

**BUILDING ON KNOWLEDGE**



# BUILDING ON KNOWLEDGE



“The construction industry is not insulated against the challenges posed by scarce and expensive raw materials, rising energy prices and climate protection requirements. In industrialized countries, around 40 percent of energy consumption goes to heating and cooling. This makes new building systems that reduce energy consumption absolutely essential, along with research into innovative building materials and prudent, forward-looking planning for buildings, settlements and cities.”

**Prof. Dr. Reimund Neugebauer**

President of the Fraunhofer-Gesellschaft

## BUILDING PHYSICS IS ONE OF THE KEYS TO SUCCESSFUL BUILDING

The Fraunhofer Institute for Building Physics IBP focuses its work on research, development, testing, demonstration and consulting in the various specialist areas of building physics. These include areas such as noise control and sound insulation measures in buildings, the optimization of acoustics in indoor spaces, and solutions for improving energy efficiency and optimizing lighting technology. They also include issues related to climate control and the indoor climate, hygiene and health protection, building material emissions, weatherproofing and protection against heat and moisture, preservation of building structures and the conservation of historical monuments. The institute employs life cycle engineering methods to analyze the potential environmental, social and technical impacts of products, services and processes. This enables us to evaluate and make lasting improvements towards sustainability and to foster innovation processes.

Our building science portfolio also includes building chemistry, building biology and hygiene, as well as cutting edge work in the field of concrete technology.

Our Kassel branch builds on conventional methods of efficient energy use and provides key expertise in the development of building system components.

The “Systems Integration in Efficient Buildings” research team, which is affiliated with the Indoor Climate department and based at our Nuremberg branch, works on integrated solutions for buildings. Its goal is to provide maximum comfort, health benefits and age-appropriate housing while keeping costs at reasonable levels and minimizing the use of energy. In a portfolio-supplementing collaboration between Fraunhofer IBP, Rosenheim University of Applied Sciences, and the testing, surveillance and certification body ift Rosenheim, the Fraunhofer Center Building Technology formulates and develops innovative building concepts and optimized components for new and existing buildings at our Rosenheim branch. Research there focuses on current topics such as energy conservation, the generation of solar energy, resource efficiency, sustainability, energy-plus concepts, modularity, adaptivity and comfort. Fraunhofer IBP works together with industry partners to help

“Sustainability and energy efficiency have evolved into standard requirements for new buildings. The level of sustainability that can be achieved is dictated by what is technically feasible. Far from being constant and unchanging, sustainability is something that can and should be continuously improved.”

**Prof. Dr.-Ing. Klaus Peter Sedlbauer**

Director of the Fraunhofer Institute for Building Physics IBP



develop and launch novel and environmentally-friendly building materials, components and systems. Our clients mostly comprise building companies, mechanical engineering firms, plant manufacturers, contractors, developers, architects, planners and licensing authorities, as well as private and public-sector institutions engaged in construction research.

The application of building science expertise to related areas of specialization has expanded our circle of partners to include companies from the automotive and aviation industries. We carry out complex building physics studies at our efficient and well-equipped laboratories and test centers and at our outdoor testing site in Holzkirchen, which to the best of our knowledge is the largest facility of its kind. Modern laboratory measuring techniques and computational methods help researchers develop and optimize building products for practical applications. We also carry out experiments in environmental test chambers, simulation facilities and existing buildings to assess components and overall systems for new buildings and renovation projects based on the principles

of building physics. Fraunhofer IBP has been approved by the German building inspection authorities as a testing, monitoring and certification center for building materials and building techniques in Germany and the rest of Europe. Four of the institute's test laboratories have been granted flexible accreditation by the German accreditation body Deutsche Akkreditierungsstelle GmbH (DAkkS) in accordance with DIN EN ISO/IEC 17025. This entitles them to develop new test methods and to modify existing methods.

The motto “Building on knowledge” lies at the heart of the institute's research and development work and includes the academic programs offered through the departments of building physics at Technische Universität München and the University of Stuttgart. The doctoral study courses “Climate – Culture – Building” and “People inside” provide a solid framework for conducting basic research into climate-adapted building design and the interaction between people and their indoor environments. At the same time, close ties to regional industry ensure a strong and steady influx of professional expertise in all the institute's fields of research.

A handwritten signature in black ink that reads "Klaus Sedlbauer". The signature is written in a cursive, flowing style.

**Prof. Dr.-Ing. Klaus Peter Sedlbauer**

# AREAS OF EXPERTISE



---

## ACOUSTICS

Noise is a typical product of technological progress that in many cases can only be reduced or eliminated by developing innovative acoustic technologies. Powerful calculation and simulation techniques and analysis and forecasting methods are the basis for achieving this. The focus here is on developing new kinds of acoustic components for buildings, machines, plants and vehicles. In collaboration with industrial licensing and cooperation partners, the department offers a constantly expanding international platform for innovative acoustics which aims to optimize the acoustic system quality of complex products and structures.



---

## BUILDING CHEMISTRY, BUILDING BIOLOGY, HYGIENE

Key aspects of the department are research into chemical, sensory and concrete technology as well as biological and hygiene-related issues that arise inside and outside of buildings or the enclosed spaces of cars and aircraft. It advises customers and develops new materials and analytical methods and focuses on technical materials, components and building products used in interior spaces. For buildings, materials and material composites used in the building envelope are studied. Researchers also investigate emissions and eluates from materials, precursors, end products and manufacturing processes. Another aspect of the department's work is to locate and evaluate odors via sensory methods (human odor panels) and then clarify the results by analytical and chemical methods.



---

## ENERGY SYSTEMS

At its facilities in Kassel and Holzkirchen, the Energy Systems department carries out research and development into improving energy efficiency in buildings. Its primary tasks include investigating the energy issues affecting individual dwellings and residential communities, developing efficient energy supply concepts, examining ways of minimizing energy requirements, and using renewable energy sources to cover residual demand in an energy-efficient way. The department carries out comprehensive, integrated studies of buildings, building envelopes and building systems and services in order to facilitate the coordinated development of harmonized building system components, façade systems and prefabricated building components.

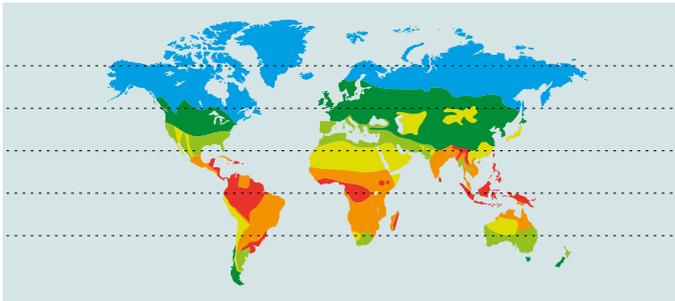


---

## LIFE CYCLE ENGINEERING

The main focus of research at the Life Cycle Engineering department is on sustainability analysis methods. The department works with partners from politics and industry and research institutions on clearly defined projects with a strong international orientation and that combine life-cycle-related topics with overarching issues relating to technical feasibility, capacities, infrastructure and material flow management. To facilitate its day-to-day sustainability analysis work, the Life Cycle Engineering department collaborated with PE INTERNATIONAL to develop the practical GaBi software and database system. At reasonable expense, this allows complex system models to be created and evaluated according to different criteria, for instance a product system's environmental impact or life cycle costs.

## AREAS OF EXPERTISE



---

### HYGROTHERMICS

The Hygrothermics department analyzes the behavior of building materials, components and buildings under changing moisture and heat conditions. This includes carrying out laboratory materials testing and outdoor tests under defined conditions as well as devising and trying out new test procedures. A significant portion of the department's activities is also devoted to developing and applying numerical simulation models. The department's many years of experience with both experimental and computational research methods allows it to comprehensively evaluate ways to protect building structures from climate-related moisture damage, while also giving it the expertise to optimize building products using targeted approaches and even to develop new kinds of building materials and systems.



---

### INDOOR CLIMATE

The Indoor Climate department works on the analysis, monitoring and optimization of indoor climate conditions. Its teams conduct research into creating user-friendly climates for enclosed spaces in the building construction, aviation and automotive sectors. As well as focusing on the relationship between the effects of indoor climate and people's sensation of comfort, researchers also investigate how to create optimum indoor climates using the minimum of resources. Key aspects of the department's work include user acceptance, variations in user requirements, and the use of energy-efficient systems based on renewable energy.



---

## HEAT TECHNOLOGY

The Heat Technology department carries out research and development into energy-efficient living, working and building for new and existing buildings. The department's scientists plan, supervise and evaluate very-low-energy, zero-emissions and energy-plus houses. Their development work incorporates all energy-relevant construction, heating, cooling, ventilation, air-conditioning, lighting and materials-handling technologies. In addition, the department develops energy efficiency concepts for individual settlements and even whole cities. The researchers create assessment and computational tools for indoor and outdoor lighting. The department also develops and maintains computer-aided planning instruments and information systems for end users as well as CPU cores for software companies.

# INNOVATION CENTERS



## FRAUNHOFER CENTER FOR ENERGY EFFICIENCY OF HISTORIC BUILDINGS AND CONSERVATION OF CULTURAL HERITAGE BENEDIKTBEUERN

The Fraunhofer Center for Energy Efficiency of Historic Buildings and Conservation of Cultural Heritage in Benediktbeuern is a Fraunhofer IBP innovation project. The center addresses issues around the conservation of architectural heritage and historical building structures. A main focus of the center's work is on improving the energy efficiency of existing buildings while taking into account historic preservation concerns. The goal is to combine historic preservation and building physics and also to incorporate topics such as energy efficiency, sustainability, economics, ecology and renewable energy while factoring in the specific urban planning context. Multidisciplinary knowledge is called for in order to develop innovative solutions for the

energy-efficiency and building-physics aspects of our old and historic buildings. The Fraunhofer Center Benediktbeuern pursues a variety of approaches using models and on-site demonstration areas, where it studies technical innovations and traditional solutions for existing and historic buildings in order to prevent long-term structural damage. To achieve this goal, the center collaborates with partners from different fields, including historic building conservation, architecture, the environment and the construction industry.

[www.denkmalpflege.fraunhofer.de](http://www.denkmalpflege.fraunhofer.de)



## FRAUNHOFER CENTER BUILDING TECHNOLOGY

The Fraunhofer Center Building Technology pools the expertise of three institutions in the field of building research and development: namely, Fraunhofer IBP, Rosenheim University of Applied Sciences, and the testing, surveillance and certification body ift Rosenheim. Working together with the building industry, innovative building concepts and optimized components for new and existing buildings are devised and developed at this interdisciplinary center. Key areas of research are energy and resource efficiency, age-appropriate housing, energy-plus concepts, adaptivity, modularity and comfort. However, the center's work also includes collaborations to devise optimized general building concepts and innovative building systems, components and processes as well as researching constructive solutions for the building envelope as the interface between the interior and the external environment. While closely involving partners and drawing on their expertise, the center pursues the development and optimization of cost-effective designs for renovation and new buildings as well as the integration of renewable energy production into building façades. However, these smarter, more complex building envelopes must still remain affordable, which requires manufacturing and installation processes that are subject to rigorous quality assurance together with resource-efficient designs.

[www.bautechnik.fraunhofer.de](http://www.bautechnik.fraunhofer.de)

## FRAUNHOFER INHAUS CENTER

At the Fraunhofer inHaus Center, the Fraunhofer-Gesellschaft currently bundles the potential of seven Fraunhofer Institutes and numerous business partners in order to collaborate on developing, testing and demonstrating new solutions for rooms and buildings and bringing them to market. Examples of inHaus activities range from improving energy efficiency through the use of new materials and automated building services to optimizing the design of office space and hotel rooms, and using technology to enhance patient security and care in the nursing sector. Jointly planned and run application laboratories in test buildings inHaus1 (for residential property) and inHaus2 (for commercial property) provide a connection to the market. Another goal of the center is to open up new market opportunities for its business partners, with the focus here on component, system and service innovations for function and process optimization in residential and commercial properties. The integrated innovation chain from research to practice (inHaus pilot projects in the market) greatly increases the chances that new developments will be successful. Joint use of the inHaus laboratories and shared use of all resources in the inHaus network significantly reduce partners' costs, even for complex and high-risk new developments.

[www.inhaus.fraunhofer.de/en.html](http://www.inhaus.fraunhofer.de/en.html)

# TRAINING A NEW GENERATION OF EXPERTS

In addition to the Fraunhofer Institute for Building Physics IBP, two universities play an important role in carrying out research and in training a new generation of experts.



**Universität Stuttgart**

In response to the growing importance of building physics in the construction arena, the Institute of Building Physics was established in the Department of Civil Engineering and Surveying at Technische Universität München (TUM) in 2004. The institute carries out application-oriented research in close cooperation with the Fraunhofer Institute for Building Physics IBP. Students may elect to take laboratory internships at Fraunhofer IBP as part of their coursework. The research topics are primarily thermal and hygrothermal in nature, with a particular focus on numerical simulation of building features such as airflow within rooms. TUM's Institute is doing fundamental research in the fields of »Climate-adaptive construction« and »Effects of indoor environments on performance and user comfort«.

## **TECHNISCHE UNIVERSITÄT MÜNCHEN**

Institute of Building Physics  
Department of Civil Engineering and Surveying  
[www.bp.bgu.tum.de/en](http://www.bp.bgu.tum.de/en)

The University of Stuttgart established a Department of Building Physics for Structural Design 25 years ago with the aim of teaching the subject of building physics to new generations of civil engineers. The current Department of Building Physics has expanded its scope to encompass multiple disciplines in addition to structural design and now offers five courses covering various aspects of building physics. An Online Master's in Building Physics was successfully launched for the winter semester 2007/08 as the latest continuing education course; it is aimed at architects and engineers working in the construction industry who wish to improve their skills in the field of building physics by acquiring a practical, comprehensive and academically solid qualification while pursuing their career. Research projects currently underway at the department include a method for assessing bridges, life cycle engineering and inflatable baffle collectors. The department is also a member of the Building Physics Learning Network (Lernnetz Bauphysik).

## **UNIVERSITY OF STUTTGART**

Department of Building Physics  
Faculty of Civil and Environmental Engineering  
[www.uni-stuttgart.de/lbp](http://www.uni-stuttgart.de/lbp)



## **MASTER:ONLINE** Bauphysik

Building physics today is undergoing rapid change as building technology advances, user demands grow and functional requirements for buildings increase. These dynamic developments create the need for a continuing education program for architects, engineers and other construction professionals working full time.

The “Online Master’s in Building Physics” provides working professionals with comprehensive and up-to-date building physics knowledge. To help these students meet the challenge of balancing study, work and family, the course uses innovative techniques and teaching and learning methods.

The Online Master’s in Building Physics focuses on damage prevention rather than damage repair, which is a fundamental difference between it and comparable further education courses.

The course is the first and only accredited master’s degree with the qualification “Master of Building Physics (M.BP.)”. Under the umbrella of the Fraunhofer Academy, only Fraunhofer IBP and the Department of Building Physics at the University of Stuttgart offer this course. They also cooperate with professional associations and industry. The resulting proximity to research and industrial practice as well as the highly qualified lecturers guarantee both the quality and up-to-date relevance of the curriculum over the long term. Students come into contact with innovative, ground-breaking technologies before they even reach the market.

[www.mob.uni-stuttgart.de](http://www.mob.uni-stuttgart.de)

# HOW TO FIND US

## STUTTGART INSTITUTE

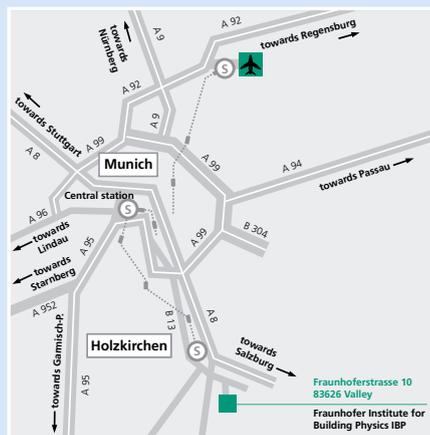
Nobelstrasse 12  
70569 Stuttgart, Germany  
Phone +49 711 970-00

## HOLZKIRCHEN BRANCH

Fraunhoferstrasse 10  
83626 Valley, Germany  
Phone +49 8024 643-0

## KASSEL BRANCH

Gottschalkstrasse 28a  
34127 Kassel, Germany  
Phone +49 561 804-1870



### Car

Take A81/A8 to Stuttgart interchange (Autobahnkreuz Stuttgart); continue on A831/B14 toward Stuttgart-Vaihingen/Zentrum, approx. 2 km to Universität exit; turn left into Universitätsstrasse; follow Fraunhofer-Gesellschaft sign

### Train

From Stuttgart central station (Hbf) take suburban train (S-Bahn) S1 toward Herrenberg or S2/S3 toward Flughafen. Get off at Universität, leave station via Schranne/Nobelstrasse residential area exit, walk approx. 7 mins. Or take bus 84 or 92, get out at Nobelstrasse

### Plane

From Stuttgart airport take suburban train (S-Bahn) S2/S3 to Universität, then see "Train"; or take a taxi (approx. 16 km)

### Car

Take A8 Munich–Salzburg until Holzkirchen exit; continue for approx. 2 km on B318 toward Miesbach, Bad Tölz until Holzkirchen-Mitte exit, turn off toward Miesbach; the institute is approx. 800 m on right (place sign Oberlandern)

### Train

From Munich central station (Hbf) take suburban train (S-Bahn) S3 toward Holzkirchen, get out at final stop (journey time 45 mins), or take Bayerische Oberlandbahn (BOB) toward Bayrischzell, Lenggries or Tegernsee (approx. 30 mins). From Holzkirchen train station take bus 9561 toward Schliersee, get out at Oberlandern Fraunhofer-Institut (approx. 5 mins); or take a taxi (approx. 3 km)

### Plane

From Munich airport take suburban train (S-Bahn) S8 to München-Ostbahnhof, change to S3 toward Holzkirchen, then see "Train"; or take a taxi (approx. 75 km)

### Car

Coming from the West: Take A44 until Kassel South interchange (Kasseler Süd-kreuz); continue on A49 toward Kassel to Kassel-Waldau exit, then follow signs to Universität Coming from the North/South: Take A7 to Kassel-Nord, then follow signs to Universität

### Train

From Kassel-Wilhelmshöhe station (an ICE train stop), take tramway line 1 toward Holländische Strasse as far as Halitplatz/Philipp-Scheidemann-Haus. Then turn right into Mombachstrasse and left into Gottschalkstrasse (approx. 5 mins on foot)

### Plane

From Kassel-Calden regional airport take a taxi (approx. 15 km), or from Paderborn airport take a train to Kassel-Wilhelmshöhe station, then see "Train"; or take a taxi (approx. 85 km)

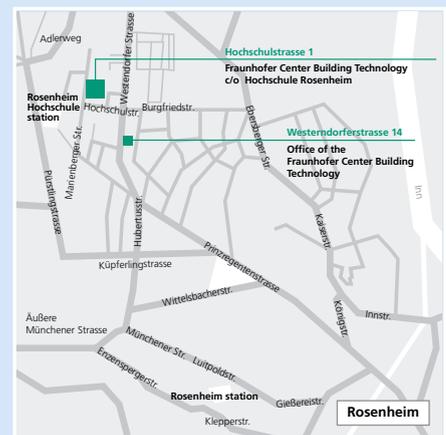
## NÜRNBERG BRANCH

c/o Energie Campus Nürnberg  
 Fürther Strasse 250  
 Auf AEG, Bau 16  
 90429 Nürnberg, Germany  
 Phone +49 911 56854-9144



## ROSENHEIM BRANCH

Fraunhofer Center Building Technology  
 c/o Hochschule Rosenheim  
 Hochschulstrasse 1  
 83024 Rosenheim, Germany  
 Phone +49 8031 805-2684



### Car

Take A3 to Exit 83 Fürth/Erlangen interchange (Autobahnkreuz); continue on A73 toward Nürnberg-Süd until Flughafen exit, then go left onto Jansenbrücke/ Maximilianstrasse/B4R/B8. After approx. 550 m turn left into Fürther Strasse/B8, entrance on right side of road

Take A6 to Exit 58 Nürnberg-Süd interchange (Autobahnkreuz); continue on A73 toward Nürnberg-Süd via the southwestern bypass (Südwesttangente) as far as exit for Nürnberg-Hafen interchange (Autobahnkreuz); continue toward A3/A73/Nürnberg Zentrum/Würzburg/Bamberg and further along N4 until Flughafen exit, go right onto Jansenbrücke/Maximilianstrasse/B4R/B8; then see A3 directions

Take A9 to Exit 52 Nürnberg-Fischbach; continue along B4 toward Nürnberg-Zentrum. After approx. 4.3 km, turn left onto Rabin-Jitzhak-Strasse/B2/B4R. Keep right on approach road toward A3/A73/Würzburg/ Erlangen/Bamberg and continue on N4 to Flughafen exit; then see A6 directions

### Train

From Nürnberg central station (Hbf) take underground train (U-Bahn) U1 toward Hardhöhe and get off at Eberhardshof. Walk along Fürther Strasse toward the inner city, the entrance is on the right side of road

### Plane

From Nürnberg airport, take underground train (U-Bahn) U2 toward Röthenbach as far as Nürnberg central station (Hbf). Change to underground train U1, then see "Train"

### Car

Take A8 Munich–Salzburg until Rosenheim exit; continue on B15 toward Lands- hut to Rosenheim. Continue through the city on B15 until you see a pink building on right. Turn left at lights (signed Hochschule, Gabor) into Hochschulstrasse

### Train

Take train to Rosenheim station from Munich central station (Hbf) (journey time approx. 45 mins), Salzburg station (approx. 60 mins) or Innsbruck station (approx. 90 mins). Change to train toward Mühldorf a. Inn/Landshut, get off at Hochschule Rosenheim. Cross Prinzregentenstrasse on foot, walk to Marienbergerstrasse, turn left and walk to Hochschulstrasse, turn right

### Plane

Travel by car from Munich, Salzburg or Innsbruck airports (driving time approx. 60 – 90 mins)

# INFO FROM THE INSTITUTE

## WHAT'S NEW AT THE FRAUNHOFER IBP?

Subscribe to our newsletter and you'll always be in the loop. Find out all the latest developments, including upcoming seminars and conferences organized by Fraunhofer IBP as well as talks and presentations from our employees.

Stay informed about current research projects at the institute and find out what building physics issues are currently under discussion and are keeping our scientists busy. The newsletter also reports on current publications, such as IBP Research News, which provides concise summaries of building physics research findings. On top of this, our press releases provide an overview of the institute's varied research and development work and media presence.

### »Newsletter«



You will receive the newsletter as an e-mail every three months. It contains brief news items and links to our website for further details: [www.ibp.fraunhofer.de/en.html](http://www.ibp.fraunhofer.de/en.html)  
Subscribe here  
[www.ibp.fraunhofer.de/de/newsletter.html](http://www.ibp.fraunhofer.de/de/newsletter.html)

### IBP Research News – Bulletins from the cutting edge of building physics



Fraunhofer IBP presents its latest research findings over a maximum of two pages on an ongoing basis. Our newsletter tells you when these findings are published and gives you the link to download them. But if you'd prefer a hard copy, put your name down on our distribution list and we'll send you the print version free of charge.

[www.ibp.fraunhofer.de/en/Publications/IBP\\_Research\\_News.html](http://www.ibp.fraunhofer.de/en/Publications/IBP_Research_News.html)

### Contact

Fraunhofer Institute for Building Physics IBP  
Corporate Communications  
Rita Schwab  
Phone +49 711 970-3301  
Fax +49 711 970-3395  
[rita.schwab@ibp.fraunhofer.de](mailto:rita.schwab@ibp.fraunhofer.de)

### Research in Focus



Every month, "Research in Focus" illuminates a different topic from the world of building physics. The online periodical showcases the variety of research carried out at Fraunhofer IBP and allows glimpses behind the scenes at the laboratories. For more information, visit

[www.ibp.fraunhofer.de/en/Press/Research\\_in\\_focus.html](http://www.ibp.fraunhofer.de/en/Press/Research_in_focus.html)



**For general media inquiries, please contact**  
[presse@ibp.fraunhofer.de](mailto:presse@ibp.fraunhofer.de)

**Publisher**

Fraunhofer Institute for Building Physics IBP

**Director**

Prof. Dr.-Ing. Klaus Peter Sedlbauer

**Editor**

Dipl.-Journ. Janis Eitner

Head of Corporate Communications

Phone +49 8024 643-203

Fax +49 8024 643-366

janis.eitner@ibp.fraunhofer.de

**Layout**

Ansichtssache, Munich, Germany

**Printing**

KaWi-Druck, Munich, Germany

**Photo acknowledgments**

Cover: Fraunhofer IBP

Pages 3 and 4: Fraunhofer IBP

Page 5 left: Fotolia

Page 5 right: iStockphoto

Pages 6 to 9: Fraunhofer IBP

**STUTTGART INSTITUTE**

P.O. Box 80 04 69  
70504 Stuttgart  
Nobelstrasse 12  
70569 Stuttgart, Germany  
Phone +49 711 970-00  
Fax +49 711 970-3395  
info@ibp.fraunhofer.de

---

**HOLZKIRCHEN BRANCH**

P.O. Box 11 52  
83601 Holzkirchen, Germany  
Fraunhoferstrasse 10  
83626 Valley, Germany  
Phone +49 8024 643-0  
Fax +49 8024 643-366

**KASSEL BRANCH**

Gottschalkstrasse 28a  
34127 Kassel, Germany  
Phone +49 561 804-1870  
Fax +49 561 804-3187

**NÜRNBERG BRANCH**

c/o Energie Campus Nürn-  
berg, Germany  
Fürther Strasse 250  
Auf AEG, Bau 16  
90429 Nürnberg, Germany  
Phone +49 911 56854-9144

**ROSENHEIM BRANCH**

Fraunhofer Center Building  
Technology  
c/o Hochschule Rosenheim  
Hochschulstrasse 1  
83024 Rosenheim, Germany  
Phone +49 8031 805-2684  
Fax +49 8031 805-2697