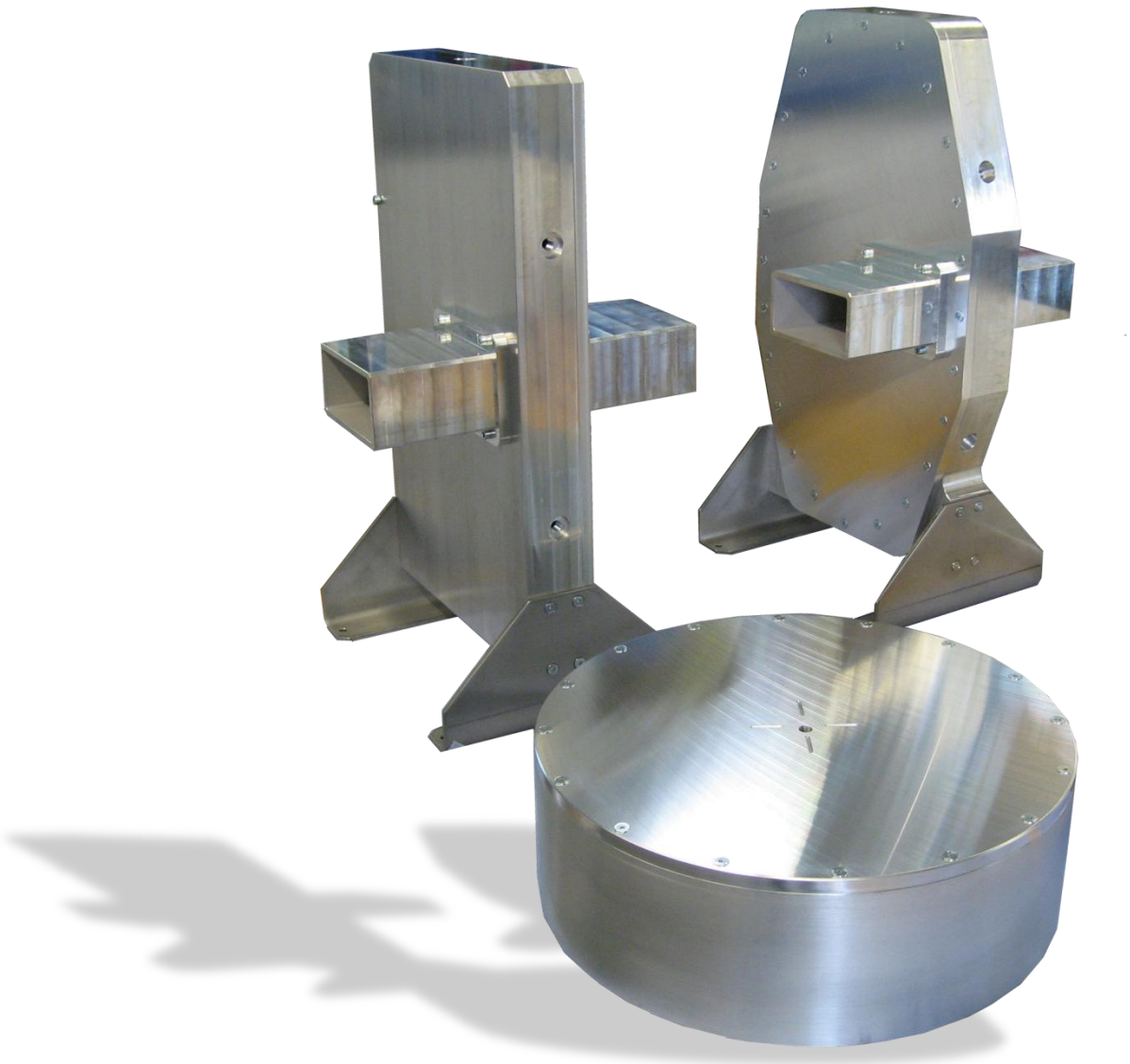
Particle Accelerators

Calibration resonators

Calibration resonators are cavities for which you can calculate the resonance frequency from the geometric data. They are used for calibration, or determining the perturbance body constants of balls or small pipes made of ceramic. With these calibrated perturbance bodies, it is possible to accurately determine the field distribution of a high-frequency resonator which is fitted in a beam line. Three calibration resonators with elliptical, rectangular and round cross sections were manufactured for the GSI in Darmstadt. During production compliance with the mechanical tolerances of 0.01 mm and surface roughness Rz<2µ must be observed.

Features
Main body milled out of an aluminium block
Surface roughness after machining Rz < 2µm
Dimensional tolerance <0,01 mm
Good electrical contact between the main body and the cover



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UHV-Technology and Particle Accelerators

Precise motorised UHV linear feedthroughs for use in the Ultra High Vacuum (UHV).

These linear feedthroughs have a potentiometer for reading the exact position of the plunger in the vacuum chamber, a customer-specific stepper motor or DC motor, two limit switches and permits optional water cooling.

Data

Mechanical stroke:	Maximum 250 mm
Mounting flange:	DN 63CF – DN 250 CF
Drive:	Step motor / DC motor (depending on customer requirements)
Positioning:	< 10µm
Vacuum seal:	Welded bellow
Can be heated:	Up to 150 ˚C
Water cooling:	Cu pipe through welded bellow (optional)

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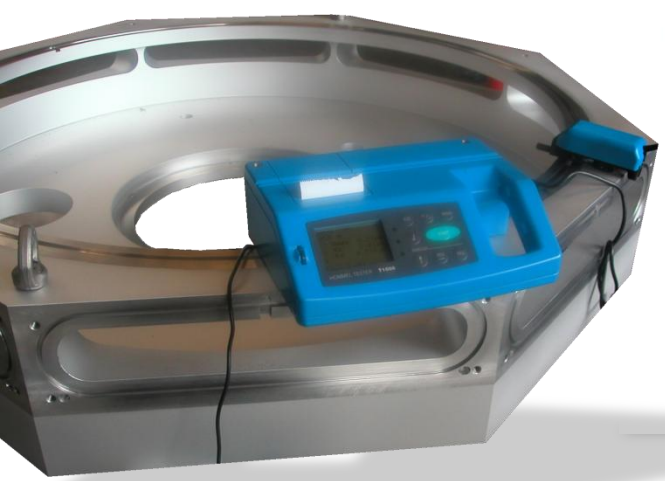
UHV-Technology

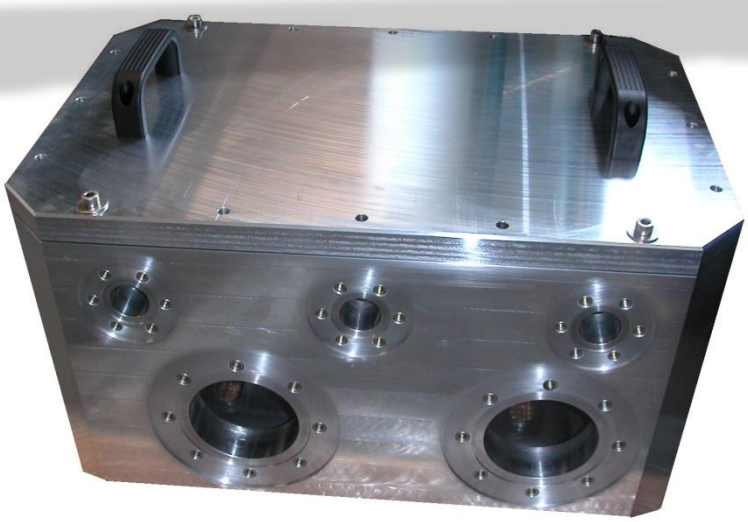
Vacuum chambers / Customer specific

We produce vacuum components exclusively to meet the requirements of our customers.

Send us your sketches and we will use them to create production drawings in our design office or give us your production drawings and we will manufacture and test the components using these drawings.

You can also simply send us your requirements for a vacuum component and we will design and produce the components to meet your specifications. From the design stage through the construction process and production and on to testing of components, we will keep you informed at every stage so you will be able to monitor the entire production process for your component.





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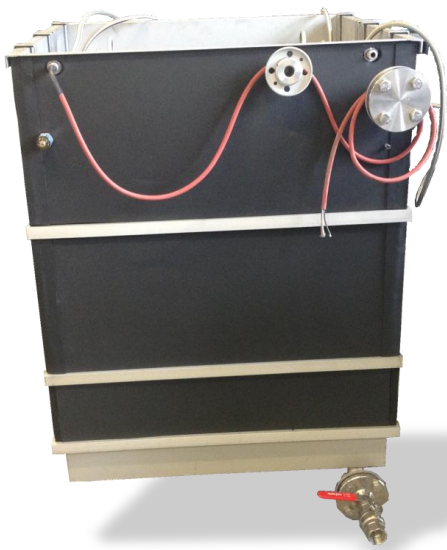
UHV-Technology

Ultrasonic bath

The program-controlled ultrasonic cleaner can be used for any application related to ultrasonic cleaning or decontamination.

The power-on time, duty cycle, temperature and RF power can be programmed separately using the SIMATIC control unit. The control unit also monitors all parameters during the cleaning process. The plant has a network connection and can therefore be operated remotely.



Data

Dimensions of the trough:	950 x 930 x 1100 mm
Total volume of the trough:	980 Litre
Frequency:	25 kHz or 40 kHz
Total RF power:	6 kW (4 x 1.5 kW)
Maximum temperature:	80˚C
Programming and control:	Siemens SIMATIC
Remote control / Connection:	Ethernet

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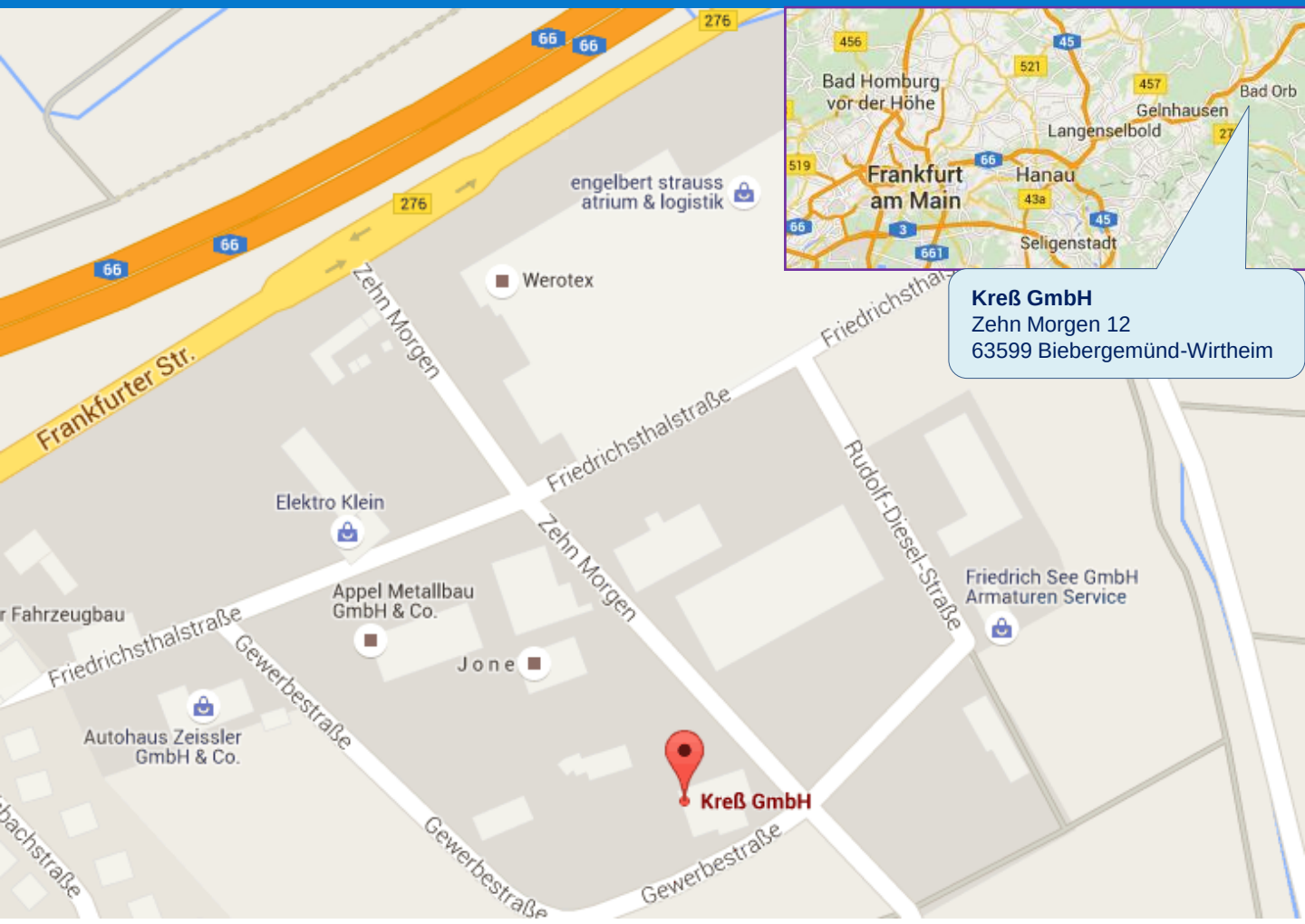
How to find us



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