Research in Germany

MANUFACTURING SCIENCE AND ENGINEERING

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MANUFACTURING SCIENCE AND ENGINEERING

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PREFACE

This brochure provides a first insight into research in Germany in the fields of manufacturing science and engineering and is especially recommended to early career researchers from abroad.

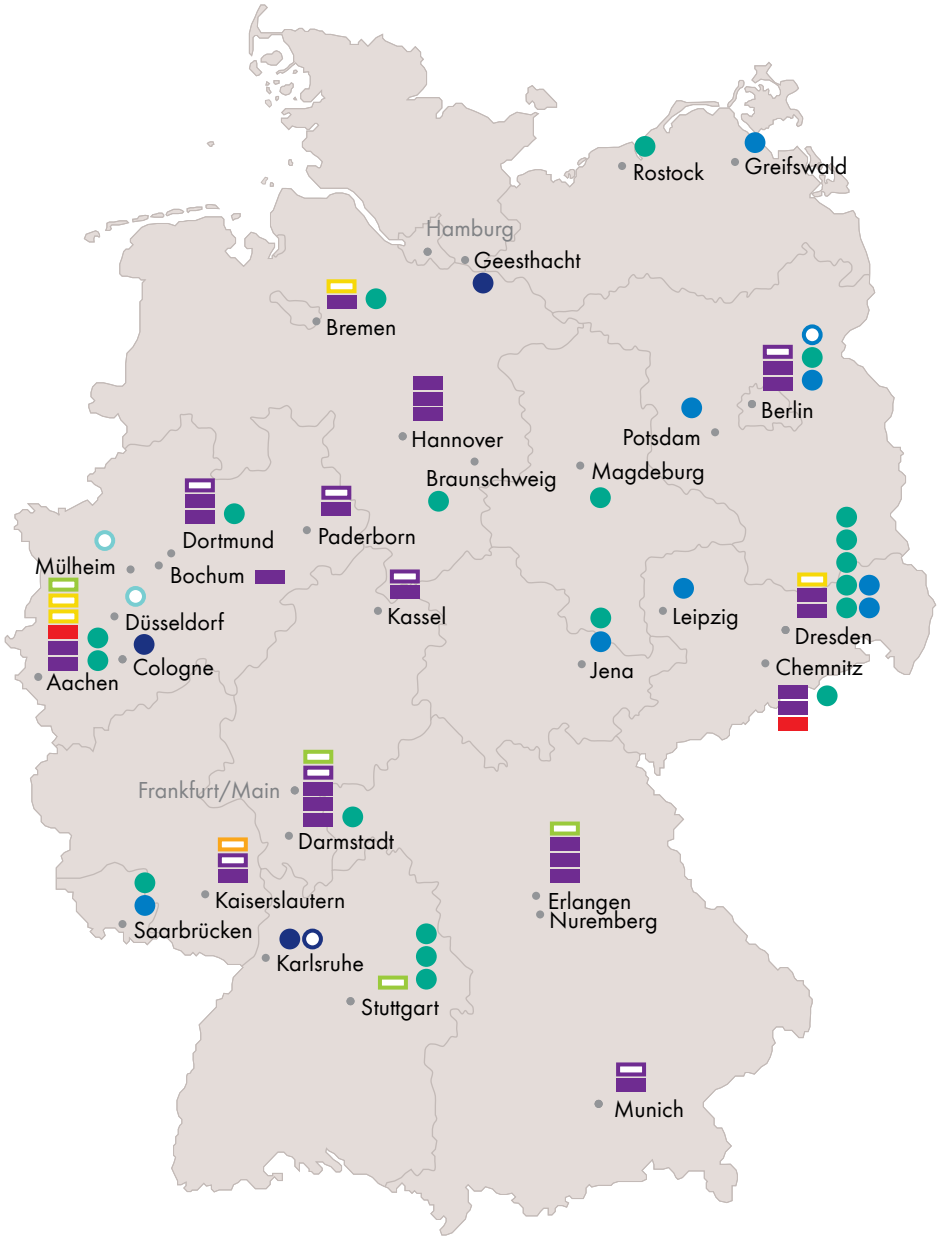
Manufacturing science and engineering in Germany is primarily conducted at universities but also at non-university research institutions. Almost all universities and many universities of applied sciences host a manufacturing science and engineering section. The spectrum ranges from small monothematic working groups to large interdisciplinary departments and covers a variety of topics from traditional areas to new explorative research fields.

This brochure is intended to give an initial overview. The following map and tables highlight research consortia and graduate training programmes at universities and non-university research institutes with a main focus on manufacturing science and engineering.

On top of this, there is a lot more to discover: e.g. the DFG funds a multitude of individual projects in the area of manufacturing science and engineering. These individual grants outweigh the research consortia both in number and in overall funding volume. Towards the end of this brochure, you will find a link to the online database GEPRIS that provides an overview of all DFG funded research projects. You will also find additional important links for further information about programmes in the fields of manufacturing science and engineering and profiles of German universities and research institutions.

We invite you to explore the many opportunities that Germany has to offer and welcome your feedback.

OVERVIEW



- Graduate Schools
- Research Training Groups
- International Research Training Groups
- Integrated Research Training Groups in Collaborative Research Centres/Transregios
- Clusters of Excellence
- Collaborative Research Centres/Transregios
- Helmholtz Graduate Schools
- Leibniz Graduate Schools
- International Max Planck Research Schools
- Fraunhofer Institutes
- Helmholtz Centres
- Leibniz Institutes

DFG funded Priority Programmes and Research Units are not shown on the map since they are not necessarily located at a single location; they are listed on pages 13 and 15.

CENTRES OF RESEARCH

-FUNDED BY DFG-

Clusters of Excellence (EXC) were established at universities in the framework of the German Excellence Initiative and promote cutting-edge research. Their objective is to engage in scientific networking and collaboration in research fields of particular promise for the future. They also offer excellent training conditions and career opportunities for early career researchers.

Collaborative Research Centres (CRC) are organisational units established at universities which enable researchers to pursue an outstanding research programme crossing the boundaries of disciplines, institutes, departments and faculties. The traditional Collaborative Research Centre is generally applied for by one university and is conducted by researchers of that university. Early career support is a key objective of the Collaborative Research Centre Programme. Early career researchers may get involved in a CRC in numerous ways, for example within the framework of an Integrated Research Training Group. Collaborative Research Centres are funded for a period of up to 12 years.

Transregios (TRR) are Collaborative Research Centres in which up to three universities collaborate with each other and submit a joint application. The contributions of the cooperative partners are essential, complementary and synergetic to the joint research objective. Funding facilitates close, nationwide collaboration among the participating universities and researchers, as well as networking and shared use of resources. There is also the option of international Transregios.

Location	Institution	Title	Funded Since	Contact
CLUSTERS OF EXCELLENCE				
Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	**Integrative Production Technology for High-Wage Countries** (EXC 128)	2006	www.production-research.de
Chemnitz	Technische Universität Chemnitz	**MERGE Technologies for Multifunctional Lightweight Structures** (EXC 1075)	2012	www.tu-chemnitz.de/MERGE
COLLABORATIVE RESEARCH CENTRES				
Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	**Precision Manufacturing by Controlling Melt Dynamics and Solidification in Production Processes** (CRC 1120)	2014	www.sfb1120.rwth-aachen.de
Berlin	Technische Universität Berlin	**Sustainable Manufacturing - Shaping Global Value** (CRC 1026)	2012	www.sustainable-manufacturing.net
Bremen	Universität Bremen	**Micro Cold Forming - Processes, Characterization, Optimization** (CRC 747)	2007	www.sfb747.uni-bremen.de
Darmstadt	Technische Universität Darmstadt	**Control of Uncertainties in Load-Carrying Structures in Mechanical Engineering** (CRC 805)	2009	www.sfb805.tu-darmstadt.de/sfb805
Darmstadt	Technische Universität Darmstadt	**Integral Sheet Metal Design with Higher Order Bifurcations - Development, Production, Evaluation** (CRC 666)	2006	www.sfb666.tu-darmstadt.de
Erlangen-Nuremberg	Friedrich-Alexander-Universität Erlangen-Nürnberg	**Additive Manufacturing** (CRC 814)	2011	www.sfb814.de
Hannover	Gottfried Wilhelm Leibniz Universität Hannover	**Regeneration of Complex Capital Goods** (CRC 871)	2010	www.sfb871.de
Hannover	Gottfried Wilhelm Leibniz Universität Hannover	**Gentelligent Components in their Lifecycle** (CRC 653)	2005	www.sfb653.uni-hannover.de
Kaisers-lautern	Technische Universität Kaiserslautern	**Microscale Morphology of Component Surfaces (MICOS)** (CRC 926)	2011	www.sfb926.de

CENTRES OF RESEARCH

Location	Institution	Title	Funded Since	Contact
Munich	Technische Universität München	**Managing Cycles in Innovation Processes - Integrated Development of Product-Service Systems Based on Technical Products** (CRC 768)	2008	www.sfb768.de
COLLABORATIVE RESEARCH CENTRES/TRANSREGIOS				
Aachen Chemnitz Darmstadt	Rheinisch-Westfälische Technische Hochschule Aachen Technische Universität Chemnitz Technische Universität Dresden	**Thermo-Energetic Design of Machine Tools - A Systemic Approach to Solve the Conflict between Power Efficiency, Accuracy and Productivity Demonstrated at the Example of Machining Production** (TRR 96)	2011	www.transregio96.de
Berlin Bochum	Technische Universität Berlin Ruhr-Universität Bochum	**Industrial Product-Service Systems (IPS2) - Dynamic Interdependencies between Products and Services in the Production Area** (TRR 29)	2006	www.lps.rub.de/tr29
Chemnitz Dresden Erlangen-Nuremberg	Technische Universität Chemnitz Technische Universität Dresden Friedrich-Alexander-Universität Erlangen-Nürnberg	**Production Technologies for Light Metal and Fiber Reinforced Composite Based Components with Integrated Piezoceramic Sensors and Actuators** (TRR 39)	2006	www.pt-piesa.tu-chemnitz.de
Dortmund Erlangen-Nuremberg Hannover	Technische Universität Dortmund Friedrich-Alexander-Universität Erlangen-Nürnberg Gottfried Wilhelm Leibniz Universität Hannover	**Manufacture of Complex Functional Components with Variants by Using a New Sheet Metal Forming Process** (TRR 73)	2009	www.tr-73.de
Dortmund Kassel Paderborn	Technische Universität Dortmund Universität Kassel Universität Paderborn	**Process-Integrated Manufacturing of Functionally Graded Structures on the Basis of Thermo-Mechanically Coupled Phenomena** (TRR 30)	2006	www.transregio-30.com

RESEARCH UNITS

-FUNDED BY DFG-

Research Units (FOR) often contribute to establishing new research directions. Research Units are made up of a team of researchers working together on a research project which is often of an interdisciplinary nature. Research Units consist of several researchers and subprojects. The subprojects of a Research Unit are often located at several locations throughout Germany. Research Units are generally funded for up to six years.

Research Units are not shown on the map. Only the titles of the thematic focus and the project websites are listed.

Title	Funded Since	Contact
Verlustarme Elektrobleche für die Elektromobilität (FOR 1897)	2014	http://gepris.dfg.de *Keyword: FOR 1897*
Ultra-Precision High Performance Cutting (UP-HPC) (FOR 1845)	2013	www.up-hpc.de
Control of Energy Consumption in Production to Achieve Energy Efficiency Maximisation through Automation (ECOMATION) (FOR 1088)	2009	www.isw.uni-stuttgart.de
Damping Effects in Machine Tools (FOR 1087)	2009	www.rwth-aachen.de/go/id/bxqg/lidx/1
Hybrid Intelligent Construction Elements (FOR 981)	2008	www.uni-stuttgart.de/hike (DE)

PRIORITY PROGRAMMES

-FUNDED BY DFG-

Priority Programmes (SPP) have a programmatic focus and have the purpose of advancing knowledge in an emerging field of research through collaborative networked support. They are characterised by their enhanced quality of research through the use of new methods and forms of collaboration in emerging fields. One programme can consist of up to 30 individual researchers and subprojects located at several institutions across Germany; it usually has one coordinating person. Priority Programmes normally receive funding for a period of six years.

Priority Programmes are not shown on the map. Only the titles of the overall themes and the project website are listed.

Title	Funded Since	Contact
Dry Metal Forming - Sustainable Production through Dry Processing in Metal Forming (SPP 1676)	2013	www.trockenumformen.de/index.php/en
Intrinsic Hybrid Structures for Lightweight Constructions (SPP 1712)	2012	www.spp-1712-hybrider-leichtbau.de (DE)
The Processes of Joining by Plastic Deformation (SPP 1640)	2012	www.spp1640.de
Machine Elements for Resource Efficiency (SPP 1551)	2011	www.fzg.mw.tum.de (DE)
Modeling, Simulation and Compensation of Thermal Effects for Complex Machining Processes (SPP 1480)	2010	www.cutsim.de
Small Machine Tools for Small Work Pieces (SPP 1476)	2010	www.spp1476.de (DE)
Optically Generated Sub-100 nm Structures for Biomedical and Technical Applications (SPP 1327)	2008	www.spp1327.de (DE)

NON-UNIVERSITY RESEARCH INSTITUTIONS

Fraunhofer Society is one of the world's leading organisations for applied research with an annual research budget of 2 billion euros, 67 institutes and more than 23,000 employees. Fraunhofer's R&D portfolio covers a wide range of fields, including health, security, communications, transport, energy and the environment. www.fraunhofer.de

The Helmholtz Association contributes to solving major challenges facing society, science and industry with world-level research in six areas: energy, earth and environment, health, key technologies, structure of matter and aeronautics, space and transport. With more than 34,000 employees in 18 research centres and an annual budget of approximately 3.76 billion euros, the Helmholtz Association is Germany's largest scientific organisation. www.helmholtz.de

The Leibniz Association is an umbrella organisation of 89 research institutes. The annual budget amounts to 1.45 billion euros. Some 8,800 researchers – more than 1,100 of them from abroad – work on a widely diverse range of subjects, including the humanities and social sciences, economics, spatial and life sciences, mathematics, natural and engineering sciences and environmental research. www.leibniz-association.eu

Location	Institution	Contact
FRAUNHOFER INSTITUTES		
Aachen	Fraunhofer Institute for Production Technology (IPT)	www.ipt.fraunhofer.de
Aachen	Fraunhofer Institute for Laser Technology (ILT)	www.ilt.fraunhofer.de
Berlin	Fraunhofer Institute for Production Systems and Design Technology (IPK)	www.ipk.fraunhofer.de
Braunschweig	Fraunhofer Institute for Surface Engineering and Thin Films (IST)	www.ist.fraunhofer.de
Bremen Dresden	Fraunhofer Institute for Manufacturing Technology and Advanced Materials (IFAM)	www.ifam.fraunhofer.de
Chemnitz Dresden	Fraunhofer Institute for Machine Tools and Forming Technology (IWU)	www.iwu.fraunhofer.de
Darmstadt	Fraunhofer Institute for Structural Durability and Systems Reliability (LBF)	www.lbf.fraunhofer.de
Dortmund	Fraunhofer Institute for Material Flow and Logistics (IML)	www.iml.fraunhofer.de
Dresden	Fraunhofer Institute for Laser and Surface Technology (IWS)	www.iws.fraunhofer.de
Dresden	Fraunhofer Institute for Ceramic Technologies and Systems (IKTS)	www.ikts.fraunhofer.de
Dresden	Fraunhofer Institute for Electron Beam and Plasma Technology (FEP)	www.fep.fraunhofer.de
Jena	Fraunhofer Institute for Applied Optics and Precision Engineering (IOS)	www.iof.fraunhofer.de
Magdeburg	Fraunhofer Institute for Factory Operation and Automation (IFF)	www.iff.fraunhofer.de
Rostock	Fraunhofer Application Center Large Structures in Production Engineering (AGP)	www.hro.ipa.fraunhofer.de
Saarbrücken	Fraunhofer Institute for Nondestructive Testing (IZPF)	www.izfp.fraunhofer.de
Stuttgart	Fraunhofer Institute for Industrial Engineering (IAO)	www.iao.fraunhofer.de
Stuttgart	Fraunhofer Institute for Manufacturing Engineering and Automation (IPA)	www.ipa.fraunhofer.de
Stuttgart	Fraunhofer Institute for Interfacial Engineering and Biotechnology (IGB)	www.igb.fraunhofer.de
HELMHOLTZ CENTRES		
Cologne	German Aerospace Center (DLR)	www.dlr.de/dlr/en
Geesthacht	Helmholtz-Zentrum Geesthacht - Centre for Materials and Coastal Research (HZG)	www.hzg.de
Karlsruhe	Karlsruhe Institute of Technology (KIT)	www.kit.edu
LEIBNIZ INSTITUTES		
Aachen	Leibniz Institute for Interactive Materials (DWI)	www.dwi.rwth-aachen.de

NON-UNIVERSITY RESEARCH INSTITUTIONS

Location	Institution	Contact
Berlin	Max Born Institute for Nonlinear Optics and Short Term Spectroscopy (MBI)	www.mbi-berlin.de
Dresden	Leibniz Institute for Solid State and Materials Research Dresden (IFW)	www.ifw-dresden.de
Dresden	Leibniz Institute for Polymer Research Dresden (IPF)	www.ipfdd.de
Greifswald	Leibniz Institute for Plasma Science and Technology (INP)	www.inp-greifswald.de
Jena	Leibniz Institute of Photonic Technology (IPHT)	www.ipht-jena.de
Leipzig	Leibniz Institute for Surface Modification (IOM)	www.iom-leipzig.de
Potsdam	Leibniz Institute for Agricultural Engineering Potsdam-Bornim (ATB)	www.atb-potsdam.de
Saarbrücken	Leibniz Institute for New Materials (INM)	www.inm-gmbh.de

GRADUATE TRAINING

-FUNDED BY DFG-

Graduate Schools (GSC) were established at universities in the framework of the German Excellence Initiative. Their objective is to provide training and qualification for outstanding doctoral students from Germany and abroad within an excellent research environment. They serve as an instrument of quality assurance in promoting early career researchers and offer large networks that cover wide areas of research.

Research Training Groups (RTG) combine an ambitious research programme at universities with comprehensive training, tailored supervision and academic freedom to form an ideal environment for a successful doctorate. Research Training Groups can also have an interdisciplinary approach. They are funded for a period of up to nine years.

Integrated Research Training Groups (within Clusters of Excellence or Collaborative Research Centres/Transregios) offer ideal research environments for doctoral researchers. The main aim of these structured training programmes is to provide young scientists and academics with opportunities to independently carry out research at an early stage of their career. The programmes further take care to closely integrate early career researchers into an academic network. Working in Clusters of Excellence or Collaborative Research Centres projects, doctoral researchers achieve additional qualifications. As research assistants in these projects, they contribute to the Research Centre's success. They are closely involved with the projects and have access to the entire project infrastructure.

Location	Institution	Title	Funded Since	Contact
GRADUATE SCHOOLS				
Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	**Aachen Institute for Advanced Study in Computational Engineering Science (AICES)** (GSC 111)	2006	www.aices.rwth-aachen.de
Darmstadt	Technische Universität Darmstadt	**Graduate School of Excellence Computational Engineering (CE)** (GSC 233)	2007	www.graduate-school-ce.de
Erlangen-Nuremberg	Friedrich-Alexander-Universität Erlangen-Nürnberg	**Erlangen Graduate School in Advanced Optical Technologies** (GSC 80)	2006	www.aot.uni-erlangen.de
Stuttgart	Universität Stuttgart	**Graduate School of Excellence Advanced Manufacturing Engineering (GSaME)** (GSC 262)	2007	www.gsame.uni-stuttgart.de
RESEARCH TRAINING GROUPS				
Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	**Integrated Energy Supply Modules for Roadbound E-Mobility** (RTG 1856)	2013	www.mobilem.rwth-aachen.de
Aachen	Rheinisch-Westfälische Technische Hochschule Aachen	**Ramp-Up Management - Development of Decision Models for the Production Ramp-Up** (RTG 1491)	2008	www.anlaufmanagement.rwth-aachen.de
Bremen	Universität Bremen	**Micro-, Meso- and Macroporous Nonmetallic Materials: Fundamentals and Applications** (RTG 1860)	2013	www.mimenima.uni-bremen.de
Dresden	Technische Universität Dresden	**Hydrogel-Based Microsystems** (RTG 1865)	2013	www.tu-dresden.de/forschung/dfg1865
INTERNATIONAL RESEARCH TRAINING GROUPS				
Kaiserslautern Davis (USA)	Technische Universität Kaiserslautern University of California	**Physical Modeling for Virtual Manufacturing Systems and Processes** (IRTG 2057)	2014	www.irtg2057.de
INTEGRATED RESEARCH TRAINING GROUPS IN COLLABORATIVE RESEARCH CENTRES				
Berlin	Technische Universität Berlin	**Integrated Research Training Group within: Sustainable Manufacturing - Shaping Global Value** (CRC 1026)	2012	www.sustainable-manufacturing.net

GRADUATE TRAINING

Location	Institution	Title	Funded Since	Contact
Darmstadt	Technische Universität Darmstadt	**Integrated Research Training Group within: Integral Sheet Metal Design with Higher Order Bifurcations - Development, Production, Evaluation** (CRC 666)	2006	www.sfb666.tu-darmstadt.de
Kaisers-lautern	Technische Universität Kaiserslautern	**Integrated Research Training Group within: Microscale Morphology of Component Surfaces (MICOS)** (CRC 926)	2011	www.sfb926.de
Munich	Technische Universität München	**Incorporated Research Training Group within: Managing Cycles in Innovation Processes - Integrated Development of Product-Service Systems Based on Technical Products** (CRC 768)	2008	www.sfb768.de
INTEGRATED RESEARCH TRAINING GROUPS IN COLLABORATIVE RESEARCH CENTRES/ TRANSREGIOS				
Dortmund Kassel Paderborn	Technische Universität Dortmund Universität Kassel Universität Paderborn	**Integrated Graduate School within: Process-Integrated Manufacturing of Functionally Graded Structures on the Basis of Thermo-Mechanically Coupled Phenomena** (TRR 30)	2006	www.transregio-30.com

GRADUATE TRAINING

-AT NON-UNIVERSITY RESEARCH INSTITUTIONS-

Helmholtz Graduate Schools provide a roof under which a varied number of curricula in different fields, or across disciplines, can find a home. Helmholtz Graduate Schools constitute a valuable addition to the wide range of training programmes available within the Helmholtz Association. They offer optimal conditions for PhD students to work and enable them to create a network of contacts with fellow university researchers while also fostering the integration of participants into the research environment.

Leibniz Graduate Schools were established to foster the systematic promotion of junior researchers. Young researchers are given the opportunity to do their doctorates in an excellent, collaborative, cross-disciplinary research environment. To this end, Leibniz institutions cooperate closely with universities. As every Leibniz institution focuses on clearly defined, socially-relevant themes, doctoral candidates have a wealth of networking opportunities in a large, dedicated scientific community. The particular character of research at the institutions in the Leibniz Association, which includes fundamental, large-scale and application-oriented research, means doctoral candidates can conduct research from basic idea right through to application.

International Max Planck Research Schools (IMPRS) offer talented German and international junior scientists the opportunity to earn a doctorate under excellent research conditions. The research schools are established by one or several Max Planck Institutes. These IMPRS work in close cooperation with universities and other – sometimes international – research institutions. This provides an extraordinary framework for the graduate students to work in, and is a great advantage in interdisciplinary research projects, or in projects that require special equipment.

Location	Title	Contact
HELMHOLTZ GRADUATE SCHOOLS		
Karlsruhe	Helmholtz Research School on Integrated Materials Development for Novel High-Temperature Alloys	www.imd.kit.edu
LEIBNIZ GRADUATE SCHOOLS		
Berlin	Leibniz Graduate School - Dynamics in New Light (DinL)	www.mbi-berlin.de/DinL
INTERNATIONAL MAX PLANCK RESEARCH SCHOOLS (IMPRS)		
Düsseldorf Mülheim	IMPRS for Surface and Interface Engineering in Advanced Materials	www.imprs-surmat.mpg.de

SOCIETIES AND ASSOCIATIONS
IN GERMANY:

Association of German Engineers (VDI): **www.vdi.eu**

Deutsche Gesellschaft für Materialkunde e.V.: **www.dgm.de** (DE)

German Academic Society for Production Engineering (WGP): **www.wgp.de**

German Federation of Industrial Research Associations (AIF): **www.aif.de**

Verband Deutscher Maschinen- und Anlagenbau e.V. (VDMA): **www.vdma.org**

Wissenschaftliche Gesellschaft für Produktentwicklung (WiGeP): **www.wigep.de** (DE)

OPEN POSITIONS:

Research in Germany: Provides a list of job portals that specialize in academic and research-related posts. **www.research-in-germany.de/jobs**

Helmholtz Association: **www.helmholtz.de/en/jobs_talents**

Max Planck Society: **www.mpg.de/jobboard**

Leibniz Society: **www.leibniz-gemeinschaft.de/karriere** (in German only)

Fraunhofer Society – Application-oriented research: **www.fraunhofer.de/en/jobs-career**

GERMAN UNIVERSITIES & RESEARCH INSTITUTIONS
INDIVIDUAL PROJECTS, PROGRAMMES, PROFILES, CONTACTS

German Project Information System (GEPRIS): Online database providing information about all current DFG-funded research projects and contact information for the Principal Investigators. **http://gepris.dfg.de**

The Research Explorer: Information on more than 19 000 institutes at German universities and non-university research institutions, searchable by geographic location, subject and other structural criteria. **http://research-explorer.dfg.de**

Website of the DFG: Further background information about DFG funding programmes, funding guidelines, and lists of currently DFG-funded activities. **www.dfg.de**

The German Rectors' Conference (HRK) Research Map: Information about 329 main areas that define the interdisciplinary research priorities at 74 German universities. **www.hrk.de/6754.php**

The Higher Education Compass: Information on Germany's higher education institutions, the range of courses and programmes that they offer, their worldwide cooperation, and who to contact locally. **www.hochschulkompass.de**

Contact

German Research Foundation (DFG)
DFG Head Office Germany
www.dfg.de
researchmarketing@dfg.de

Deutsche
Forschungsgemeinschaft