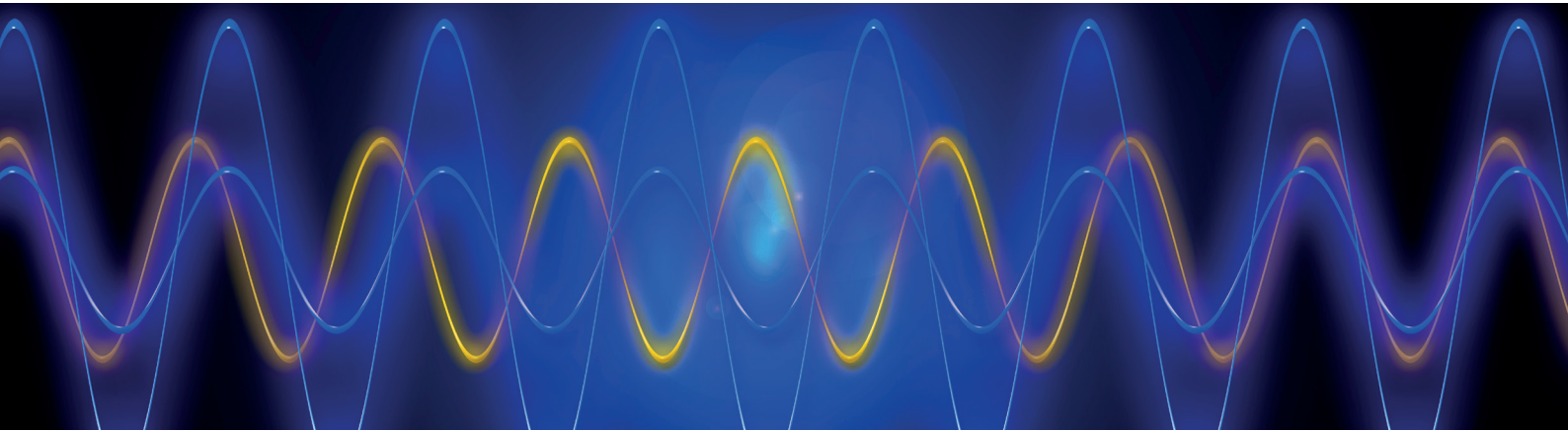


FEINMETALL RADIO FREQUENCY CONTACTING



- CONTACT PROBES FOR CONNECTOR TEST
- SPECIAL ADAPTIONS AND SOCKETS
- PROBE CARDS FOR WAFER TEST



ABOUT FEINMETALL



Contacting solutions with a great usability

Feinmetall is your partner for the reliable contacting of electrical and electronic components, whether for testing printed circuit boards or wire harnesses, in wafer testing in the production of semiconductors or in products requiring low-wear detachable contacts. As an independent medium-sized company with around 500 employees worldwide, we are committed to making our customers successful using our products.

**Finest structures require highest precision.
That is our world, that is what we do.**



In-house competence and innovative strength

For many years, Feinmetall stands for a high degree of innovative strength. In particular, the development and production of spring contact probes and probe cards under one roof form a very broad basis of precision engineering and micromechanical competence. This combination is unique on the market and stands for "German Technology" literally at its finest.



Quality

Quality awareness dominates all process steps at Feinmetall. From development and design and the manufacturing of individual parts to the finished product and its delivery. All process steps are perfectly coordinated with each other. This ensures maximum reliability of our products.



RADIO FREQUENCY CONTACTING

Challenge of radio frequency contacting

The special challenge in contacting RF signals is the contact design, because a lot of experience is required here. Geometry and material selection are decisive for the RF behavior of contacts, and the smallest changes design can have drastic effects. Experience and modern simulation tools are extremely beneficial in the development phase of RF contacting solutions.

From automotive connectors to semiconductor wafers - we provide the contacts

Radio frequency signals are needed almost everywhere. In cars for modern assistance systems or autonomous driving as well as in communications systems using technologies like 5G or 6G, and of course in all other applications requiring data transmission. Thanks to our expertise in contacting wire harnesses, connectors, PCBs and semiconductors, we are well prepared to meet these challenges.



Automotive applications

Driver assistance systems, entertainment and communication

Mobile technology

Smartphones and navigation, 3G, 4G and 5G technology at frequencies up to 6 GHz, in the future even up to 60 GHz



Radar

Radio signals up to 80 GHz especially for automotive applications.

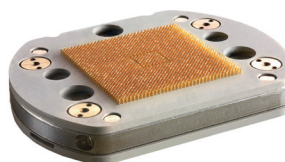


RF contact probes

For contacting connectors and switch connectors up to 6GHz / 12 GHz / 18 GHz

FeinProbe®

Probe card with contact probes as contact elements - perfectly suitable for 80 GHz and more



LiProbe®

Semiconductor contacting up to 100 GHz

RADIO FREQUENCY PROBES



Innovative solutions for all connectors and for frequencies up to 18 GHz

Feinmetall offers innovative and high-quality contacting solutions for all common connectors. Our focus is always on the added value for our customers, achieved by technological leadership and a broad range of services. This includes among others:

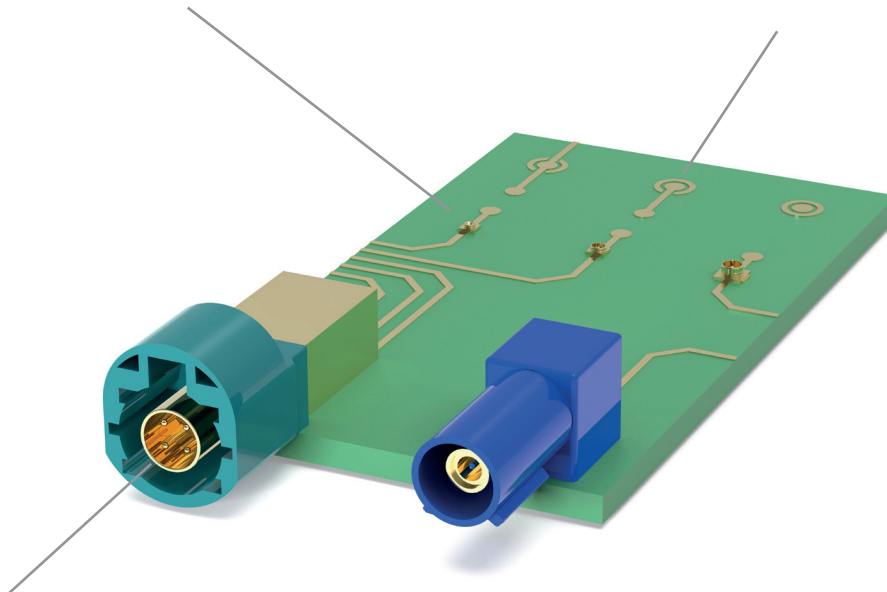
- Very broad portfolio for all industries and applications
- High quality based on in-house assembly and use of comprehensive test equipment
- Wide range of accessories for good reproducibility of the entire transmission line
- Customized development projects

SMD mini coax and SMD switch connectors

are used as RF interfaces on PCBs. Feinmetall offers various radio frequency probes for this purpose (e.g. HF66).

PCB test points

To test PCBs with high-frequency signals, special radio frequency probes have been designed to meet the typical requirements of the test points (e.g. HF05, HF60).



RF connectors

A large variety of connector types are used for the signal transmission of different applications in telecommunications, consumer electronics and also in the automotive industry. Feinmetall offers various radio frequency probes for contacting these connectors (e.g. HF60, HF19, HF66).

RADIO FREQUENCY PROBES

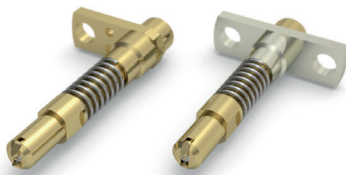
The right RF contact probe for each application

For all common connectors, the appropriate Feinmetall contact probes are available. And when new applications come along, we simply develop a new contacting solution. We are ready.

**We are at home in many industries.
Customer focused and experienced.**

Automotive applications

- Solutions for all common connectors
- HSD, MateNet, H-MTD, Fakra, HFM/MateAX
- RF contacting up to 18 GHz
- Solutions also for continuity test



Communication technology

- Solutions for switch connectors and PCB pads
- Probe design is specifically engineered to fit in limited spaces
- Contact solutions for 5G technology

Industrial applications

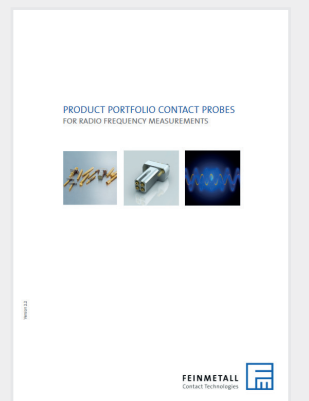
- Proven and economical solutions with long life cycle
- Individual customer projects
- Various mounting options
- SMA, SMB, SMC etc.



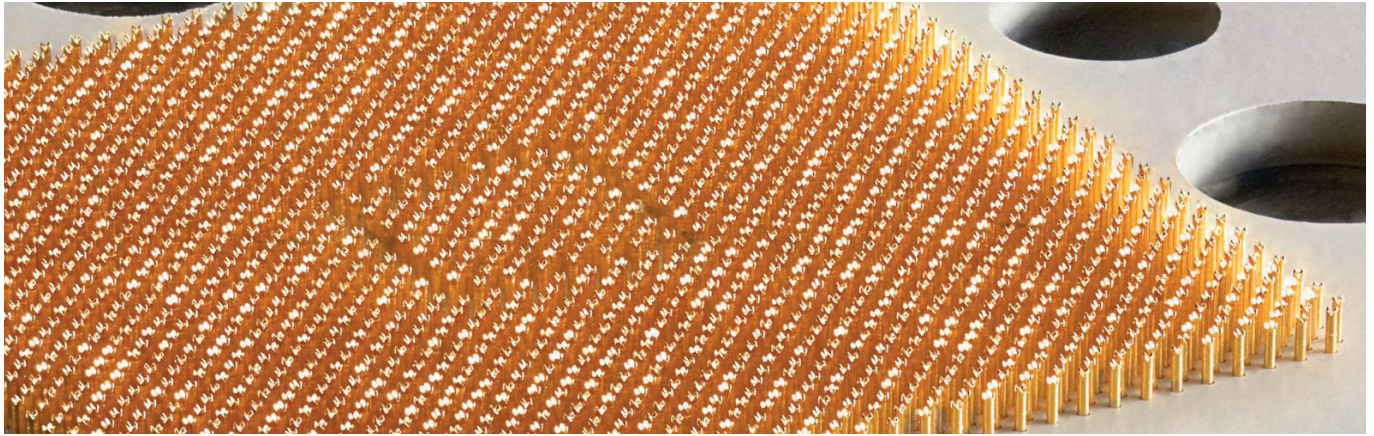
Contact probes for RF applications

Detailed information about these contacting solutions can be found in our corresponding product overview.

The entire product portfolio as well as corresponding step files for integration into your CAD system can be found on our homepage at www.feinmetall.com



FINE PITCH PROBES FOR RF APPLICATIONS



Fine pitch probes

For contacting fine structures at high frequencies, very short fine pitch probes are particularly well suited. Feinmetall offers suitable designs and tip styles for a great variety of ground signal arrangements and surfaces. An RF simulation allows an evaluation of the RF behavior of the contacting even before realization.

So small and yet so big

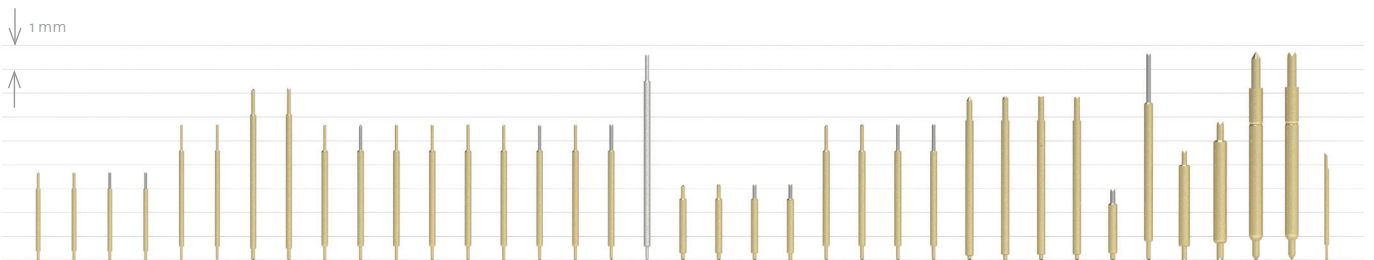
Fine pitch probes are so small that they can hardly be seen with the naked eye. The diameters are a few tenths of a millimeter, and their inner structure can only be seen with high magnification. For us, dealing with these fine structures is everyday life; this is our strength and our experience.



Manufacturing in Germany - with quality control

For good frequency behavior of the probes, high quality of the probes is particularly important. Feinmetall manufactures a broad portfolio of fine pitch probes in-house, both for small series and prototypes as well as for large series with very high volumes. We are ideally equipped to meet this challenge.

State-of-the-art automatic assembly machines allow 100% optical inspection of the manufactured parts for dimensional accuracy of length and diameter.



Impressive variety

The right fine pitch probe for every application. There is almost an inexhaustible choice of possibilities, the manufacturing behind it is almost unimaginable - and the probe is nearly invisible to the naked eye.

SPECIAL ADAPTIONS AND SOCKETS FOR RF APPLICATIONS

Customized RF contacting - always the right solution

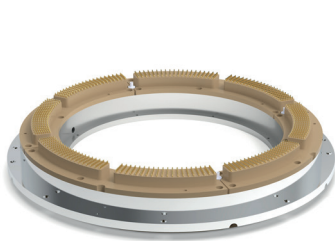
Do you need a special adaptation for high-frequency contacting? In that case, Feinmetall is the right partner for you. We not only develop standard products, we also realize completely individual and customer-specific solutions. Because we know that sometimes more is needed than just a contact probe. Benefit from the many years of experience of our developers. And from our manufacturing technology - we are well equipped for even the finest structures.

**You have a difficult contacting task?
Simply get in touch with Feinmetall.**

Want some examples?

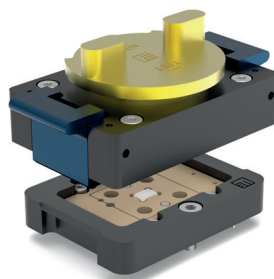
Based on the requirements and conditions of the application, we work with our customers to create the most effective contacting solution. Take us at our word. Our advantages:

- Direct customer support during the development phase
- Implementation of complex RF simulations
- Broad experience regarding materials, contact elements and manufacturing methods



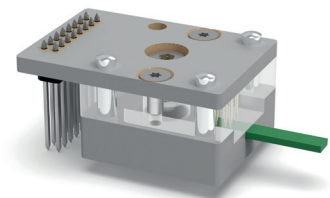
Interfaces

for example in semiconductor testing.
Transmission of RF signals with precise impedance control.



Sockets

for contacting 5G chips.
Signal transmission up to 77 GHz.
Rotary lock for secure contacting.



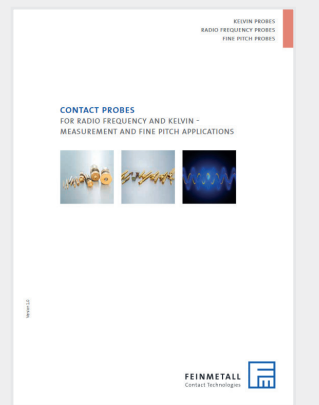
Customized solutions

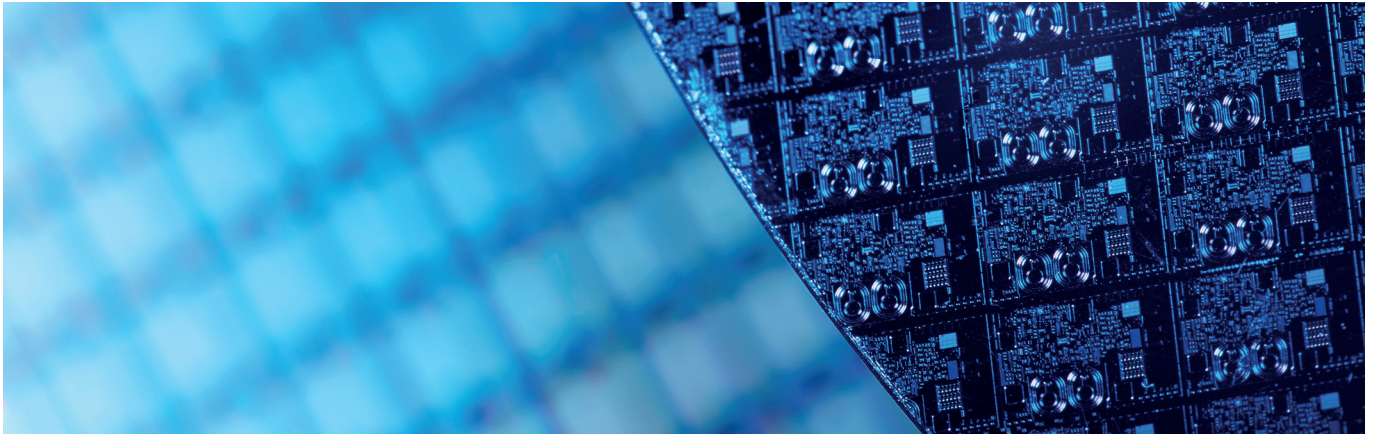
such as sensor contacting with flexible connection cable. Special solution for medical project.

Contact probes for RF and fine pitch applications

Detailed information on these contacting solutions can be found in our application-specific catalog. Here you will also find technical background information, overviews and practical examples.

The entire product portfolio as well as corresponding step files for integration into your CAD system can be found on our homepage at www.feinmetall.com





Probe cards for semiconductor testing - even for very high frequencies

High frequencies are strongly growing fields of probe card applications. This is always associated with very specific and complex challenges. We meet these needs on the one hand through many years of experience and customer focus, and on the other hand through intensive research and development activities.

**In good hands with Feinmetall.
From the first inquiry to delivery.**

Probe card projects at Feinmetall

We develop our probe cards in close coordination with our customers. And this from the first inquiry to the final release and commissioning. Our special attention is paid to

- **Simulation, RF modification and impedance control**

With the customer layout, we simulate the signal transmission in PCB and head. This allows us to identify many optimization possibilities in advance. Undesirable effects such as crosstalk are avoided by appropriate design of the test head and shielding. Impedance control ensures that data transmission to the DUT is as loss-free as possible.

- **Manufacturing and quality control in clean room environment**

Our clean room and the corresponding equipment ensure the highest quality in the production and inspection of our probe cards.



RF CONTACTING OF SEMICONDUCTORS

LiProbe® with lamella beams - for high frequencies and fine pitches

The lamella technology enables the realization of shorter contact elements than conventional buckling beams. It is therefore used for demanding applications in the high frequency range.

- Suitable for pitches down to less than 150 µm
- Signal transmission up to 100 GHz
- Product families with different geometries of contact elements in the same head are possible
- High flexibility in contact element design allows realization of desired impedances
- Consistent contact force with low contact resistance over the entire life cycle

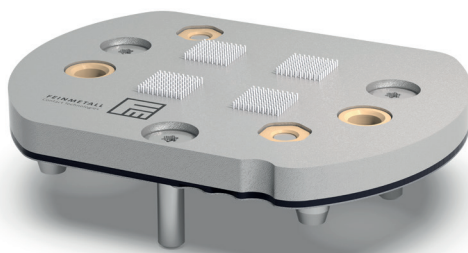


Principle of lamella beam

FeinProbe® with spring contact probes as contact elements

In our FeinProbe® very fine spring contact probes are used as contact elements instead of buckling beams or lamella beams. This offers several advantages for chip contacting, as the contact probes are spring-loaded independently of each other and can establish optimum electrical contact with the DUT thanks to their special tip styles.

- Optimally suited for larger pitches
- Signal transmission up to 100 GHz
- Unique RF modification capabilities to optimize RF performance
- Self-centering crown tip reduces pressure on the bump
- Spring contact probes enable higher current carrying capability

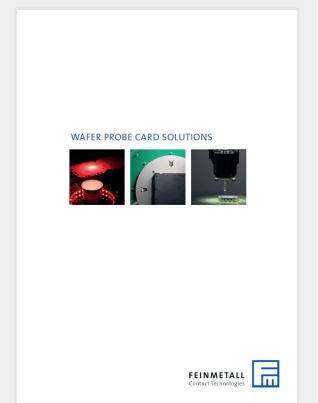


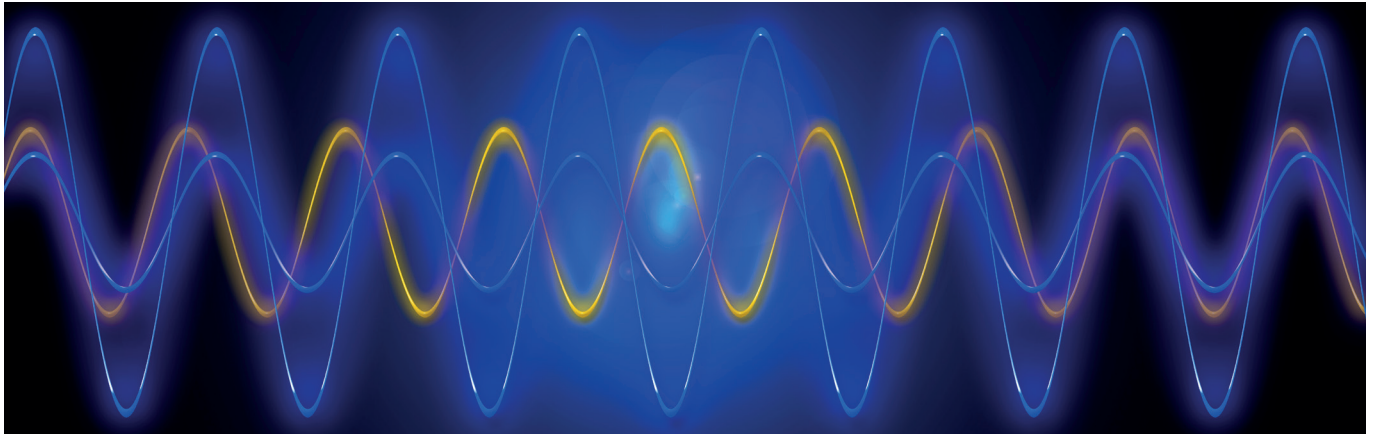
Principle of contact probe as contact element

Wafer Probe Cards - Portfolio

Detailed information on these contacting solutions can be found in our overview brochure. However, in semiconductor contacting, every project is customer-specific. Please feel free to contact us directly.

The entire product portfolio of Feinmetall can be found on our homepage at www.feinmetall.com





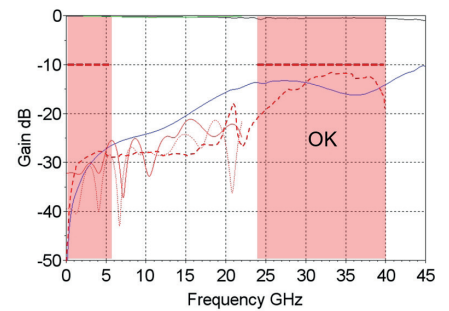
The Feinmetall RF competence center

Feinmetall has established a competence center with an in-house RF laboratory specifically to meet the growing demand for RF contacting applications and has greatly expanded the portfolio of contacting solutions in recent years.

Simulation tools

Already in the design phase, various contacting solutions are tested in detail using suitable simulation methods and appropriate software. This is a fast and economical way to quickly reach the best outcome.

The example on the right shows the result of an RF simulation (blue line) and the corresponding measurements (red lines) for a test head design for a 5G application. The frequency bands relevant for the customer are shaded in red.



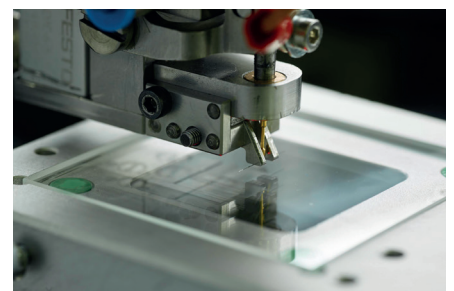
In-house RF laboratory

The Feinmetall RF laboratory is equipped with high-quality measurement equipment. This is a great advantage, especially in the prototype phase, and ensures rapid analysis of the RF performance of new developments. Among other aspects, this verifies whether the simulation results correspond to reality, as can be seen in the example above.

Mechanical precision and reliability

Mechanical precision and dimensional accuracy is an enormously important factor, especially for RF performance. Here, our quality awareness in combination with appropriate testing technology is particularly important, for example:

- Precision equipment for dimensional accuracy testing
- High current test
- Life cycle test
- Climatic chamber





Stay happy - still after buying contact probes, adaptations and probe cards

Feinmetall is a partner for long-term customer relationships. And for us, that means that we won't leave you out in the cold after a purchase. We also offer repair or maintenance of contacting units, for example

- Replacement of contact probes after specified maintenance cycles
- Repair of contacting units after damage or after failure of individual contact elements
- Exchange of individual beams in probe cards

**We take your requirements seriously.
And all over the world.**

Worldwide service

We are where our customers are. Our worldwide service locations ensure fast and flexible service, also in your region.

Our main service locations:

- Herrenberg, Germany
- Berkeley, USA
- Taiwan
- Singapore



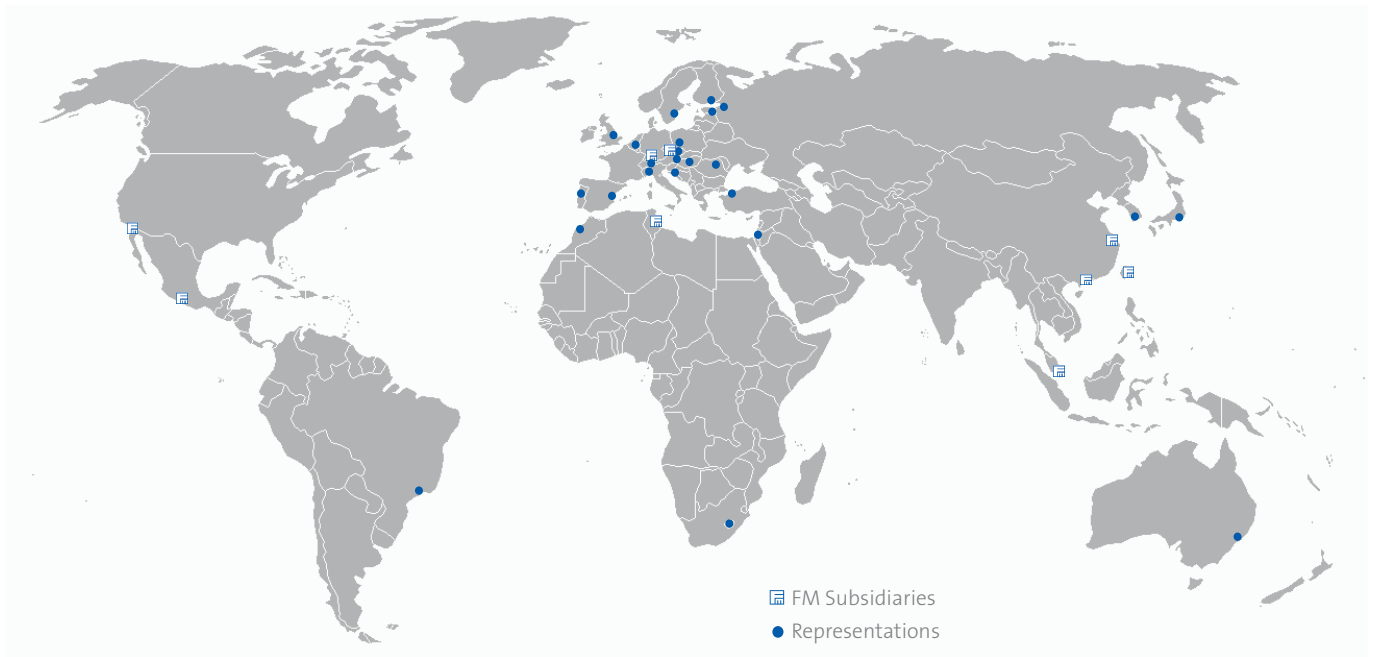
Tailored services - the choice is yours

With different service levels, we offer services tailored precisely to your needs.


Our strengths:


- Support at your site
- Extensive test equipment
- Guaranteed repair turnaround times
- Solutions tailored to customers' needs - from simple repairs via service contracts to comprehensive repair lab management or service training courses
- High level of expertise and deep understanding of customer needs

FEINMETALL WORLDWIDE





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