



**Vossloh
Rolling Stock**

Perfect



Match

Sustainability in motion



For more
rail transport
in Europe

Being one of the leading locomotive manufacturers in Europe means taking responsibility. **As a company steeped in more than 150 years of tradition in the heart of Europe, Vossloh Rolling Stock is committed to sustainable mobility through clear-sighted, definitive action and in constant dialogue with our customers.** We regard the provision of traction solutions perfectly suited to requirements as key to gaining the trust of our customers in all areas, no matter whether they're state-owned railways, vehicle lessors, industrial operators or privately-owned railways.

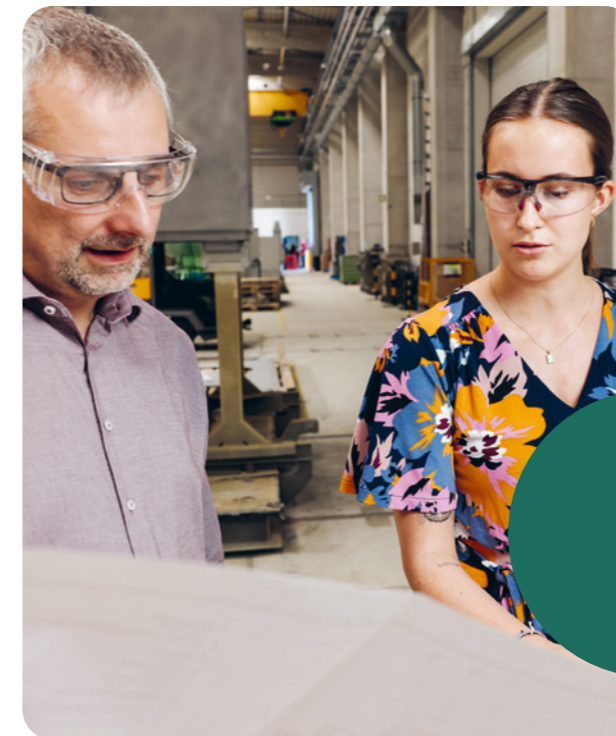
Our focus has always been on providing highly efficient, well constructed, user-friendly solutions for every kind of transport service involving shunting and hauling applications. Whether it's using drive shafts instead of the coupling and connecting rods standard at the time, the Start-Stop function (even with diesel-hydraulic locomotives), fuel-saving operating modes or the use of synthetic fuels in our DE 18 locomotives, we've always been setting new standards in the industry with our technological innovations and resource-friendly manufacturing and service processes.

We're extending the already extraordinary longevity we've established for our locomotives even further with the new Modula hybrid locomotive platform. Its variability in equipping such a durable asset to meet future requirements throughout its entire lifecycle using plug-&-play interfaces enables our customers to head into the future with a confidence they've never experienced before. For the first time, these locomotives fully reflect

the principle of comprehensive, condition-based maintenance. Based on data retrieved from sensors, a locomotive undergoes maintenance that is very flexible and depends on the number of kilometers the locomotive has traveled and the time it has spent in operation.

Intelligent rail logistics translates into protecting the climate and achieving low-emission economic growth, and in collaboration with our customers we see to it that more goods and raw materials are transported by rail. This requires a more robust infrastructure, and updating the locomotives using that infrastructure throughout Europe is also on the agenda.

With our outstanding portfolio and the excellent range of services provided by our European IMATEQ network, we offer modular solutions to meet the major challenges of today and the future.



Vossloh Rolling Stock:

150

years of company tradition
in the heart of Europe

Together for Europe – Made in Kiel

Having come under the umbrella of its new parent company CRRC ZELC in 2020, Vossloh Rolling Stock – previously Vossloh Locomotives – has started a new, forward-looking chapter in its long history. As a strategic investor with a long-term outlook, CRRC Zhuzhou Locomotive Co., Ltd. (CRRC ZELC) has more than 60 years of railway experience in the field of electric locomotives and is also one of the core subsidiaries of CRRC, the world's leading manufacturer of rolling stock. This connection is laying the groundwork for significantly expanding our portfolio while at the same time pressing ahead even more urgently with technological innovations and sustainable concepts.

Furthermore, we also profit from economies of scale in production and material investments in our manufacturing capacities.

In Kiel, Vossloh Rolling Stock covers the entire value chain of a locomotive with passion and the highest awareness of quality. From design and engineering to production and customer-specific service.

On this basis Vossloh Rolling Stock operates as a company that looks after the entire locomotive value chain with passion and the keenest awareness of quality from the design and engineering of the locomotive and platform production in a state-of-the-art production facility all the way to individualized customer service with all the ECM functions. At the same time, the intensive and trusting cooperation with CRRC ZELC is increasing our impact on local markets so that we can continue providing our customers with innovative and reliable locomotives for demanding applications and at good value for money. With the platform approach, our customers get tailor-made locomotives built using proven train components from renowned suppliers. And finally, we also set ourselves apart from the competition in that we always regard our collaboration with our customers and partners as a business-to-human relationship, and we do business in a very personal way.



Sustainability gives us the edge

The innovation lies in customers being able to choose a hybrid configuration that suits a specific application and equip that locomotive perfectly to suit its actual operational profile. In order to assist customers with selecting the optimum Modula variants, Vossloh Rolling Stock has used future route characteristics, timetables and train weights to construct a simulation that analyzes power consumption, costs and operating range. While variable power distribution between battery and diesel engine enables subsequent fine-tuning of the locomotive parameters, the modular vehicle architecture of the Modula allows the flexible implementation of different energy source solutions.

These range from the current catenary/battery combination and catenary combined with two diesel engines all the way to a fully electric locomotive for completely electric hauling and shunting work. And considering the increasing availability of hydrogen in the period to 2030 with fuel cells ready to go into mass production and procurement costs decreasing, versions with hydrogen fuel cells or the more durable hydrogen-powered piston engine are certainly feasible.

Plug-&-Play drive systems

Thanks to standardized and validated interfaces, upgrading to hybrid drive variants different from the ones currently in use today is also possible as requirements change. Given the climate targets that have been set in Europe and our own efforts to continue reducing noise and CO₂ emissions, the four-axle Modula is pointing the way to a very promising future.

Regardless of how fuel costs develop and which form of energy storage prevails in the future, this compatible platform is ready to integrate current and future energy storage and power generation technologies.

Condition-based maintenance

Our predictive maintenance concept enables us to guarantee a locomotive's excellent availability and reliability. This provides scheduling certainty and reduces per-kilometer running costs at the same time. The Train Control & Management System – TCMS for short – continuously analyzes the physical parameters during operation and makes adjustments where necessary, which ensures that customers of our smart Modula locomotive platform are ideally equipped for the future in accordance with Industry 4.0.



1 Traction tasks of the customer



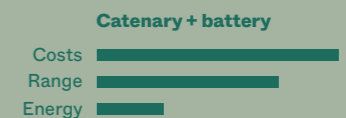
2 Operation and Traction analysis

3 Route definition (Elevation profile, breakpoints, trailer mass, etc.)

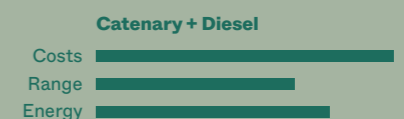
4 Simulation (Travel time, speed profile, recuperation, etc.)

5 Evaluation (Energy consumption, costs, range, etc.)

Modula EBB



Modula EDD



Modula

Simply put, our Modula hybrid locomotive platform offers our customers a level of future-proof flexibility that they've never had before.

Expertise in construction

Striking a successful balance between environmental, technical and financial considerations

Since its TSI approval and introduction into the market in 2014, the four-axle DE 18 has established itself as a state-of-the-art industry standard. It's a mixed-traffic locomotive that can handle a diverse and challenging range of applications in shunting, line hauling or construction.

Fuel consumption varies significantly depending on the application, and the fuel savings it achieves are primarily due to the diesel-electric drive train and a host of additional functions and smart operating modes such as the Eco Drive, Eco Mode Switch, Start-Stop and the Stage IIIB/2 Mode to name just a few. ECO Mode, for example, which is activated using the HMI on the driver's console, can be used to structure engine management more efficiently by limiting the output of the diesel engine to 1,200 kW. Besides simultaneously improving performance and lowering fuel consumption, this engine setting also helps to reduce maintenance costs because the lower output allows longer periods between engine overhauls. This represents a further advantage when shunting operations don't require maximum power output. What's more, Vossloh Rolling Stock also provides its customers with advice on other ways to reduce diesel fuel consumption during normal, day-to-day operations.



Universal network access

Even in a future that promises tougher stipulations on fossil fuels, we're leading the charge in operational dependability by making it possible to use environmentally-friendly HVO biofuels in our latest diesel locomotives. Biofuels reduce CO₂ emissions by up to 55% compared with fossil fuels, and a reduction in CO₂ emissions of as much as 95% is anticipated with the second generation (PTX), which is expected to be available before 2030.



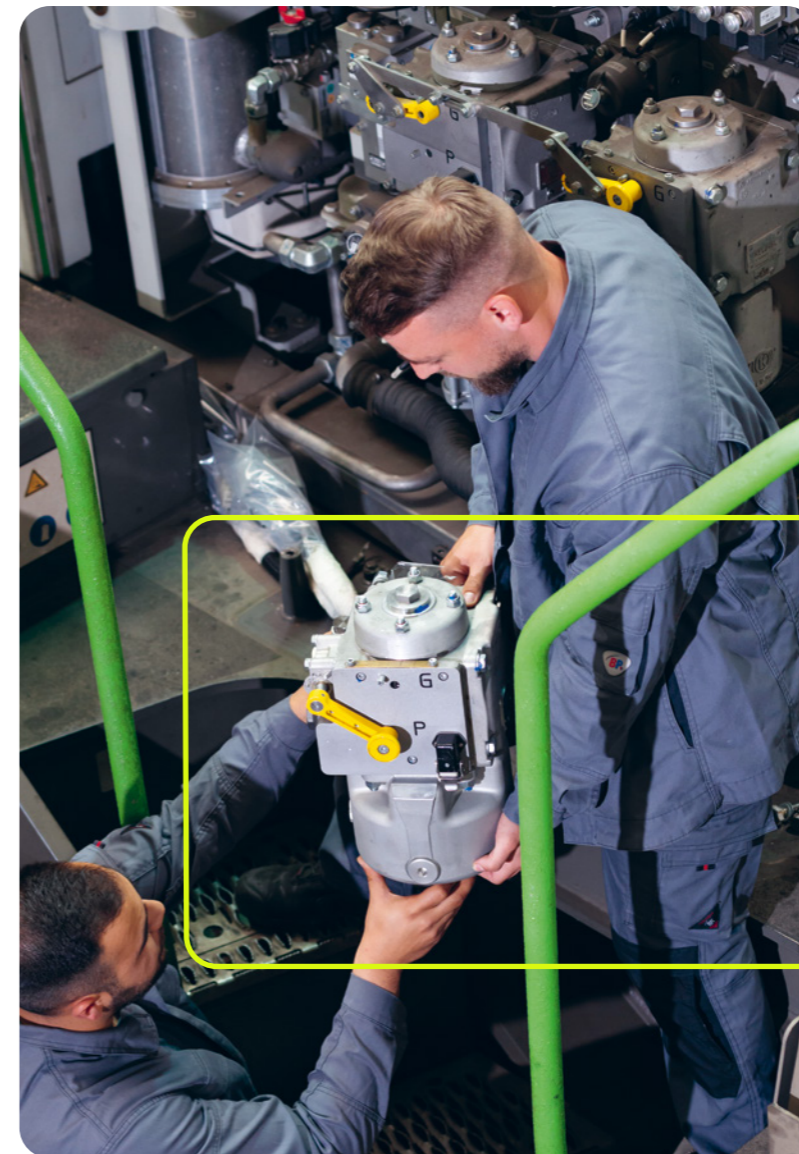
Our fuel-saving solutions
are the product of

4.400

years of experience.*



A hybridized version of the well-engineered DE 18 platform is also available, which is also fitted with a traction battery boasting the latest lithium-ion technology. Not only does this pay off over the “last mile”, it also provides noiseless, zero-emissions operation in sensitive areas such as tunnels, sheds or railway stations. With the Plug-In Hybrid, the diesel engine’s stop phases can also be extended by running all the auxiliary systems off the traction battery. Not only does the locomotive’s radically reduced idling time represent significant fuel savings, using the battery for low-power operations requiring less than 400 kW is also more efficient. Reducing its hours of operation shortens the time that the engine spends actually running by 40 to 50 percent, which in turn allows considerably longer maintenance intervals.



The overall design of the components and subsystems is such that maintenance can be carried out efficiently.

Noiseless
“zero emissions”
in sensitive areas

– thanks to
lithium-ion
technology



Ergonomics & Safety

Each of our platform generations has set standards for vehicle concepts. Sturdily built with a central, ergonomically designed and clearly laid out driver's cab, our locomotives provide superb visibility, excellent shunting capabilities, lower sustained speeds and unlimited continuous tractive effort.

Naturally we're continuing this philosophy with the Modula. The new control and bus system gives customers the option of upgrading the locomotive with new functionality in the years following delivery. New market requirements expected to materialize going forward have already been factored into the platform. It will be possible to use Augmented Reality functionality, for example, when servicing locomotives.

Reorganized driver's console

The Modula's modern driver's console is uncluttered and comfortable. Equipped with only the essential levers, buttons and standard-specified instrumentation, all the other functional elements are displayed on the control system's display screen. This arrangement provides more flexibility for future adaptations and improvements, and the modern control and communication system architecture promises even more reliability.

The modern locomotive control system display provides more flexibility for future modifications.

Energy-efficient air-conditioning and air circulation

The new CO₂ air-conditioner features a climate-neutral refrigerant, a heat pump and a heat recovery feature, all of which make it particularly efficient in terms of both energy and cost.





The air circulation feature heats up a cold cab faster. There's an integrated particulate filter on the outside air supply for working in dusty environments like tunnels or during infrastructure works (e.g. while ballasting) that complies with the highest quality standards (M6 according to EN 779). The driver can also switch off the supply of fresh air coming in from outside in order to prevent any smoke or fine dust from entering the cab.

Get in and feel good – this is where not only children's dreams come true!

Very good interior lighting

The cabs of our locomotives are equipped with different lighting systems. The general lighting together with the lighting on the steps can be switched on for a predetermined duration from outside the cab using push buttons located at all four entry points. If the power supply is interrupted, the general lighting can continue to be used for up to three hours as part of the emergency lighting.

The instrument panel illumination for the display instruments and operator controls on the driver's consoles is of course dimmable. This also applies to the ceiling spotlight that serves as a reading light for reading schedule books while at the driver's consoles. Floor lighting runs along the gangways, steps and access doors to the cab so that personnel can negotiate them safely.



See clearly what's going on at all times

The mid-cab concept is still the best solution for shunting work. It impresses with its good 360° view, and allows the driver to change consoles and directions very quickly. Safe access ways designed as riding platforms cater to frequent alighting and climbing on board. Spacious walkways across the top of the buffers are accessible from the track via the access ways, and they enable personnel to remain safely inside the locomotive's loading gauge while moving from one side of the locomotive or track to the other. The locomotive also has a very well-lit access platform in case the driver needs to get down from the locomotive, e.g. when approaching a damaged train.

Equipped with the retainer for an automatic DAC shunting coupler and radio remote control, our locomotives have all the characteristics of modern shunting locomotives. When using the radio remote control, the locomotive driver does not have to leave the locomotive when moving from the cab to the riding platform at the end of the vehicle. This protects him from the train traffic on the adjacent track and from dangerous areas and obstacles next to the track. With the traction power available, shunting with heavy trailing loads is no problem, and the undersides of our vehicles are designed to be able to negotiate classification humps and shunting facilities unhindered.

Availability throughout Europe

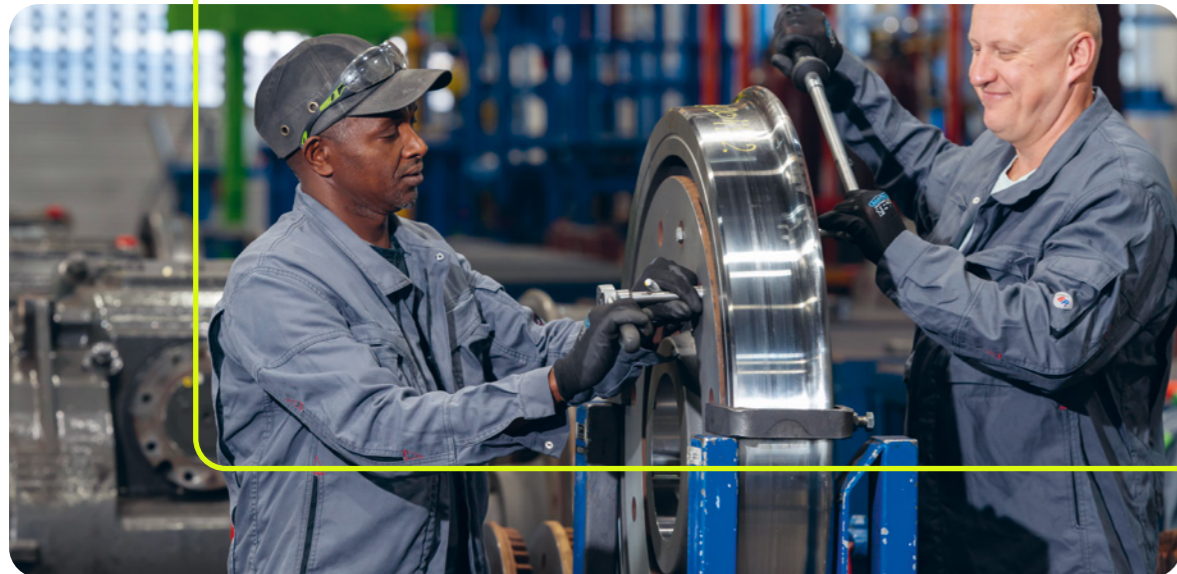
Forward-looking service philosophy

In an era characterized by globalization and rapidly developing technologies, our customers depend on reliable locomotives, transparent communication and short response times.

In order for our customers to be able to concentrate on their core business and on running their locomotive as cost-effectively as possible instead of having to worry about replacement parts, maintenance schedules or technical reports, our European service teams are ready to respond if needed with everything from maintenance to main inspections. For us, product quality and service quality are inextricably linked, so we see both sophisticated technology and demand-oriented service packages as the key to the longevity of our locomotives:






Our service packages include:

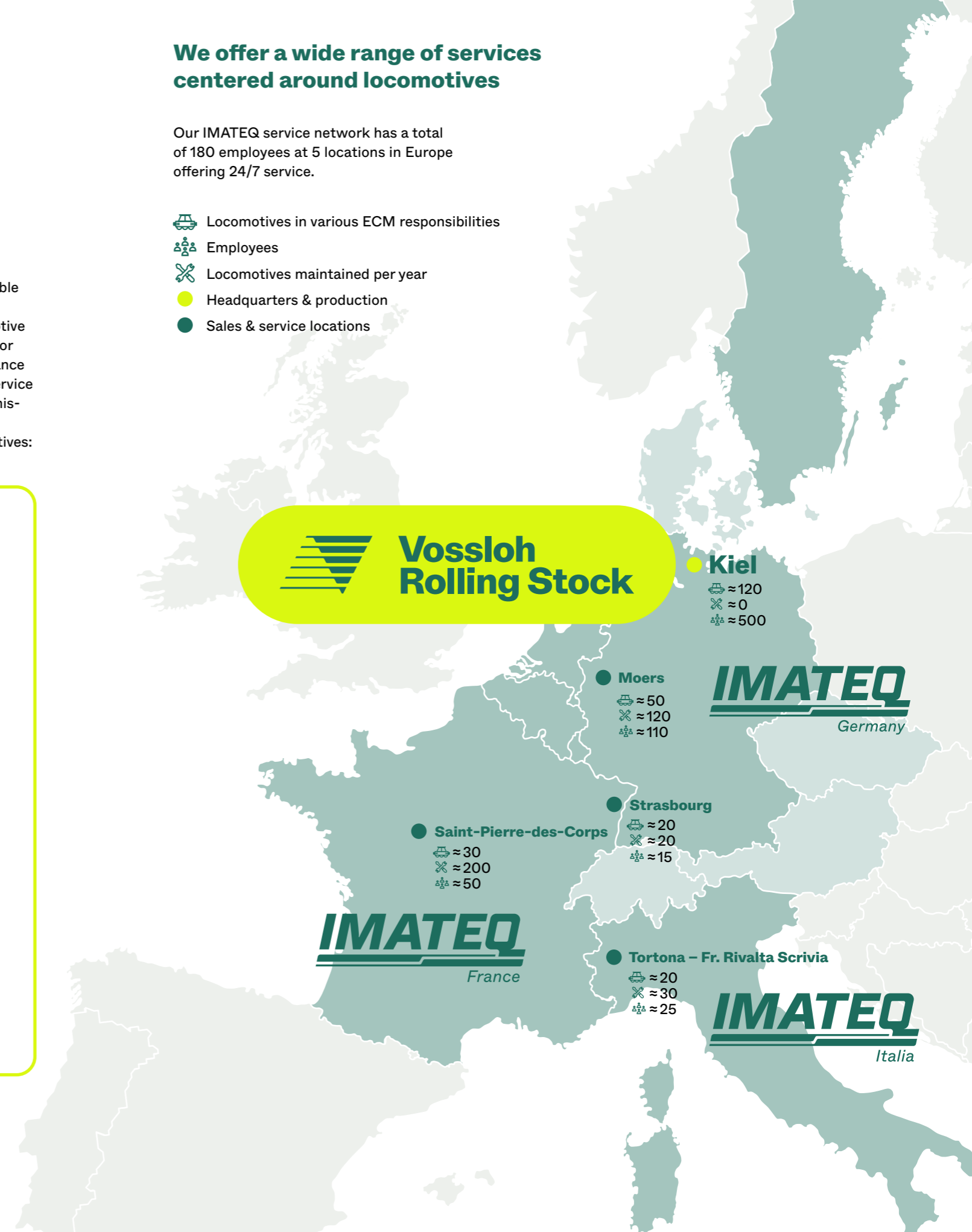
- technological upgrades
- adherence to the specified maintenance and inspection cycles
- unconditional availability of replacement parts
- anticipatory maintenance
- rental vehicles for the interim
- target-oriented staff training.



We offer a wide range of services centered around locomotives

Our IMATEQ service network has a total of 180 employees at 5 locations in Europe offering 24/7 service.

-  Locomotives in various ECM responsibilities
-  Employees
-  Locomotives maintained per year
-  Headquarters & production
-  Sales & service locations





Closer to the customer thanks to an interactive support link-up

We have invested in our key skills for the purpose of servicing and supporting our customers' portfolios throughout Europe. Our German service hub in Moers, for example, has a state-of-the-art wheelset workshop. We're also currently preparing all the IMATEQ locations to handle hybrid and electric locomotives by establishing the necessary infrastructure and ensuring our personnel have the required qualifications.

Intimately connected with these developments, the Modula platform offers a new service dimension: working in a "Mixed Reality". In the event of a malfunction, our interactive service team patches into the locomotive to quickly determine the root cause and a solution to the problem in conjunction with the virtual back office comprising Fleet Management, Engineering or the supplier. At the same time, the uninterrupted data evaluation of the most important locomotive parameters during operation facilitates constant analysis in order to identify problems before they occur and develop the appropriate technical solutions early to improve the product.



ECM I & II

Central Functions / Engineering in Kiel

ECM III

Fleet management at all European IMATEQ locations

ECM IV

Certified workshops at all service sites

Modular offerings

Standardized service packages in the European workshop network; parts and wheelset overhaul in Moers

Backed by our ECM-compliant European service network, we're doing our part every day towards further increasing the interoperability and safety of railway transport throughout Europe.

Certified for ECM I to IV, we perform every function relating to maintenance management, maintenance development, fleet management and required maintenance works.

Binding values

As a locomotive manufacturer, Vossloh Rolling Stock is active in an area of industry that places a high priority on sustainability. Not only do we contribute to safe and environmentally-friendly freight transportation throughout Europe with our products and services, we also place the greatest importance on saving resources and achieving low emissions during production through the use of new technologies.

Modern workplaces in a sustainable industry

Our plant in Kiel-Suchsdorf is the most modern locomotive works in Europe. In addition to state-of-the-art manufacturing using optimized production processes and interfaces, it also represents the implementation of far-reaching ecological standards. We've been able to significantly lower our energy costs compared to our previous location and we've increased sustainability considerably in all areas of production.

Beginning with zero-emission forklifts and an energy-saving paint shop with optimized filter technology, these efforts also include an optimized filter technology and extend to an optimized welding-gas extraction system that combines safety with efficiency and a two-part jet-blasting system with integrated recirculation of the blasting shot, which is considerably quieter thanks to improved filtering. In this way, we're creating a working environment for our staff that is both modern and health-conscious at the same time.



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Ecological & social responsibility

In all aspects of the work we do, we comply strictly with all the applicable provisions for preventing environmental hazards, and we take our corporate responsibility for issues such as the environment, workers' rights, human rights, ethics and sustainable procurement practices very seriously. This was also verified by the audit carried out by EcoVadis in late 2020, for which we achieved the Silver Score. Compared to the ratings received by other companies working in the industry, ours was a positive, above-average rating.

Safety first

Of course, when it comes to health and safety we also pursue an occupational health & safety policy with uniform guidelines that apply across Europe in our production facilities, our European service locations and in the field serving customers.

The health and workplace safety of our staff are of paramount importance – and not just during a global pandemic, either. In 2020, Vossloh Rolling Stock received the Corporate Health Award in the Mechanical Engineering / Heavy Industry category for its corporate health management, particularly in connection with the Covid-19 pandemic.



**If you're interested in our products and services, please feel free to contact us:
contact.kiel@vl-rs.com**