



Fahrzeuginstandhaltung

Comprehensive service for your electronics

Professional. Solution-oriented. Innovative.

Service without limits for electronic components

It is simply impossible to imagine modern rail vehicles without electronic components now. And this means that, over the coming decades, demand for maintenance services will grow significantly. Electronic components have life cycles and innovation cycles that are much shorter than those of rail vehicles. For operations, this translates into challenges such as obsolete components or discontinued parts. So, to avoid the issue of wagon out-of-service times, we have developed a wide range of services to extend the availability of your electronic components.

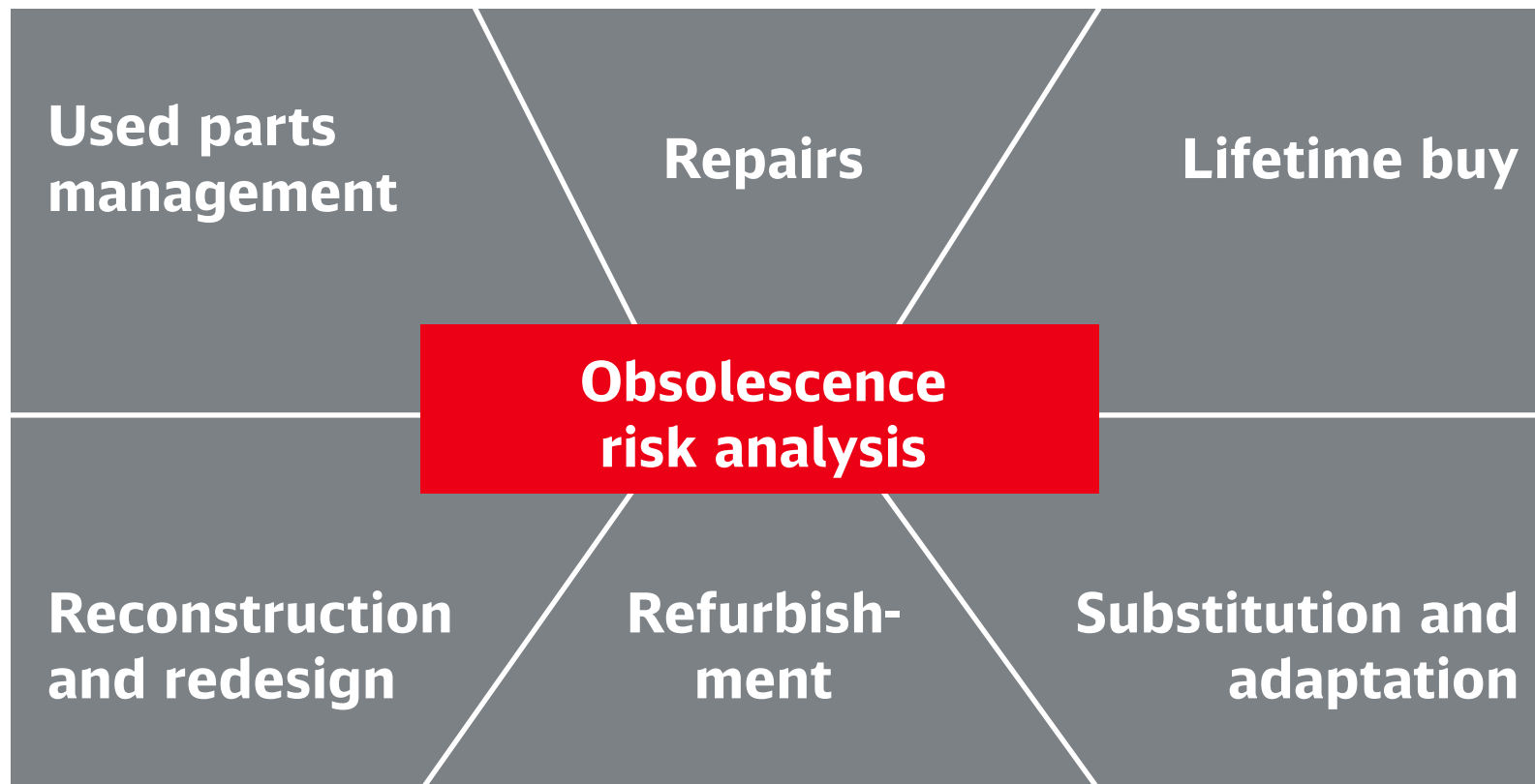
Ever shorter development cycles and manufacturers discontinuing their electronic components are creating more demand for repairs and obsolescence management. However, only a few companies on the market specialise in repairing and replacing electronic components in rail vehicles. At our Munich central electronics workshop we have access to proven and long-standing expertise in how to maintain and reconstruct electronic components

for rail vehicles. Whether you need repairs, obsolescence management, test management or material logistics – we offer you customised and lasting solutions for every area so that your rail vehicles and rail infrastructure can run smoothly. We ensure that your electronic components will remain available – regardless of manufacturer, age or quantity. To keep things moving by rail.



Solutions for long-term availability: Obsolescence management

When electronic components are discontinued, there are far-reaching consequences for your rail vehicles and their availability. Taking precautions early enough can prevent your vehicle from experiencing out-of-service time. We monitor the market for electronic components and offer you innovative solutions for long-term availability.



Obsolescence risk analysis

Technical upgrades to interior fittings or critical systems lead to cyclical redesigns of complete rail vehicles. However, these redesigns offer the perfect opportunity to ensure materials will be available for obsolete or critical components in the long term. An obsolescence analysis identifies the risks and forms the basis for developing a lasting solution.

This analysis covers the following milestones: data collection, analysis of the maintenance situation, assessment of the ageing condition and identification of possible solutions. The result is a coordinated obsolescence strategy, which can be implemented as part of the redesign, for example if substituting the entire system has been identified as the preferred solution.

Repairs

We support you by carrying out repairs on numerous electronic components from a very wide range of manufacturers. This also includes providing the relevant logistics services.

Our product portfolio covers the repair of components from the following product groups:

- Control-command and signalling
- Train radio
- Control electronics
- Passenger information systems
- Mechatronics
- On-board electronics
- Terminals
- Controls
- Displays
- Line displays
- Battery charger units
- Electronic brake components

Lifetime buy

Thanks to precisely planned stockpiling and warehousing, we have materials available until the end of your rail life cycle. We can provide suitable storage conditions for almost any component. Our storage facilities are equipped with optimum long-term storage technologies, e.g. drying and nitrogen cabinets, special packaging and special containers. In order to extend service life, we carry out cyclical preservation measures, such as energisation, as well as regular inspections.

Substitution and adaptation

Substitution encompasses the replacement of components or assemblies with a suitable or equivalent solution from an assembly and signalling perspective. If the substitution seems reasonable, we will provide an equivalent replacement. In the case of an adaptation, we replace the discontinued component with a solution that is not directly equivalent from an assembly and signalling perspective. We check the equivalence of the substitute or the adapted solution through extensive tests.

Refurbishment

Wear and dirt have a detrimental effect on how components function and in the worst case scenario can lead to the total failure of a system. We remove contamination, renew aged components (e.g. batteries, capacitors, relays or switches), professionally clean the components (e.g. using dry ice, professional rinsing technology or ultrasound) and repair damage. We also rectify design flaws at this stage wherever possible.

Reconstruction and redesign

If no suitable substitute is available or the profitability analysis shows that a reconstruction is the most economical solution, we will develop a new product with new documentation and identical specifications based on the existing original specifications and requirements or based on a sample device. The first step is to redevelop the logic of the printed circuit board and digitise it as faithfully as possible. We then use experienced service providers to produce the desired number of units. The electrical and mechanical properties of the original are retained in a 1:1 reconstruction and a costly requalification process can be reduced to a minimum. Qualification tasks such as determining the product's suitability for railways (DIN EN 50155) are also handled by our professional service providers.

Old parts management

We will refurbish component parts or components removed from vehicles and return them to proper operative functionality for you. As reconditioning old parts has been one of our core activities for many years, we also have stocks of electronic components from older vehicles.

Testing and acceptance : Safety down to the smallest detail

Fast fault identification

We will conduct tests to identify the causes of faults in electronic components. We have numerous test stands and devices at our disposal at the Munich central electronics workshop to carry out these tests. After identifying the faults, we will suggest solutions for troubleshooting.

Development of a test strategy

We will develop the perfect test strategy for the problem at hand and will set up the test stand accordingly. With several hundred test stands at its disposal, the Munich central electronics workshop has a suitable test stand for every product and every functional system. Our own specially created software checks the relevant functions in complex test sequences semi-automatically so that faults can be excluded.

Final inspection

Each component that leaves our maintenance depot is given its own test seal and identification number. Any repair work carried out is documented as a repair statistic. The engineering department can then use this data to conduct research into faults and make suggestions to you for optimising the product.

Test stands

Certain components require regular functional checks – for example, electronic control cards from Knorr brake systems. To deal with this issue, we have recently acquired a certified test stand that can be used to check these control cards in fast throughput lead time.

In-circuit tester and flying probe

The Munich central electronics workshop test infrastructure is equipped with three industrial needle testers for testing at PCB level and an additional flying probe. The fault diagnosis procedure is fully automated. Eight X/Y/Z-controlled test probes move precisely to the specified test points at high speed. This enables open lines, short circuits and faults in components to be identified reliably.

PinPoint

PinPoint is a compact, flexible in-circuit/function testing system for locating faults on printed circuit boards. The individual ICs are checked for proper functioning using test clips. The PinPoint diagnosis technology enables us to analyse faults rapidly and efficiently and has demonstrated a high fault identification rate in testing-intensive processes and of sporadic faults.

Infrared camera

An infrared camera is used for faster and more efficient troubleshooting and for verifying optimisations. We have developed this specifically for troubleshooting printed circuit boards and electrical systems.

Test System and LabVIEW

The Functional Test System (FTS) developed by the Munich central electronics workshop is a building-block system of individual interface modules that are used flexibly to test different components in the railway industry. The electrical connections are configured individually and the control software is assembled from various software modules. The vehicle environment can be simulated in this way. The software is created using LabVIEW (National Instruments) and is a graphical development environment.



Quality management: Certified processes

One of the most crucial factors behind our success is the quality of our products and services. Our management system is based on the requirements of the standards DIN EN ISO 9001 for quality management systems and DIN EN ISO 14001 for environmental management systems. Our quality standards are regularly checked and recertified through internal and external audits.

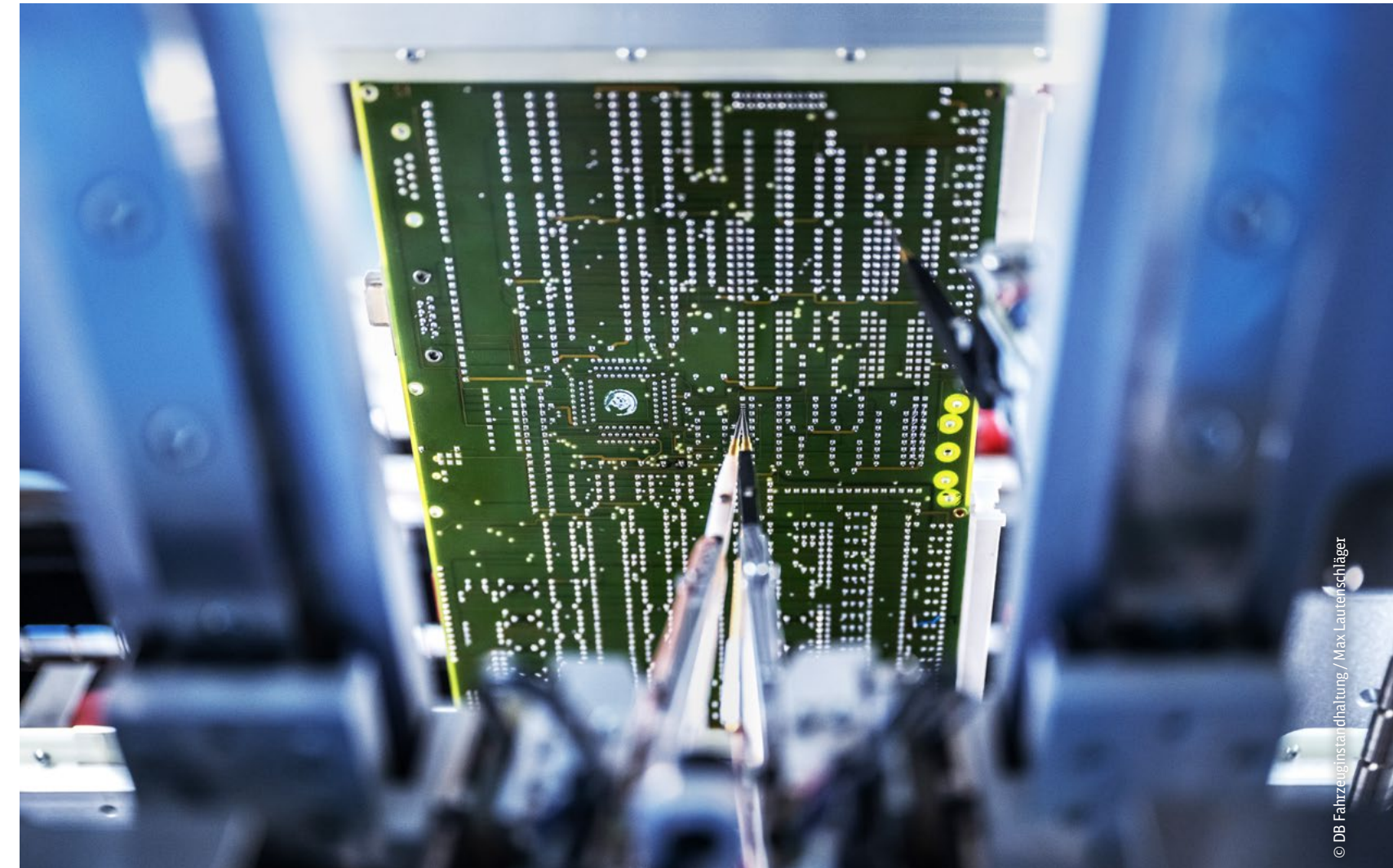
We work in line with common industry standards:

- Electrostatic discharge (ESD) DIN EN 61340
- Welding DIN EN 15085-2 (CL 1)
- Non-destructive testing (NDT) DIN 27201-7

Many companies have authorised us to repair electronic components – not least because of our many years of experience and collaborations with companies from a wide range of sectors.

Qualified staff

Our highly qualified employees are the basis of our success. In order to achieve or exceed our quality goals – and be of even better service to our clients as a result – we offer the best possible training opportunities. For example, all team members take part in the „fabrication of reliable hand soldered connections“ advanced training course run by the Fraunhofer Academy. Since 2015, we have also been running an in-house training programme tailored to our exact needs with external experts from various academies. We involve all employees in the continuous improvement process in order to maintain quality, service, costs and technology at the highest level and to ensure that our product portfolio is consistently further developed. So our customers are always well looked after.



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Innovative technologies

In addition to keeping a keen eye on our employees' qualifications, we also pay close attention to maintaining or increasing our competitiveness through innovative technologies. That is why we continuously invest in new technologies, in research and in development. We link up with others in the German research landscape and test out new technologies with our industrial partners.

We bring these to bear through an internal technology network and technology mentors in the form of:

- Inspection and test stands
- Infrared camera
- Pattern tester
- Several in-circuit testers
- Dry-ice cleaning for electronics
- Flying probe test system
- Rework station
- Systems for paint stripping and application

Getting your components on site as quickly as possible

Packaging and logistics

Our processes in the maintenance depot ensure that your parts and components are available on time, right where you need them. We use state-of-the-art IT tools for our logistics processes, such as:

- Barcode scanners
- Visualisations by means of our Q-EZW system
- Serialisation via barcodes

Submission document

To optimise processing times, we have introduced a submission document. You can easily request this by e-mail (ezw-auftragsservice@deutschebahn.com) so you can enclose it with your consignment.

Delivery to the customer

We deliver using proven and reliable service providers. To avoid transport damage, we always deliver in ESD packaging. With electronic consignment tracking, you always know where your delivery is and when it will arrive.

Long-term storage of lifetime buy material stocks

We store your components according to the highest industry standards. We develop a customised storage strategy, create a long-term storage plan and select the appropriate storage technology for every component. Nitrogen cabinets, drying cabinets and refrigerators are available, as well as special films with pollutant-absorbing interior coatings.

On request, we can also take care of the timely procurement of the components you will need before they are discontinued. We inspect all last calls cyclically, test them in stochastic functional tests or energise them cyclically on the test stand to counteract the effects of degradation.

Our goal is for you to be happy

Reconstruction

A total of 1,000 printed circuit boards were reconstructed for a major German rail vehicle operator. The project included post-developing the circuit diagram as well as redeveloping the PCB layout and creating the parts list and the assembly plan. Once the prototype had been developed, environmental testing and EMC testing were carried out in accredited laboratories to prove compliance with the relevant standards. After extensive in-circuit tests using a flying probe and testing in the vehicle, the printed circuit board was manufactured in series.

Repairs

As the largest provider of electronics repairs in the European rail sector, we are not only fully committed to our customers' rail vehicle business, but also to infrastructure managers, energy systems, stations and sales systems. Our biggest customers are within the DB Group. Our unique technical expertise has already convinced many external customers in the wider rail sector. We can repair several thousands components, keep more than 14,000 spare parts in stock and usually deliver within 14 days. Find out all about our services for yourself.

Refurbishment

As part of the redesign of a high-speed rail vehicle, complex containers, each with three battery chargers and a hydraulic cooling system, were dismantled and thoroughly cleaned. Sheets and wiring were replaced where necessary, along with all hoses, and the paintwork was renewed. Finally, the device was fully assembled and electrically and electronically tested and approved in a functional test.

Substitution

The manufacturer of a train radio stopped doing service and repair work. The Munich central electronics workshop developed a conversion kit that replaces the functions performed by the components and plug-in cards of the GSM-R train radio system that have been discontinued. All other functions remain in place, as well as the overall approval. In addition, all relevant standards are complied with (EN 50155, EN 5510-2 or EN 45545, EIRENE).

Manufacturer and products

Manufacturer	Power electronics					Control electronics							Control element	Components for information provision		Electromechanics			Train control systems		
	Battery charger	Rotating funnel	Power electronics	Inverter	Power inverter	Break controls	Relay	Control electronics	Door control	Ballast	Toilet control	Climate controls and regulators	Operating units	Microwave ovens	Passenger information	Terminals/EBuLa/MMIs	Wheel slide protection	Contactors and regulators	Voltage selectors	Control technology/ LZB/PZB	GSM-R
ABB	✓	✓	✓	✓			✓	✓	✓			✓	✓						✓		
Adtranz	✓	✓		✓				✓				✓	✓		✓						
AEG	✓	✓	✓				✓	✓		✓			✓		✓			✓	✓		✓
Annao															✓						
AST	✓				✓																
Bachleitner & Heugel																✓					
BBC								✓													
Bode									✓												
Bombardier	✓							✓				✓	✓		✓						
Brose															✓						
Center Systems																					✓
Comsys																					✓
Deuta-Werke																✓					
DLOG																✓					
Dowaldwerke								✓	✓		✓		✓								
EADS													✓								✓
EBEG	✓									✓			✓								
Elektromatic							✓														
Elin								✓													
EMB										✓											
Euroatlas					✓																
EVAC											✓										
FAGA	✓		✓		✓		✓	✓													
Focon															✓						
Funkwerk ITK															✓						
Gercom																✓					
Gersys																✓					
Gessmann													✓								
GEZ	✓	✓	✓				✓	✓		✓			✓			✓		✓			
GSP								✓		✓					✓						
Haag										✓			✓								

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Almex															✓						
Hörmann Funkwerk													✓								✓
IFE									✓												
INFOSYSTEMS															✓						
Jumo												✓									
KACO	✓																				
Knorr-Bremse						✓		✓					✓				✓				
Konvekta AG												✓									
Krupp	✓	✓	✓				✓	✓													
Lütze								✓					✓		✓						
LUWA								✓				✓									
Meiko								✓					✓								
MSB													✓								
Panasonic														✓							
Philips							✓						✓								
PINTSCH BAMAG	✓		✓	✓	✓		✓	✓	✓	✓			✓								
Schaltbau	✓		✓				✓	✓			✓		✓		✓			✓	✓		
SEL																				✓	
Semco								✓			✓										
SFT	✓		✓				✓	✓													
Sharp														✓							
Siemens	✓	✓	✓	✓	✓		✓	✓			✓		✓		✓	✓			✓	✓	
SMA	✓	✓	✓					✓					✓								
SYKO	✓																				
TEKNOWARE										✓											
Trion																✓					
Vossloh								✓		✓					✓						
WMF								✓													
Liebherr													✓								
Hagenuk Faiveley								✓				✓	✓								
Webasto													✓								

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