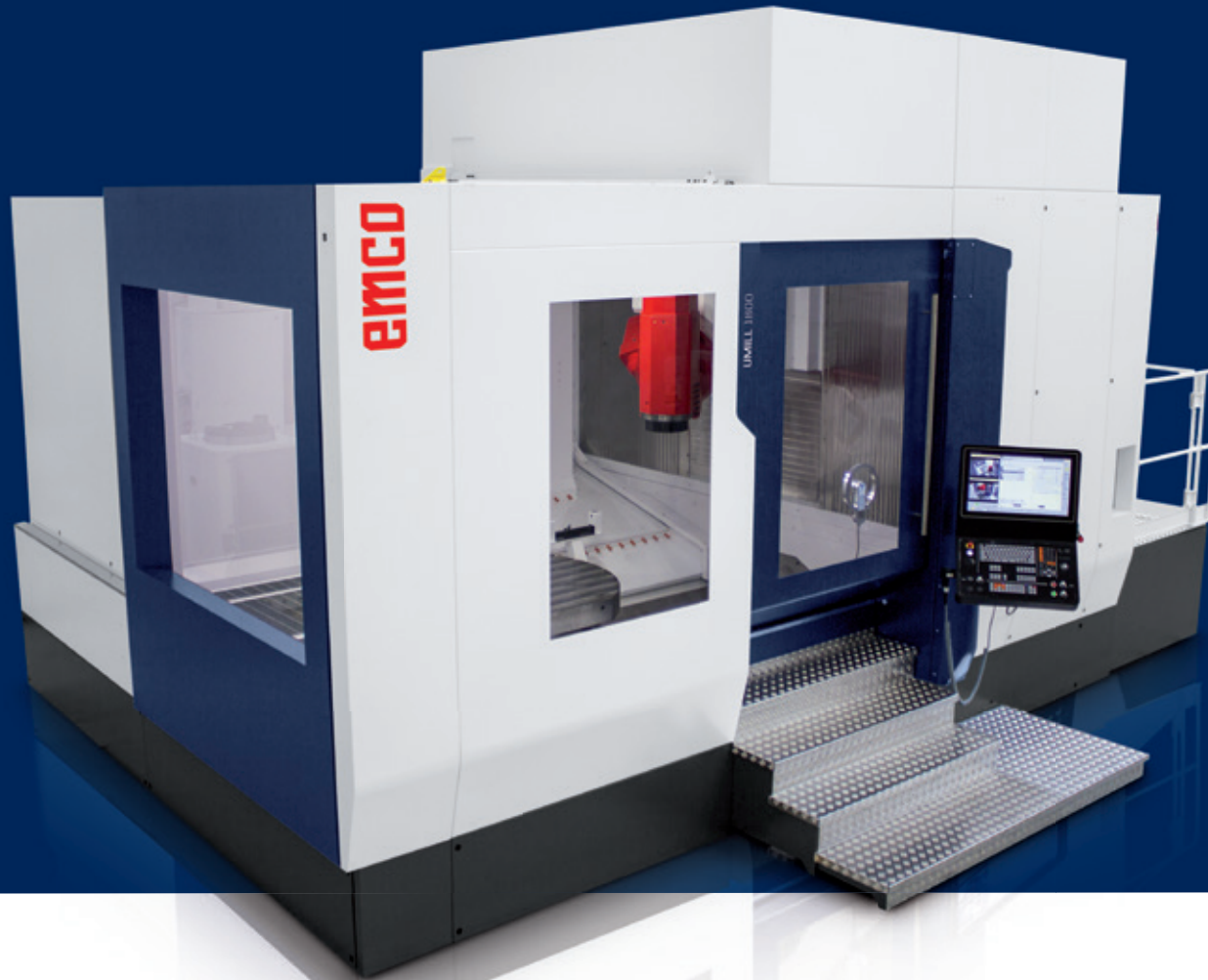


emco

/ HIGHLY SOLUTION-ORIENTED



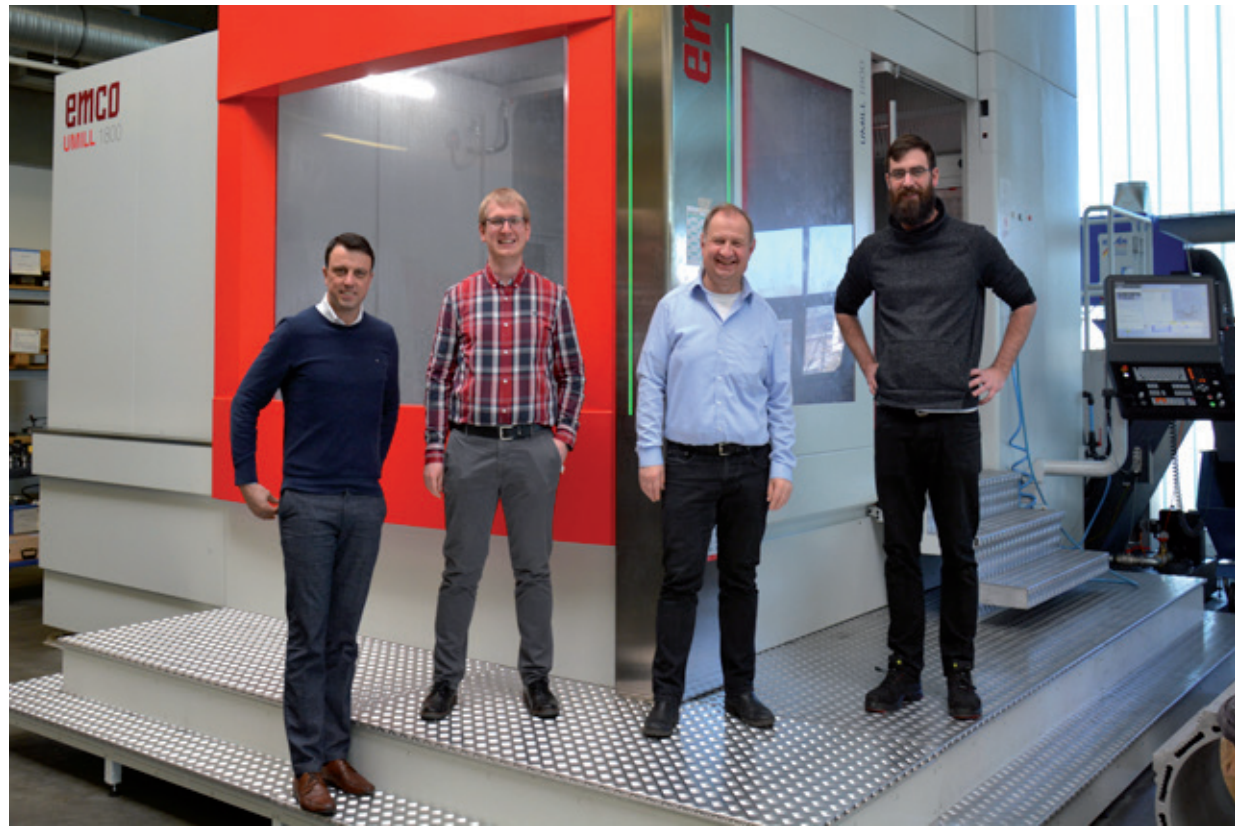
UMILL 1800
machining center
with milling-turning
applications in
drive technology

Based in Rehau, Schwarz Elektromotoren GmbH was founded 23 years ago by Markus Schwarz. The success achieved by the company with its highly customised electric motors is based not only on know-how, but also on a high degree of in-house manufacturing assisted by universal machines provided by Emco as a partner.

When it comes to driving, lifting or steering motions powered by electric motors, there are many reasons why the use of standard engines is out of the question: spatially complex or confined assembly situations, individual mounting interfaces, demand for engines with higher output densities or other design- and construction-related special wishes. Schwarz Elektromotoren is based in Rehau and Germany's top address for all of these cases, especially when it comes to battery-operated asynchronous motors in the low-voltage range from 24 V. From the motors' design and development to their engineering and manufacture with guaranteed quality from batch sizes starting at 1 up to series production, Schwarz has become a largely self-sufficient problem solver. Customers benefit therefrom in the form of competent consulting services, technologically sophisticated concepts, on-time deliveries and fair prices.

Earth, Fire, water and air – at ease in all environments

Dipl.-Ing. (FH) Markus Schwarz – founder, owner and managing director of the company – has developed more than 1500 different solutions for use in all four elements: in all kinds of fork lift trucks and electric vehicles (cars and trucks) including snowmobiles, in extinguishing systems and fire trucks, in lifeboats and solar-powered excursion boats as well as in the form of drives for pitch-controlled wind turbines, and much more. When he became self-employed as an electrical engineer in 1999, Schwarz focused on consulting services, design, construction and assembly in the field of customised E-drive solutions. 'At first I didn't see any increased value in running my own mechanical production line, all the more so because there was no lack of suitable suppliers in the surrounding area. However, it didn't take long for us to notice the disadvantages of this strategy, namely the dependence on the suppliers' delivery times, adherence to schedules and quality, the coordination efforts related to the feasibility of the production process and a permanent knowledge gap when it comes to manufacturing technologies. All this would complicate and delay both our consulting services and the project schedule. That's why I've been investing in the development of my own production line since 2000. Save for sheet metal punching, casting and hardening, all production processes are carried out here at the headquarters, which is essential for the quality of our consulting services and our responsiveness, and hence also for our monopoly.'



A partner-like team of problem solvers (from the left): Michael Lutz (product sales manager with EMCO), Tobias Schwarz, Markus Schwarz (managing director) and Manuel Hacker (machine operator and milling expert with Schwarz Elektromotoren) are extremely satisfied with the Umill 1800 project. © Hanser

Emco offers the perfect technology portfolio

In the early days, it is all about learning: A balancing machine was followed by drilling, turning, milling and grinding machines. At first glance, the machines from Far East had appeared to be cost-effective. However, it did not take long for the first problems to arise, especially in the field of service and, above all, the availability of spare parts. That is why Schwarz started to look for a partner competent, if possible, in the fields of both turning and milling. 'In order for us to be an economically successful problem solver, our pool of machine tools must offer a high degree of flexibility. In the end, we don't know the challenges we'll face in four weeks' time. What we do know, however, is the majority of our range of parts when it comes to their material, i.e. steel, cast steel, and cast aluminium, their weight that varies between several kilos and a tonne, and their dimensions and degrees of complexity. We're dealing

with loads of rotation-symmetric components like shafts, for instance, which are usually machined in turning processes. However, we also handle flanges and housings which are mainly milled and carry out processes for both internal and external toothing,' explains Markus Schwarz. 'With that in mind, we set out on a search for a service-oriented manufacturer whose machines are built here in Europe using high-quality components and who would be able to offer a high degree of efficiency and reliability.' It did not take long for Schwarz to make up his mind and pick EMCO from among the candidates. He recalls the reasons for his decision quite clearly. 'EMCO's range of turning and milling machines had already been extremely huge from a technological point of view. Considering the company's product range and its serious and competent consulting services, I just felt that growing requirements would be no problem for me in the foreseeable future. The EMCO machines that our factory

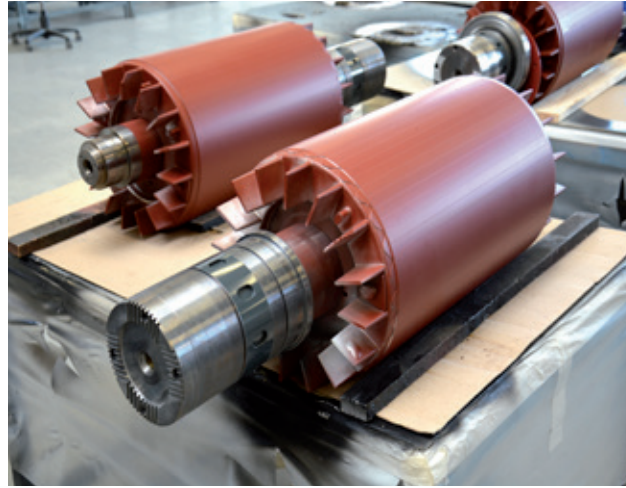


A production line consisting of EMCO machines: For over ten years, EMCO has successfully cooperated with Schwarz, supplying the Rehau-based electric motor manufacturer with eight different turning and milling machines and, most recently, a milling and turning centre.

workshops are equipped with today reflect the trust that has been built over their period of use. In cooperation with EMCO's sales department, we've found machines that, apart from being a perfect match for our tasks, have proven to be robust and stable in their value. All of the machines, including our first one, a Maxxturn 95 purchased in 2011, are still productive. What's more, we benefit from high-quality support. EMCO has advanced their training courses, technical support and application consulting services on a continuing basis so that they conform to the latest methods. And that also applies to their teleservice. From a technological perspective, our cooperation culminates in the latest investment, a Umill 1800 5-axis milling and turning centre. Not only does it open up many options when it comes to the complete machining of components in different sizes, but it provides us with further productivity and quality potentials. We've been working with this machine since September 2021, and all the while we've been benefitting from the fact that EMCO has succeeded in synergistically merging its many years of experience in the realms of turning and milling in a single machine.'

A solution to every problem

Eight different EMCO machines represent the partnership that has been continuing for more than ten years. They also reflect how Schwarz's requirements have changed during the same period. The robust Maxxturn 95 is still used to machine shafts from bar stock and to manufacture bearing plates



Featuring a customised front end, this rotor's cardan interface was manufactured by Schwarz using a Hyperturn 95 by EMCO.

and housings using the chuck. Equipped with two chucks, the Hyperturn 65 Duoturn is a mere shaft machine. However, it also makes it possible for the user to subject fed cut-offs to two-sided face machining processes between centres (e.g. for the insertion of cardan interfaces). The company's horizontal turning machines are completed by a small Emcoturn E 45 and a Hyperturn 95 that comes with a milling head for higher-performing milling processes and a corresponding pool of tools. In order to be able to manufacture medium-sized series too, for example in the area of wind energy, Schwarz uses a VT 400 vertical pick-up turning machine for the multi-model production of bearing plates. A Maxxmill 500 and an Emcomill 750 were acquired to take care of the milling operations. Whilst Siemens is the most important manufacturer when it comes to control units used for turning processes, the machining centers and the most recently acquired Umill 1800 are controlled by Heidenhain units. Tobias Schwarz, son of the company founder and assistant to the management since 2017, explains the strategy. 'We programme exclusively at the machine. Even though this has led to the fact that our employees have built up their strengths in specific areas of turning and milling only, we don't consider this a disadvantage. It's quite the opposite: When it comes to completing our specific tasks, which change on a daily basis, we attach importance to an active exchange between our production employees and engineers. This occurs in a very effective manner during a shared shift. When we purchased the Umill 1800 milling and turning combination machine, we

had employees from both fields intensively trained by EMCO. Today, they can support each other.'

Applications Engineering, Training Courses and Teleservice

Michael Lutz, product sales manager with EMCO Germany and "specialist in all things big and complex", knew right from the start that the Umill 1800 (for technical data, refer to the infobox) would be the perfect solution for Schwarz's increasing requirements. 'With Schwarz, the basic impulse emerged from the large, water-cooled housings of an electric engine with a continuous output of 270 kW and a torque of 400 Nm that serves as the main drive of a 26-tonne truck. The creation of the inner diameter including the fit for the iron packet's shrinkage, the milling operations required for creating the transitions to the coolant channels, the drilling of each and every mounting hole and thread, and the lateral external machining procedures would all be taken care of by two machines in four and six setups, respectively. Thanks to the Umill 1800, these processes can now be completed with high efficiency as they require two setups only. Featuring a modular design, a torque rotary table and an EMCO milling head specifically selected for Schwarz, the machining centre UMILL 1800 is also able to machine several parts in a row. Staff training too was crucial to the success, as the parts must now be conceptualised differently. Besides, the axis coordination is somewhat more sophisticated, at least at the beginning.'

According to Tobias Schwarz, the successful training courses are part of EMCO's comprehensive service package. 'We can always fall back on EMCO's application expertise. And we're quite happy to use it, especially when it comes to tricky topics that deal with the improvement of our processes. We increasingly use the teleservice and, in rare cases, the quick on-site support offered by the decentralised service network. Thanks to its easy-to-read screen, the Heidenhain TNC 640 is extremely convenient when it comes to workshop programming. Apart from that, we've created a browser-based Wiki system including a collection of tips and tricks for individual components that users may benefit from.'

Company director Markus Schwarz sees another important advantage in EMCO as a partner. 'We share a very similar corporate philosophy. EMCO too attaches importance to a high degree of in-house manufacturing, as it ensures that individual customer requirements can be taken charge of in no time. We can feel that with each joint project and also when it comes to the topic of spare parts which are made available to us in the shortest possible time.'

All things considered, the company is perfectly prepared for the tasks that lie ahead.



View of the work area of EMCO's Umill 1800, a 5-axis milling and turning machine used by Schwarz Elektromotoren: Reaching rotational speeds of up to 250 min⁻¹, the NC rotary table is able to machine components in the same way as a vertical lathe. The component shown in the picture is the biggest electric motor housing built by Schwarz so far.



The ultimate reason for Schwarz's decision: this housing for truck engines. Made from aluminium sand casting, it requires all-round internal and external machining and ultimately led Schwarz to the purchase of EMCO's Umill 1800 milling & turning combination machine. Today, it only takes two setups from the blank (left-hand side) to the finished part (right-hand side), whereas in the past it would take ten.



Schwarz Elektromotoren GmbH
 Leading manufacturer of special electric motors.
 / 60 employees
 / Headquarters: Rehan, Bavaria
 / Products: Synchronous and asynchronous motors for
 Special applications and vehicle applications

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TECHNICAL DATA UMILL 1800

Axis travel instead of displacement linear axes

UMILL 1800

X (transverse axis)	1800 mm
Y (horizontal axis)	2150 mm
Z (vertical axis)	1250 mm
Feed rate	60 m/min

Workpiece/tool cooling

External cooling	28 l/min; 6 bar
Internal cooling	20 l/min; 40 bar

Milling head with electrospindle basic equipment E58

Power S1 / S6	45 / 58 kW
Torque S1 / S6	300 / 372 Nm
Speed	12000 rpm
Tool taper	HSK-A(T)100
Undercut	15°

Milling head with electrospindle High Power milling E67

Power S1 / S6	46 / 77 kW
Torque S1 / S6	600 / 1000 Nm
Speed	8000 rpm
Tool taper	HSK-A100
Undercut	15°

Milling head with electrospindle High Speed milling E61

Power S1 / S6	50 / 63 kW
Torque S1 / S6	100 / 125 Nm
Speed	20000 rpm
Tool taper	HSK-A63
Undercut	15°

Magazine places

UMILL 1800

Magazine places	88 / 122 / 203 pockets
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NC-rotary table basic equipment

Size	1700 x 1400 mm
Max. load	10000 kg
Drive	torque motor
Max. torque	6800 Nm
Max. speed	10 rpm

NC-rotary table for mill-turn operations

Size	ø 1800 mm
Max. load	6000 kg
Drive	Torque-Motor
Max. torque	6800 Nm
Max. speed	up to 260 rpm

Coolant system

Tank volume	2500 l (paper band filter)
Coolant pumps for inside/outside	40 / 60 / 80 bar
Working area and washing gun	6 bar

beyond standard /

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