



ELECTRIC DRIVES FOR EVERY DEMAND



Electric drives and systems for
railway solutions
worldwide

Rail vehicles, buses, mining trucks

VEM - specialist for drive solutions in the following branches:



Transportation



Machine & Plant Engineering



Steel & Rolling Mills



Cement & Mining



Shipbuilding



Chemicals, Oil & Gas



Water Management



Power Plant Technology



Renewable Energy

Currently, there are around 30 million VEM labelled electric machines in use around the world.

The motors are applied in ships, trains and trams, 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 to 80 MW, 100 MVA, 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



Traction motor with water-jacket cooling

Modern watercooled drives for tram systems worldwide

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



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

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 railbuses. 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.



Motor with forced ventilation



3-Car EMU (Electrical Multiple Unit)

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



Vossloh locomotive DE18

High energy availability with VEM generators

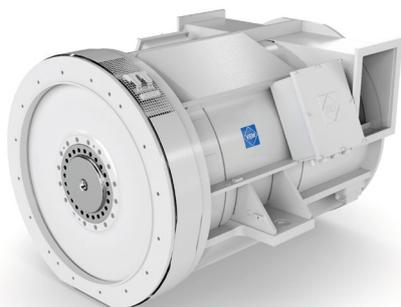
Almost every diesel-powered railway vehicle needs an additional power source alongside the starter battery to maintain a constant traction and on-board power supply. This is usually a synchronous or asynchronous generator or powerpack coupled directly to the diesel engine to provide the entire power 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. These machines are extremely robust and perfectly adapted to the harsh conditions prevalent in ore, coal and tar-sand mining.



Mining truck



Brushless synchronous generator



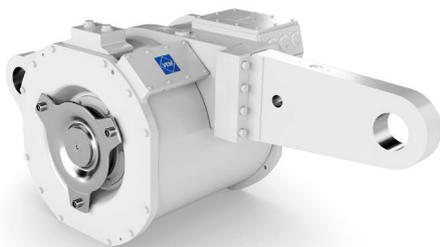
Digital 24 V excitation and control system with CAN bus

Long traditions in the development of mainline and industrial locomotive drives

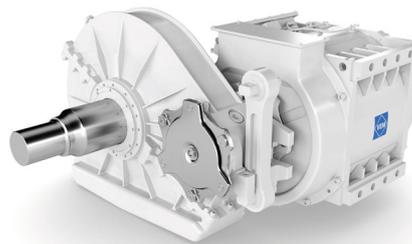
VEM boasts long traditions in the development and manufacturing of locomotive traction motors. Already up to the mid-1990s, we supplied more than 7,000 DC traction motors for heavy industrial locomotives and almost 5,000 single-phase AC traction motors for the DB series 112, 143, 155 and 156.

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 1,800 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



Locomotive drive with asynchronous traction motor with forced ventilation



Three-phase asynchronous generator with two winding systems



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, in the latest development also IE5 versions, are ideally suited for pumps, fans and compressors, while compact drives of type VEMoDRIVE M41R 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.

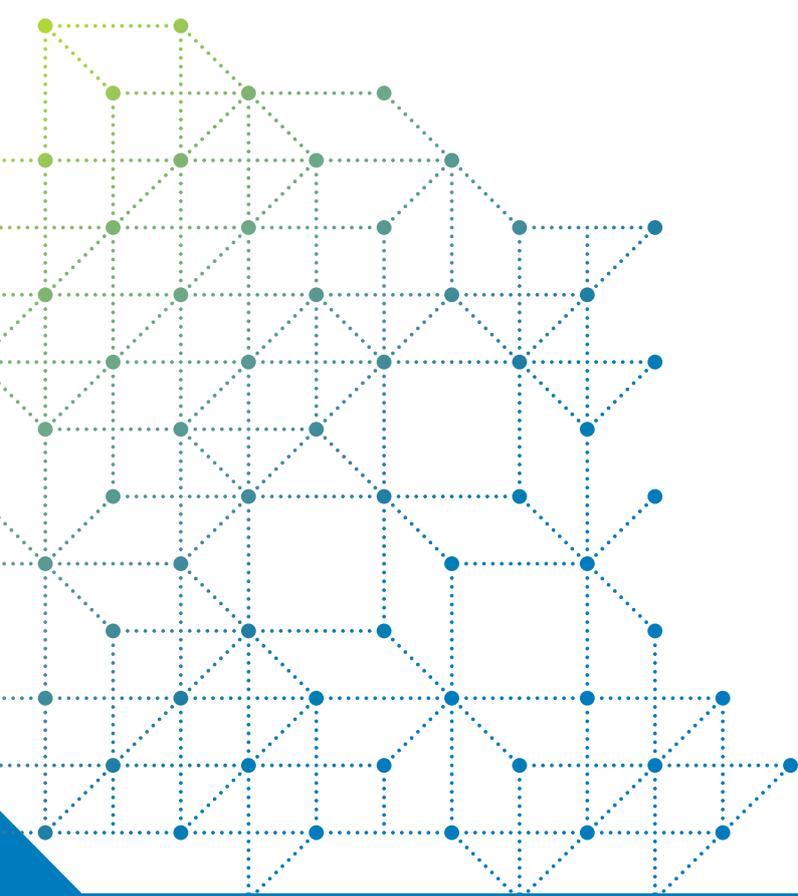
In combination with a brake, our auxiliary motors are also installed in the electric lifting and lowering equipment used in Deutsche Bahn's car-carrying trains. Further uses for VEM motors include urban tram systems, where the drives are exposed to heavy stress from moisture, dirt, snow, ice and vibration.



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

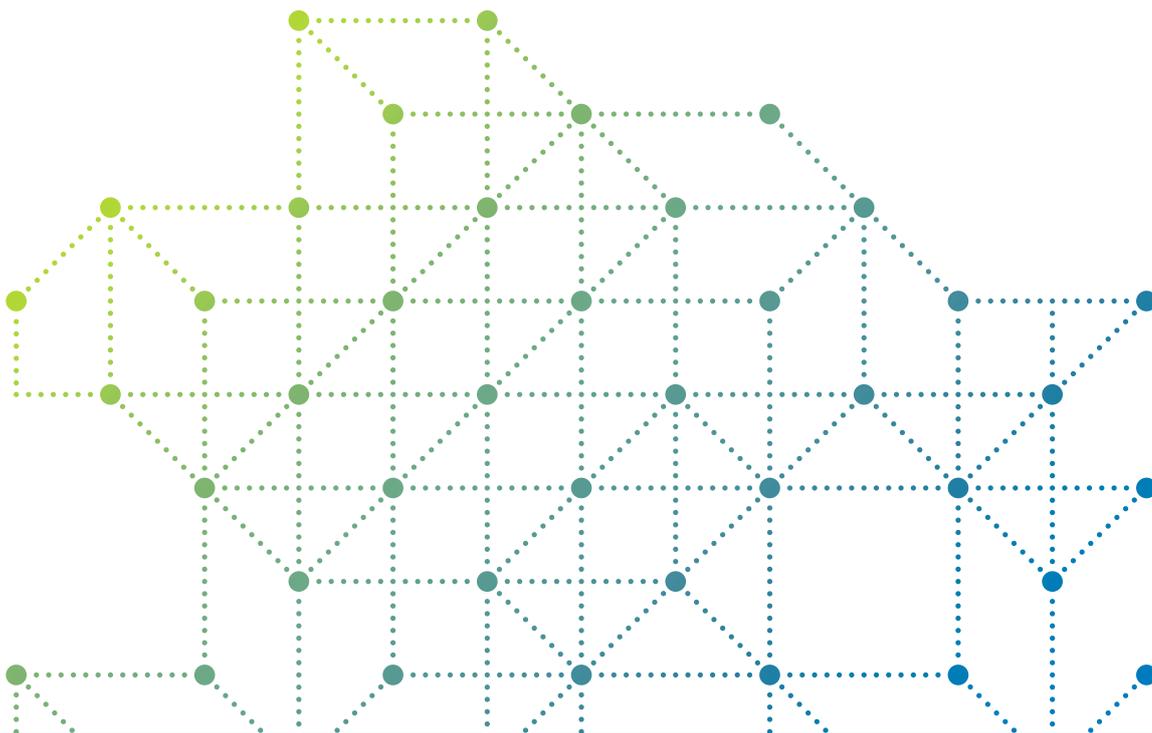


Fan motors ensure travel comfort

Reliable operation and comfort are hallmarks of passenger train services today, and one important factor in the latter is quiet, draughtfree 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.

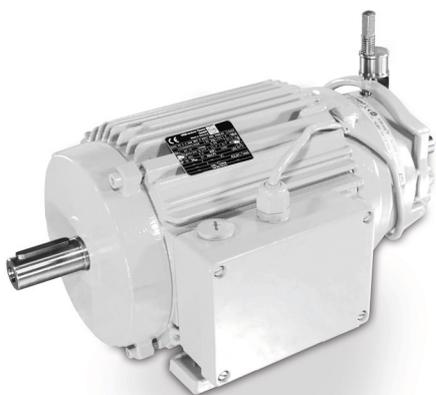


Motor in special version for use in a bypass fan: K200 71 GX4, with flat connector technology, IP 56, 50 °C room temperature, 0.55 kW



VEMoDRIVE Compact keeps traction motors cool on the “Frecciarossa”

Energy-saving compact drives for railway applications are mainly used to drive controlled fans in the train. They ensure optimal air conditioning of the passenger compartments or efficient cooling of the traction motors and transformers. Trenitalia uses this technology for its high-speed train „Frecciarossa“, which can travel at speeds of up to 400 km/h. The M41R 90 LY2 AST BAH compact drive, which was developed at the customer’s request, withstands both the extreme demands of vibration and shock loads as well as changing climatic conditions. According to DIN EN 61373, these components must withstand shocks of 5 g undamaged when mounted on the vehicle body of the train. The operating temperature range of -25 to +50 °C, at which the drive can be operated without power reduction, also exceeds the standard range for general applications of controlled drives. In addition, the drive must also be able to start at an ambient temperature of +70 °C and deliver full power for 10 minutes. When entering or leaving tunnels, the motor mounted on the underbody of the train and the control electronics are also subjected to extraordinary temperature changes of up to 3 K/s. These extreme loads place high demands on the drive. These extreme loads place high demands on the development, design and operation of the motors as well as the frequency converters installed, as the performance parameters must be maintained over the entire frequency range under full load of the train.



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

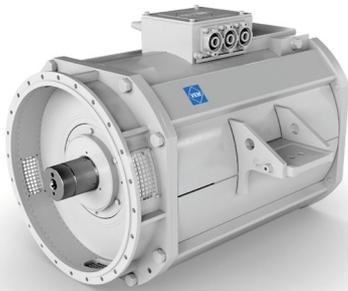


Compact drive M41R 90 LY2 AST BAH mounted on the Systemair centrifugal fan. The unit is used for cooling traction motors

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.



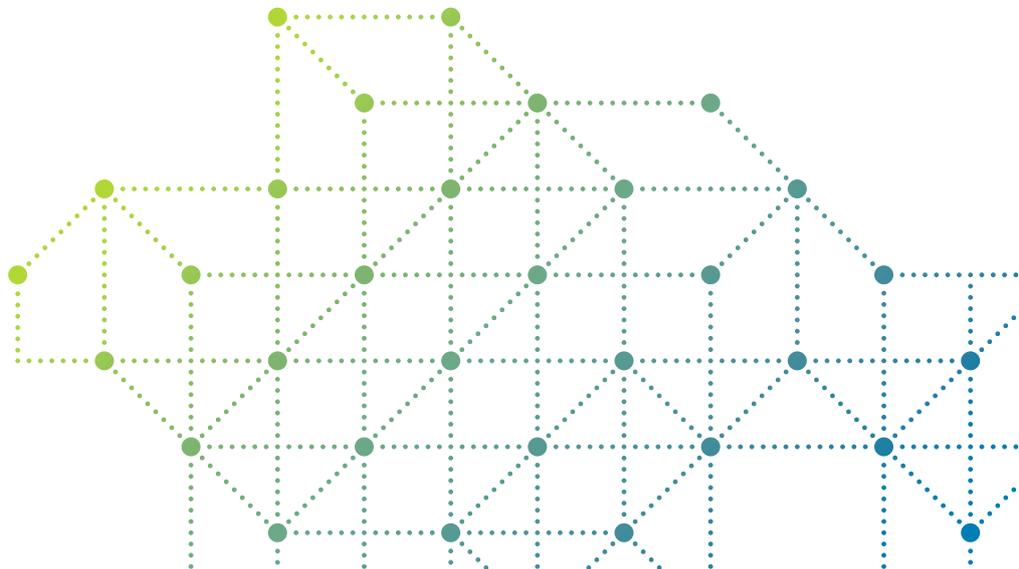
Permanent-magnet synchronous generator



Three-phase asynchronous traction motor with forced ventilation



A vehicle of the Dresden hybrid bus fleet



Our Service – Good reasons for VEM

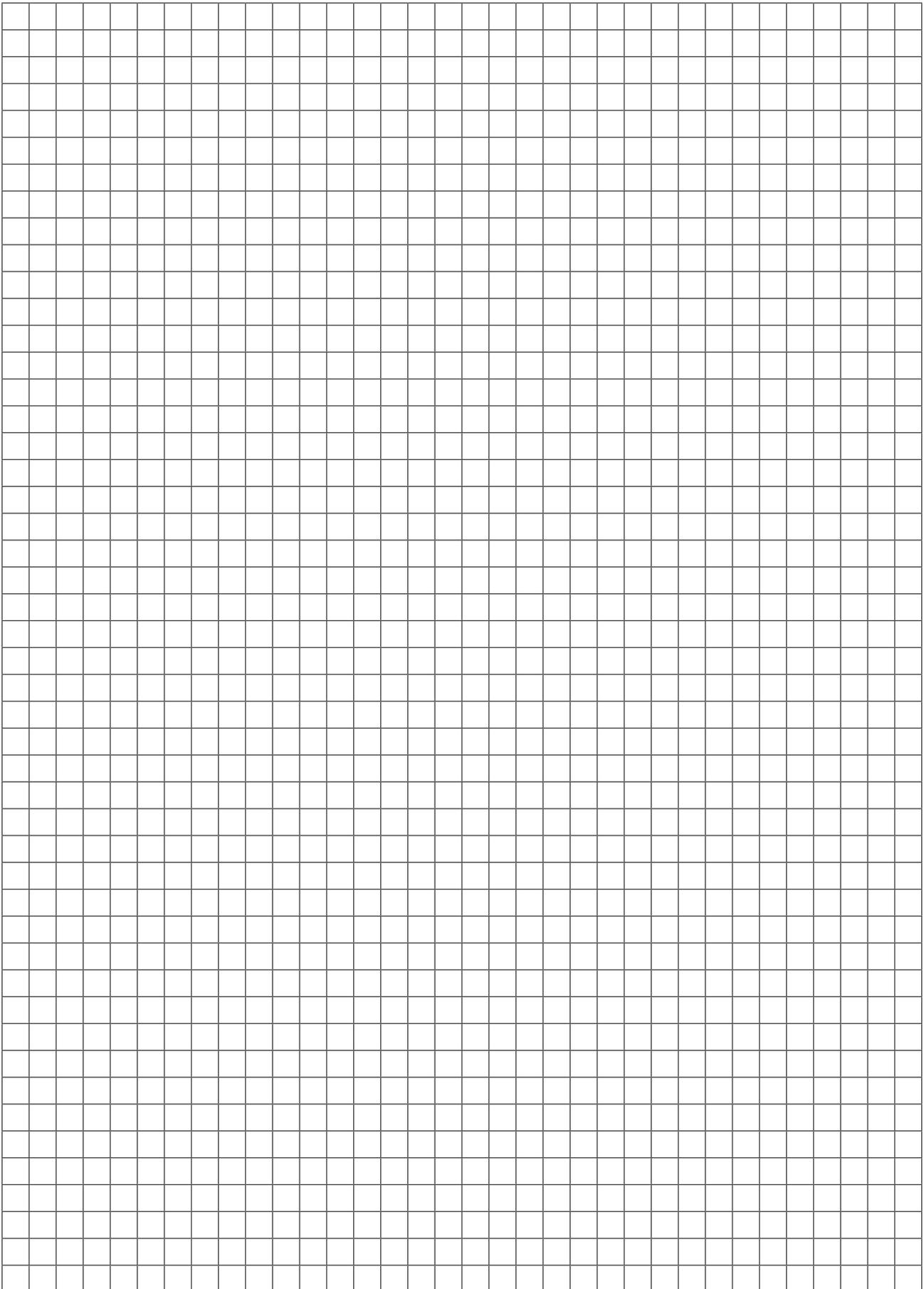
- product range from single motors to complete drive systems
- own design engineers develop tailored solutions
- flexibility thanks to a high proportion of in-house manufacturing
- fast response times
- worldwide service availability
- 24h delivery service for stock motors (online warehouse)
- 1,500 highly qualified employees

Made in Germany

- durable and robust under extreme conditions
- environment-friendly and energy-efficient
- low life-cycle costs



Notes





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