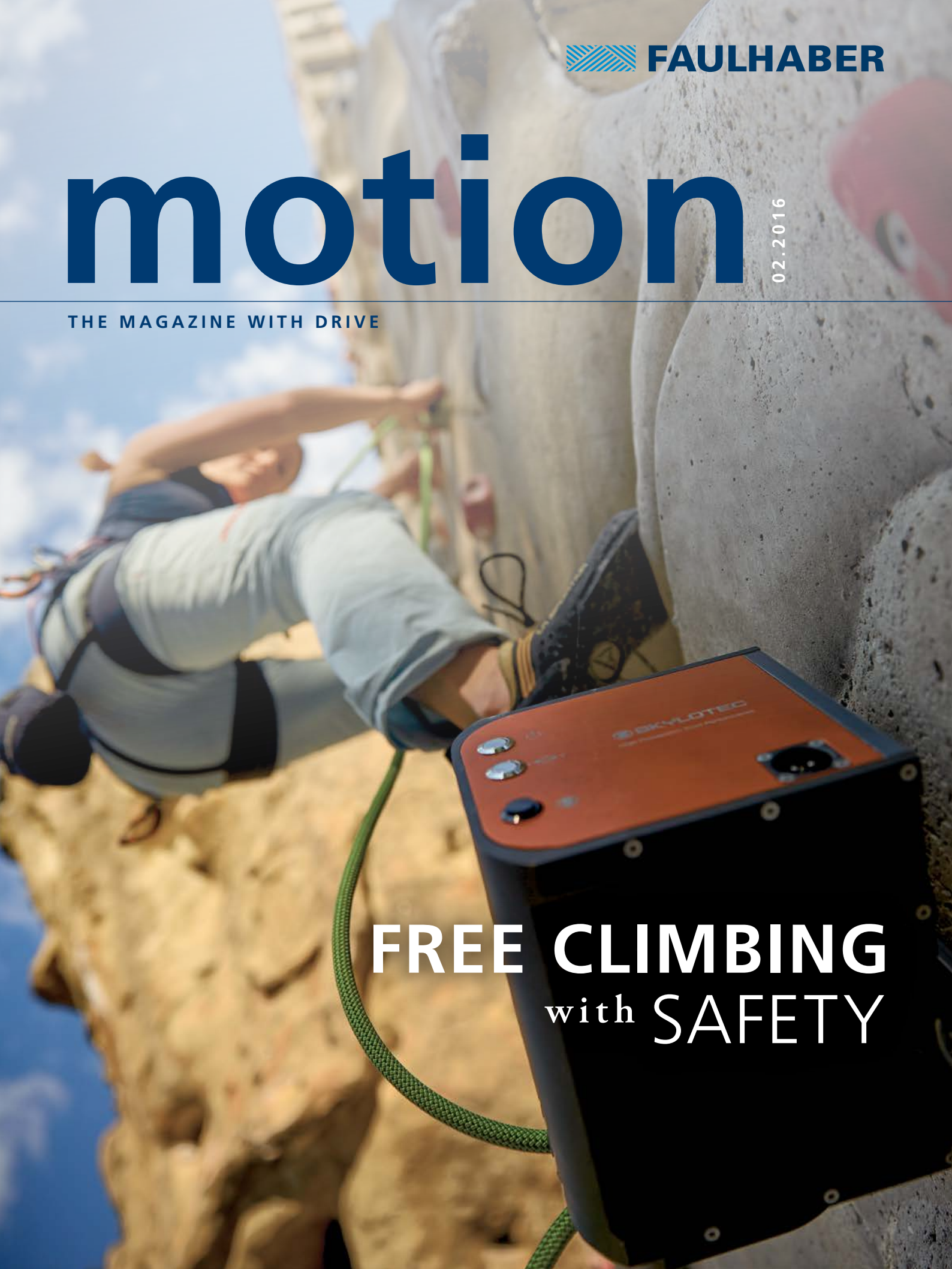


# motion

02.2016

THE MAGAZINE WITH DRIVE

**FREE CLIMBING**  
with **SAFETY**





**SAFETY TECHNOLOGY**

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**Dear readers,**

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Every time that one of the hundreds of thousands of electricity pylons in Germany is serviced, a two-man team needs to go to work: one climbs, the other belays. The task of the latter could soon be performed by the EPIC, the world's first mechanical belayer – thanks to the power and reliability of drive systems from the FAULHABER company. They help to considerably reduce the work here and in many other applications in the professional climber's field of work.

In the laboratory, on the other hand, they ensure fast and precise positioning for a high throughput rate. They provide decisive support, for example, in the development of individually tailored active components, so-called biologicals, and are, thus, important allies in, among other places, the fight against cancer.

This is typical FAULHABER: high-performance in a minimum of space, whether on electricity pylons, in the laboratory, on the golf course or during dosing in production systems. And not only with products, but also when it comes to teamwork within the company – Reiner Bessey and Jochen Hasenmaier explain in an interview how production throughput was doubled in just three years.

I hope you find inspiration while reading!

Sincerely

Dr. Fritz Faulhaber  
Managing Partner

**Issue 02.2016**

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FAULHABER motion is now available as an app.



[www.faulhaber.com/motion](http://www.faulhaber.com/motion)

## DRIVE MODULE FOR ENTHUSIASM

Awaken enthusiasm for science and technology – that is the goal of TecDays, which are held about ten times per year in Swiss schools. The event series is an initiative of the Swiss Academy of Engineering Sciences. It is aimed at the students in the graduation classes of secondary schools. During a typical TecDay, companies, organisations and

educational institutions present interesting examples from individual areas of technology and science in some 40 lecture modules. In 2016, FAULHABER in Switzerland supports TecDays with a module on the technology of drive systems and their wide range of uses in the field of aerospace. Since 2007, more than 30,000 students have participated in TecDays.

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### FURTHER INFORMATION

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[www.satw.ch/index](http://www.satw.ch/index)  
[www.faulhaber.com/news](http://www.faulhaber.com/news)

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## SERIES 1016 ... SR – MAXIMUM PERFORMANCE IN A MINIMUM OF SPACE

The new 1016...SR series from FAULHABER expands the proven motor family to compact DC motors with precious-metal commutation. Together with the already introduced 0816...SR and 1024...SR series, these drives, combinable with suitable FAULHABER drives and encoders, are ideally suited for applications where maximum power is required in the most compact spaces. The new 1016...SR motor series reaches a continuous torque of 0.92 mNm at a length of only 16 mm and a diameter of 10 mm. Its  $\Delta n/\Delta M$  characteristic curve has an especially flat slope of 5953 rpm/mNm, 3 V and therefore makes it possible to have extremely soft transitions during a load change. Further strengths of the motor are its low power consumption, high energy-efficiency and minimal vibration and low audible noise.

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### FURTHER INFORMATION

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[www.faulhaber.com/news](http://www.faulhaber.com/news)

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## SERIES 1935...BRC - MORE POWER FOR PUMPS

The facelift of the proven 1935 ... BRE Brushless DC-Motor, the "BRC", awaits with a number of optimisations. The new motor achieves a continuous torque of 3.5 mNm while still retaining its compact design, making it more powerful than its predecessor model. Its direction of rotation is reversible. At the same time, the speed range was increased from

1,000 to 11,000 rpm and the efficiency was further improved. The temperature range has also increased significantly, ranging from -25 °C to 85 °C. The new high-performance bearings allow for a prolonged service life. The proven connection concept of the 1525...BRC and 3153...BRC series was standardised with the 1935...BRC.



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FURTHER INFORMATION

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[www.faulhaber.com/news](http://www.faulhaber.com/news)

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## YOUNG ENGINEERING TALENTS ARE WORLD CLASS



A team of students from the University of Freiburg won the international iCan Competition of Students in Microsystems Applications 2016 in Paris with their project Cablebot, whose drive is provided by FAULHABER motors. Konstantin Hoffmann, Karl Lappe, Ann-Kathrin Leiting and Christoph Grandauer developed the prototype of a cord winding robot which can draw in conductors or antenna, network and phone cables into empty conduits during the electrification of buildings. In current practice, cables or conductors are drawn in through a hydro-static pressure difference or mechanically via a pull cord. With their idea and implementation the winning team outpaced 23 competitors from China, Taiwan, Thailand, Japan, USA, Switzerland, France and Portugal.

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FURTHER INFORMATION

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[www.partner.vde.com](http://www.partner.vde.com)  
[www.faulhaber.com/news](http://www.faulhaber.com/news)

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# FREE CLIMBING

## WITH SAFETY

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The belayer literally has the life of the climber in his hands:

if he pays careful attention, a fall will be stopped by the rope after one or two meters. Since the climber also takes care for his own self-interest, the occasions when anything happens are few and far between. Securing is fairly boring - and expensive if professional climbers are working on power lines or the facades of high-rise buildings. Anyhow, it was until recently. Because now a fledgling company from Munich has brought the world's first automatic belayer onto the market - EPIC.

With this device the climber can safely climb without a second person. Motors from FAULHABER provide a secure grip and a taut rope.



The history of the electronic climbing partner (Electronic Partner for Individual Climbing, EPIC) began seven years ago at the University of Regensburg. Florian Widmesser, engineering student and enthusiastic climber, developed the concept of automatic securing as part of his thesis. Even at this stage, FAULHABER was assisting the inventor with motor expertise. He established Auroco GmbH with business studies graduate Jan Lohse in 2011 in order to turn the concept into a commercially viable product. The first prototype emerged in 2012, and the reliability of the newly-developed securing technology was confirmed with DEKRA certification in 2014. Widmesser produced the first series production order batch of one hundred units single-handedly. The company has now undergone significant growth due to crowd funding and an outstanding reaction to the product.

### Lead climbing and second climbing

“EPIC is the first automatic securing system for climbers that can handle lead climbing, second climbing and abseiling mechatronically”, says Jan Lohse, explaining the special features of the product and describing (for non-climbers) what these terms mean: “During lead climbing, the climber attaches the rope to a carabiner every two meters. The belayer stays at the bottom and holds the rope. If the climber slips, he will only fall down to the next carabiner. During second climbing the climber follows a rope that has already been secured and is pulled upwards by the belayer. The belayer must keep the rope taut during lead climbing and second climbing so that a fall is stopped immediately.”

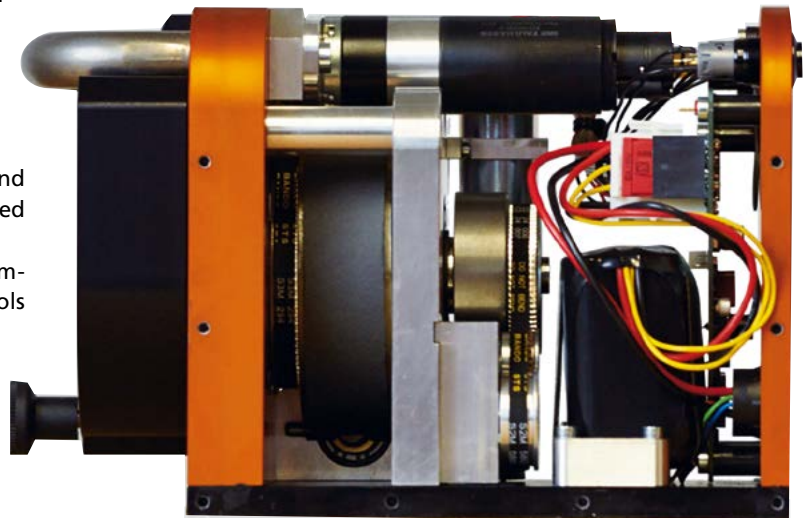
EPIC can take over this task completely. This brick-sized device controls the rope using two motors. The first motor takes care of winding, and the other is responsible for braking. The rope runs between two profile discs which prevent it from slipping. For lead climbing, the device is secured at ground level. During stationary use such as on a climbing wall, the device can be secured to a wall using screws or click closures. A clamping device is available for mobile use. It can be fastened to any fixed struc-

ture such as the base of an electricity pylon.

During lead climbing, the rope motor idles so that the climber can tighten the rope without using force. If he has pulled up too much rope and dangerous “slack rope” is produced, he gives the command to tighten the rope by radio. In order to do this, he wears a radio module on his arm that communicates with the securing device via Bluetooth. The first motor now winds up the loose rope. During second climbing, i.e. when the climber is following a suspended rope, he can choose whether the battery-operated motor should tighten the slack rope by command or automatically.

### Securing with double redundancy

The second motor is responsible for braking and blocks the rope, for example, if the climber wants to take a break and has issued an appropriate command. When abseiling, the brake automatically unwinds the rope from the roller at a defined speed, and the climber can “hang out” in a relaxed way. However, the brake motor is also responsible for securing. A triple-axis acceleration sensor is installed in the radio module. In the event of a fall, this transmits an emergency signal to the securing device within 30 milliseconds, which then operates the brake.



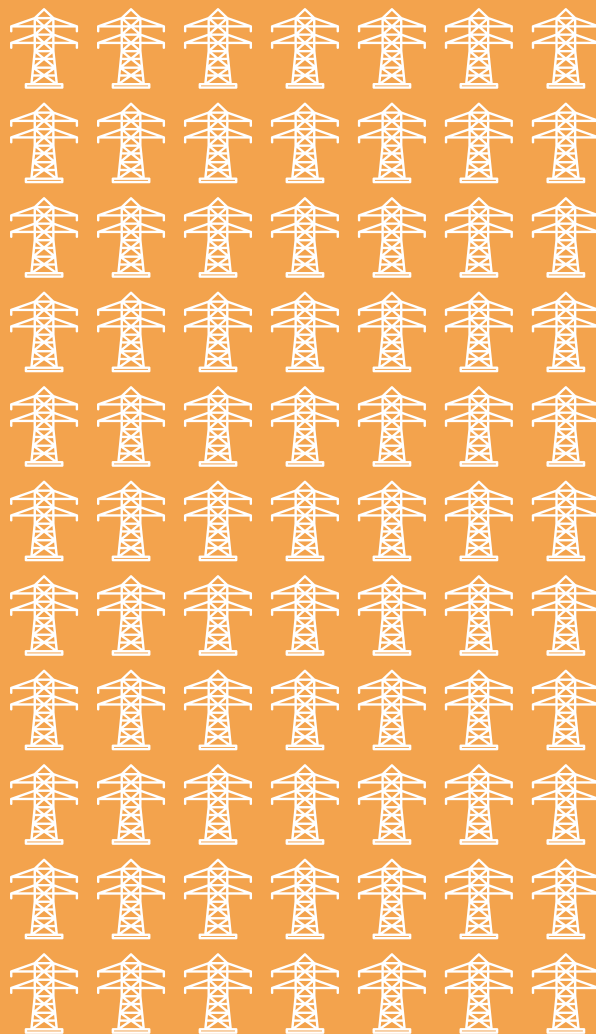
This brick-sized device controls the rope using two motors.

"Of course, we don't rely on just one system", stresses Jan Lohse. "The securing is designed with double redundancy." The second mechanism: in the event of a fall, the rope sets the rope pulley and therefore the rope motor into fast motion. The significant speed increase is the signal for the pulley to become an electricity-generating generator. It now supplies the brake motor with energy and uses this to activate the brake. This guarantees that reliable braking is provided, even if the battery is empty. As a third securing mechanism there is an all-mechanical centrifugal clutch which closes the brake as soon as the roller starts rotating at speed.

### Motor power for brake energy

The fast rotating speed which acts upon the rope motor in the event of a fall was one of the challenges that needed to be met by the drive technology. Up to 25,000 revolutions per minute could destroy a winding mechanism with less quality within an extremely short time. "After consulting with us, the customer decided to use the copper-graphite-commutated motors from the 2657... CXR series", explains Andreas Eiler, who is responsible for looking after Auroco at FAULHABER.

"The second, more powerful drive, a 3257...CR, provides the power for abseiling and braking. It bears the weight of the climber with its static torque rating." Gearheads in the 26/1 and 32A model series provide power transmission, and a robust IE3 encoder monitors the speed. Perfect functionality of these drive and control components is literally life-saving as far as EPIC is concerned. "The certification proves that they do their job reliably, even under the harsh conditions that are usually the case when climbing", stresses Jan Lohse. "They are not adversely affected by strong vibrations or extreme temperatures."





# THERE ARE MORE THAN 300,000 ELECTRICITY PYLONS IN GERMANY ALONE

Together with sales partner Skylotec, a specialist for anti-fall protection, the two founders have now started to conquer the market. The first interested parties did not come from the usual sports climber customer group, but from the industry. There are more than 300,000 electricity pylons in Germany alone, which have to undergo regular maintenance. There are also increasing numbers of systems that are difficult to access such as wind turbines, high-bay warehouses and crane booms. The companies can significantly reduce their costs for the prescribed securing with EPIC. Climbing halls and high rope courses are other potential customers, and the company is working hard on optimising the device for sports climbing. The company says that there will soon also be a Smartphone app which will record and analyse the kilometres climbed, speed, elevation in metres, energy consumption, fall height, number of falls and also load values. Jan Lohse is convinced: "Our device will radically change the face of both sports climbing and professional climbing."



The EPIC solution is a fully automatic, electronic rope safety system. The device is battery operated and, thus, suitable for mobile use. The climber controls it remotely and is always 100% secured.

## DC-MICROMOTOR

Series 2657...CXR  
Ø 26 mm, length 57 mm  
Torque 40 mNm



## FURTHER INFORMATION

Auroco GmbH  
[www.auroco.de](http://www.auroco.de)

FAULHABER  
[www.faulhaber.com](http://www.faulhaber.com)





CONSUMER

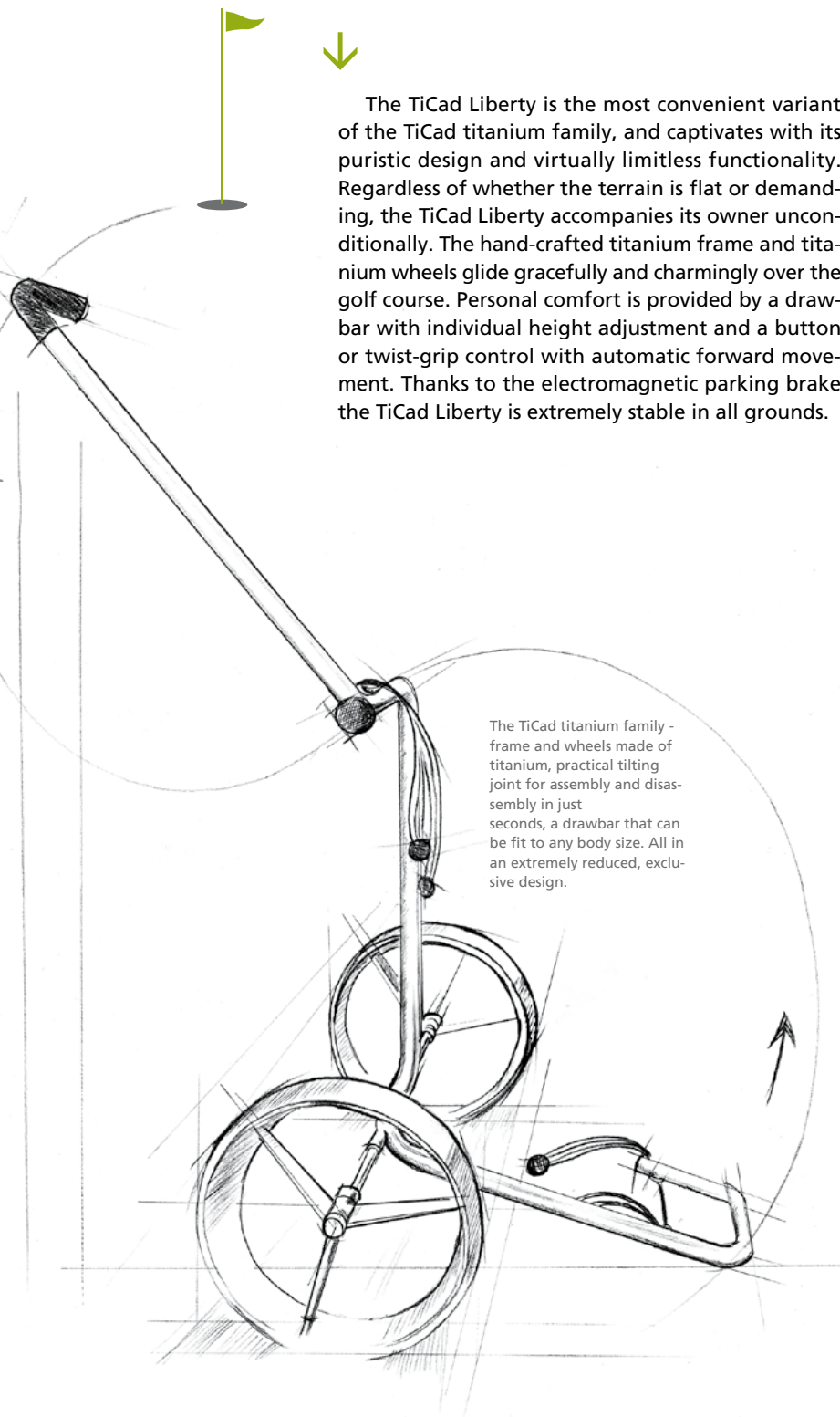
# Puristic **DESIGN** and

convenient

# functionality

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A combination of exercise, relaxation and a sporting challenge - these are the things that motivate golfers when they step onto the green. The golfer's most important companion is a lightweight and manoeuvrable golf trolley. The latest models assist their owners as E-caddies, like the TiCad Liberty, the premium golf trolley from manufacturer TiCad. The drive for these trolleys is provided by micromotors from Schönaich.



The TiCad Liberty is the most convenient variant of the TiCad titanium family, and captivates with its puristic design and virtually limitless functionality. Regardless of whether the terrain is flat or demanding, the TiCad Liberty accompanies its owner unconditionally. The hand-crafted titanium frame and titanium wheels glide gracefully and charmingly over the golf course. Personal comfort is provided by a drawbar with individual height adjustment and a button or twist-grip control with automatic forward movement. Thanks to the electromagnetic parking brake the TiCad Liberty is extremely stable in all grounds.

The TiCad titanium family - frame and wheels made of titanium, practical tilting joint for assembly and disassembly in just seconds, a drawbar that can be fit to any body size. All in an extremely reduced, exclusive design.



### Impressive on any terrain

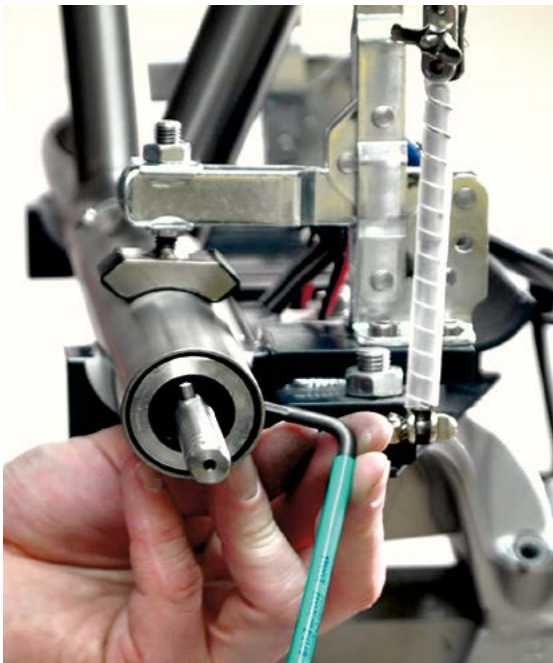
The practical motor brake ensures that the speed remains constant when going downhill, so that the owner can regulate the speed himself on any terrain. Even extra holes are not a problem, at least as far as the equipment is concerned, since the TiCad Liberty guarantees a range of at least 27 holes thanks to the handy lithium battery. Other features are a pivoting joint which ensures that the trolley can be assembled and disassembled in seconds, as well as the impressive packing and storage dimensions of just 68 x 63 x 7 centimetres. The TiCad Liberty therefore fits in almost any car boot.

### Made in Germany

TiCad GmbH & Co. KG is based in Altenstadt near Frankfurt in Hessen, and has been hand-crafting golf trolleys since 1989. The company manufactures trolleys made from high-quality titanium, and produces unique models that have impressed customers throughout Europe. TiCad recently started to install FAULHABER motors in all of its motorized trolleys. "FAULHABER is a traditional German company like us that is one of the leading providers in its sector and offers top products 'Made in Germany'", says TiCad Managing Director Björn Hillesheim about FAULHABER. "A match made in heaven for us and our own high standard of quality and service." As far as FAULHABER is concerned, Hillesheim particularly values the quick and reliable cooperation.

### 32 millimetre diameter

The golf trolleys are driven by powerful DC-micro-motors with graphite commutation. With a diameter of 32 millimetres and a length of 72 millimetres, the motors are particularly lightweight and compact. The graphite commutation is extremely robust and ideally suited for dynamic applications with quick start and stop operation, as well as occasional overload conditions such as those that occur during use on the golf course.



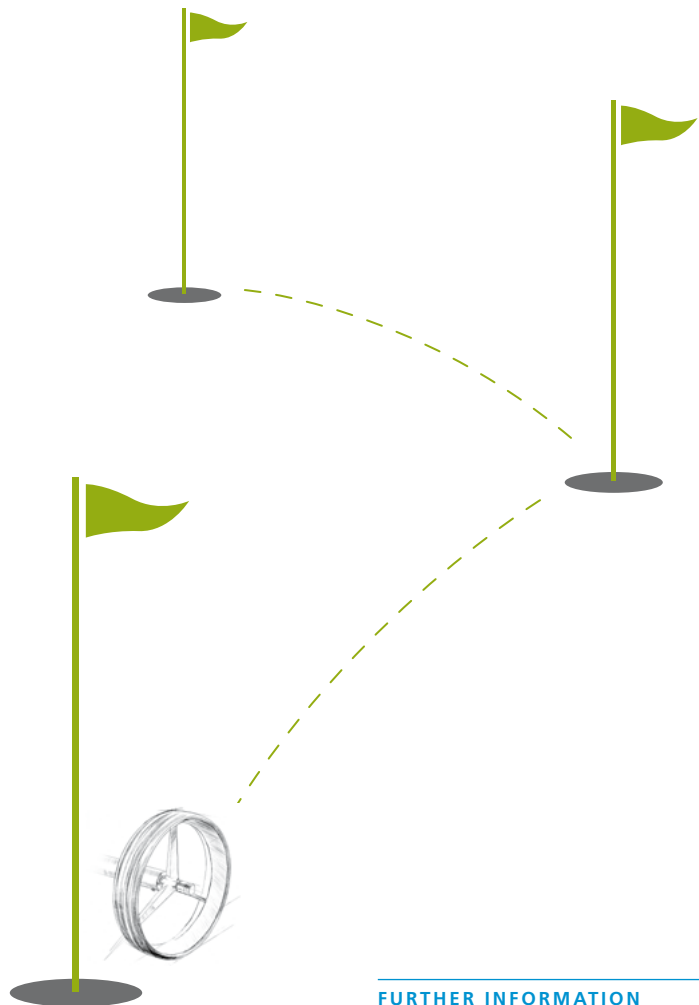
#### DC-MICROMOTOR

Series 3272...CR  
Ø 32 mm, length 72 mm  
Output torque 120 mNm



### Established sales network

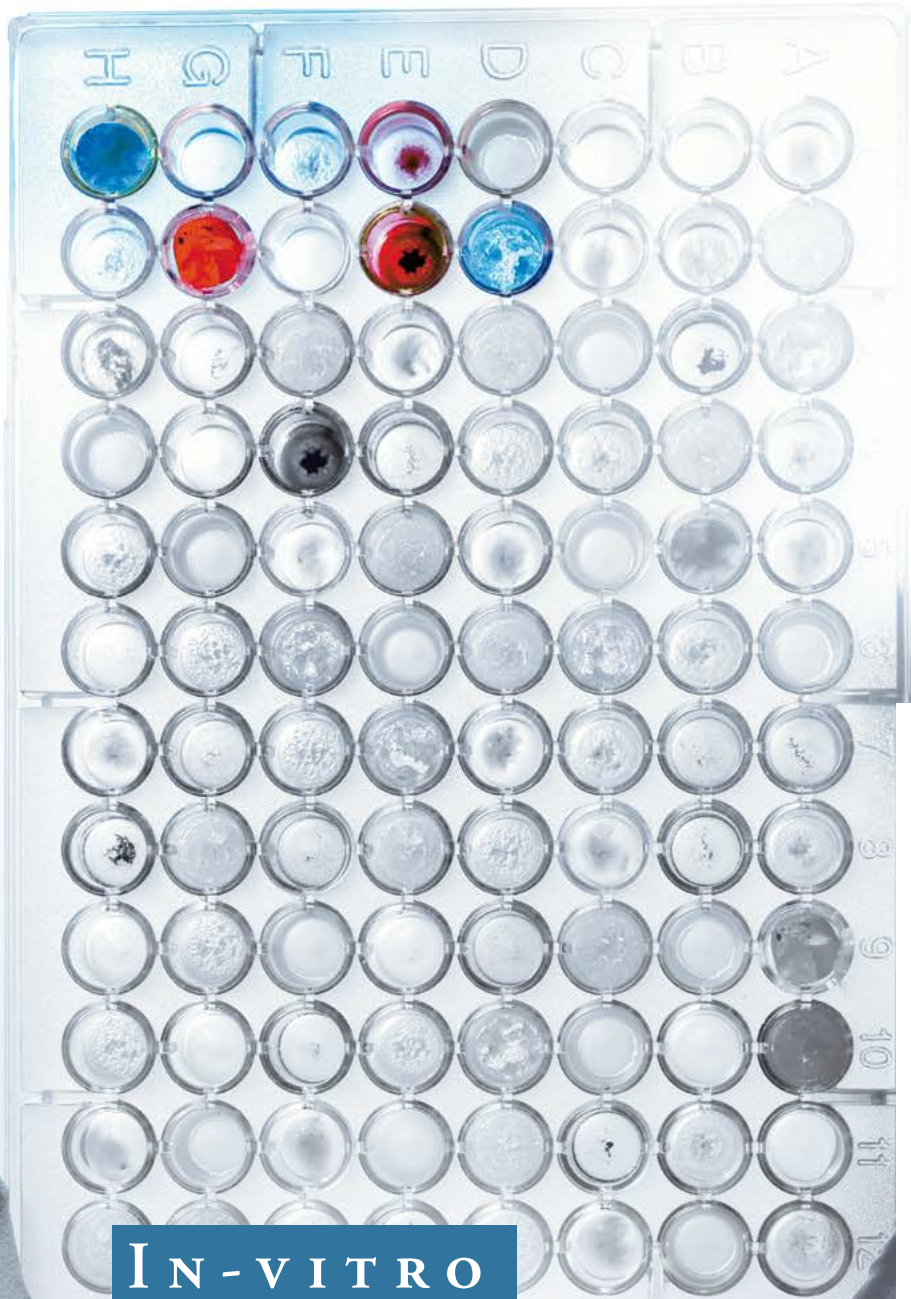
TiCad has revolutionised the sector with the invention of the world's first titanium golf trolley when it started 27 years ago. TiCad currently has more than 50 employees at its headquarters in Altenstadt. With about 370 dealers in Germany and a total of 600 across Europe, TiCad has an extensive and established sales network. All products are sold only in pro-shops and by selected specialized dealers.



#### FURTHER INFORMATION

TiCad GmbH & Co. KG  
[www.ticad.de](http://www.ticad.de)

FAULHABER  
[www.faulhaber.com](http://www.faulhaber.com)



IN-VITRO

# VERITAS.

High-speed diagnostics,  
automatically **ERROR-FREE.**



DR. AIHUA HONG

Sales Engineer  
International

## Drive solutions for laboratory automation

Countless samples are tested daily in analytical laboratories. The benefits of automation in this area is obvious: They make it possible to achieve faster results, higher throughput, fewer errors and lower personnel costs. In order to ensure smooth operation, high dynamics and precision are extremely important for the drive systems. We spoke to Dr. Aihua Hong about the requirements and developments in this market segment, for which she is responsible at FAULHABER.



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### In which industries does laboratory automation play a part?

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Automated processes can be found in all laboratory areas, such as the chemical, pharmaceutical and food technology. The medical industry is an area in which there has been considerable growth worldwide. Automated solutions have been indispensable in this area for many years in so-called in-vitro diagnostics (IVD), i.e. the analysis of medical samples such as blood, urine and tissue. Test procedures are also becoming increasingly automated in the research laboratories of pharmaceutical companies in the development of new drugs.

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### What exactly is laboratory automation?

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The degree of automation in the different laboratories varies considerably. It ranges from carrying out individual processes using stand-alone devices up to complete sample analysis in complex systems. The latter is particularly required in areas where large numbers of samples need to be examined in accordance with a standardised protocol and little flexibility is needed - such as IVD in the main laboratory of a hospital or in large laboratories for medical diagnostics.





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**Which processes are carried out automatically in these areas?**

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Almost the entire analysis process takes place automatically in these laboratories. It starts with the preparation of the blood samples in colour-coded sample test tubes. A scanner records the type of analysis that is required for a test tube, and ensures that it is picked out by a robot arm accordingly. Some of these samples are centrifuged in order to separate the constituents of the blood. The samples are then transported in special transport units to the actual analysis station, e.g. by conveyor belt or in a small trolley with a wheel drive.

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**What happens in the analysis station?**

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The sample is first identified by directing the bar code at a camera and having it read. Then the stopper is removed from the test tube, and some of the sample is removed. The test tube is then sealed again and archived for possible testing at a later date. The sample is transferred to a reaction vessel for the actual analysis, e.g. onto a test plate or petri dish. During the subsequent testing, the drive technology is mainly used for processes such as pipetting, liquid handling, mixing and stirring.

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**Which requirements have to be met by the motors?**

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Many different movements have to be carried out during the entire process, and the demands made of the drive technology differ accordingly. The conveyor belts require large, powerful motors, and components that are as compact and lightweight as possible. Thanks to our comprehensive product range we can cover the entire spectrum, and can supply an extremely good solution for almost any requirement.



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### Can you give us some examples?

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Many applications require a highly dynamic system for repeated start/stop movements such as pick-and-place and pipetting processes. Both speed and extremely accurate positioning are required when doing this. Size and weight also play a part here: The drive for the upwards and downwards movement of the gripper arm or pipetting head can usually be found in the mobile component. It must therefore be extremely light and compact.

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### What are the advantages of FAULHABER motors?

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The DC-micromotors of series 1524SR and 2224SR are particularly suitable for these applications. They have no iron armatures and are therefore much lighter and smaller than other models with comparable performance. At the same time, they are characterised by having extremely high dynamics. They are mainly used in combination with a series IE2 encoder, which only increases the overall length of the unit by two millimetres. High performance is therefore achieved with an extremely compact design.

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### Are there any other reasons for opting to use FAULHABER products?

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It is extremely important to our customers to have high-quality components so that their equipment will operate reliably for longer. They generate about ninety percent of their profit with the reagents that they sell with their devices for sample analysis. The service life of their equipment and the continuity of their reagent sales are therefore directly related.

Furthermore, the equipment for IVD has to undergo an expensive certification process before it can be put into operation. In order to avoid repeating this process, the replacement of existing devices with other models is avoided wherever possible. The availability of replacement parts therefore plays an important part as well. If a FAULHABER component has to be replaced after a long service life, the customer can rely on the fact that it can still be obtained from us, even after many years.



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#### DC-MICROMOTOR

Series 1524...SR  
Ø 15 mm, length 24 mm  
Torque 2,9 mNm



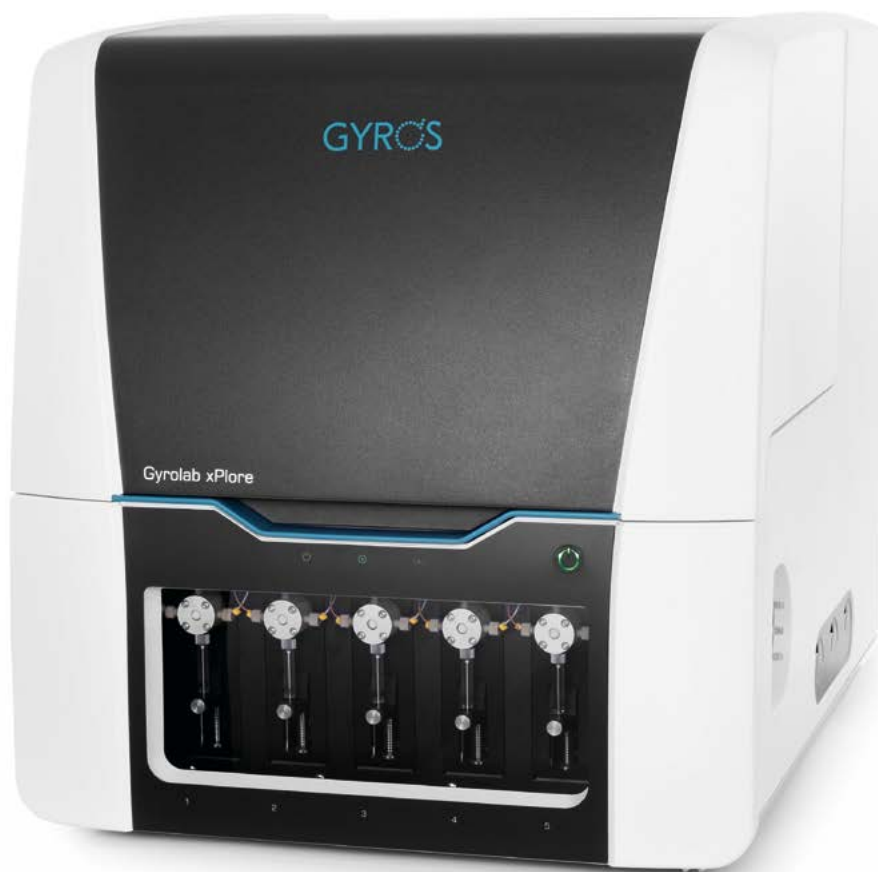
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#### FURTHER INFORMATION

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FAULHABER  
[www.faulhaber.com](http://www.faulhaber.com)

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# LABORATORY

## MINIATURE

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Researchers hope that they will soon be able to fight cancer cells without damaging healthy tissue, thanks to so-called biologicals. These new active components spot specific molecular characteristics of abnormal cells and help to destroy them systematically. A large number of pharmaceutical candidates must be examined to find customized biologicals for various types of cancers. Gyros, a Swedish company, has developed an analytical device which facilitates the search: Gyrolab xPlore™ automatically and quickly runs tests of multiple samples in parallel, saving time, work force and material. FAULHABER motors provide the speed and precision needed for handling the tests.



If you saw Gyrolab xPlore in an office, you would probably take it for a large laser printer. However, lifting the cover reveals a miniature laboratory. A plastic disk, the size of a compact disk, is located at the heart of the device – this is where the samples are analysed. This CD contains a system made up of channels, each with a diameter of less than one millimetre. Capillary and centrifugal forces transport the samples through the channel system, analysing them in the process.

### Biological agents as weapon against cancer

"The majority of our customers are pharmaceutical companies," explains Maria Hjortsmark, Head of Marketing at Gyros. The companies use the system to test their biologicals. Biologicals are molecules which are too large and complex to be created synthetically. This is why they are produced by living – usually genetically engineered – cells, which are cultivated in nutrient fluid in the laboratory. Most biologicals are proteins. Cancer researchers have been pinning their hopes on one type of protein in particular: antibodies. These molecules are produced by specialized cells of the immune system. They recognize and bind foreign proteins – for example of bacterial or viral origin - that enter the body during an infection. Thus, the pathogens can be eliminated or marked for degradation by phagocytes. The same principle can also be applied to fight cancer cells.

### Detection on CD

Gyrolab xPlore can be used to analyse the new drug during any development phase – for example, in the cells' nutrient solution or in the blood of test animals and patients. Up to 112 data points can be generated in parallel using a single CD. Thanks to the CD microstructures, Gyrolab xPlore requires very low sample volumes and minimizes reagent consumption. The sample fluid is pipetted into the wells of a microtiter plate, which is then placed into the instrument. Inside, the samples are transferred onto the CD by a robotic arm. They are then introduced into the appropriate channels by a capillary force. Only a minute amount of sample fluid is needed for the test – between 20 and 200 nanolitres, depending on the CD type.

The exact volume of the sample liquid is measured on the CD itself. For this purpose, the channel

expands to form a chamber, which is the right size for the required volume. There is a hydrophobic barrier at the lower end, which stops the liquid from flowing further into the channel. Next, the CD starts to rotate. The centrifugal force diverts the sample fluid, which is located above the chamber, through an overflow channel. Then, the rotational speed is increased so that the sample overcomes the hydrophobic barrier and moves into the next section.

The same principle is used to run wash cycles and add further reagents to the experiment. The entire test process is fully automatic – each individual step is controlled by the software included with the device. "Automation does not only reduce the amount of work, but it also minimizes the risk of errors," explains Maria Hjortsmark.



Gyrolab xPlore™ automatically and quickly runs tests of multiple samples in parallel, saving time, work force and material.

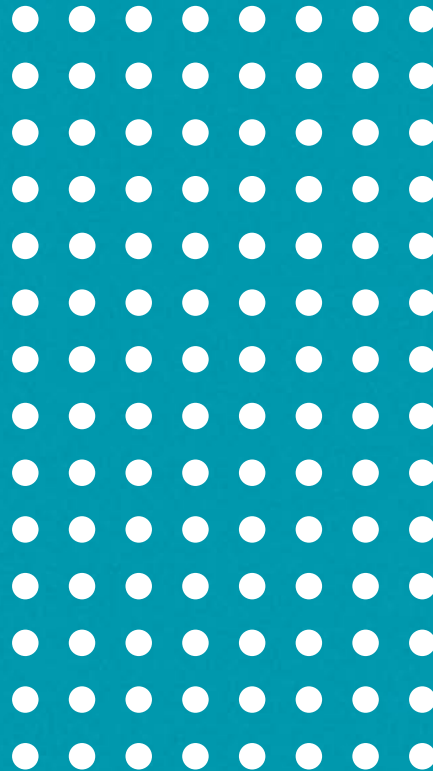
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### Binding according to the lock and key model

The special binding characteristics between an antibody and its target protein – the so-called antigen – are utilized to detect the active component. Similar to the lock and key model, antigen and antibody bind very specifically: they invariably recognize each other even among millions of other molecules. To determine the concentration of an antibody, for example, in sample fluids, its antigen is closely bound to a short section of the CD's channel wall. When the antibody passes the antigen in the channel, it is extracted by the antigen and retained in the channel. Following the same principle, a second antibody, which is marked with a fluorescence dye, subsequently binds to the first one. The dye is then excited by a laser. Detection of the emitted light is used to determine the concentration of the protein within the sample – in this case, the antibody.



HIGH  
SPEED THROUGH  
BX4



UP TO 112  
DATA POINTS  
CAN BE  
GENERATED  
IN PARALLEL  
USING A  
SINGLE CD

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## Speed for high throughput

Gyros launched Gyrolab xPlore in 2015. At that time, many companies were already working with the new device's big brother, Gyrolab™ xP workstation, which is able to analyse five CDs in one run. However companies with relatively low throughput rates and small departments of large pharmaceutical companies often found the device a little too large. With Gyrolab xPlore, Gyros now brings these customers a tailored alternative.

When designing the new device, developers made sure that it matches its predecessor in analytical speed. The robot arm therefore has to be able to transport samples just as quickly and safely. Unfortunately, the extremely fast stepper motors which move Gyrolab xP's robotic arm were no longer being produced. The search for an alternative led Gyros to Compotech Provider AB. "The motors must be very fast without compromising the torque. This is why we decided to replace the stepper motors with powerful servomotors," explains Compotech's Pelle Almgren. The model finally selected was FAULHABER's BX4 series brushless DC-servomotor with 4-pole technology and high torque.

The motors are equipped with incremental encoders and, thanks to their compact design, are just a little larger than the stepper motor used in the previous model. Another advantage is their excellent price-performance ratio.

Gyrolab xPlore contains three servomotors from the BX4 series, two of which have been mounted on a linear table. They move the robotic arm horizontally to transfer the samples and control



The high-precision control electronics with more than 3,000 position set points and low torque ripple ensure that the samples are positioned accurately on the CD, directly at the inlet of the respective channel.

the laser's movements during analysis. The third motor has a planetary gear box, which lifts and lowers the pipetting head. The high-precision control electronics with more than 3,000 position set points and low torque ripple ensure that the samples are positioned accurately on the CD, directly at the inlet of the respective channel. Equipped with BX4 motors, the Gyrolab xPlore also meets the speed requirements: "Generating 112 data points takes less than an hour," reports Maria Hjortsmark.

### BRUSHLESS DC-SERVOMOTORS

Series 2232...BX4  
Ø 22 mm, length 74 mm  
Torque 8.5 to 165 mNm



### FURTHER INFORMATION

Gyros DE GmbH  
[www.gyros.com](http://www.gyros.com)

FAULHABER  
[www.faulhaber.com](http://www.faulhaber.com)

NEWS

"It's not a trick.  
It's ENGINEERING."



It is hard to believe how much intelligent and high-performance drive technology we have conjured up in the compact FAULHABER Motion Control Systems. They combine powerful brushless DC-Servomotors with tailor-made control electronics in the smallest of spaces.

With the new Motion Control Systems of generation V3.0, FAULHABER offers highly dynamic drive systems for complex positioning tasks and therefore the most effective benefit to the customer with maximum flexibility. The servomotors with integrated Motion Controller are already preconfigured which makes use directly in the automation environment possible. They are connected via M12 round connectors as per industry standard. Their rugged design in accordance with IP 54 meets even the most demanding industrial requirements. An intelligent modular system makes it possible to integrate diverse motor variants through which the power range of the FAULHABER Motion Control Systems can be scaled perfectly up to a peak torque of 190 mNm in S2 operation.

In addition to use as a servo drive with controlled position, the speed or current can also be controlled. The actual values for speed and position are determined via integrated encoders. Limit switches and reference switches can be directly connected. The control setpoints can be preset via the communication interface, the analogue input or a PWM input or can come from internally stored application programs which are available in all interface variants. Supported as communication interfaces are – depending on the device – as standard RS232 or CANopen. EtherCAT is also an available interface option with which multiple axes can easily be controlled synchronously via the usual cyclic modes CSP, CSV and CST, together with, e.g., a higher-order PLC.

Extensive additional and display functions simplify the operation and monitoring of the system in all applications. Commissioning is, as usual, quick and simple using Manager 6.0 in combination with a programming adapter.

No matter whether in laboratory automation, industrial automation technology, robotics or aerospace: With the new Motion Control Systems of generation V3.0, FAULHABER offers the optimum solution for the respective requirements.



Supported interfaces:

EtherCAT

CANopen

RS232 / USB

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#### FURTHER INFORMATION

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FAULHABER  
[www.faulhaber.com/mc/en](http://www.faulhaber.com/mc/en)

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# Top **PERFORMANCE** for **MINUTE** quantities

The miniaturization trend extends across all industries; however, the ever-decreasing product sizes are a challenge to the automation technology, e.g. when it comes to accurately applying the correct amount of soldering paste, adhesive, lubricant, potting material or sealant. Dosing according to volume has been proven to be the simplest and most flexible method in practice, since the substance that needs to be delivered “only” needs to be moved back to the dosing tip by pumps delivering uniform quantities. Precision dispensers such as these should also be as compact as possible so that they can be easily integrated into the production systems. They are therefore reliant upon small, powerful drives that provide the best possible dynamics and can be precisely controlled.



The heart of the dispenser unit is a rotating, completely pressure-sealed displacement system

ViscoTec Pumpen- u. Dosiertechnik GmbH manufactures dosing systems and components for semi-automatic and fully-automatic production systems as well as assembly processes. Using the preeflow® micro-volume dosing units, the company already set the standards in the precision dispensers area almost 10 years ago.

Typical applications range from semiconductor and electronics manufacturing, optics and photonics and all the way to biochemistry and medical technology. Many different liquids can be dosed. The range extends from “A” for anaerobic adhesives to “Z” for zinc chloride solutions.

## BRUSHLESS DC-SERVOMOTORS

Series 2237...CXR  
 Ø 22 mm, length 37 mm  
 Torque 12 mNm





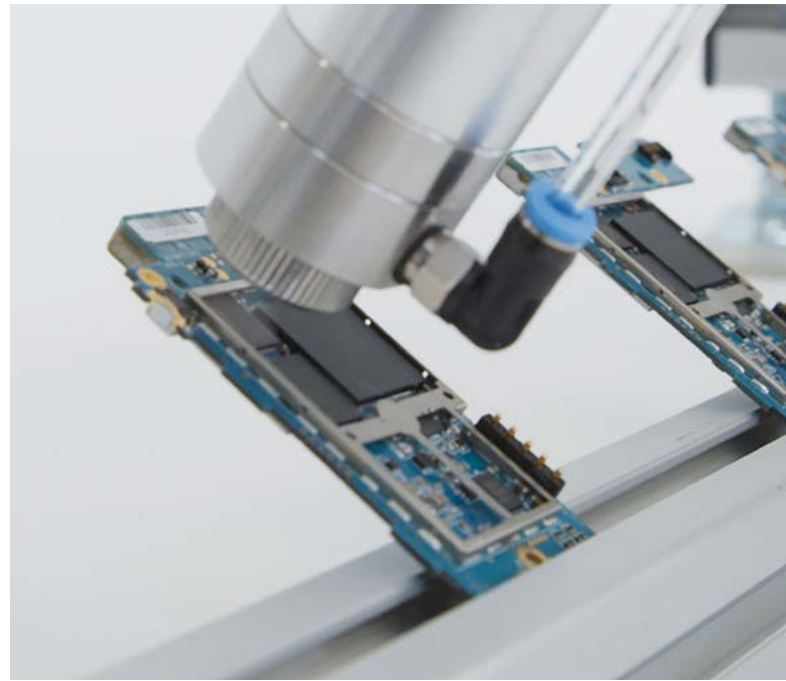
## Rotating, pressure-sealed displacement system

The basic functionality of the precision dosing unit is easy to understand: The heart of the dispenser unit is a rotating, completely pressure-sealed displacement system. It consists of a self-sealing inner rotor and the outer stator. The medium that is delivered is transported by means of displacement by a controlled rotating movement of the rotor. Changing the direction of rotation also allows the system to transport backwards. This ensures that the material separates in a neat and controlled way without dripping. The medium itself is transported in a protective way without changing the structure. The system is designed to be self-sealing with water up to a feed pressure of 2 bar. As the viscosity increases, so does the self-sealing effect. Dosing pressures of 16 to 20 bars are therefore easily possible. In turn, this high feed pressure makes it possible to use smaller needle and nozzle cross-sections for delicate application surfaces.

## Compact drive block consisting of motor, encoder and gearhead

A high feed pressure in the dispenser module requires a high-torque drive. "With the limited unit sizes, only a micro motor with an ancillary gearhead came into question", recalls Diringer. "We have therefore been collaborating closely with FAULHABER for almost ten years now. Together with the drive specialists from Schönaich, we quickly found a suitable powerhouse. Small dimensions and high power density are important, so that the preeflow® eco-PENs can also be built with small dimensions and fitted directly to the robot in the automated dosing process without problems."

The best price/performance ratio turned out to be a DC-micromotor with encoder and planetary ancillary gearhead. The brush commutation makes simple pulse-width regulation and direction of rotation changes possible. The encoders and planetary gearheads in the motor diameter make it possible to have a slim design. The compact drive block measures just 22 mm in diameter with an overall motor length of 32 mm, depending on the dispenser design. There is also the gearhead, which provides ratios of 9:1 to 23014:1 with a length of between 27 and 48



The small dosing units are used in many different areas worldwide, often operating 24/7.

mm. The smaller motors supply a continuous torque of 10 mNm and the bigger motors achieve 28 mNm. This torque is increased by the respective gearhead to the 20 bar of feed pressure that is needed for the dispenser unit. The push-on encoder only increases the overall length by 1.4 mm, and supplies 64 to 512 pulses per revolution depending on the model. This enables precise quantity allocation, provides drip-free medium separation due to the precise feedback of the rotor position of the drive. The gearheads and the motor bearings have lifetime lubrication and are maintenance-free. "We have found a reliable, robust and dynamic drive solution for our micro dispensers", concludes Diringer.

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### FURTHER INFORMATION

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ViscoTec Pumpen- u. Dosiertechnik GmbH  
[www.preeflow.com](http://www.preeflow.com)

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FAULHABER  
[www.faulhaber.com](http://www.faulhaber.com)

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**REINER BESSEY**  
(on the left)

Head of the Development Platforms  
and Technology department

**JOCHEN HASENMAIER**  
(on the right)

Head of Purchasing

Twice as many

**PROJECTS**

with the  
SAME **TEAM**

FAULHABER has doubled project throughput in the last three years. Reiner Bessey (Development) and Jochen Hasenmaier (Purchasing) are involved in implementation. The process has been sped up because the management now controls capacity using the taskboard, and projects can be dealt with one after the other. Experience at FAULHABER has shown that multi-tasking does not make employees and processes quicker, but has quite the opposite effect.



**Mr. Bessey, you control your projects using a taskboard. Who else is involved?**

**Reiner Bessey:** The project leader, the development manager and the bosses of all members of the project meet together twice a week. Here, we discuss capacity bottlenecks and priorities at HR manager level. Between 20 and 30 active projects are discussed during these meetings. In spite of this, the meeting only lasts for 10 minutes.

**Jochen Hasenmaier:** However, the invitation is actually for 25 minutes because we subsequently discuss topics that cannot be resolved in the main meeting. This is very effective.

**Do the project teams use similar methods?**

**Reiner Bessey:** In this case we have team meetings which are subdivided into core team meetings and overall project team meetings, and we have design and management reviews and milestones.

**So you haven't quite waved goodbye to classic project management yet?**

**Reiner Bessey:** We have our own flexible approaches and our software developers work in a flexible way, but in the development area as a whole we prefer to focus on tackling the issues which are helpful to us.





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**If processes are accelerated, the coordination must work. Where are the critical issues?**

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**Jochen Hasenmaier:** We actually have a large number of projects, and there is always a lack of capacity. This is the main topic which we discuss on the board. We examine the critical path and coordinate the prioritisation.

**Reiner Bessey:** Prioritisation or staggering. Three years ago, the company management set the task of doubling the number of projects without increasing capacity and maintaining quality and reliability.

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**That is tough, how did you achieve this?**

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**Reiner Bessey:** Mainly by means of controlling via the taskboard and by staggering projects. We have succeeded in doubling the number of projects. We are currently in a situation where capacity has become an issue because many new projects have been added.

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**How do friction losses occur?**

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**Jochen Hasenmaier:** Damaging multitasking is a major issue. If employees cannot concentrate on one thing but have to do many things in parallel, they are ultimately slower than if they did things sequentially. This means: If we deal with things one at a time, even if multiple projects are involved, we will be faster than if we dealt with the projects simultaneously. This was one of the first findings to emerge from the process acceleration. This means that you have to start projects but you may then have to say that you're not going to deal with the project for a month.

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**How do you protect your employees so that no-one demands an exception ?**

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**Reiner Bessey:** We communicate this to the management, since sales also has to be informed, and in some cases it goes as far as the customer.

**Jochen Hasenmaier:** That is what takes place in the second 15 minutes after the taskboard meetings. Here you clearly see that there are 13 orange cards for purchasing this week, for example, which is too many and staggering is required. Then we postpone and reorganise the priorities.

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**Is it as simple as that? Is everyone in agreement?**

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**Reiner Bessey:** We have tried to objectify that using a buffer plan. The decision is made depending on use of the buffer, and in relation to project progress until the next deadline. This means that projects which are in the green as far as buffer use is concerned must be put back, and the ones in the red area have priority.

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**Your cooperation works well. What is the recipe for success?**

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**Jochen Hasenmaier:** Mainly transparency. In order to advocate capacity topics to superiors and to create clarity with the employees. To know why we are doing that. The taskboard is directly in front of the department, everyone walks past it every day and can see the status of the projects. This is all the more important, since our project purchasers are also strategically and influentially integrated in series production.

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**What goals do you have at the moment?**

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**Jochen Hasenmaier:** From a purchasing point of view we wish to obtain parts that are close to series production standard within a short time, with which we then carry out sampling but can also be used for equipping for the start of a series production run. We require parts that are close to series production standard in a flexible and quick way. We have built some resources, but there are always technologies which we do not have in-house. The suppliers are currently well utilised. Since our parts push the boundary of what is possible, we depend on standard suppliers who can provide this quality.

**Reiner Bessey:** From a development point of view the goal is crystal clear: to introduce new technologies to the market, build up innovation leadership and further improve cooperation. We require more interlinking, also with suppliers.



PREVIEW

Living  
**GEOMETRY**  
ILLUSTRATES  
DRIVING PLEASURE  
of the **FUTURE**



On the occasion of its 100th anniversary, the BMW Group is looking ahead to the future and, with its "Iconic Impulses" exhibit, draws an image of what mobility might look like sometime in the next hundred years. In the BMW brand space, a kinetic-digital sculpture explains to the visitor the vision of the developers with regard to interaction between driver and vehicle - Alive Geometry. In the next issue of motion, learn how hundreds of razor-thin carbon scales, a complex controller and a great deal of FAULHABER drive technology bring this visionary idea to life for the viewer.



Ident-no. 000.9222.16

Further information:



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**FAULHABER motion is now also available as an app.**

You can get the free download with this QR code.



WE CREATE MOTION

