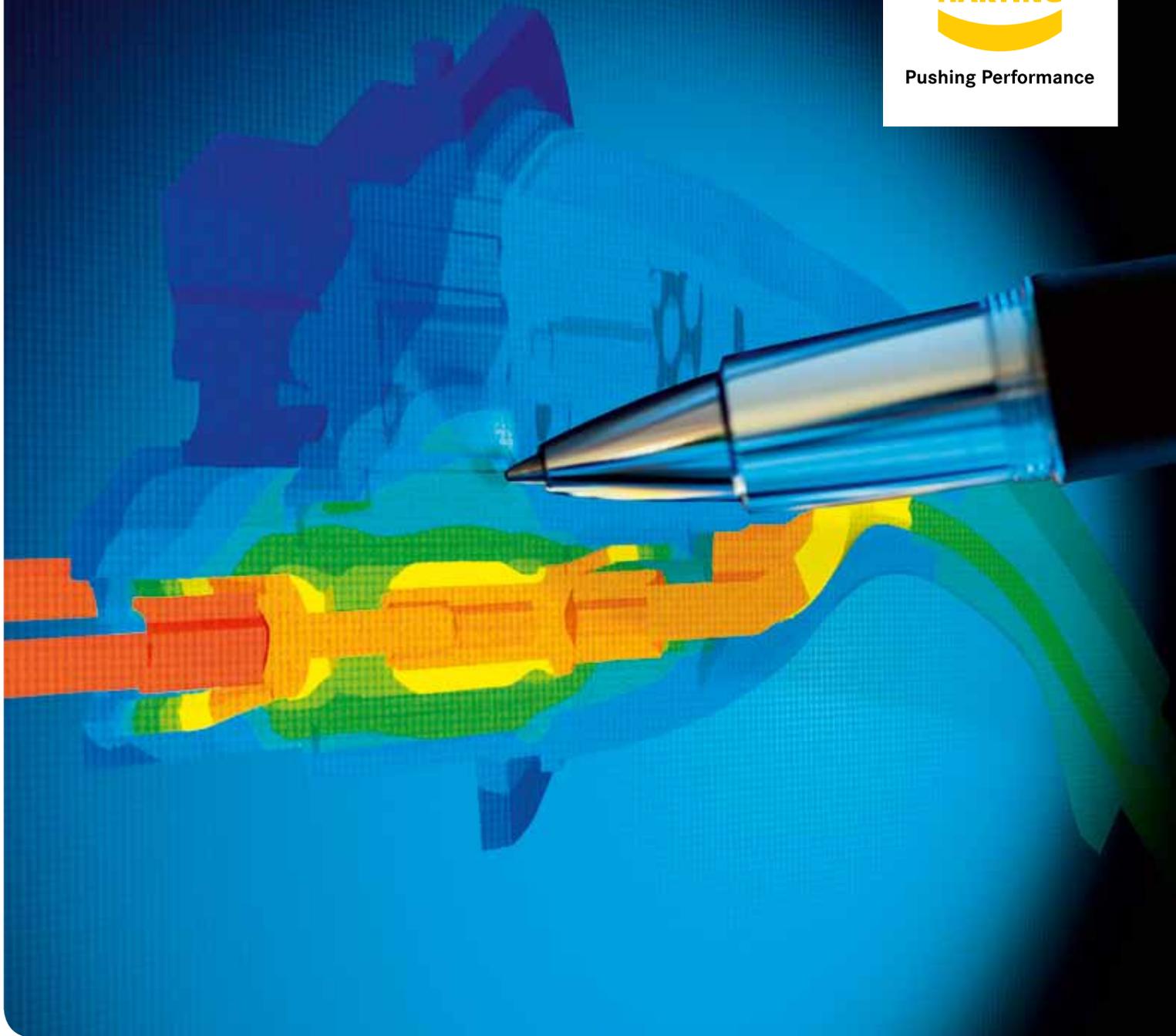




Pushing Performance



HARTING sets trends.
Develops technologies. Secures quality.

Technology and quality management
for best customer solutions

"Quality is more than just a characteristic. Above all, it is an uncompromising stance. This stance is something we apply in all aspects of our quality understanding, from reliability to future-proofing."



Philip F. W. Harting



Employees from the New Technologies, Quality Management and Test Laboratory departments

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Our quality standard: Providing constant growth for our customers.

The Han® connector symbolises HARTING's quality standard. It is not just enough to maintain standards, we set them. Our benchmark is the requirements of our customers. To be able to fully meet these, you need to have a comprehensive understanding of quality. From the product to the process. From the individual components to system solutions. From the initial idea through to the after-sales service. Only then can HARTING's quality fulfil its purpose - to sustainably improve the customer's benefit and the value-creation.

Quality is much more than robustness and reliability today. Instead of pure products, customers increasingly demand solutions with which they can deal with the new challenges. This means that personal consultation and assistance play

just as important a role as safety in determining how you can be set up well for the future.

The interplay of ecological, economical and social aspects have quite rightly become a given in companies.

HARTING meets these customer expectations with an expanded quality understanding and based on the proverbial reliability which customers can expect from us.

Solution-oriented



Service-oriented



Future-proof



Reliable



Sustainable





Daily Q-board meeting at HARTING electroplating



HARTING charging plug and charging connector type 2 (AC) for Europe



HARTING charging equipment on the car

Solution-oriented: How we develop the connection to the mobile future.

We develop solutions which provide added value for our customers. This means that we grow with the tasks that are presented to us and are open to new challenges. The eMobility solution which we designed for the automotive industry, shows this statement in its finest form.



Electrical vehicle connected to a charging station

The challenge

eMobility is a developing market and an ecological opportunity. One of the key challenges presented is being able to charge the batteries quickly in electric and hybrid vehicles. High currents must be safely transferred via an easily handled charging cable (charging system) from the charging station to the vehicle.

HARTING's solution

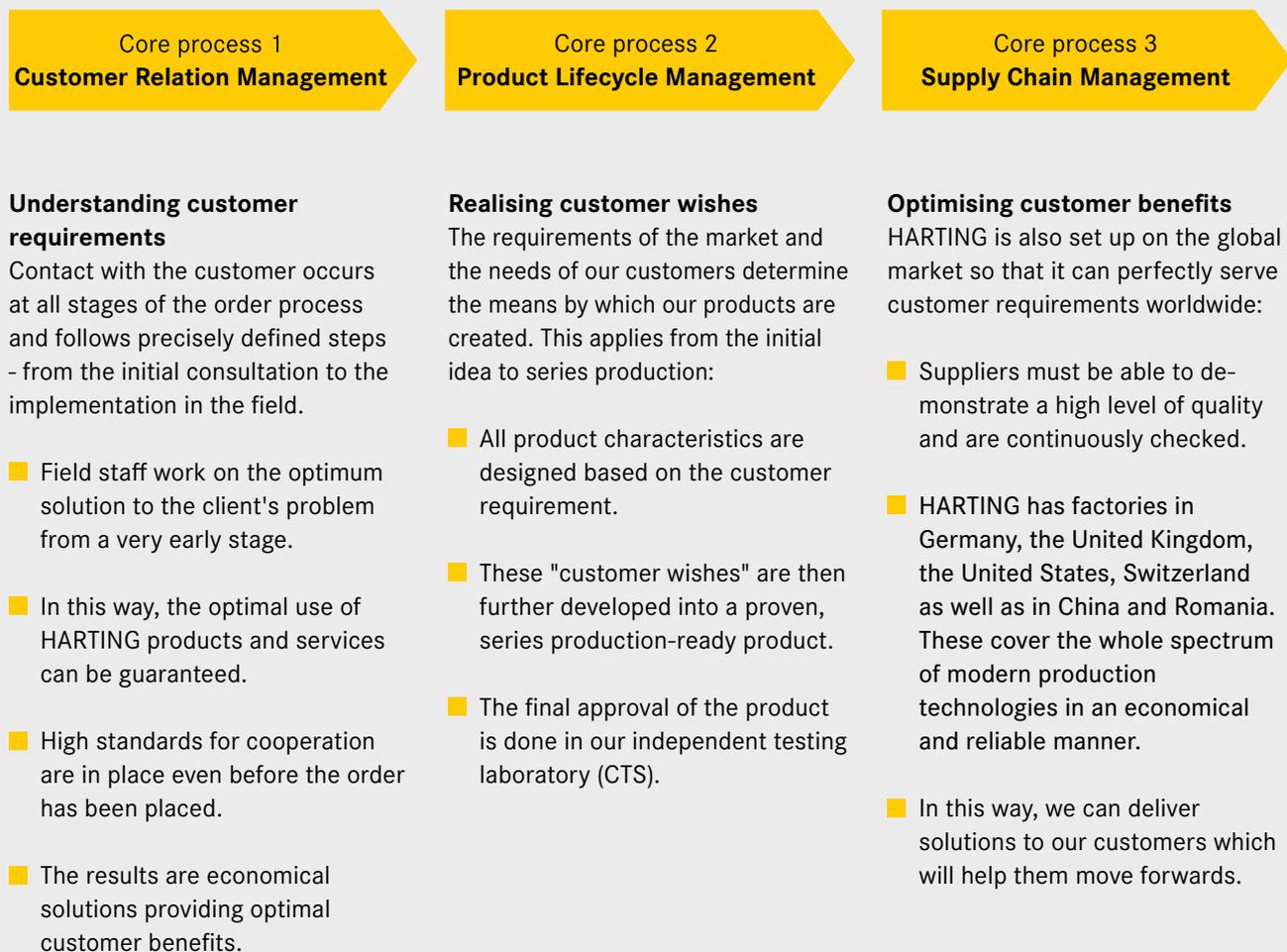
We helped define a new standardised charging plug in standard committees. Based on our comprehensive connector know-how and proven contact systems, HARTING was able to develop solutions for the automotive industry in next to no time. These were then used in various vehicles and charging columns from several different manufacturers.

The customer benefits

Our partners in the automotive industry benefit from the unique combination of our connector competence and the ability to be able to introduce an innovative solution quickly into practice. In short: ready for series production in no time at all with the extra bonus of reliability.

Our processes define the path: To the optimum customer benefits.

You need clear processes if you want to reach your goals. For this reason, we have established clearly defined standards worldwide. These apply to product development, through manufacturing and logistics down to customer care. It is only in this way that customers benefit fully from HARTING quality - independent to their location or which product they are using.





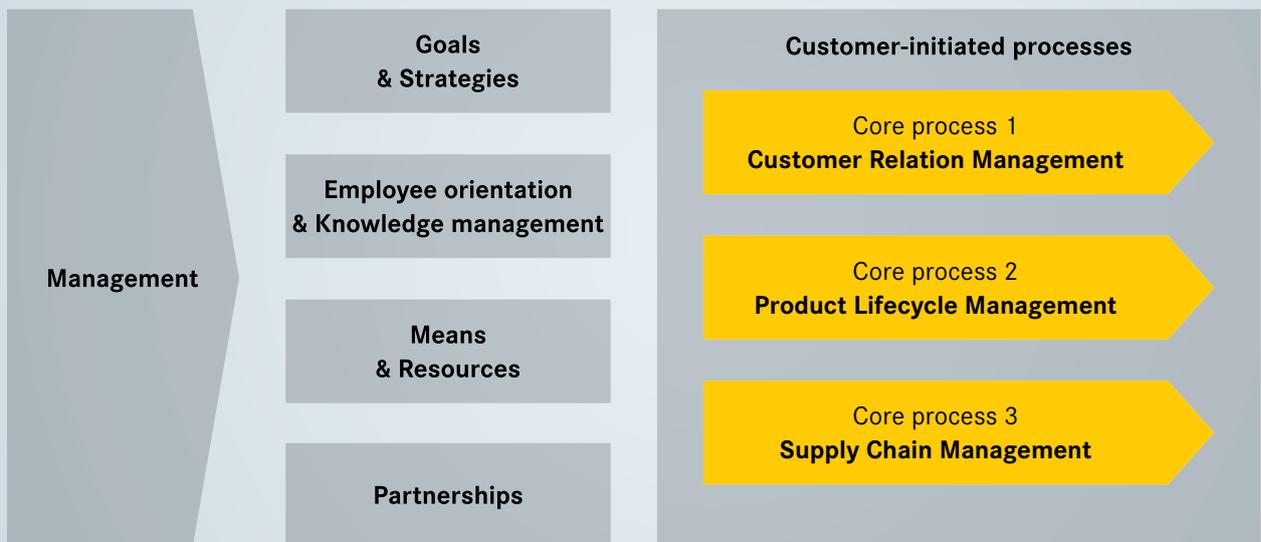
Customer Relation Management – Employee from the order receipt department



Supply Chain Management – Logistics employees preparing shipments



Product Lifecycle Management – CAD design of a tool



HARTING's process model



Top picture: HARTING tower lighting in a wind power system
Bottom picture: HARTING slip-ring connector

HARTING cable systems in wind turbines

Service-oriented: How we support communications for wind turbines

We live and breathe service from the highest management level through to the local representative on site. Our employees align products and processes flexibly to meet the specific requirements. For example, we developed a termination solution which is used by wind turbine system manufacturers across the globe. It can deal with all weather conditions and meets the hardest customer requirements.



HARTING electrical cabinets in wind turbines

The challenge

Wind turbine systems are an important part of the change to renewable power sources. They are also very complex. Data are collected continuously in the turning blades which need to be transferred to the fixed tower for further processing - and this under extreme, constantly changing environmental conditions.

HARTING's solution

Based on a highly modified Han® connector and a special slip-ring connection, we developed a solution to connect tower and blade sensors. This enables the transfer of power and data without any errors via an interface.

The customer benefits

The transmission solution developed by us guarantees a higher level of operational safety and reliability for our customers. So susceptibility to malfunctions is reduced and power generation efficiency is increased.

There is much potential in new technologies: We make this usable for our customers.

In our "New Technologies" department we work daily to grow our leading technologies. Above all, we increase the speed and reliability of product development and therefore ensure maximum benefits for the customers: this is due to a combination of our innovative approach and ground-up trials under close to practical conditions in the HARTING laboratories.

The connector reinvented time after time

The focus of the "New Technologies" department lies on our core business, connection systems. To be able to meet the increasing requirements of our customers, we are researching new contact principles and surfaces among other things.

HARTING has developed its own metalisation laboratory specially for this which develops and trials new and innovative coatings.

HARTING's innovation process

As a solution provider, HARTING Technology Group continuously works on innovations which far exceed the current range of

products. We have defined an innovation process for this purpose:

- Four phases from the concept to the product development
- Fixed milestones between the stages
- Clear definition of the decision processes and responsibilities before each new stage
- Reduced risk and shorter time for the subsequent product development
- A link between mega-trends, current research results and manufacturing technologies to the needs of our customers
- From theory into practice

The "New Technologies" department is rounded off by its many collaboration projects with universities and research establishments. With satisfying results:

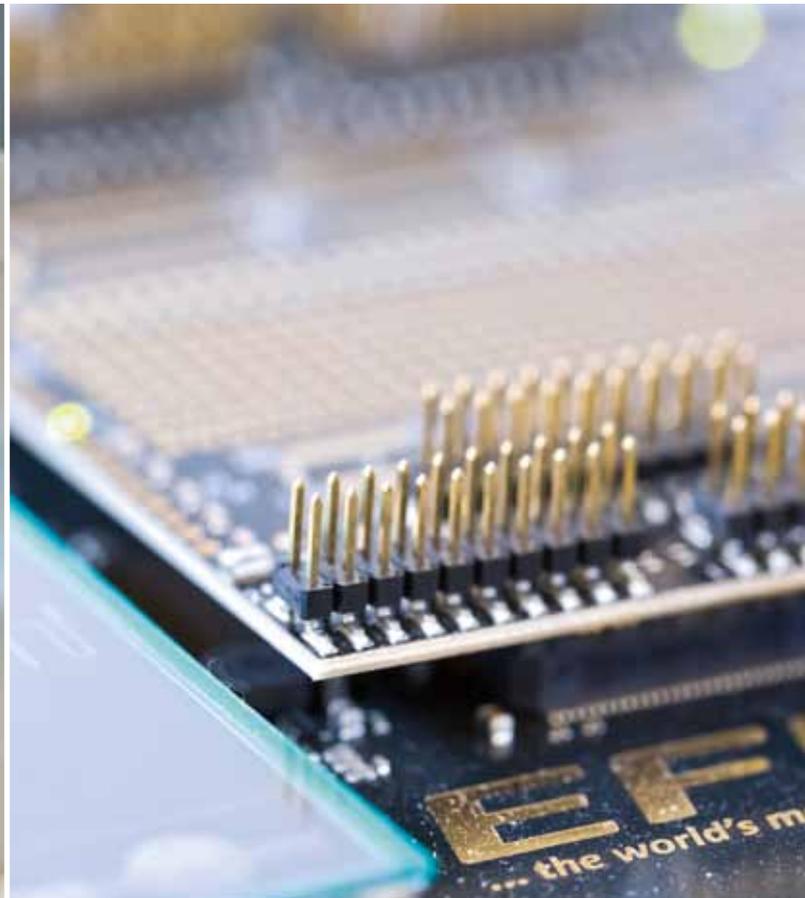
- Endowed professors in the strategically important areas of artificial intelligence and modern sensor networks
- Developments of solutions in the area of Industry 4.0 based on current research results
- Intensive trials of new applications manufactured in-house before market introduction
- Close contact with students - and thereby with tomorrow's specialists

HARTING Technology Group's innovation process

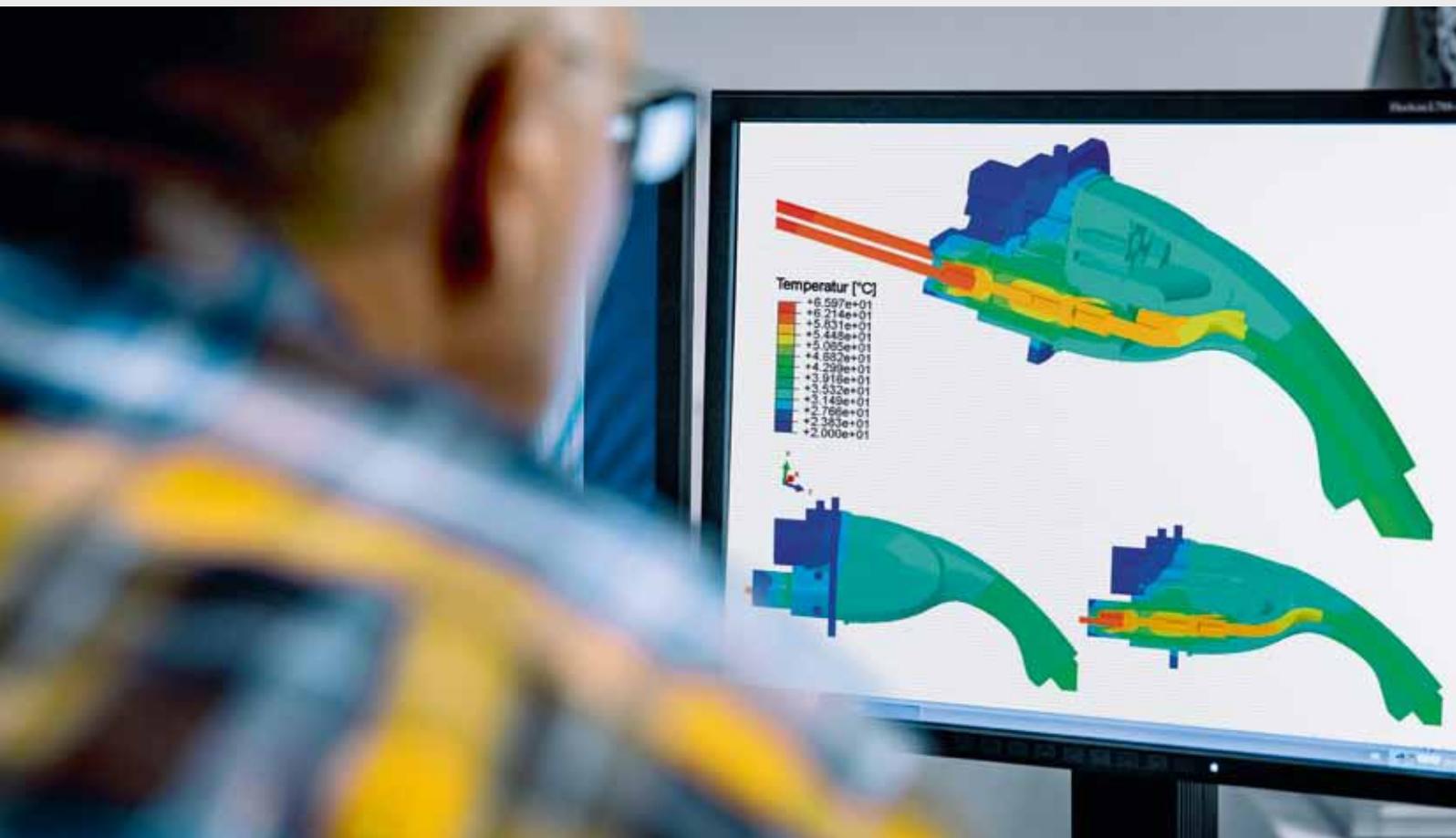




Testing Ethernet switches



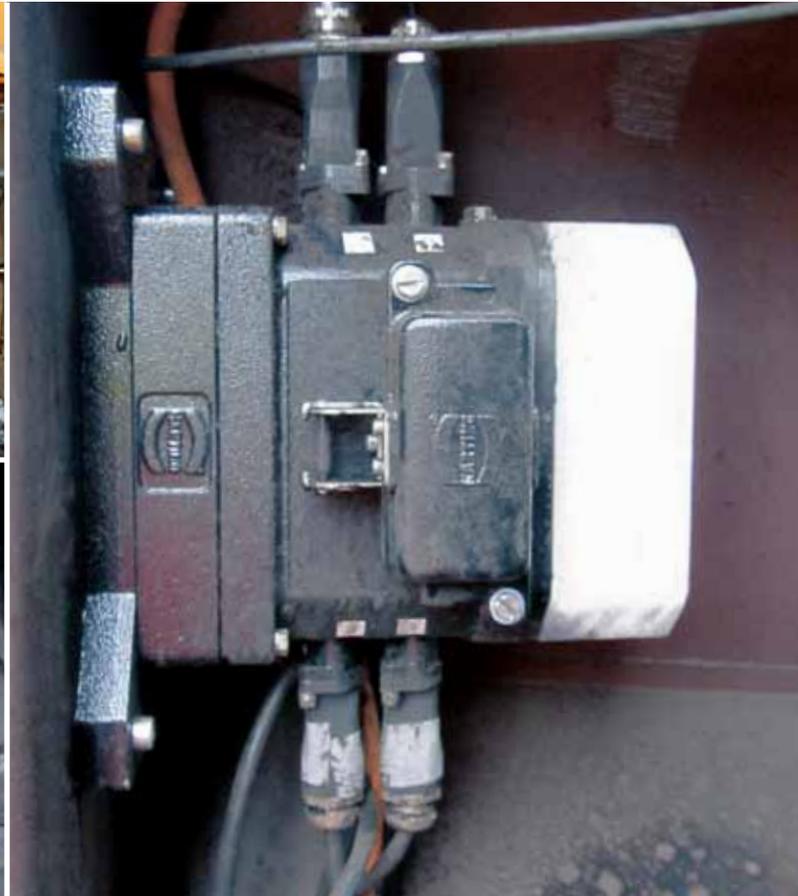
Electronic development in the "New Technologies" department



Simulation of an eMobility charging plug



Vibration sensor on freight cars



Evaluation unit with radio transmission module

Future-proof: How we make freight traffic more efficient.

We rely on innovative technologies which remain modern in the future. At the same time we have the resources needed to be a strong partner in the long term. With our Cargo Condition Based Maintenance (CargoCBM) project, we have provided a foundation which will ensure that freight transport by rail will also be safer in the future.



Freight car with CBM system in operation

The challenge

To further improve the efficiency and availability of freight cars, they should be fitted out with modern sensors and algorithms to be able to have more precise information about the technical condition and/or the maintenance state of the wagon. On the one hand, a poor technical condition presents a very high risk when transporting dangerous goods. On the other hand, frequent accidents result in high costs for damages and track outages.

HARTING's solution

Together with TU Berlin (Technical University of Berlin), we developed a system which detects damage to freight cars and reports them online to the train driver or a central maintenance department. In addition, the position of the freight car can be determined at any time so that maintenance or repair can be initiated at the optimal point of time. This so-called Condition Based Maintenance (CBM) has already been successfully tested in the railway network at one of Vattenfall's lignite mines.

The customer benefits

Our CargoCBM solutions helps to make freight cars more reliable and efficient and thus future-proof. This is very important based on the background of the increasing importance on rail-borne freight transport.

Quality with distinction: Accreditation and product analysis.

HARTING stands for the highest levels of reliability, all around the globe. This is possible due to our uniform quality standards, a certified management system as well as constant quality testing of our products by our Corporate Technology Services business unit.

Quality with a system

If you want to provide a worldwide quality guarantee, you need clear standards:

- HARTING Technology Group has worked according to the standards of ISO 9001 since 1991.
- All country companies follow this internationally recognised quality management standard.
- Meeting our quality promises worldwide is ensured using these means.

Quality right from the start: Corporate Technology Services

With our Corporate Technology Services (CTS), our test laboratory certified in accordance with DIN EN ISO/IEC 17025, we have created our own business unit which has taken over the entire responsibility for all aspects of product quality:

- Definition of individual quality requirements during the development phase
- An early connection into the whole manufacturing process
- Uncompromising quality assurance for products and solutions

Quality on the test bench

Before our products and services are used by our customers, they must go to our test laboratory and pass comprehensive quality tests:

- Tests during development to maintain the high quality requirements
- Analysis of quality and long-time properties under various environmental conditions
- Artificial aging by temperature and shock testing as well as mechanical loading

Our test areas in overview:

- Dimensional measuring technology
- Surface and material analysis
- Microsystem technology
- Corrosion and protection class testing
- Electrical and mechanical testing
- Fibre optic testing
- Electromagnetic compatibility
- Signal integrity
- Software testing





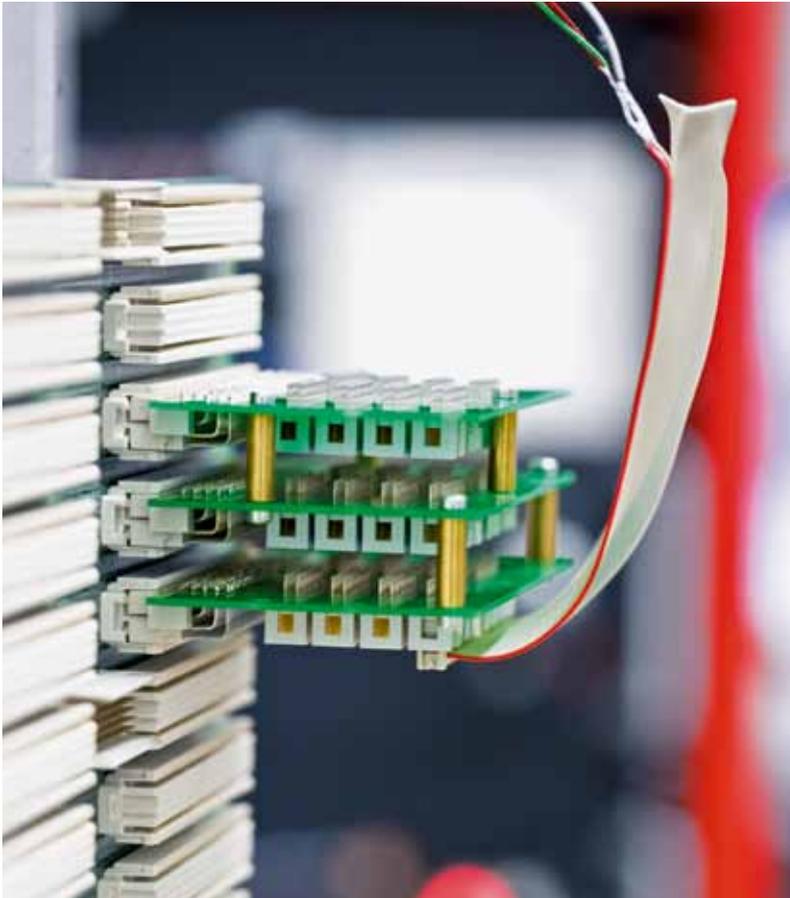
Measuring wire separation forces



Preparation for an EMC test in the anechoic room



Testing a FO connector



Vibration testing on a PCB

Top picture: REM analysis of contacts
Bottom picture: Corrosive gas test on a test panel

Reliable: How we ensure safe connections in air traffic.

We see reliability as the basis of our quality promise. Our products stand for robustness and longevity. In our relationships with customers we prove ourselves to be a reliable partner. This combination is also convincing in our newly developed contact surface for aircraft.



Application: HARTING *har*-bus PCBs in cockpits

The challenge

Electronic systems in an aircraft is often exposed to strong vibrations. In addition, despite high levels of mating cycles, it must always function reliably. To guarantee this, special contacts are needed for vibration-resistant connection systems at a high temperature range.

HARTING's solution

Based on our connector know-how as well as our expertise in material selection we developed a new contact surface for PCBs with connectors. Thanks to its design and the robust mix of materials, this is optimally suited to the conditions experienced in aircraft.

The customer benefits

Reliable connections give a lower maintenance effort, lower outage times and an improvement to safety. In this way, HARTING is making flights more reliable and comfortable.

Said - done: An interview about quality.

Interview with Dr. Frank Brode, Chair of New Technologies
Heinz Welling, Director of the central department Quality and Technology

Industries and technologies change - HARTING combines tradition and innovation in this environment to create solutions for new challenges. What role does quality management play in this? An interview with Dr. Frank Brode, Chair of New Technologies, and Heinz Welling, director of the central department Quality and Technology at HARTING Technology Group.

What does the term "Quality" mean today?

Dr. Frank Brode: The term quality has become multi-faceted. Alongside measurable values like robustness and reliability, new aspects like sustainability and solution competency have come to the forefront today. The quality of our services is judged highly against these factors, to see how far it is possible to solve a concrete problem for a customer.

Heinz Welling: We have a special relationship to quality at HARTING. Thanks to the Han® connector, quality has become synonymous with HARTING. We want to expand on this lead in quality - when developing total system solutions too.

What makes a good solution stand out?

Heinz Welling: A good solution must offer a technical advantage which helps create an economic advantage for the customer.

Dr. Frank Brode: You could describe it as "Solutions with added-value". These could be shown in totally different

ways. Sometimes a very high gain in efficiency or increase in safety can be produced by an optimised connector, i.e. an individual product. This can be continued through to our modular Auto-ID systems which allow a completely new control of all processes along the value-creation chain.

How does this affect the requirements placed on quality management?

Dr. Frank Brode: If you consider HARTING as a solution provider, quality management must have a stronger considered influence during the introduction of new technologies and their own requirements for innovation. We must constantly decide which materials and technologies to use and how we want to make them usable for our customers. To couple this with quality management, modern management systems based on the V-model are required.

Heinz Welling: For individual products and solutions there are structured processes using Quality Gates. We design all relevant processes continuously with the aim of achieving "zero-error product quality". To achieve this,



The new HARTING Quality and Technology Center (HQT)



In interview (from left to right) Dr. Frank Brode, Heinz Welling

all new product developments are tested in an accredited central laboratory and approved, this is followed by testing in the HARTING production facilities.

Quality management is therefore a task for the whole company?

Heinz Welling: Yes, certainly. The strategy of our department is aligned with that of the entire company. This also applies in reverse. The required measures run through all levels and departments of the technology group - from the management culture through to the identification of customer requirements.

Dr. Frank Brode: The all-encompassing requirement is also visible in a further detail: the quality management department makes its technologies, materials and analysis competence available as a service to the whole HARTING Group. Of particular importance is our new HARTING Quality and Technology Center (HQT). Here we develop and research technologies and bring them to market-readiness following the most stringent testing. All profit from this know-how transfer. In the new HQT we have deliberately chosen an open building design so that our specialist departments can bring together their know-how from material science and technology by exchanging information. Along with the pre-development, testing of the products is also done in this building. The synergistic effects provide a sustainable optimisation of HARTING's quality management.

Could you describe the decision-making process for a technology and the function that quality management has at HARTING with a concrete example?

Dr. Frank Brode: Our RFID systems are the perfect example. We recognised early that, as part of the Integrated Industry Auto-ID systems would play an important roll. Based on our standardised selection process, we decided that RFID technology was a future-proof platform. We have developed a truly modular system solution based on this which guarantees consistent HARTING quality from the transponder through to the software.

Heinz Welling: Quality aspects such as consulting strengths and service orientation play a big roll, too. We accompany the customer in this from the idea to the implementation in the field. This also needs guidelines which guarantee the highest level across the world. Above all, this needs the right minds: people who are prepared to dedicate themselves completely to quality.

What is the largest challenge in the future for quality management at HARTING?

Dr. Frank Brode: You should never stop trying to get better; in the area of system solutions this involves a significantly closer cooperation with our suppliers and customers.



Top picture: HARTING connector with integrated RFID tag
Bottom picture: HARTING connector with RFID tag on an industrial robot

Reading out data using a tablet

Sustainability: How we are already working on the industry of the future.

We act sustainably - economically and ecologically. Therefore, new concepts must combine the efficient use of resources with maximum benefit to our customers. Our solutions for Integrated Industry are consistently following this path.



Assembly robot in use in automotive assembly

The challenge

As part of the vision of Integrated Industry, products should have their own intelligence and be completely independent when running through logistic and production processes. This means that concrete products and solutions are required for this.

HARTING's solution

Based on RFID technology, our products can have additional information created and read-out using a smartphone or tablet-PC, e.g. configuration, circuit diagrams, information for re-ordering as well as information about the operating state can be collected and transferred. This can also be used to control processes along the whole value-creation chain using HARTING components and software.

The customer benefits

Our solutions can help customers already to work sustainably and to adapt manufacturing processes flexibly and efficiently to the requirements presented using the resources available.

HARTING worldwide.

Ultimate quality achieved by the most talented minds.

HARTING is a globally successful company. We concentrate on the growth markets and make an effort to be present there for our customers. The challenge particularly is to ensure the high quality level of HARTING products across countries and cultures and, at the same time, to be able to meet local needs and quality standards.



I believe quality is a **continuous commitment** – and also essential for forming strong customer relationships. That is why I trust in our local quality manager who is available for our customers around the clock.



Chris H., design engineer / Elgin, USA



For me, quality means developing global solutions that lead to **technical and economical improvements**.



Alina M., engineer / Espelkamp, Germany



Ultimate quality – ultimate standards

Our commitment to outstanding quality and reliability also means that we must be committed to meeting global standards and certifications.

We comply with management certifications (such as ISO 9001, ISO 14001 and ISO 17025) as well as quality requirements from the automotive (TS 16949), railway (IRIS), aerospace (AS 9000) and nuclear (KTA 1401) industries.

Our entire process is focused on producing quality – so that each of our products embodies **the highest level of quality.**

Max H., training supervisor / Sibiu, Romania

Our products are being used **in many countries** – because our quality is recognized around the globe.

Raghav U., electronics engineer / Chennai, India

Quality means ensuring **globally reliable standards** of production and customer service.

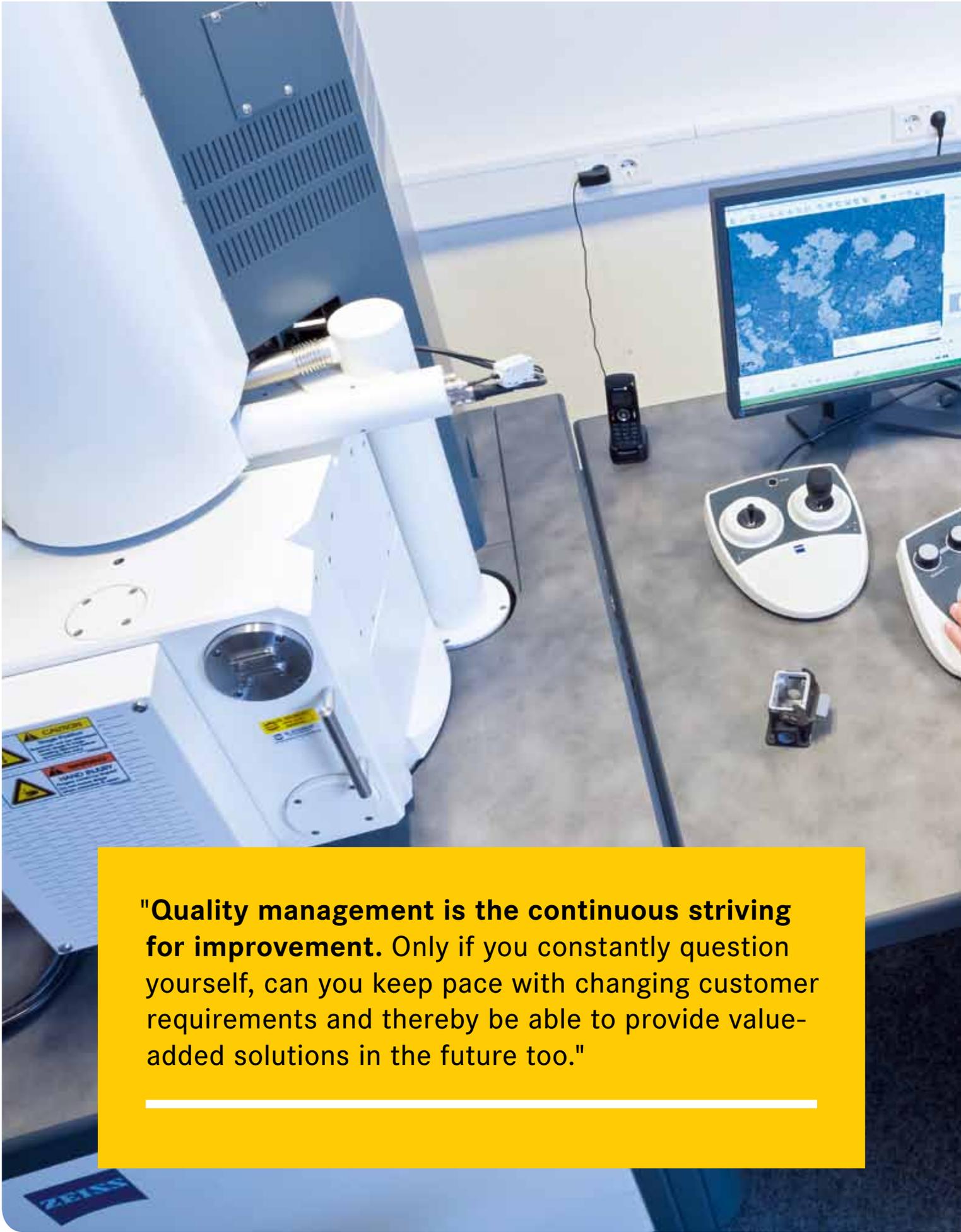
Yukiko L., quality planner / Zhuhai, China

Quality begins in the minds of our employees – and ultimately brings our customers forward. Our unified management system ensures that our **consistent quality** is achieved throughout the world.

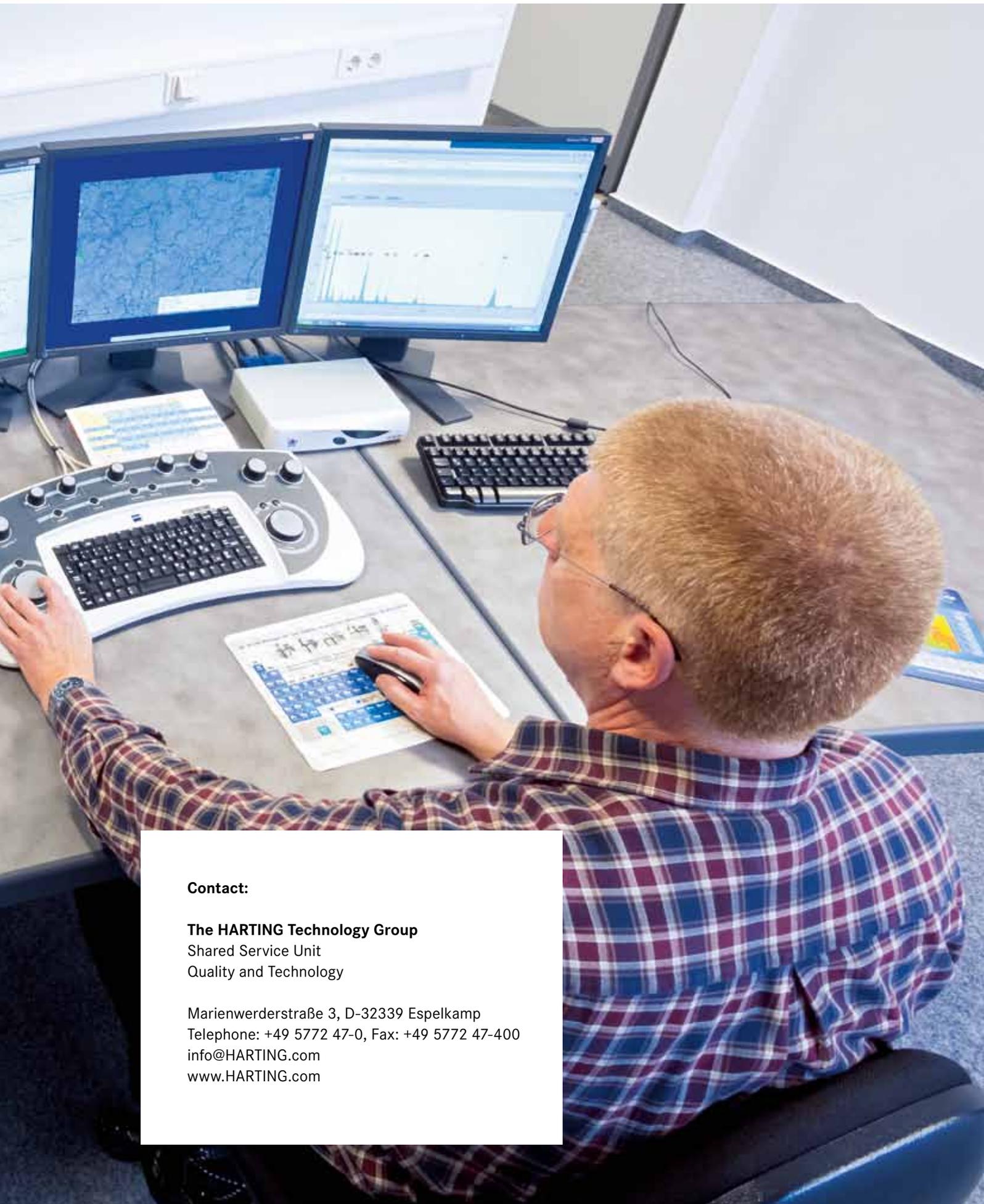
Abhinava U., electronics engineer / Chennai, India

We also ensure our customers global acceptance for product certifications. With regional market approvals – such as CCC (China), GOST (Russia), UL (USA) and CSA (Canada) – we ensure that our

products are used and accessible throughout growing markets.



"Quality management is the continuous striving for improvement. Only if you constantly question yourself, can you keep pace with changing customer requirements and thereby be able to provide value-added solutions in the future too."



Contact:

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