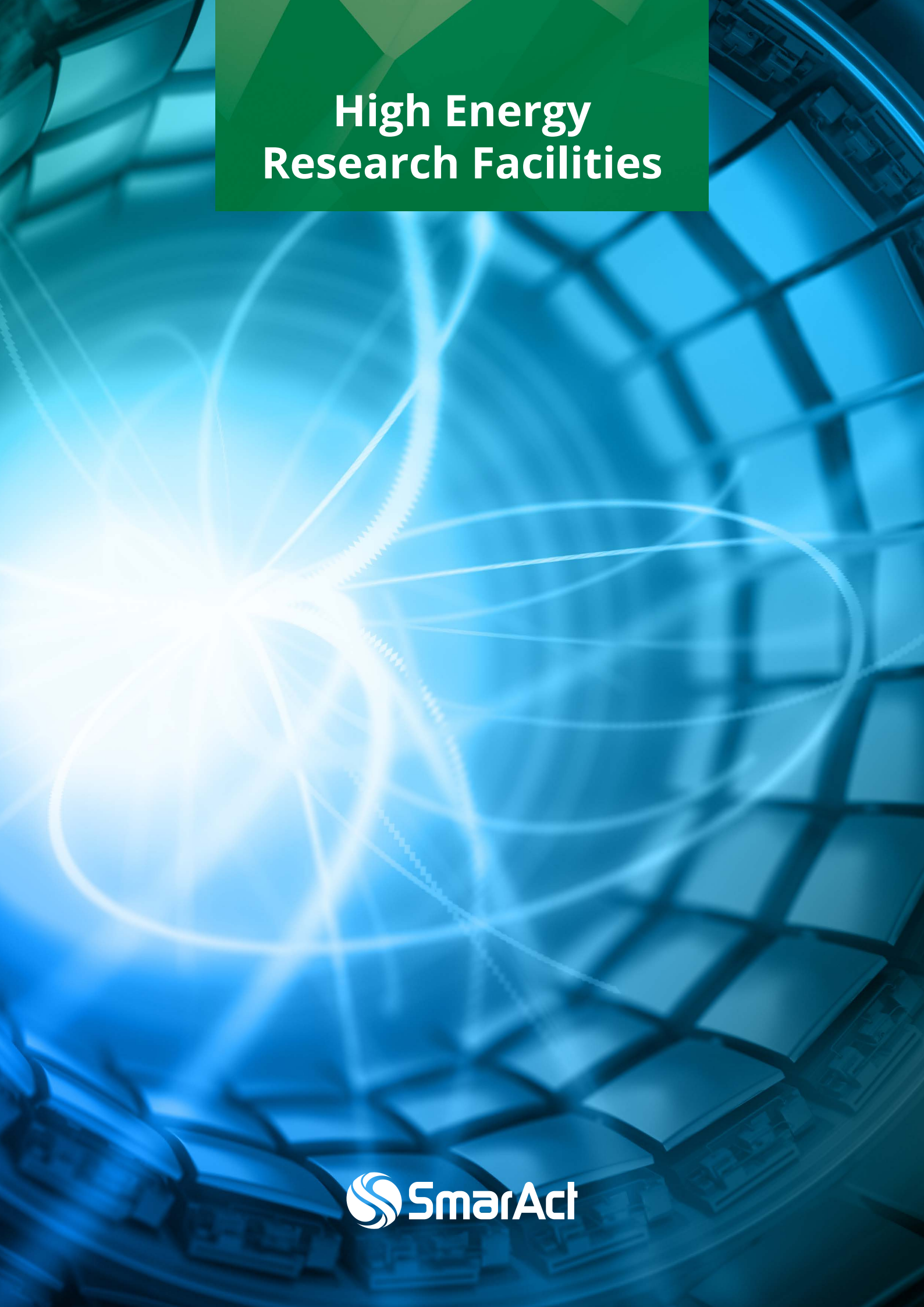
High Energy Research Facilities



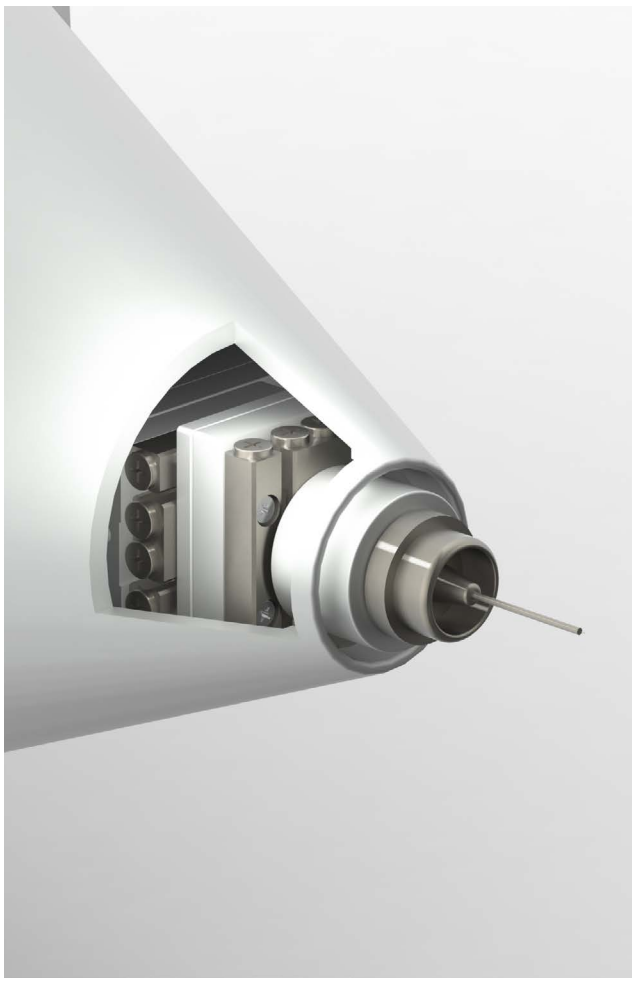
High Energy Research Facilities

Top notch research is, and always has been, a key driving force for innovation and invention. Founded as a university spinoff, research and engineering are the base of SmarAct's success. Given those roots, we at Smaract are proud to support researchers all around the globe, promoting their scientific achievements with our expertise in high precision positioning and metrology technologies.

High Energy Research Facilities such as particle accelerators, synchrotrons, free electron lasers, X-Ray optics or crystallography experiments require a challenging feature set for their positioning solutions. Complex movements with multiple degrees of freedom, accuracies down to the micro- or nanometer range and rotational positioning with low eccentricity meet extreme environmental conditions like ultra-high vacuum surroundings, wide temperature ranges or presence of magnetic fields.

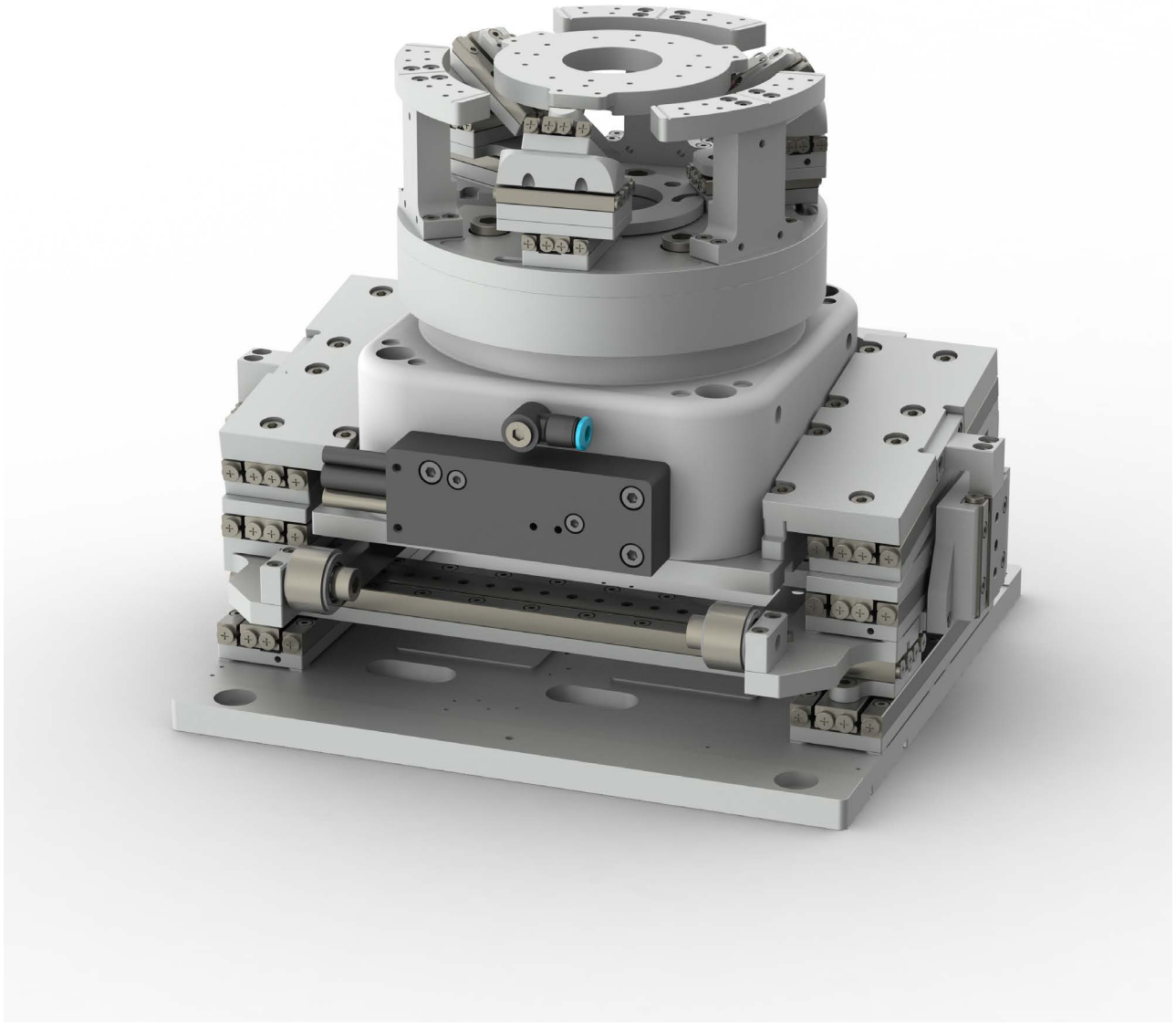
Smaract's flexible in-house production combined with our construction-, engineering- and validation capabilities enable us to be a reliable partner for exactly those projects. Whether you need a single positioner, a complex position solution or a custom robotic system – we offer the expertise to find the ideal approach for your application.

Complicated? We put you on point!



Correction of Eccentricity During Rotations

Today's synchrotron, Nano CT and Macroscopic Protein Crystallography facilities share similar requirements in the design of their end stations. A primary requirement is the possibility to accurately position and rotate samples with sufficiently low eccentricity in the range of < 1 µm within a highly focused X-ray beam. SmarAct has extensive experience in the fabrication of such demanding positioning solutions using inhouse fabricated linear and rotary nanostages. Application specific combinations of single axis stages are used to achieve fine positioning to meet the most demanding requirements. In collaboration on various projects, customers such as the Fraunhofer Institute for Integrated Systems (IIS), the University of Lund at Max Lab, Shanghai Synchrotron and Radiation Facility and Brookhaven National Lab commissioned systems with various levels of integration to develop and continuously operate solutions for research and developmental purposes benefiting from our experience with custom applications.



Multi Axis Positioning Systems

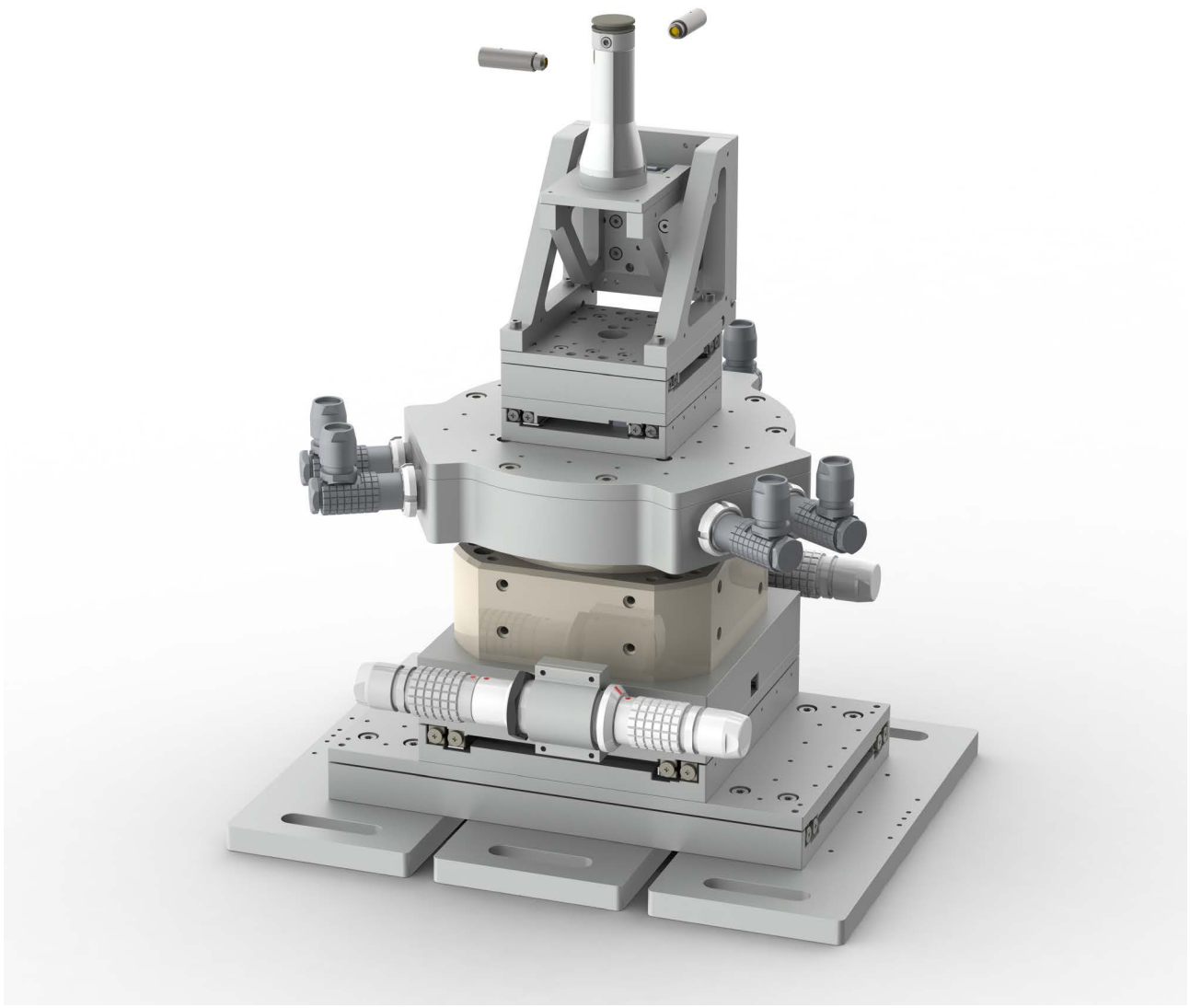
The pictured multi-axis positioning solutions provide highest precision capabilities on the nanometer range using SmarAct's piezo stick-slip positioners while also achieving macroscopic travel ranges of up to several centimeters, necessary for coarse and fine alignment of the sample with the beam. We can provide positioning systems with various degrees of freedom from single axis positioners, over basic XY-setups to 6 DoF multi-axial parallel kinematics and complete customized installations. They can be designed to align small diffraction samples of a few grams within an external cryo-stream or to tip-tilt and position extensive loads of complex sample holders with integrated cryo-coolers of up to several kilograms.

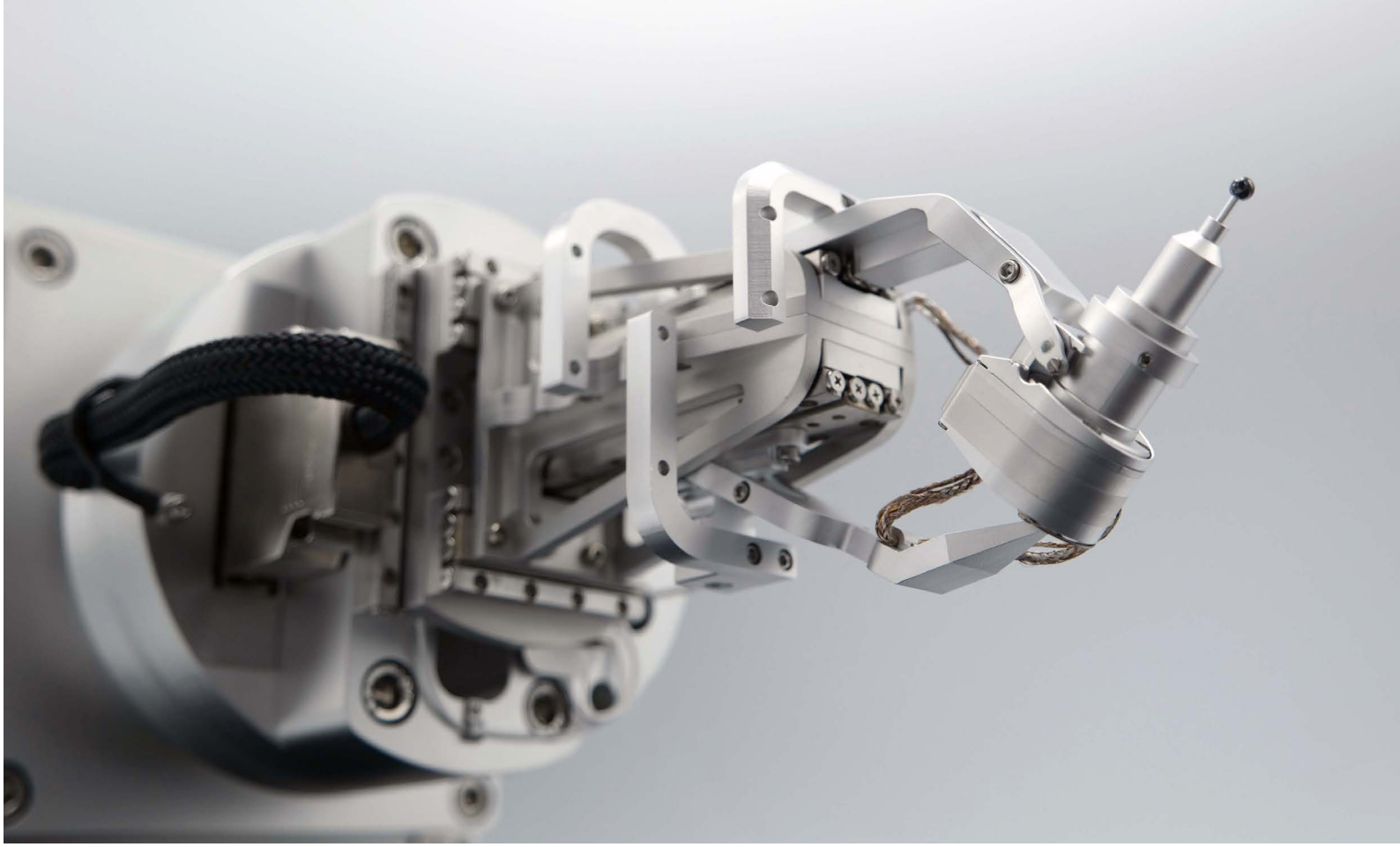
Active Compensation

Sample positioning to offset or correct eccentricity errors are typically performed by linear XY-stages which are placed on top of the continuously rotating parts. Achieving rotations angles of > 360° with electronically wired stages require in general extensive integration effort and large installation spaces. With the consideration of those challenging circumstances a compact and reliable solution with a standardized interface, mountable on most common slip-ring assemblies, was devised. All necessary sensor electronics are integrated into the air bearing connectors design.

As the piezo scan range of SmarAct's piezo drives exceeds the eccentricity error of commonly used air bearings they are the ideal choice for a quick, responsive, and active compensation. Such active position correction algorithms can be devised either by programmed look-up-tables which can be generated by a provided calibrator, by capacitive sensors or performed with support of SmarActs **PICO**SCALE Interferometer.

To provide a complete solution, SmarAct uses high precision cylinders as reference to integrate active interferometer-based compensation. Individual subcomponents to retrofit already existing setups can also be provided.

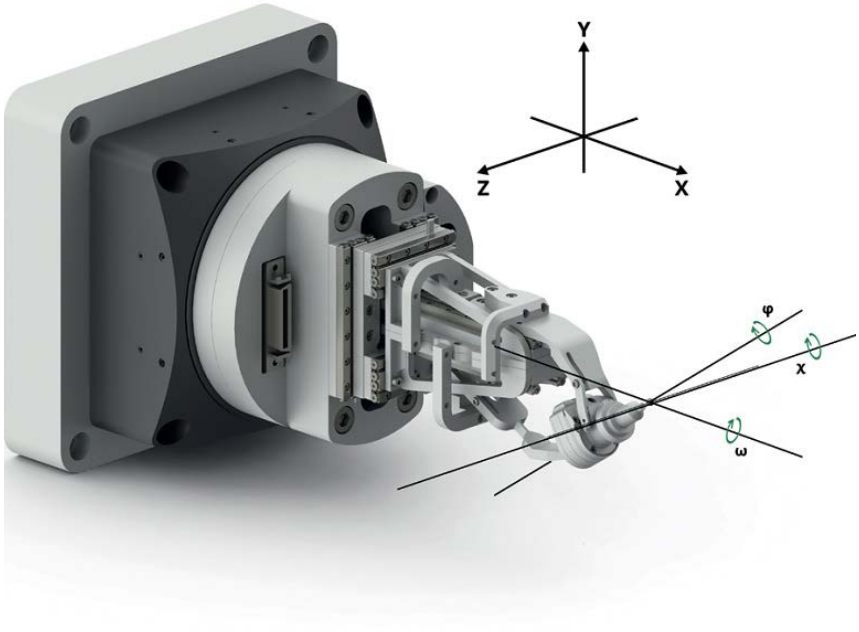




Crystallography

Highest precision, robustness and reliability are the top priority properties when selecting positioning equipment for the use in science and industry. SmarAct has designed a robotic positioning system with six degrees of freedom to be used for various positioning tasks in experiments or micro-assembly setups. Its compact design results in a slim silhouette and allows large rotary angles even in confined spaces. With a smart automated calibration routine, it achieves a sphere of confusion in the single-digit micrometer range for all rotary axes.

The **SMAR**GON is a positioning system with six degrees of freedom based on a combination of serial and parallel kinematics mounted to a heavy duty rotation stage, defining the ω-axis of the device. This rotation platform can either be a Direct-Drive or a piezo-driven stage. The sophisticated hybrid kinematic approach allows the end effector which can also be a component or another payload up to 50 grams to be positioned in X, Y and Z direction and to be rotated in χ-, φ- and ω-direction.



With the development and production of market-leading solutions in the field of high-precision positioning, automation and metrology, the SmarAct Group reliably accompanies their customers in achieving their goals. The broad product portfolio – from single positioning stages to complex parallel kinematics, miniaturized robots, control systems and measurement technology – is complemented by automated microassembly solutions. Even the most challenging customer requirements can be met by maximum adaptability and complete in-house production.

Since its founding in 2005, SmarAct has steadily grown from a small team of engineers to a group of companies with three independent business units and over 220 highly skilled members. Today, SmarAct relies on years of experience and, above all, on a very passionate team with unconditional customer focus.

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