



ELECTRIC DRIVES
FOR EVERY DEMAND



Solutions for transportation

Electric drives and systems




ELECTRIC DRIVES
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VEM – specialist for drive solutions in the following branches:


 Transportation

 Machine and plant engineering

 Steel and rolling mills

 Cement and mining industry

 Shipbuilding

 Chemical, oil and gas industry

 Water management

 Renewable energy

 Power plant technology

There are currently around 30 million electric machines bearing the VEM badge in use around the world. They are found aboard ships, in trains and trams, and in chemical plants and rolling mills. VEM generators produce electricity as hydropower and wind turbines. The VEM product range embraces variable-speed electric drive systems, special motors and special machines for outputs ranging from 0.06 kW to 60 MW, as well as a diversity of drive technology and power generation components.

A vision in motion

VEM has been active in the field of electromobility for more than 100 years, developing and manufacturing a broad diversity of traction drives. With this wealth of experience, a team of highly qualified professionals and our advanced production facilities, we are recognised as a competent and innovative partner of the transportation branch.

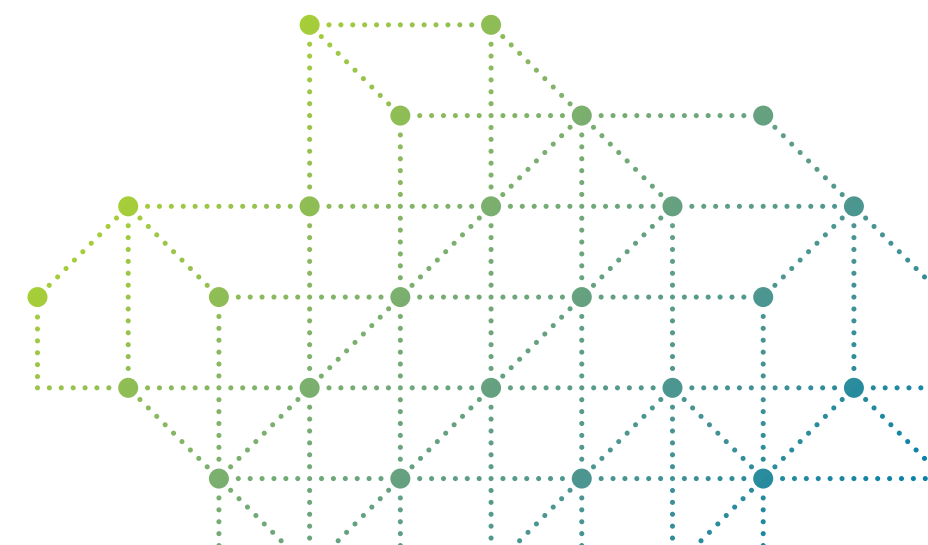
Hand in hand with scientific institutes, universities and research laboratories, we are working untiringly to advance the development of our technologies. VEM traction machines represent the absolute state of the art and stand out by way of their long service lifetimes and low life-cycle costs. We live the vision of supplying our customers with a competitive market solution, and VEM machines present an ideal solution for every conceivable application.

Renaissance of rail vehicles

Increasing traffic density in our metropolitan areas, along with the ensuing traffic issues, have lent trams and suburban light-rail systems a new lease of life. Today's rail vehicle industry supplies modern high- and low-floor designs which leave no wish unanswered in terms of transport capacity, acceleration capability and, most importantly, passenger comfort.

At home on the railways of the world

With our experience and first-class know-how, we are today in a position to address all the international railway industry's challenging demands for powerful drive solutions. These include highly efficient traction motors for electric and diesel-electric locomotives, multiple units, trams and maintenance vehicles. Main and auxiliary equipment generators and control systems, as well as auxiliary equipment motors, round off this section of the portfolio. Our product range at VEM also embraces traction motors for hybrid and trolley buses for environment-friendly public transport systems.



VEM traction motors for all low floor concepts

Our air-cooled DKCBZ motor series, with its design height of just 270 mm and an output range of 50 to 125 kW, was developed specifically to serve the market for ultra-modern low-floor vehicles. These encapsulated machines feature noise-optimised, bi-directional surface cooling.

As with all VEM traction motors, the stator winding is a two-layer former-wound coil meeting the requirements of insulation class 200. The motors were designed to permit both transverse and longitudinal drive operation with only minor modifications, making the DKCBZ series ideal for low-floor vehicles and wide-ranging application scenarios for all common gauges.



Surface and air-cooled traction motor, 125 kW



Traction motor with water-jacket cooling, 50 kW

Modern water-cooled drives for the Berlin tram system

VEM first began the development and production of DKWBZ three-phase traction motors for tram system applications in 1994, and a whole line of further motors with similar water-jacket cooling has been developed since then. These include very small motors for single-wheel drives, as used in modern Berlin trams, alongside more powerful locomotive motors with high-level protection to withstand extreme climatic conditions.



Motor series for fast trams and metros

The DKOBZ motor series was developed to deliver the drive power needed by larger and faster trams and metro systems. With continuous outputs between 120 and 155 kW, DKOBZ motors are significantly more powerful than those of the DKCBZ series. Our DKOBZ series motors are available in design heights of 370 and 430 mm. An internal cooling circuit further improves the power-to-weight ratio. These motors are to be found in service on London's Docklands Light Railway, for example.



Surface/air-cooled traction motor, 130 kW

Retrofit is the magic word

VEM also offers ideal solutions for the refurbishment of ageing tram systems with modern three-phase technology. DC motors which are essentially still in good condition are brought up to date with reworking of the existing housing parts and a slot-in three-phase stator. This is the basis for our DKABZ series of cross-ventilated three-phase traction motors with outputs from 42 to 85 kW. The benefit of this concept: Simple installation back into the bogie without requiring alterations to the mounting fixtures or connections.



Pöstlingberg tram, Linz/Austria



Cross-ventilated traction motor, 65 kW

Complete solutions for all types of locomotive or railcar

VEM works closely with major railway gearbox manufacturers to offer complete drive systems comprising motors, couplings and gearboxes for light-rail vehicles, railcars and locomotives. Berlin-based manufacturer Stadler Pankow GmbH, for example, commissioned us to develop a motor and to supply motor-gearbox units for the DT 8.12 light-rail vehicles used by the Stuttgart metro tram system.

Three-phase asynchronous traction motors for electric trains

Rapid and suburban transport services at speeds of up to 160 km/h are similarly equipped with our modern three-phase asynchronous traction motors. Examples here are the class 4023/4024 "E-Talent" railcars operated by the Austrian Federal Railways (ÖBB), as well as state-of-the-art railcars for PESA and others. Such train motors are usually designed with forced ventilation, but can also be supplied in a self-ventilated variant for rail-buses. They are available in various sizes, as single- and dual-bearing designs, with continuous outputs ranging from 280 to 650 kW. The high-quality, high-strength winding insulation supports a direct 3 kV DC power supply. Special features include a speed-sensing system, temperature sensors in the stator windings, and insulated bearings on the N side. Torque is transmitted to the gearbox via a diaphragm or gear coupling.



3-Car EMU (Electrical Multiple Unit)



Motor with forced ventilation, 360 kW



Our drives get locomotives and special vehicles on track

We supply not only force-ventilated traction motors, but also motors with water-jacket cooling and individually customised designs for both locomotives and special vehicle applications such as rail maintenance, milling and grinding vehicles. Examples: Our motors are used by Germany's Deutsche Bahn on its high-speed rail grinders, and by the Swiss SBB for the new maintenance vehicles deployed to service the transalpine Gotthard Tunnel.



Locomotive traction motor with forced ventilation, 400 kW



Vossloh locomotive DE18

High energy availability with VEM generators

Almost every diesel-powered railway vehicle needs an additional power source alongside the starter battery to maintain a constant traction and on-board power supply. This is usually a synchronous or asynchronous generator or powerpack coupled directly to the diesel engine to provide the entire power supply to both traction motors and the vehicle's on-board equipment. Diesel-hydraulic transport vehicles use hydrostatically powered auxiliary generators to supply the vehicle's electrical system with power. A broad range of VEM railway generators covers outputs from 30 to 5 000 kVA – and thus virtually every conceivable application scenario. Our standard system is a self-cooled and electrically excited brushless synchronous generator with electronic excitation and control systems. The latter also serve monitoring and protection of the generator.

One outstanding feature is the frameless design with integrated exciter. The unit can be installed either suspended under the floor or upright in the locomotive's engine room. Our portfolio includes both single- and dual-bearing generators; the choice is dependent on the design of the diesel engine. In addition to electrically excited synchronous generators, we also supply asynchronous generators and permanent-magnet synchronous generators. VEM railway generators are in reliable use in literally hundreds of vehicles around the world, including some of the most hostile climatic environments.

Traction generators for mining trucks, with outputs up to 4 000 kVA are further prominent members of the product family.



Mining truck

These machines are extremely robust and perfectly adapted to the harsh conditions prevalent in ore, coal and tar-sand mining.



Brushless synchronous generator, 1 900 kVA



Digital 24 V excitation and control system with CAN bus

Long traditions in the development of mainline and industrial locomotive drives

VEM boasts long traditions in the development and manufacturing of locomotive traction motors. Already up to the mid-1990s, we supplied more than 7 000 DC traction motors for heavy industrial locomotives and almost 5 000 single-phase AC traction motors for the DB series 112, 143, 155 and 156. With our vast engineering potential and modern production and testing facilities, VEM is in an excellent position to manufacture and test three-phase traction motors in compliance with the exacting quality standards of Europe's railway operators. We draw on know-how acquired from thousands of low-floor trams, commuter trains and electric railcars using three-phase traction motors.

The VEMoDUR VPI-200® insulation system was developed specifically to meet the extreme thermal, mechanical and electrical challenges of mainline use and allows us to design traction motors for outputs up to 1800 kW and voltages up to 3 000 V.

Long motor lifetimes are guaranteed. The durability of the insulation system against voltage spikes makes it ideal for IGBT and GTO converters for use as axle-hung or integrated bogie-mounted drives with full suspension. One special example is the use of 600 kW locomotive motors with water-jacket cooling, as operated under the extremely rugged conditions of Chilean copper sulphate mines by CODELCO. Auxiliary drives for cooling and fan units are also found in marshalling and light maintenance vehicles.



Locomotive traction motor
with water-jacket cooling, 600 kW



Locomotive drive with asynchronous traction
motor with forced ventilation, 1400 kW



Three-phase asynchronous generator
with two winding systems, 3 000 kW

Pleasant journeys with VEM technology

An important focus of our product and system development activities lies on energy-efficient drive solutions which ensure passenger comfort in combination with economical operations. Advanced manufacturing technologies are the key to sparing and efficient resource use. Our high-efficiency low-voltage motors and compact solutions stand out by way of their extraordinary operating reliability, long service life and minimised environmental impact.

More than just standard products

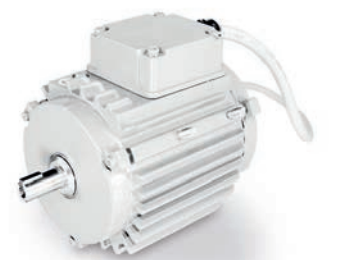
Our expertise in railway technology, paired with decades of experience, enables us to address exacting demands from the international railway industry for high-performance auxiliary drives. VEM motors are used in a wide variety of applications. IE2 and IE3 versions, for example, are ideally suited for pumps, fans and compressors, while compact drives of type VEMoDRIVE M21R AST BAH are certified specifically for operation in the pump and ventilation systems of railway vehicles.

VEM motors for machine and traction motor fans operate in all manner of extremely difficult climatic conditions. Whether as single-speed or pole-changing motors, our auxiliary drives can easily withstand wide temperature fluctuations. Temperatures up to 70°C are possible, depending on project requirements, and even challenging track beds and extreme route lengths pose no problems. Our motors operate smoothly and reliably in many different applications, for example as fan drives on electric locomotives in Russia or on regional trains in Germany and Austria.

In combination with a brake, our auxiliary motors are also installed in the electric lifting and lowering equipment used in Deutsche Bahn's car-carrying trains. Further uses for VEM motors include urban tram systems, where the drives are exposed to heavy stress from moisture, dirt, snow, ice and vibration.



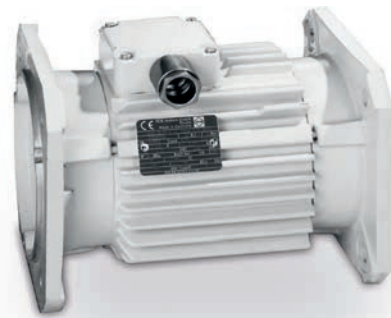
Motor in special rail version, with flat connector technology, K210 100 L2, 2.5 kW, -50 to +60 °C room temperature



Motor in special rail version, with flat connector technology, cable and special housing, K200W 71 K2, 0.12 kW, 70 °C room temperature

Fan motors ensure travel comfort

Reliable operation and comfort are hallmarks of passenger train services today, and one important factor in the latter is quiet, draught-free air conditioning. These systems must be resistant to dust and chemical influences, and must be capable of maintaining ideal temperatures inside the vehicle over all seasons. This is no problem for VEM drives. Converter-fed operation calls for motors with an increased withstand voltage. With sophisticated designs, reinforced insulation systems, customised bearings and increased lubrication effectiveness, VEM motors meet the highest standards.



Motor in special version for use in a bypass fan: K200 71 GX4, with flat connector technology, IP 56, 50 °C room temperature, 0.55 kW

VEMoDRIVE Compact keeps traction motors cool on the “Frecciarossa”

Railway applications place high demands on all the electrical components involved. In response to a customer request, we developed a special compact drive – M21R 90 L2 AST BAH – to cope with both significant vibration and shock loads and highly variable climatic conditions. These new drives replace conventional pole-changing motors in the traction motor ventilation systems. The key benefit lies in stepless adaptation of the cooling air volume to the load on the traction motors; this permits considerable energy savings. Trenitalia opted for this technology for its Frecciarossa high-speed trains, which will in future reach a top speed of 400 km/h. The new drive must still be able to deliver full output for at least ten minutes when ambient temperatures reach 70 °C. Furthermore, motors and control electronics mounted underneath the train are subjected to high thermal shocks when it enters or emerges from a tunnel. Our drive system cools the motors to enable them to withstand these massive loads at full performance.



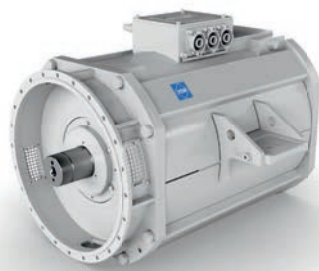
Brake motor in special rail version B210 U 100 LX4, with mechanical brake release, 4.0 kW, S2 10 min



Compact drive in special rail version M21R 90 L2, with AST converter, 50 °C room temperature, 2.2 kW

Innovative drive technology from VEM

We have developed a series of permanent-magnet traction machines for railcars and public transport buses, for example trolley and hybrid buses. The same high-energy magnet principle is applied when designing generators for the power supplies of diesel-electric and hybrid vehicles such as the EcoTrain – a further development of the VT642 – operated by DB regional subsidiary Erzgebirgsbahn.



Permanent-magnet synchronous generator, 400 kVA



Three-phase asynchronous traction motor with forced ventilation, 160 kW



A vehicle of the Dresden hybrid bus fleet





Our Service – Good reasons for VEM

- Product range from single motors to complete drive systems
- Own design engineers develop tailored solutions
- Flexibility thanks to a high proportion of in-house manufacturing
- Fast response times
- Worldwide service availability
- 24h delivery service for stock motors (online warehouse)
- 1500 highly motivated and qualified employees

Made in Germany

- Durable and robust under extreme conditions
- Environment-friendly and energy-efficient
- Low life-cycle costs



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