

Today's ideas. Tomorrow's innovations.

#WeKnowHow



Quantum Technologies



Resource Efficiency
and Climate Technology



Next Generation
Computing



Hydrogen Technologies

Bioeconomy



Digital Healthcare



Artificial Intelligence



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Our challenge

Finding outstanding solutions for today's and tomorrow's markets

Ingenuity is our country's most important resource. This is what makes the efficient and sustainable transfer of scientific knowledge to commercial use possible. This knowledge transfer is the backbone of our innovation system.

Challenges such as the COVID-19 pandemic, the climate and energy crises, global supply chain problems, demographic changes, and new geopolitical conflicts have changed our world — and shaken the long-term stability of our security and prosperity. According to studies carried out by the Federation of German Industries (BDI), among others, Germany has been losing innovative strength since the beginning of the 2020s.

However, change also offers opportunities, for example when it comes to achieving more sovereignty in central areas of technology and transforming our economy to a more sustainable system. From

our energy supply, to the medical sector through to cybersecurity: We can now emerge stronger and more resilient after a crisis — and we have the chance not only to use specific innovations to preserve our competitiveness, expertise and knowledge but to expand them, too.

Our key objectives include ensuring that Germany and Europe have the political and economic freedom to act and make decisions, as is the involvement of civil society.

With integrated solutions for business, politics and society, Fraunhofer delivers solutions that create an impact across all sectors. In our strategic research fields, we provide both deliberate and dynamic impetus — looking ahead to the markets of tomorrow.

Fraunhofer #WeKnowHow



Learn more



The team around Dr. Peter Kürz (r.), ZEISS Semiconductor Manufacturing Technology (SMT), Dr. Michael Kösters (l.), TRUMPF Lasersystems for Semiconductor Manufacturing, and Dr. Sergiy Yulin, Fraunhofer Institute for Applied Optics and Precision Engineering IOF in Jena, are revolutionizing the performance of modern microchips with their development of BUV lithography. For their efforts, they were awarded the German Future Prize in 2020.

Our mission

Delivering innovations to business
and society

The Fraunhofer-Gesellschaft is the leading organization for applied research. Since 1949, it has been our mission to strengthen the competitiveness of the German and European economies and their regional research and innovation.

Concentrating on future-relevant key technologies and transferring our ideas and research findings to industry, business and society, we are helping shape German and European innovation.

+ We see ourselves as a trailblazer and trendsetter for both innovative developments and research excellence.

+ Our inspiring ideas and sustainable scientific and technological solutions support and empower our customers and partners — for the benefit of society.

+ Our interdisciplinary research teams, working alongside partners from business, universities and the public sector, turn original ideas into innovations.

+ We coordinate and implement key policy research projects that are of systemic relevance, and we strengthen the German and European economy with ethical value creation.

Comprehensive Impact Goals

In addition to focusing on the direct needs of our customers, we concentrate our efforts on five social goals — for a future worth living:

- + Digital transformation
- + Fully circular economy
- + Complete energy transition
- + Affordable healthcare
- + Security and a resilient society

Strategic Research Fields

We use our passion, creativity and ingenuity to develop new approaches for the challenges facing society today. Current research priorities for tomorrow's markets include:

- + Bioeconomy
- + Next Generation Computing
- + Digital Healthcare
- + Artificial Intelligence
- + Quantum Technology
- + Resource Efficiency and Climate Technologies
- + Hydrogen Technologies

Guiding
principles



A research team from the Fraunhofer Institute for Physical Measurement Techniques IPM led by Dr. Albrecht Brandenburg and Dr. Alexander Blättermann turned fluorescence imaging into a robust, high-speed precision instrument. This process raises quality assurance in manufacturing to a new level and is already generating sales in the millions on the international market.

Our impact

Creating advances in knowledge and new competitive edges

Fraunhofer supports companies from the initial idea to market launch. In this process, the impact of applied research goes far beyond the direct benefit to the customer: Fraunhofer institutes strengthen the performance and efficiency of companies and promote the acceptance of new technologies within society while also training the future generation of scientists and engineers that the economy so urgently requires. And: Fraunhofer is also a key player in making Germany a center of innovation.

+ We are tech scouts, bringing new ideas and business models to small, medium-sized and large companies.

+ We are a reliable partner for our customers.

+ Together with our partners, we set standards for new technologies and provide companies with an edge in international markets.

+ We set up technology spin-offs and support the small- and medium-sized enterprises (SMEs) of today and tomorrow.

+ We train specialists and managers in future technologies.

+ Together with international partners, we research solutions to global challenges.

+ Working closely with universities, we strengthen regions by creating local innovation networks and ecosystems.

+ We are making a decisive contribution to the global Sustainable Development Goals of the United Nations — and supporting coal-mining regions affected by the phase-out of coal in an innovation-driven structural transformation.

Fraunhofer research has an impact

We expedite the use of new technologies. Collaborating with Fraunhofer on research and development has been proven to strengthen companies — not least small- and medium-sized enterprises that form the core of the German economy. Our customers demonstratively increase their productivity, Fraunhofer customers commercialize more innovations and increase their sales and returns. Studies confirm that Fraunhofer is a key player when it comes to taking new technologies from research to commercial viability. Investing in Fraunhofer is profitable for the country and society.

Fraunhofer activities created 437,000 new full-time jobs in Germany during the calculation period and generated investments in the economy of over 15.2 billion euros. These additionally increased government revenues by 14 billion euros. Particularly strong results were achieved in knowledge-intensive sectors of chemicals and pharmaceuticals, computers and electronics as well as in mechanical and vehicle engineering.

[Learn more](#)





Fraunhofer

Together with her multi-institute team, Dr. Jasmin Fertey from the Fraunhofer Institute for Cell Therapy and Immunology IZI received the Fraunhofer Prize for Human- and Environment-Centered Technology in 2021 for a vaccine production process that is faster, more efficient and more environmentally friendly.

Our approach

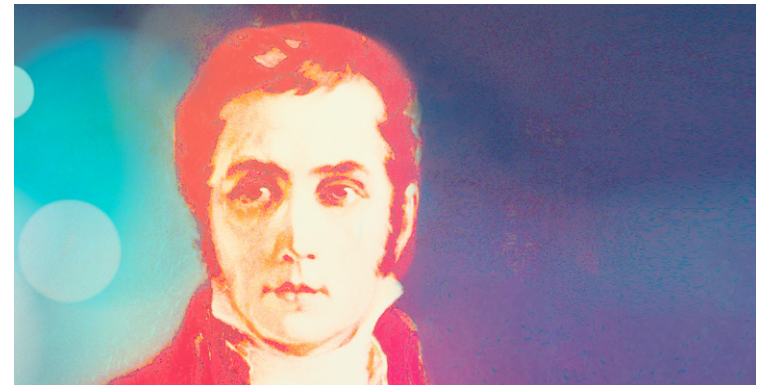
Supporting innovation and focusing on customers

Our main form of cooperation is contract research. We develop technical and organizational solutions that can be implemented effectively and support the widespread use of new technologies. Industrial and service companies of all sizes benefit as a result. Fraunhofer is an important source of innovative expertise for small and medium-sized enterprises that do not have their own R&D department. For our corporate customers, we develop and fine-tune technologies, processes and products through to the production of prototypes and small batch series.

At Fraunhofer, we pool our expertise in close collaboration between our institutes and our partners in business, science, research and academia — both nationally and internationally. This means we can make powerful contributions to the major challenges facing society while finding fast, efficient solutions for our customers.

Fraunhofer research teams work together with contract partners from industry and the public sector on a wide range of activities, from small-scale process optimization to complex large-scale projects. Key components of this work center on an entrepreneurial mindset coupled with scientific excellence.

A well-functioning exchange between experts at the interface between science and industry is crucial in order to transfer research knowledge quickly and effectively into new products and services. Only in this way can we adequately meet the key social challenges of today and tomorrow, such as structural transformation, sustainability and climate issues, digitalization and the consequences of demographic developments.



Our nonprofit organization, founded in 1949, is named after the Munich scholar **Joseph von Fraunhofer** (1787–1826). Equally successful as a research scientist, inventor and entrepreneur, he continues to be our role model and inspiration.

[Learn more](#)



For industry and business

We are reliable partners for our customers in business and industry — even in times of crisis: Our wide-ranging expertise, strong customer focus, market proximity and great capacity for synergy enable us to respond flexibly to new tasks and challenges.

For government and society

Advice we provide to policy makers at the national, state and local levels is topical, relevant, and easy to implement. Fraunhofer is the first point of contact for national and state governments and parliaments when it comes to technology and innovation.

Our Fraunhofer Group for Innovation Research supports innovation and transformation with a wide range of expertise and methods in sociotechnical and socioeconomic research.

Fraunhofer worldwide

Fraunhofer collaborates with independent international Fraunhofer affiliates located in Europe, in North and South America and Singapore. Representative offices and senior advisors worldwide build bridges to local markets. Our office in Brussels serves acts as a liaison to the institutions of the European Union. Strategic collaborative partnerships with distinguished international partners complete our portfolio.



Hydrogen is considered the fuel of the future, but it is not suited for small vehicles. The pressure surge during fueling would be too great. Dr. Marcus Vogt and his team at the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM have developed an alternative, POWERPASTE. Hydrogen can be stored in it chemically, easily transported and refueled without any fueling station infrastructure.

Our services

Customizing solutions for all customer groups

Bringing technological innovations to the economy and society — this is the task of the Fraunhofer-Gesellschaft.

Our research units generate valuable technological knowledge and expertise on a daily basis. Tumor detection using artificial intelligence, self-driving trucks on the highway and real-time control of production facilities using 5G mobile communications — these developments would be inconceivable without a properly functioning transfer of research findings into commercial applications. Not only do we serve the established sectors of mechanical engineering, manufacturing and energy, but also quantum technologies, translational medicine, artificial intelligence and smart farming.

For more than 70 years, the institutes of the Fraunhofer-Gesellschaft have been valued by business and government as the bedrock for a competitive industry and

as a hotbed for company relocations and start-ups.

Fraunhofer develops new processes, products, services and materials. Patents, utility models, trademarks and copyrights protect the intellectual property (IP) from our research. Our customers and partners access this through licensing models.

Successful technology exploitation requires a broad, differentiated set of transfer solutions, all of which we have in our portfolio:

- + Industrial projects and public-private partnerships
- + Use of intellectual property (IP)
- + Continuing education and training for industry
- + Spin-offs and shareholdings
- + Transfer via individuals
- + Standards and norms
- + R&D infrastructures for industry

Leader in inventions

Fraunhofer is the leading German research institute in terms of the annual number of invention disclosures, patent applications and total intellectual property rights. We also enjoy an excellent standing in comparison with industrial companies:

We have consistently ranked as one of the German Patent and Trade Mark Office's 10 to 20 most prolific patent applicants over the last decade.

We are also among the European Patent Office's most active patent applicants. Fraunhofer's intellectual property comprises more than 7,600 patent families, giving our customers freedom of action. These also serve to shape standards and trends in markets.

Fraunhofer lead markets — our strategically targeted sectors

Our core activity is applied research. Industry is our partner. In tune with our research fields, Fraunhofer has defined sectors that are of particular relevance as our lead markets. In these sectors, customers use our help to turn innovations into global competitive advantages. This enables us to work together to secure the technological sovereignty of Germany and Europe.

Learn more



Prof. Michael Moseler (l.) and Prof. Matthias Scherge from the Fraunhofer Institute for Mechanics of Materials IWM have developed a unique method for detecting fluctuations in friction coefficients. This helped EagleBurgmann Germany GmbH & Co. KG shorten the development time by at least 99 percent for the manufacture of virtually frictionless mechanical seals.

Continuing education for professionals and managers

The Fraunhofer Academy provides internal continuing education courses for specialists and managers in technology-driven companies who are interested in advancing their skills and expertise. These specialized and highly topical courses are supported by the Cybersecurity Training Lab — our model for the continuing education of IT security specialists. This approach incorporates universities of applied sciences as partners in cooperative research in the development of the continuing education programs and teaching modules as well as in the teaching of the course content.

The modules are tailored to the needs of business as well as public administration in terms of sector, focus and function and focus on tomorrow's expertise requirements by applying targeted solutions.

Learn more



Founding spirit for cutting-edge technology

More and more, innovations require an interdisciplinary approach. Our world-class, high-tech researchers have an entrepreneurial mindset and help bring successful spin-offs to the markets — over 500 since 2000. This is a reflection of our true founding spirit for cutting-edge technology.

Spin-offs are an integral part of our commercial activities. They are an important and, above all, effective bridge between research and business and a direct catalyst for the transfer of innovation. Fraunhofer spin-offs demonstrate proven business success and high stability in the market.

Learn more



Successful joint venture: Clean seeds without chemicals? André Weidauer, E-VITA GmbH, and Maik Schwarz, Ceravis AG, have expanded technology from the Fraunhofer Institute for Organic Electronics, Electron Beam and Plasma Technology FEP that uses an electron beam to kill fungi, viruses and bacteria in agricultural seeds without damaging the seed or contaminating it with toxins.

Our system solutions

Implementing research and development through collaboration and infrastructure

Our laboratories and infrastructures are state of the art. This is where Fraunhofer's research scientists find new solutions, test their feasibility, develop prototypes, new manufacturing processes and provide demonstrators and prototypes. Companies, especially small- and medium-sized ones, benefit from research and development services that are provided and tested on state-of-the-art infrastructure. Close cooperation with universities opens up the opportunity to pool complementary skills and helps elevate the status of all partners.

By combining expertise into institute groups as part of joint research and development projects with dedicated roadmaps, we develop system solutions that impact multiple industries. We

have the complementary skills to align our expertise with specific problems or issues. In addition, our institutes and networks pursue new trends and ensure the ongoing advancement of research expertise.

The Research Fab Microelectronics Germany FMD and the Fraunhofer Research Fab Battery Cells FFB successfully orchestrate topic-specific and interdisciplinary collaborative activities in real market environments. We master the complexity of these assignments, exploit synergies by leveraging the expertise of our networked institutes and thereby contribute to the successful development of key technologies for society as a whole. We are an attractive and well-established participant in public-private partnerships and the industry-

compatible resources we provide enhance entire value chains.

We also coordinate high-performance centers to provide the necessary framework to align university and non-university research with business. These concentrate universities, higher education institutes and other non-university research institutes at a single local or regional location. Here they work closely with civil businesses and stakeholders to carry out research on specific topics and to rapidly bring innovations to practical application. High-performance centers stand for excellent infrastructure, training concepts and expertise that can be used across organizations. They bring together like-minded partners and act as innovation guides to help bring ideas to the market.

Learn more



Fraunhofer puts quantum computing into practice

Science and industry need computing capacities that can perform increasingly complex computing operations at faster and faster speeds. Quantum computers can perform calculations and simulations that would take conventional computers years to complete: These can be used to analyze complex industrial systems, disentangle complicated molecular and chemical interactions and make artificial intelligence even more powerful.

Our Quantum Computing competence network provides the German industrial and research communities with exclusive access to the first quantum computer installed in Germany, the IBM Q System One.

Learn more



Prof. Haya Shulman, Head of Cybersecurity Analytics and Defences at the Fraunhofer Institute for Secure Information Technology SIT, received the country's highest cybersecurity award, the German IT Security Award from the Horst-Görtz Foundation for the development of the Cache Test security solution.

Our Greatest Strength

Our employees — proven experts in their fields

Career opportunities at Fraunhofer are as diverse as our research fields. Our greatest asset as a science organization is our highly-motivated employees engaged in cutting-edge research or who provide effective support in the areas of research management and administration. The distinguishing feature of our Interdisciplinary work is the great deal of individual professional freedom.

Fraunhofer offers its researchers the opportunity for independent, creative and,

at the same time, goal-oriented work. We help our employees develop professional and personal skills that will enable them to take on positions of responsibility at institutes and universities, as well as in industry and society. Students involved in projects at Fraunhofer institutes have excellent career prospects due to the practical work experience they receive and the opportunity to interact with contract partners at an early stage in their career.

More than 80 percent of our institute directors hold professorships at universities.

Fraunhofer is a sought-after partner in the higher education sector, for example as part of the Excellence Strategy of the German federal and state governments. Because of Fraunhofer's close cooperation with universities, Fraunhofer employees can carry out their PhD research directly at partner universities.

We aim to strike a balance between recruiting and retaining staff and to achieve our objective of transfer via individuals. In fact, ten percent of our total workforce each year transfer to the private sector,

mainly as qualified specialists. Excellent qualifications, interdisciplinary work and the formation of professional networks mean that every year thousands of employees become highly sought-after specialists in their industry. In line with the principle of individual knowledge transfer, some 3,000 follow the call to industry each year. In addition, we ourselves regularly occupy top positions in employer rankings.

New Work

Fraunhofer offers a cooperative and trusting work and research environment for motivated employees. We promote independence, team responsibility and goal-oriented leadership and provide suitable training, digital platforms and modern working environments. Our sense of purpose, shared corporate identity and flexible working within networks are all key to making us an attractive employer.

To ensure success for our customers as well, we are establishing agile work processes and improving our response times and innovative strength.

Learn more



The odor of recycled plastics hinders recycling. As part of her doctorate at the Fraunhofer Institute for Process Engineering and Packaging IVV, Dr. Miriam Strangl analyzed the odor-active compounds in recycled plastic. In doing so, she paved the way for targeted decontamination and odor reduction strategies along the entire value chain.

Our values

Ensuring responsibility, transparency and sustainability

Responsible action

We believe that corporate social responsibility means taking responsibility for a future worth living. Wherever we operate, we make sure that our activities are economically, ecologically and socially sustainable. Good scientific practice is an integral part of our work. The principle of responsibility guides our interaction with all of our stakeholders and the focus of our research is on sustainability and the common good. We consider integrity and responsible action to be the foundation of long-term success. These values have been sustained by our membership in the United Nations Global Compact since 2017. At all our sites, we promote and ensure compliance with human rights and labor and environmental protection standards, and we work to combat corruption. We are committed to fulfilling corporate due

diligence obligations in supply chains. To ensure systematic compliance, Fraunhofer also operates an established and proven compliance management system.

Diversity

We recognize and harness the potential of diversity. We do not think in terms of gender, ethnic origin, religion and belief, disability, age or sexual identity. Our diversity management ensures fairness of opportunity, work-life balance and the inclusion of people with disabilities. Fraunhofer is a dedicated founding member of the Chefsache initiative, a network advocating equal opportunities for men and women, and has been a member of the Diversity Charter since 2011.

Fraunhofer Climate Neutral by 2030

Our mission is becoming reality: We are transforming into a climate-neutral research operation. Fraunhofer is the first research organization in Germany to commit to climate neutrality by 2030 and is testing technologies for our own use.

How we achieve this objective:

- + Strategy for a climate-neutral scientific enterprise
- + Climate neutrality and sustainability officer available at every institute
- + Funds dedicated to climate protection measures
- + Climate-friendly building and redevelopment
- + Multiple institutes share infrastructures
- + Funding for photovoltaics/solar power
- + Business travel by rail in Germany and Europe
- + Pioneering mobility concepts
- + Climate-friendly and sustainable corporate procurement
- + Consistent offsetting of CO₂ emissions

[Learn more](#)



Today's Ideas. Tomorrow's Innovations.



Is it possible for a microchip, powered by a button cell, to operate non-stop for ten years and consume 99 percent less power than conventional microchips? Dr. Heinrich Milosiu, Dr. Markus Eppel and Dr. Frank Oehler (from left) from the Fraunhofer Institute for Integrated Circuits IIS have made a giant leap forward with the development of RFicient® technology.

Our organization

Using modern structures for scientific excellence, successful transfer and meaningful work

We operate 76 institutes and research units at sites in each of Germany's federal states. Over 30,000 employees with backgrounds in science, engineering or socioeconomics work with an annual research volume of roughly three billion euros.

We are continuously developing our areas of expertise. By collaborating in interdisciplinary groups, Fraunhofer institutes with related expertise can assume technological leadership in key strategic areas and jointly implement complex customer projects.

International collaboration with outstanding research partners and companies from around the world brings the Fraunhofer-Gesellschaft into direct contact with the most prominent scientific communities and most dominant economic regions. We generate two-thirds of our budget

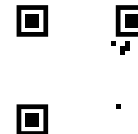
with revenue from industry and publicly-funded research projects, which are acquired through competitive bidding. The German federal government — in particular the German Federal Ministry of Education and Research — and the German states contribute another third as base funding, enabling our institutes to develop solutions now to problems that will drastically impact industry and society in the near future. We use the base funding to strengthen our scientific expertise, reduce development risks, shorten the time-to-market process and open up new technological potential for companies. The Fraunhofer model is unique and is the key to our competitiveness and continued success in the marketplace. We are continuously challenged to align ourselves with the market's needs for innovation and transfer. Our executive board manages the business and

represents Fraunhofer both internally and externally. It formulates scientific and research policy, determines expansion and financial planning, assists in the acquisition of base funding and manages its distribution among the institutes. The presidential council participates in executive board decision-making processes and, as such, is entitled to make proposals and recommendations to and has the right to be heard by the board. It consists of the executive board and the chairs of the groups.

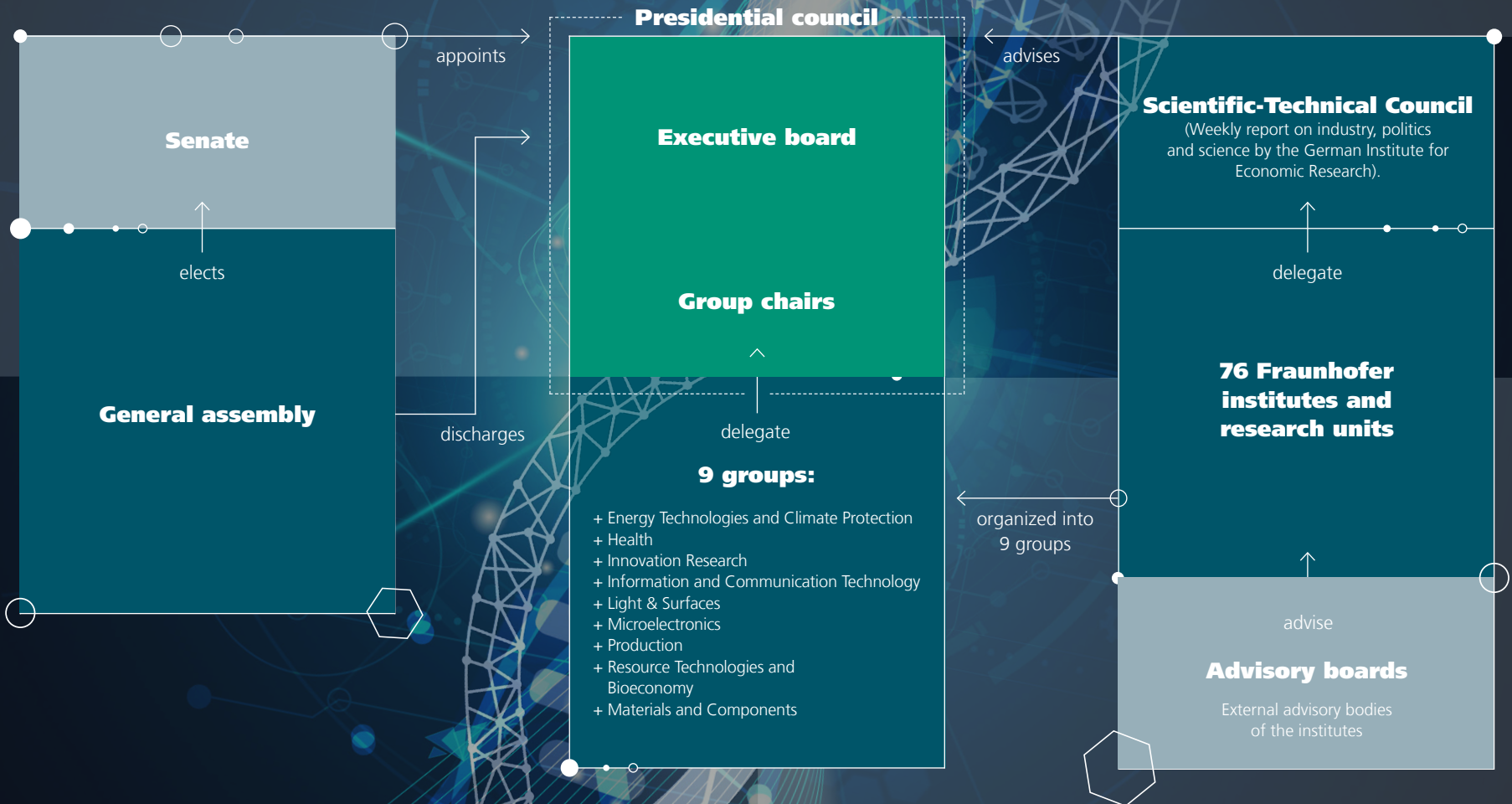
Our senate's duties include appointing members of the executive board and defining the basic principles of the Fraunhofer-Gesellschaft science and research policy. It has around 30 members from the fields of science, business and public life, representatives of the German federal and state governments, and

members of the Scientific and Technical Council (STC). Advisory boards at our institutes support the institute management in their research strategy and organizational development and help anchor them in society. These are made up of local representatives from science, business, society as well as German state and federal political representatives.

[Learn more](#)



Structural organization, committees



1990

2000

2010



Mp3 and AAC

Development of mp3 and AAC audio coding



White-light LED

For energy-efficient and long-lasting lighting



Video compression

H.264/MPEG-4 AVC standards for multimedia



Lab-on-a-chip system

Biological and microelectronic components on one chip



Bionic handling assistant

Robotic gripper modeled after an elephant's trunk

Our research highlights

Real innovations. #WeKnowHow

Over
30,000
employees

In 2021, the recruitment rate for female scientists increased to 29 percent (overall approximately 23 percent of research staff are women).

Over
6,200
customers from the private sector

... of which around 60 percent are small- and medium-sized companies.

Over
75
institutes

... organized into nine groups.

2
patent applications
every workday

Fraunhofer ranks among the 10 to 20 most active patent applicants every year.



Surgery with augmented reality

Mobile image guidance for highly complex surgeries



Smallest pump in the world

25 mm² micro-membrane pump



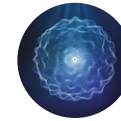
CAR-T cells for cancer therapy

Process for the complex production of cell specimens cell specimens



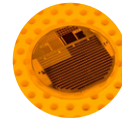
Voice assistants

Data sovereignty with AI-based voice assistant systems made in Germany



H₂ technologies

Materials, systems and production technology for a sustainable H₂ economy



Solar energy world record

Most efficient solar cell in the world with 47.6% efficiency

90%
of our institute directors hold a professorship

They combine university research with applied research and development at Fraunhofer.

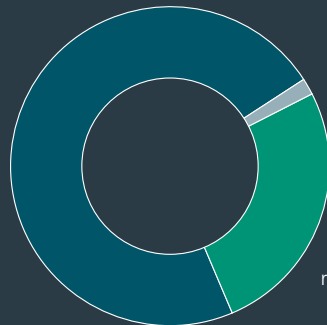
Approximately
30
spin-offs per year

... over 500 since 2000.
Roughly 80 percent are still active after ten years.

Over
7,600
active patent families*

Fraunhofer is an EU-wide leader in the establishment of standards.

roughly
72.1%
scientific, technical and administrative staff



roughly **1.7%**
trainees

roughly **26.2%**
students

2.5 billion
euros of revenue from contract research each year

Fraunhofer is both an attractive employer and a career springboard.

Demand from the private sector and society is driving growth.



Plant, mechanical and
vehicle engineering



Food



Health



Mobility



Aerospace

Construction



Energy



Digital



Chemistry



Published by:

Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e. V.
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Editor-in-chief:

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Design:

IAN In A Nutshell GmbH, Augustenstrasse 52, 80333 Munich

Photos:

Fraunhofer/Ansgar Pudenz; Fraunhofer/Piotr Banczerowski (5); Fraunhofer/Laif/Jonas Ratermann;
Fraunhofer/Roger Hagmann; Fraunhofer/Studioline; Adobe Stock (3); iStock (4); Shutterstock (3);
Unsplash (6); Fraunhofer; German Future Prize (2); pixorg; Fraunhofer (6); Icons: Fraunhofer (8)

Lithography:

NUREG GmbH, Dorfackerstrasse 31, 90427 Nuremberg

Printed by:

Pinsker Druck und Medien GmbH, Pinskerstrasse 1, 84048 Mainburg
This brochure was printed on FSC® certified paper.

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