WE OPTIMIZE PRODUCTION
Competence and expertise, scientific excellence and innovation are the hallmarks of the Fraunhofer Institute for Production Systems and Design Technology IPK in Berlin. For over 35 years now our international and interdisciplinary team has supported our partners and customers with application-oriented research and development.

To ensure that your own production system is competitive, sustainable and resource-efficient, we don’t merely optimize individual process stages, methods, technologies and applications but take a holistic view of the whole process and value chain. We offer systems solutions for the entire spectrum of industrial usage – from production development and production processes to maintenance of investment assets, product reuse and recycling to design and management of factory operations. Our proven approach is of equal benefit to manufacturing industry, service providers and public institutions. What’s more, we also transfer technical production solutions to areas of application outside of industry – such as transport and security.

We cordially invite you to take a look at the range of services we offer and the way we work and see how you too can benefit from the scientific know-how of our team of dedicated experts. We look forward to meeting you and sharing expertise.

Prof. Dr. h. c. Dr.-Ing. Eckart Uhlmann
At Fraunhofer IPK we conduct applied research and development across the whole process spectrum of manufacturing industry – from product development, production processes, maintenance of investment goods, and product recycling to the design and management of manufacturing companies. We also transfer production technology solutions to areas of application outside of industry such as transport and security. IPK is structured in the divisions Corporate Management, Virtual Product Creation, Production Systems, Joining and Coating Technology, and Automation Technology. Close collaboration between divisions means that we are able to tackle even extremely complex issues.

As an institute of the Fraunhofer-Gesellschaft, we tailor our work closely to the needs and requirements of our customers and partners. With its market orientation and high real-world value, our R&D helps to sharpen their long-term competitive edge. We develop forward-looking novel solutions and modernize, optimize and extend existing technologies and applications. In all our endeavors we seek to harmonize economic considerations with the imperatives of resource efficiency, sustainability, and environmental compatibility. Apart from contract research, we also conduct pre-competitive research projects to develop innovative concepts for tomorrow’s production, working closely with our partners to transform the basic innovations thus delivered into marketable products.

Private-sector companies, industry associations and public sector institutions and agencies can all draw benefit from the innovative strength of Fraunhofer IPK. Our enterprise customers range from global players in a wide range of industrial and service branches to a broad base of small and medium-sized enterprises (SMEs). Indeed, an ever larger number of SMEs are being integrated as development partners and systems suppliers in enterprise networks; giving them a gateway to low-cost and ecologically friendly solutions is one of our key endeavors.
The Production Technology Center (PTZ) Berlin hosts two research institutes: the Institute for Machine Tools and Factory Management (IWF) of the Technische Universität Berlin and the Fraunhofer Institute for Production Systems and Design Technology IPK.

The round building consists of a central machine hall enclosed by an office building and fronted with a seminar building, and was built between 1982 – 1986 by the architects Professor Gerd Fesel and Professor Peter Bayerer. In 2011 when work was completed on the Application Center for Microproduction Technology – AMP, the PTZ was enriched with a state of the art laboratory building dedicated to production of microcomponents and structures. Architect Peter Bayerer ensured that the new building fitted seamlessly into the existing architecture. Covering some 10,000 square meters, the ensemble of buildings offers room for a central test area, numerous specialized laboratories and workshops, lecture halls and seminar rooms for training and further education in engineering sciences, and six floors of offices. The premises of the PTZ are ideal for building bridges between research and industrial application.

And with such infrastructure to draw on, our partners know that they can rely on us for each and every stage of development. Feasibility studies, project planning and research project management are just as key elements in the range of PTZ services as specific development activities and systems testing. Furthermore, with its »Mehr Können« further education program the PTZ promotes the transfer of know-how by organizing a broad range of events of all types of formats targeted at specialists and management that offer practical knowledge and useful insights into the latest methods and technologies.

In addition to university teaching at IWF, both institutes offer students internships and job opportunities which in many cases have served as the springboards to successful careers. Formats such as »Jugend forscht« (Youth Researches) and »Girls’ Day«, and guided tours of the institute for national and international students also help us to pass on our passion for the engineering profession – and most of all for mechanical engineering – to the next generation.
The concept of uniting expertise in basic know-how with application-oriented research embodied by PTZ can look back on a long tradition. Professor Georg Schlesinger, who founded the IWF in 1904, attached tremendous importance to nurturing the dialogue between science and industry, and his decidedly practical approach is exemplified in the IWF test area for production technology, the first of its kind to be introduced in Germany.

Professor Günter Spur who became IWF director in 1965, introduced the idea of a Berlin Research Institute for Production Technology, an institution of applied research which could act as a bridge builder between university basic research and industrial applications. This was the idea that led to the founding of Fraunhofer IPK in 1976, initially as a branch of Fraunhofer IPA in Stuttgart, then as an independent institute in its own right in 1979.

In 1986 Fraunhofer IPK and IWF were given a new building which brought them together under one roof. The architects designed a circular set of buildings that in architectural terms integrated management and production and thus nurtured a stronger sense of community. The concept and its implementation received the German Architectural Award in 1987.

Since 1997 Professor Eckart Uhlmann has been director of both Fraunhofer IPK and the division of Machine Tools and Manufacturing Technology at IWF. Under his leadership a strategic realignment of PTZ research foci took place putting a new focus on the lifecycle phases and process chains of manufacturing and production-related industry. With this move, the PTZ now covers the whole spectrum of industrial usage.
With our proven track record in the field, we can advise and assist you in building effective innovation structures on the regional and national level.

Our methods include analysis and evaluation instruments such as benchmarking and knowledge management. Building on these, we develop and implement customer-tailored tools for process management and technology-oriented factory planning, and design value networks and supply chains. We take a holistic and interdisciplinary view of companies and organizations, their processes, products and customers, their organizational structures and information technology and their suppliers and competitors. Our team of mechanical and industrial engineers, computer scientists, natural scientists and social scientists develops customer-specific all-round solutions – from concept development to roll-out. Our mission is to deliver performance-related processes that are effective, efficient and human-centric.

Prof. Dr.-Ing. Holger Kohl

Process innovation secures enterprise long-term competitive advantages. We don’t simply take a look at those processes that directly concern production and services but also cover the whole range of a company’s planning and controlling processes. Our Corporate Management division is dedicated to the planning, specification and roll-out of such processes and structures.

Our two specialist departments »Business Excellence Methods« and »Business Process and Factory Management« develop innovative ideas for management, planning, controlling and production processes. Implementation of these concepts is critical for ensuring the competitiveness not just of individual enterprises and organizations but also of complex companies and supplier networks in a wide range of different industrial and service sectors.

Our R&D Focus:

» Knowledge Management and Intellectual Capital Statements
» Benchmarking
» Innovation Systems: Planning and Realization of Research Centers and Technology Parks
» Cooperation and Innovation Management
» Process-oriented Management Systems for Company Planning and Controlling
» Holistic Production Systems
» Self Organized Production Systems
» Next Generation Shopfloor IT
» Process Management 4.0
Modern product development is no longer just a matter of technical skill but a strategic technological challenge that takes into consideration the entire lifecycle of products and services. Digital techniques, processes and methods define the core of engineering because they enable successful planning and controlling of development time, product quality and associated costs. In the Virtual Product Creation division we realize the vision of a fully digitized product creation process. In addition to solutions for Begin of Life (BOL) until the start of production we also work on digital engineering solutions that enable subsequent stages of the product lifecycle such as production, the use of products and associated services up to maintenance, end of life and reuse.

Our two specialist departments »Information and Process Control« and »Model-based Engineering« support industrial companies and public institutions in their quest for ever-higher standards of excellence in their solutions. Our portfolio of consultancy and development services ranges from independent technology surveys and optimization of digital applications (e.g. CAD, CAE, Digital Mock-up, Digital Factory, PDM/PLM) to optimization of information standards and IT integration architectures. Our well recognized experience is targeted to improve your company situation: state-of-the-art analysis of the as-is (existing) solution as well as the development of the future state solution set. We can help you make the successful switch to a modern, fully digitized organization operating at high efficiency and utmost effectiveness.

Dr.-Ing. Kai Lindow

We redefine product development as a powerful engineering operating system consisting of the following intertwined layers: organization and processes, engineering activities and collaboration, digital information models and best fit information technology.

Our R&D Focus:

» Product Data Management (PDM) and Product Lifecycle Management (PLM)
» CAD and CAE
» Virtual Reality
» Tangible Functional Safety
» Model-based Systems Engineering
» The Smart Factory and Industry 4.0
» Sustainability, Energy Efficiency and MRO
Materials, tools and production techniques, machines and process chains are the beating heart of manufacturing industry and the extraordinarily diversified area of expertise covered by the Production Systems division. Our work is focused on the development, fabrication and adaption of production and manufacturing technologies, and on the engineering and control techniques needed in the creation of innovative products. Our specialist departments »Manufacturing Technologies«, »Microproduction Technologies« and »Production Machines and Systems Management« develop novel machines and processing strategies, optimize existing production facilities and engineer forward-looking concepts for tools.

On top of this we also develop solutions for systems and process automation, control and monitoring, analyze and remove interference factors and embed novel techniques in existing process chains. We also support manufacturers in the development and roll-out of novel product-related services. The complex interdependencies that exist between these multiple areas of innovation mean that an interdisciplinary approach that takes an all-round view of the totality of company processes is vital for the evolution of all our solutions.

The technologies and systems we develop are deployed in both industrial micro- and macro-production and may be found in a vast array of fields from automotive engineering and automobile parts supply, tool and mold construction, aviation and aeronautics, energy technology, machine tools and plant construction to medical technology and the print machine and timber processing industries.

Prof. Dr. h. c. Dr.-Ing. Eckart Uhlmann

Our overarching aim is to engineer application-specific modular and systems solutions that ensure significant long-term improvements in the competitiveness of our customers.

Our R&D Focus:

» Cutting Technology, Ablation
» Finishing
» Cleaning and Jet Technologies
» Generative Technologies
» Microfabrication, Precision Machining
» Structural Analysis

» Measuring Technologies for Micro- and Macroproduction
» Machine-integrated Measurement and Testing
» Tool Machine Development and Construction
» Process Monitoring and Status Reporting
» Control Applications
Nearly every product consists of a multiple of different components which means that joining and coating are among the key stages of the production process. At the same time use of complex materials and combinations of materials such as high tensile and ultra-high tensile steel, and composite steel-aluminum joints in combination with rising safety requirements are driving the on-going development of the sector. At the Joining and Coating Technology division we work in close collaboration with the Federal Institute for Materials Research and Testing (BAM) to develop new techniques for materials which thus far have proven largely resistant to processing.

Working in interdisciplinary teams we open up new fields of application for both traditional techniques like resistance spot welding (RSW) and electric arc welding, as well as modern steel welding and coating technologies. Simulation of welding processes, distortion and residual stress facilitates the rapid introduction of cost-effective, energy-efficient techniques in industry, while also ensuring optimization of existing processes and components. Our work is focused on engineering the requirements-specific joining and coating of cutting-edge materials and combinations of materials, on raising the quality and reliability of joints and coatings, as well as on improving techniques to make them safer and more productive, more environmentally friendly and less resource-intensive.

Prof. Dr.-Ing. Michael Rethmeier

New materials call for new approaches in joining technology. We develop innovative methods which ensure safety in process chains and joined components – from automobiles and factory systems to shipbuilding and pipelines. «

Our R&D Focus:

» Laser Powder Cladding
» Laser Beam and Hybrid Welding
» Resistance Spot Welding
» Arc Welding
» Welding Simulation
The Automation Technology division develops technologies and systems which combine innovative robotics and control and security concepts with methods of machine vision. The aim is to raise process efficiency through integration and combination of these key automation components. One example of such an approach is machining processes with new control technology and integrated human-machine collaboration which enable industrial robots to flexibly and cost-effectively perform production stages previously performed by conventional machines. Another aim is to use innovative methods and automation concepts from the world of production engineering to pave the way for new applications and business sectors in the fields of security technology and human-machine interaction. Well-known examples include our technology for automated virtual document reconstruction and our robot systems for stroke rehabilitation therapy.

Our expertise is embodied in two specialist departments. The »Process Automation and Robotics« department has a proven track record of over 30 years of research in automation technology and robotics. This department develops innovative kinematics systems and novel drive and control solutions for applications in industrial production, handicrafts, rehabilitation technology and the service sector. Its competence in the fields of force-controlled robot systems and physical interaction between humans and robots is particularly outstanding.

The »Security Technology« department draws on its long record of expertise in image processing and pattern recognition research to open up new fields of application, in particular for mobile sensor systems and the automated reconstruction of artifacts. Optical inspection for the detection and evaluation of defects, especially defects in transparent materials, is another of the department’s proven areas of expertise.

Our vision is one of human-centric automation in which humans and machines engage in close and flexible collaboration.

Prof. Dr.-Ing. Jörg Krüger

Our R&D Focus:

- Technologies and Systems for Human-Robot Collaboration
- Robot Systems for Handling, Assembly and Processing
- Assistance Systems for Industry, the Service Sector, and Rehabilitation Therapy
- Industry 4.0 – Distributed Control Systems and Development Tools
- IT Security in Control Technology
- Automated Virtual Reconstruction
- Support Systems for Physical Reconstruction
- Pattern Recognition in Digital Media
- Automatic Optical Inspection
- Energy and Resource Efficiency
PARTNERSHIPS

We have the right key to unlock complex assignments – because we can pool the expertise of researchers from various disciplines in a variety of fields of research, enrich our knowledge with the know-how of Fraunhofer work groups dealing with similar issues and bring together experts from a wide range of disciplines in interdisciplinary research projects spanning multiple business divisions.

POOLING EXPERTISE

We have the right key to unlock complex assignments – because we can pool the expertise of researchers from various disciplines in a variety of fields of research, enrich our knowledge with the know-how of Fraunhofer work groups dealing with similar issues and bring together experts from a wide range of disciplines in interdisciplinary research projects spanning multiple business divisions.

IPK Competence Centers
IPK competence centers pool our expertise to target the particular requirements of specific industrial branches and markets. In this way, we can offer our customers interdisciplinary and theme-oriented one-stop access to the R&D fields addressed by our institute. Also, customers immediately find the right contact person. Our Competence Centers are:

- Additive Manufacturing
- Application Center for Microproduction Technology – AMP
- Benchmarking
- Center for Innovative Product Creation (CIP)
- Knowledge Management
- Mehr Können – Events
- PDM/PLM
- Process Management
- dip – Digitally Integrated Production
- Simulation and Factory Planning
- Virtual Reality Solution Center (VRSC)

Fraunhofer Alliances
Fraunhofer institutes engaged in different spheres of activity join forces in Fraunhofer Alliances to develop and market a particular business area. Fraunhofer IPK is head and central office of the Fraunhofer Cleaning Technology Alliance. We are a member of the following Fraunhofer Alliances:

- Additive Manufacturing
- AdvanCer – High-performance ceramics
- autoMOBILE production
- Big Data and Artificial Intelligence
- Cleaning Technology
- Numeric Simulation of Products and Processes
- SysWasser
- Transport

Fraunhofer Group for Production
We are one of seven production-oriented institutes linked in the Fraunhofer Group for Production. It makes use of the latest findings in industrial engineering and information science to offer a range of services that covers the entire product life cycle or value chain.
INTERDISCIPLINARY RESEARCH

Complex research projects can only be successful when the know-how of experts from a number of disciplines is brought to bear in one collaborative effort. In fact, interdisciplinary work is a matter of course for us. At Fraunhofer IPK scientists and engineers from the fields of mechanical engineering, electrical engineering and computer science work in close collaboration with psychologists, economists or scientists in arts and humanities. The holistic solutions we engineer result in large part from the close collaboration that exists between our seven business divisions. Two examples of such close collaboration are:

Generative Manufacturing for the Medical Sector
Turning powder into products – with the range of new materials now on the market, a well established technology for making prototypes from plastic can now be extended for the fabrication of application-ready products. The metal- and ceramic-based Rapid Tooling method is of particular interest to the medical sector because, for instance, selective laser melting (SLM) using 3D CAD data as a digital information source can be used to fuse metal particles to create individual patient implants. At Fraunhofer IPK medical technicians have joined forces with materials scientists and mechanical engineers to qualify suitable materials and equip the technology for wide use in the medical sector.

Innovation Centers for Brazil
Technological know-how goes hand in hand with managerial competence in a wide-ranging partnership with the Brazil’s National Industrial Training Service (SENAI). Fraunhofer IPK is assisting SENAI in its moves to build 23 innovation centers designed to promote vocational training and applied research throughout the country. Fraunhofer experts are drawing up business plans and management concepts for the institutes and the lead institute in Brasilia. Fraunhofer IPK also supports evolution of the institutes’ future product portfolio and projection of the need for personnel and resources this will entail. Fraunhofer’s fund of experience in the establishment of similar institutes is of tremendous benefit here.
In Fraunhofer High Performance Centers, universities, higher education institutions, Fraunhofer Institutes and further non-university research institutions work together with companies and civil society as locally anchored ecosystems to improve economic impact and societal benefits of R&D. We are members of one High Performance Center and also participate in a Collaborative Research Center.

**Fraunhofer-Leistungszentrum »Digitale Vernetzung«**

The Berlin Center for Digital Transformation develops technologies and solutions that take into account the increasing digitization and networking of all areas of life. It conducts research on basic and cross-sectional technologies for the application areas »Networked Industry & Production«, »Networked Mobility & City of the Future«, »Networked Healthcare« and »Networked Critical Infrastructures & Energy«.

The four Fraunhofer Institutes Fraunhofer FOKUS, Fraunhofer HHI, Fraunhofer IPK and Fraunhofer IZM bundle their expertise in the fields of information and communication technologies (ICT), data processing, production and microelectronics in the Berlin Center for Digital Transformation. Industry partners and public institutions have the opportunity to cooperate with the participating Fraunhofer Institutes in research projects.

Partners of the Center benefit from the latest basic and cross-sectional technologies as well as from the numerous ways project results can be transferred into practice. Fraunhofer experts make the Internet of Things (IoT) and Industry 4.0 come alive. In addition, enterprises can develop and test their own digitization concepts. Especially for this purpose, the participating institutes have set up »Transfer Centers« in which solutions for four areas of application are developed and put to the test.

The central office of the Berlin Center for Digital Transformation is currently located at Fraunhofer IPK.

[www.digitale-vernetzung.org](http://www.digitale-vernetzung.org)
Collaborative Research Center 1026
»Sustainable Manufacturing – Shaping Global Value Creation«
Established in 2012 and funded by the German Research Foundation, the Collaborative Research Center 1026 »Sustainable Manufacturing – Shaping Global Value Creation« consists of a team of 50 scientists who work on the development of sustainable production technologies and strategies with the aim of creating greater global prosperity with less consumption of resources.

Partners in the Center are the Technische Universität Berlin, Fraunhofer IPK, the Federal Institute for Materials Research and Testing (BAM), the Fraunhofer Institute for Reliability and Microintegration IZM, the Social Science Research Center Berlin (WZB) and the Zuse Institute Berlin (ZIB Berlin). The CRC spokesman is Professor Dr.-Ing. Günther Seliger of the Institute for Machine Tools and Factory Management at the Technische Universität Berlin.

www.sustainable-manufacturing.net
True excellence in research calls for the brightest minds and a really excellent infrastructure. The latter Fraunhofer IPK has found at the Production Technology Center (PTZ) Berlin where it’s housed under the same roof as the Institute for Machine Tools and Factory Management IWF at the TU Berlin. At this state-of-the-art facility scientists dispose not just of the huge test area with its assembly of some 70 machines but also the laboratories of the Application Center for Microproduction Technology – AMP.

The beating heart of the PTZ is its huge light-flooded circular machine hall – 3,200 square meters of floor space under an 18 meter high roof which houses an assembly of about 70 machines and testing stands. The machine park is a highly dynamic environment: machines are constantly being installed in the test area or adjusted or removed in line with the requirements of the final or initial stages of projects or shifts in research foci. Yet the hall is superbly equipped to meet with such comings and goings. Two rotary-table cranes with load capacities of seven and 20 tons respectively can reach each and every point in the test area from two directions, while a broad central aisle makes it possible to drive large trucks directly into the hall to unload and load heavy machinery – thus keeping the need for fork truck traffic to a bare minimum.

The hall boasts everything that modern production technology has to offer. The southwest side is home to the machine tools with an accent on traditional types of machining (cutting, milling, turning, drilling). A recently cleared free space on the northwest side of the hall is where robots are now grouped which are mainly used for research into Life Cycle Engineering and MRO. Other areas of the hall are dedicated to cleaning with dry ice and Sustainable Manufacturing. In between these areas is room for individual devices for a wide range of purposes including rapid prototyping and tooling, reshaping and coating. The test area also features a workshop area which is used as a teaching workshop and for preparation of test trials.

The test area is partly enclosed by a series of dedicated laboratories for research projects with special requirements, for instance in terms of cleanliness, air conditioning or safety. Their close proximity to the test area means that easy access to the other testing stands is assured at all times, which is an invaluable benefit – for instance for robotics whose lab overlooks that part of the hall where numerous associated heavy machines are directly situated.

### Specialized Labs at the Test Area
- Robotics Lab
- Laser Lab
- Optical Inspection Lab
- Impact Testing Lab
- Climate Lab
- High Precision Lab
- Finishing Lab
Modern machines are now capable of processing components and parts of down to an astonishing 100 nanometer in breadth – one tenth the thickness of a spider’s silk thread. Tools used in microproduction technology are correspondingly small – and correspondingly sensitive to ambient influences. The expansion in a tool caused by a temperature fluctuation of just a few degrees Celsius is enough to consign a product to the reject pile, while the slightest corrosion-induced changes in material make processing in set parameters impossible.

The Application Center for Microproduction Technology – AMP is housed at the Production Technology Center in a special building opened in 2011 and designed to take full account of the special needs of ultra-high precision machining technology. The ambient humidity of the entire building can be regulated to keep it in a band under 55 percent – where it would cause corrosion – and above 45 percent – where it would be detrimental to the health of the people working there. In the two labs with high-precision working environments the temperature is maintained at a constant 20 °C ± 1 °C to prevent expansion of the tools while the ambient air in the ultra-high precision lab – the most sensitive part of the AMP – is maintained at an exact temperature of 20 °C ± 0,2 °C. Furthermore, this lab is also built on a special vibration-isolated foundation of exceptionally solid mass whose supporting pillars reach down deep into the earth. All of this serves as passive vibration dampening so that neither vibrations from the road nor from the building itself can be directly transferred to this critical area.

The three labs are fully equipped with state of the art machining and measuring technology for high precision and ultra-high precision cutting and processing and process development. Variable transparent walls can be used to transform 380 square meters of the total floor space of 780 square meters into individual laboratories. Moreover, the Process Development lab has no fixed units, which means that we can install flexible temporary experimental set-ups that replicate the on-site situation of our customers.

Labs at the AMP
» High Precision Lab
» Ultra-high Precision Lab
» Process Development Lab
The PTZ also boasts numerous other labs, both large and small situated throughout the entire building. Here we present a few of them:

The Virtual Reality Solution Center
Opened in 2001, the Virtual Reality lab opens up new potential and areas of application for the technology and drives development of deployed hardware and software. Building on basic technologies such as projection-based 3D visualization, 3D interaction technologies and haptic interaction solutions, the Virtual Reality lab develops applications for CAD/CAS and evolves new opportunities for use in the fields of fly-and-walk-through for technology and architecture installation and extension analysis, training, prototype development and telepresence machine control.

The Secure Verification Lab
Is it real or just a counterfeit? Ever since high value documents and artifacts first appeared there have been attempts to counterfeit or manipulate them. Fraunhofer IPK partners with the Bundesdruckerei (Federal Printing Office) to develop solutions for document security. Security features like the digital watermark patented by Fraunhofer IPK are now used for documents such as visas and passports. Since 2009 both partners have run the Secure Verification Lab at PTZ in which highly sophisticated systems inspect official documents and 3D artifacts for counterfeiting and manipulation.

The Impact Testing Lab
To guarantee the safety of the housings and casings of tool machines, impact testing investigates the suitability of the materials and construction principles on which they are based. The Institute for Machine Tools and Factory Management at the TU Berlin first established a laboratory for conducting such tests in the late 1990s. The centerpiece of the lab is a compressed-air-driven acceleration unit originally designed for projectiles of up to 100 millimeters in diameter but overhauled in September 2013 to cope with projectiles with diameters of up to 300 millimeters. Not just the casings but the actual projectiles themselves can be part of
the investigation. The burst test rig investigates the properties of particles thrown off cutting or grinding wheels.

**The Virtual Engineering Learning Center (VELC)**

The VELC – Virtual Engineering Learning Center is a facility for instruction and training in virtually assisted engineering operations and as such is a modern form of teaching that responds to the needs of prospective engineers and industry. Training is not based on single workspace computers with loose software integration but takes place in an integrated systems landscape that factors in the technologies and concepts of present and future information systems. The teaching and learning paradigms are based on flexible furniture and IT with plug-and-play capability.

**The Robot Complex**

The PTZ test area features four 6-axis industrial robots of various sizes manufactured by KUKA and COMAU. The robot stations are equipped with a variety of tool drives as well as tool and workpiece holders which enable workpieces to be milled, ground, polished and optically measured. Work is either tool- or workpiece-led depending on the size of the component, the requirements and the technology. The aim is to have robots now perform those rough machining or preparatory processes which so far are the domain of machine tools. In general, the investigations scientists carry out in the Robot Complex enable them to identify new areas of application for standard industrial robots.
Our network

Scientific establishments seldom pursue their work in splendid isolation as most research projects require the pooling of expertise from a range of scientific partners. Yet Fraunhofer IPK does not limit its collaboration with other R&D institutes to singular projects. Long-term strategic partnerships bind the institute with two major scientific establishments in Berlin:

» The Institute for Machine Tools and Factory Management IWF at the TU Berlin
» The Federal Institute for Materials Research and Testing (BAM)

Ever since it was first established, Fraunhofer IPK has been closely associated with the IWF at the TU Berlin. Both institutes don’t just share the same building which enables joint use of its laboratories, function rooms and machines; their joint project work is an efficient means of translating the results of university-level basic research into real-world practical applications.

Our partnership with BAM pursues two main goals: firstly, facilities can be jointly used without the need for bureaucratic red tape while sophisticated equipment with a price tag of several million euros only needs to be purchased once. At the same time the mission of both institutions is complimentary: while BAM’s exclusive concern is with issues of safety in technology and chemistry, Fraunhofer IPK investigates how techniques and procedures can be made more cost-effective and rapid. Our partnership means that customers can benefit from uncomplicated simultaneous support in both areas.

You too can benefit from the close collaborative bonds between Fraunhofer IPK and two leading Berlin research institutions, from our international network and from the services of our parent organization, the Fraunhofer-Gesellschaft.
Founded in 1904, the IWF was one of Germany’s first institutions for production technology teaching and research. Its test area was a ground-breaking facility that opened up new directions in the discipline. IWF research and teaching activities are oriented to technologies and the management of industrial factories, and range from development of process technologies and production systems to their modeling in information technology.

The departments
» Machine Tools and Manufacturing Technology
» Assembly and Handling Technology
» Quality Science
» Industrial Automation Technology
» Industrial Information Technology
» Coating Technology
» Micro-Tools and Precision Instruments
» Joining Technology
» Sustainable Business Development
» Quality Strategy and Quality Competence
» Tribology
» Methods and technologies for highly stressed welded joints

» Knowledge Dynamics in the Engineering Sciences

evolve the »Digital Factory« to use information technology for mapping and networking product development, production planning and actual production so as to enable consistent simulation, verification and optimization of product creation cycles and product lifecycles. As an institute of the Technische Universität Berlin, the IWF instructs some 200 students a year in mechanical engineering. The Master’s degree course on Global Production Engineering, in which the IWF is a major mover, teaches students from all over the world the skills needed to cope with the challenges of the global industrial society.

Currently, Fraunhofer IPK and IWF are involved in a long-term project funded by the German Research Foundation (DFG). The Collaborative Research Center (CRC) »Sustainable Manufacturing« aims to create sustainable production technologies and strategies for more global prosperity with less consumption of resources.
The BAM is a scientific-technical federal agency under the auspices of the Federal Ministry for Economic Affairs and Energy (BMWi). She promotes industrial development in Germany through research, testing and advice concerning safety in technology and chemistry. It is one of Europe’s leading research institutes in its chosen fields.

BAM incorporates research, assessment and consultation in technology and chemical engineering under one umbrella. BAM identifies requirements for safety in technology and chemistry for tomorrow’s society as part of its legal and political responsibilities. The work of BAM is directed at five interdepartmental focus areas

» Energy
» Infrastructure
» Environment
» Materials
» Analytical Sciences

Through its cooperation with universities, other research institutions and industry, BAM is an integral part of the German scientific landscape and closely connected worldwide with other public institutions of similar mandate.

Since 2009 Fraunhofer IPK has had a close association with the department of »Welding Technology for Manufacturing« at BAM. Professor Dr. Michael Rethmeier heads both this department at BAM and the Joining and Coating Technology division at Fraunhofer IPK. The joint research carried out by both institutes is concerned with issues of safety and reliability in joined components and systems during their fabrication and operations. A decisive role in such research is played by the interaction between materials, processes and construction. Laboratory experiments, and, critically, component testing and full-scale testing is used to evaluate the safety and reliability of the joined components. For this purpose, existing methods of inspection are adapted and novel testing methods are developed and introduced.
Research of practical utility lies at the heart of all activities pursued by the Fraunhofer-Gesellschaft. Founded in 1949, the research organization undertakes applied research that drives economic development and serves the wider benefit of society. Its services are solicited by customers and contractual partners in industry, the service sector and public administration.

At present, the Fraunhofer-Gesellschaft maintains 67 institutes and research units. The majority of the more than 23,000 staff are qualified scientists and engineers, who work with an annual research budget of 2 billion euros. Of this sum, more than 1.7 billion euros is generated through contract research. More than 70 percent of the Fraunhofer-Gesellschaft’s contract research revenue is derived from contracts with industry and from publicly financed research projects. Almost 30 percent is contributed by the German federal and Länder governments in the form of base funding, enabling the institutes to work ahead on solutions to problems that will not become acutely relevant to industry and society until five or ten years from now.

International collaborations with excellent research partners and innovative companies around the world ensure direct access to regions of the greatest importance to present and future scientific progress and economic development. With its clearly defined mission of application-oriented research and its focus on key technologies of relevance to the future, the Fraunhofer-Gesellschaft plays a prominent role in the German and European innovation process. Applied research has a knock-on effect that extends beyond the direct benefits perceived by the customer: Through their research and development work, the Fraunhofer Institutes help to reinforce the competitive strength of the economy in their local region, and throughout Germany and Europe. They do so by promoting innovation, strengthening the technological base, improving the acceptance of new technologies, and helping to train the urgently needed future generation of scientists and engineers.
The scientists and engineers at Fraunhofer IPK might do their research locally in Berlin yet their work drives industrial production forward across the whole world. The institute’s many partnerships connect it with present and future key areas of science and industry – so that we can benefit from an international knowledge transfer and open up new markets for production technology know-how made in Germany.

The institute’s key areas of activity lie in Asia and South America. As early as 1999 in close collaboration with Fraunhofer Headquarters, we opened a representative office in Indonesia where innovative management methods developed by Fraunhofer IPK facilitated the set-up of an innovation system. Fraunhofer IPK was also instrumental in the introduction of a financial plan for nurturing a broad research landscape in Vietnam and is currently engaged in projects for raising efficiency in Russia. In Dubai IPK researchers drew up the plans for a technology park the size of a small town. In China and Malaysia the institute supports the vocational training and further education of young engineers.

A prominent role is also enjoyed by IPK’s partnership with Brazil. Since 2018, Fraunhofer IPK is running the Fraunhofer Project Center for Advanced Manufacturing @ ITA, also known as FPC@ITA, in São José dos Campos. Fraunhofer IPK and the Instituto Tecnológico de Aeronáutica (ITA) join forces to develop production technology solutions for the benefit of German and European companies producing in Brazil, including the country’s industrial sector itself.
GETTING HERE

Train from Berlin Main Station »Hauptbahnhof«:
– by Taxi (appr. 10 min.)
– from bus stop »Lehrter Straße/Invalidenstraße« take bus 245, direction S+U Zoologischer Garten, to bus stop »Franklinstraße« (appr. 20 min.). Follow the road about 200 m in direction of travel and turn right into Pascalstraße (appr. 5 min.).

Car from direction Hannover, Leipzig, Nürnberg:
– A 115 to Charlottenburg (A 100); A 100 exit Kaiserdam, then B2 in direction Tiergarten (Kaiserdam, then Bismarckstr.) until Leibnizstraße. Turn left into Leibnizstraße. Further down, it becomes Cauerstraße, then Dovestraße and finally Helmholzstraße. Turn left into Morsestraße, which further down becomes Pascalstraße.

from direction Hamburg, Rostock:
– A 111 to Charlottenburg (A 100); A 100 exit Spandau Damm, turn left into Spandau Damm. Further down, it bends right and becomes Otto-Suhr-Allee. Turn left into Cauerstraße. Further down, it becomes Dovestraße and finally Helmholzstraße. Turn left into Morsestraße, which further down becomes Pascalstraße.

Airplane from Berlin Tegel:
– by Taxi (appr. 15 min.)
– take bus X9, direction S+U Zoologischer Garten, to bus stop »U Ernst-Reuter-Platz« (appr. 15 min.). Then switch to bus 245, direction Nordbahnhof, to bus stop »Helmholtzstraße« (appr. 5 min.). Follow the road about 200 m in direction of travel and turn left into Morsestraße, which further down becomes Pascalstraße (appr. 5 min.).

Ab Berlin Schönefeld:
– by Taxi (appr. 40 min.)
– take regional train RE7 (direction Dessau) to Hauptbahnhof (appr. 30 min.), or take city train S9 to Ostkreuz, then switch to S5, S7 or S75 to Hauptbahnhof (appr. 45 Min.). From there, continue as described at »Train«.