



# FAULHABER

*info*

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World's smallest drive  
system with integrated  
Motion Controller



# The lifelines of technology

**MICRODRIVES – THE KEY TO  
PRECISION CUTTING BY HIGH-END  
STRIPPING MACHINES**

Cables are a vital part of modern technology. They are an essential component when it comes to transferring electrical energy in a wide range of applications. A plastic insulating sleeve protects the conductive copper heart and prevents short-circuiting on external contact. The designs of the insulating sleeves are as varied as the cables themselves. However, a specific length of the insulating sleeve needs to be removed when the cable is connected. Small, compact stripping machines with a range of different settings provide users with a wide spectrum of adjustment options for their cable design. Thanks to different blade sets and a precision controlled microdrive, cables can be configured for various applications, e.g. data transfer or heavy current supply.

Description of finishing options	Cable samples
Full strip	
Full strip with subsequent cutting	
Part strip	
Part strip with subsequent cutting	
Multiple strip	
Strip mains cable with different internal conductor lengths	
Strip sensor cable (very precise and short break-out length)	
Strip flat ribbon cable (sleeve)	
Strip flat ribbon cable (sleeve and conductors)	
Strip double insulated cable	

Cables have become the “lifelines” of technology. Like veins, they come in all shapes and sizes, from the dimensions of a single strand of hair to several millimeters thick. Schleuniger AG from Thun in Switzerland is geared up to dealing with this level of variety and offers clever stripping machines for a wide range of cable types and diameters. In order to allow precision cutting through, thick and thin, their machines come with drives from FAULHABER'S Swiss affiliate MINIMOTOR. The compact micromotors from the drive specialists provide the power required to cut through thick insulation as well as the precision needed to expose even the finest of wires.

### Precision and diversity

Designing a stripping machine to meet the demands of high-end automation engineering applications requires experience and expertise. The method applied not only has to consider the format of the different cable types but also the thickness of the conductors to be processed. Depending on user requirements, the Swiss engineering experts can provide programmable units for cables from double-insulated cables to coaxial cables. The CoaxStrip 5300 model can handle up to 650 coax ends per hour, depending on the cable type. The UniStrip 2600 model can strip off 20 mm of insulation every 0.6 seconds. The clamping force can be motor adjusted in both models. The units come with a list of 1000 cables or 100 cable lists, so the cable type can

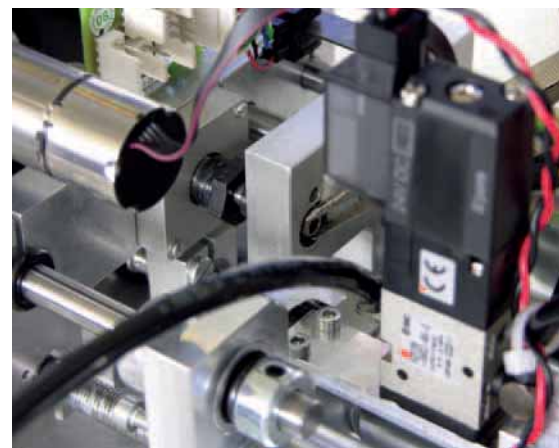
quickly be adjusted to suit changes in production. Replaceable stripping blades, an insulation extraction system and other practical functions allow seamless integration into the existing automation environment.

### Compact drive with encoder

The sophisticated cutting and pulling mechanism in the stripping devices requires a drive system that is equally sophisticated. After all, the best knife only cuts as accurately as the hand guiding it. This is why the developers opted for FAULHABER systems. They found the perfect drive system for this application from the company's extensive product range. Both stripping machines are equipped with three DC-Micromotors. One drive is responsible for clamping the cables while another moves the blades up and down in the cutting unit. The third member of the team takes care of the controlled removal of the insulating sleeve. As these drives are only used for the purpose of adjusting to new cable types or merely for specific tasks, e.g. for the withdrawal movement, using them is most cost-effective for diameters from 2 to 9 mm upward. The larger options can even handle flat ribbon cables of up to 11 mm in width. Depending on the area of application, the machine can remove all or just some of the insulation. Even multiple stripping, stripping of mains cables with different internal conductor lengths or gradual stripping of affordable brush motors is no problem.

They guarantee many years of trouble-free operation. The CoaxStrip 5300 model also has a brushless DC-Servomotor for the constant rotational movement of the cutting unit, which is vital in this application. As this motor has no mechanical wearing parts apart from the rotor bearing, it is perfect for the continuous operation required. Its service life is in excess of 10,000 hours, so it can meet even the exacting demands of three-shift round-the-clock operation. All DC-Motors are fitted with built-in encoders. These provide pulses to the controller in the device through pre-finished flat ribbon cables. There is also a light barrier aligned on each axis to define the start point and initialize the individual drives. This information allows the controller to use the motors to drive the individual axes to the required position precisely and with a high level of repeat accuracy.

[www.schleuniger.com](http://www.schleuniger.com)





# Ocean filming – tough conditions for camera and crew



## MICRODRIVES STABILIZE CAMERA SET-UP DURING OCEAN FILMING

In the rugged environment of the ocean, making brilliant films is far from easy. To shoot the "OCEANS" documentary, French film company "Galatée Films" therefore required some advances to be made to existing camera technology. The challenge of creating the necessary camera stability to ensure shutter-free images could be shot from a permanently shaky surface was a particularly difficult task for the developers. A gyroscopic mounting platform with several DC-Micromotors proved to be the perfect solution.

Shooting high-quality nature films is hard enough on land, but even more challenging at sea. For one thing, the crew is much more dependent on the weather and for another, the kind of travel required on location is extremely time-consuming and cannot be repeated indefinitely. This means that each take must produce the perfect shots, for "Cut – take 2!" is seldom an option. In this particular case, an 8-m-long and



Images of the oceans for a better understanding of our world

2.5-m-wide rubber dinghy with a 200 hp outboard motor was chosen as the "assault vehicle". The inflatable was suitable for transporting the camera equipment in the shallow waters along the shoreline as well as out on the high seas. Onboard stabilization consisted of the Thetys platform, a 4.5 m jib crane and a stand to mount it on the boat. When attaching it to the bow, care had to be taken not to exceed the maximum allowable weight, so that the seaworthiness of the inflatable was not unduly impaired. These requirements meant that the 4.5 m-long crane weighing 300 kg had to be able to carry the stabilizing platform with 75 kg of its own weight, plus camera load. The platform itself can stabilize camera equipment weighing up to 40 kg.

### Fixed point in space

As is the case with aircraft, movement in a boat occurs in all three spatial directions. Lurching, rolling and pitching are often accompanied by some hard knocks – mechanical impacts that all technical components must be able to withstand. Shock absorbing mounts can only block

some of the occupational hazards of shooting at sea, such as motor vibrations. Since any equalizing movements have to occur in real time, rapid data processing is also called for, as well as a drive system that can quickly execute the related computerized commands with as little backlash as possible. The necessary computations in this case are handled by a 1 GHz Pentium processor. The mounting plate for the camera is stabilized via three gyroscopes in all spatial directions. Optical tracking, to even out the fluctuating movements so that the lens is always focused on the right shot, is achieved via two drive systems per spatial axis.

### Top performance in the tiniest space

The performance-inhibiting factors for rapid, dynamic yet precise movements are breakaway torque, gear backlash and drive efficiency. The non-linear behavior of these factors makes it harder for the computer to calculate the steering commands. The actual drive consisted of a 24 V DC-Micromotor with a 38 mm diameter and matching planetary gearing supplied by FAULHABER. "The main benefit of the drives", explains Jacques Perrin, director and co-developer of the stabilizing platform, "lies in their almost cog-free action. They also have no iron losses and offer high dynamic performance thanks to low rotator inertia. The high performance ratio is a further plus for our purposes." The motors weigh as little as 400 g but achieve 220 W. The triple reduction gearing (with a reduction ratio of 1:64) increases the rated torque to 15 Nm. The maximum torque available in, for instance, emergency situations is 30 Nm. In order to increase the response accuracy and minimize the backlash of the gears, two drives work on each axis in a push-pull arrangement. Weighing less than 2 kg, this drive is the optimal solution due to both its rapid response and robust construction. The chosen motor control system is also part of the FAULHABER product range. The 4-quadrant, switching pulse-width modulation facilitates high-precision motor movements. With up to 10 A, the controller also ensures the necessary power supply even during substantial equalization maneuvers. Modern microdrives and match-

ing accessories like gears and control systems allow the complex actuators to be quickly assembled. Top performance in the tiniest space, minimal weight, yet high speed coupled with precise positioning make this an option that may well prove suitable for use in many other areas.

[www.oceans-lefilm.com](http://www.oceans-lefilm.com)  
[faulhaber-france.fr](http://faulhaber-france.fr)



# Miniaturized: long-term blood pressure monitor

## MICRODRIVE MANAGES THE CONTROL VALVE OF A PORTABLE MEASURING DEVICE

Dangerously high blood pressure is a frequently undiagnosed illness in the fast-paced world of today. This is a serious problem, as high blood pressure left untreated for many years can trigger a whole series of secondary diseases and skyrocketing treatment costs. To ensure optimal diagnosis and correct medication doses, blood pressure monitoring over a relatively long period of time is essential. A new measuring device in miniature form facilitates extensive, long-term monitoring, without impeding the day-to-day lives of patients. Modern microdrives inside the device ensure the necessary mechanical execution of electronic commands.



Fluctuating blood pressure or blood pressure that is chronically too high or too low will at best only impair a person's quality of life. But unfortunately the consequences are usually extensive secondary damage to vital organs like the heart or the kidneys. Conventional electronic measuring devices for blood pressure monitoring only provide snapshot information at the time a single reading is taken, rather than blood pressure profiles over a period of several hours or days. To address this gap, Schiller AG in Baar, Switzerland, has developed a mobile blood pressure measuring device for long-term blood pressure monitoring. In order to keep the size of the device as small as possible, the developers went to microdrive specialist FAULHABER in search of the optimal drive solution.

### Everyday convenience

Blood pressure is influenced by a host of different factors. Any meaningful reading must therefore take into account normal everyday activities and be as unobtrusive as possible. For this reason alone, mobile,





controlled torque, it combines with the valve body and control tube to form a single unit. This means the overall system is very lightweight, compact and robust. The special features of this DC-Micro-motor from the FAULHABER product range are crucial to the success of the blood pressure monitor. The precious metal commutated drives provide minimal contact resistance on the collector/brush system, allowing them to run on very low voltage, which is a big advantage for battery-supported use. The efficiency ratio of over 50 % also enables the device to stay in use for extended periods. Brush wear and tear for short-term usage under normal conditions is relatively insignificant. What is more important is perfect start-up even after long periods of inactivity. Maintenance-free bearings with special lubricants and a precisely balanced rotor ensure smooth running. To sum up all its attributes, this is a high-performance, long-life, miniaturized drive that always executes the electronic commands by the same, reliable process. That is the only way to ensure a series of reliable readings that provides meaningful and comparable data sets. Modern microdrives are the perfect solution for many different applications and all forms of mechanical movements. As a miniature power source, they are equally suitable for dynamic tasks, slow to virtually static functions or pulse-operated processes.

[www.schiller.ch](http://www.schiller.ch)



miniaturized solutions that do not impede patient movement are ideal. The solution developed by the Swiss specialists is based on two key components: sophisticated MT-300 analysis software for setting and evaluating the measuring sequence and readings, and the BR-102plus measuring device itself, complete with sensor and data memory. The lightweight, user-friendly device can be easily configured via PC software. It is equally capable of storing patient data, statistically analyzing the readings, recording the results in the form of patient diaries and many other functions. The actual measuring device is suitable for measuring blood pressure over a 24 or 48 hour period and offers the choice between auscultatoric or oscillometric measuring methods. This allows even patients with heart rhythm disorders or atrial fibrillation to be monitored. The device can be easily operated on site, with only two buttons for convenient navigation through the menu. Up to four measuring programs can be saved to the built-in memory, and there is a special algorithm

for both adults and children. Data can be transmitted from the device via a USB interface. Despite its compact design, the 3 v battery can handle up to 100 readings when fully charged. The great versatility of the device is only possible thanks to precise mechanical execution of the electronic commands. Miniature components and microdrive technology were the key to solving this challenge of long-term, non-intrusive monitoring. The experts at Schiller developed a special pressure regulator for the BR-102plus. An 8-mm drive that mechanically translates the electrical commands ensures sensitive operation of the high-precision component.

### **Precious metal commutated DC motor**

The pressure within the measuring cuff is the reference point for every measurement. For this reason the settings have to be as precise and reproducible as possible. The developers discovered that a precious metal commutated DC-Micromotor was the ideal drive solution. Operated with

# Muscular micromotors

## MULTIPLE-AXIS JOINT MAKES ROBOTIC ARM LIGHTER AS IT CAN BE DISCONNECTED FROM THE DRIVE

We have all seen industrial robot arms: solid constructions for heavy tools – and they are pretty hefty themselves. In fact, these designs are simply too heavy for many applications. Engineers at igus in Cologne wanted to develop a multiple-axis joint that would allow small loads to be swiveled or turned around a jib. They needed high levels of flexibility and low weight, with simple upgrade options for additional axes. These requirements have now been elegantly translated into a new concept with a multiple-axis joint made from plastic and cable controls. The cables themselves are moved from the arm's "shoulder joint" using compact, high-performance, brushless DC-Servomotors. This prevents inertia in the arm, allows dynamic movements and means the drive block can be compact in design.

### Bionic approach

To avoid having to reinvent the wheel, the team of engineers looked at further refining the trusted human elbow joint. This allowed two degrees of freedom – rotation and swivel – to be incorporated in a single joint, thereby guaranteeing high levels of precision for the moving parts. The tribo-plastic joint is also maintenance-free and does not corrode or conduct electricity. The "bones" of the arm to which the joints are attached are also pared down to a lightweight construction. Aluminum, carbon fiber and fiberglass-reinforced plastic provide excellent rigidity and good vibration insulation. As in the human arm, the weakest components of this kind of robot arm are not the bones (i.e. the body tube) or the muscles (i.e. the drive motor) but

Freely moving arms are a well-established solution when it comes to handling tools within a three-dimensional space, and not just for robots. But most of the solutions available thus far have struggled to overcome the negative interaction between the necessary drive on the rotating axis and the required arm stability. By eliminating the mass from moving parts, the forces of inertia in the arm are reduced. The arm jib is lighter in weight and can work more dynamically, while providing the same level of stability.







rather the “tendons” which transfer the power. The high-tension “tendons” or control cables are therefore made of a highly wear resistant and tensile load resistant fiber made from highly crystalline, UHMW-PE (ultra-high molecular weight polyethylene). With tensile strength of 3000 to 4000 N/mm<sup>2</sup>, it only breaks under its intrinsic weight at a length of 400 km. This design allows a load / intrinsic weight ratio of 1:1 to be achieved, or even less if the structure is optimized. As well as the traditional robot arm functions, the joint can be used for new functions such as special fittings for cameras, sensors or tools where lightweight construction is key. In the future, it may even be used on prosthetics. It is the separation of the tool, the moving parts, the control module and the actual drive that make it ideal for mobile use. As the components that have been “eliminated” from the moving parts represent a sort of counterweight to the mass of the arm, the overall structure is very light. A magnetic angle position sensor is built into every joint to improve precision. Combined with the highly dynamic drives, this produces a precision-controlled robot module.

### Dynamic, powerful and compact

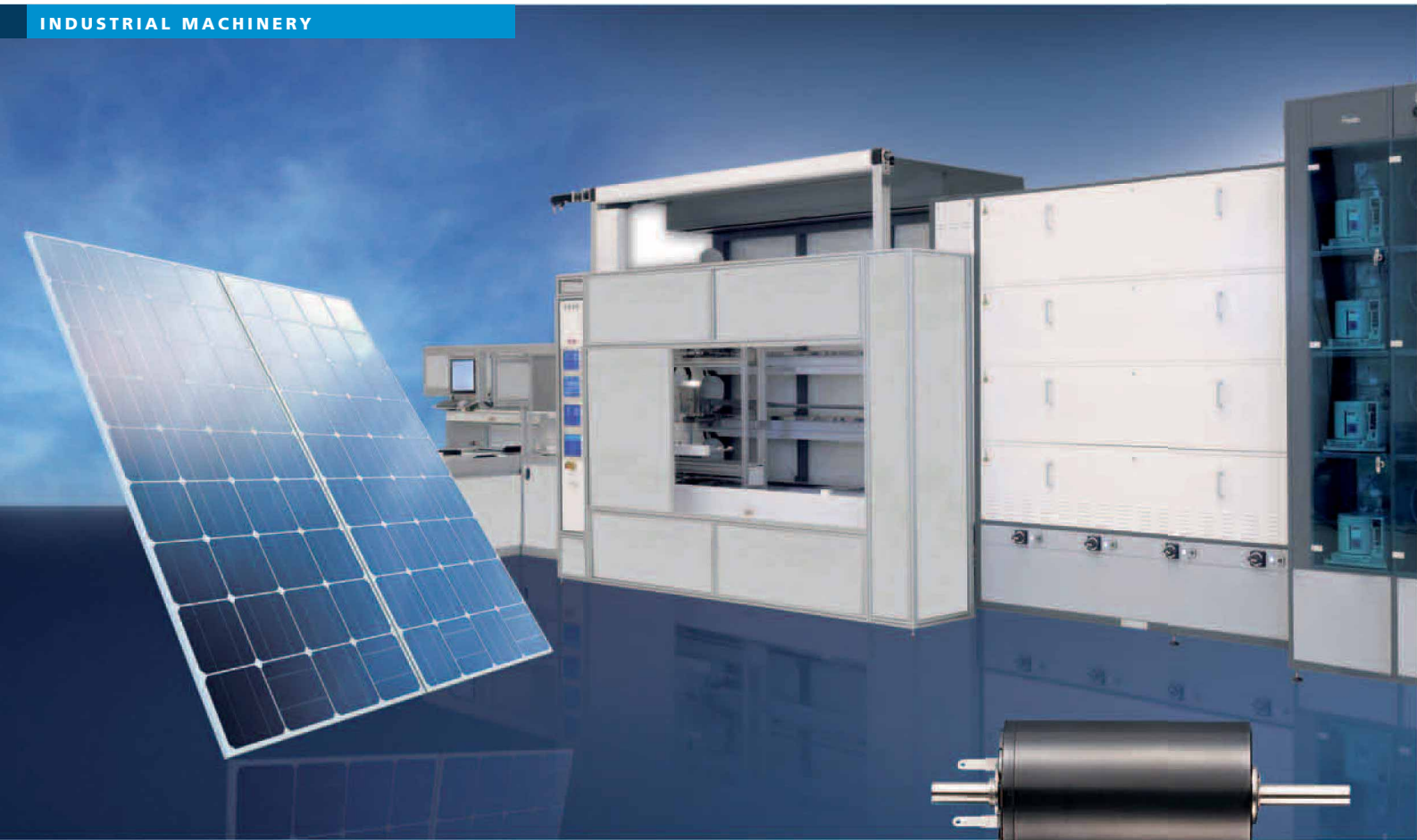
Compact drive solutions are required in order to operate the largest possible number of cable controls within a confined space. Where high levels of dynamism, real power yield and precise, controllable use are required, electronically commuted servomotors like those from FAULHABER are the best option. The small compact drives have a low moving mass and an outstanding performance to volume ratio, making them ideal for dynamic use. The excellent heat deflection allows considerable overload when operated for short periods rather than permanently, which is an additional advantage, especially when it comes to fast swivel movements. The operating voltage of 24 V DC is perfectly tailored to battery power, which is crucial for mobile applications. With a 32 mm diameter, a high permanent output with 80 % efficiency can be achieved in 4-quadrant mode. The 97 mNm torque of the four-pole motors increases the diameter-compliant planetary gearheads to the values required to operate



the arm. Depending on the area of application for the swivel movement, the planetary gearheads allow transformation ratios of 1:4 to 1600 or 6 to 20 Nm continuous torque at up to 96 % efficiency. The stainless steel casing is as weatherproof as the plastic joints and cable controls. The fact that brushless drives have no wearing components apart from the rotor bearing guarantees a long service life over many tens of thousands of hours. The precision gearheads also boast a long no-maintenance service life. The motor can be operated in a temperature range from – 40 to +100 °C, the gearheads from –25 to +90 °C. This means they can both cope with environmental conditions from the Arctic to the tropics and thus a wide range of industrial operating conditions. Modern servomotors are the tool of choice for various applications where movement is required in the construction process. High precision levels and a long service life combined with easy integration into the control system mean they can be used both for mobile applications and in compact engineering.

[www.igus.com](http://www.igus.com)





# Solar wafer production in horizontal furnace

## MICRODRIVES USED TO MOVE FURNACE LOGISTICS

Modern micro-electronics and photovoltaics “live” on coated silicon chips. The most cost-effective way to produce them is to cut out individual transistors, CPU chips and solar cells from large units known as silicon wafers. This means that the highly sterile silicon wafer has to be accurately and reproducibly coated with a range of different substances. Special horizontal furnaces are used for this process, as they allow the conditions to be defined exactly for the relevant reaction. High-performance, extremely reliable modern microdrives are perfect for the furnace logistics, i.e. the loading and unloading of furnace pipes and the opening and closing of the furnace doors.

Virtually all modern electronic devices are based on silicon chips incorporating a range of components, such as transistors. They need to be produced quickly and in large volumes in order to offer cost-effective pricing for individual chips. The chips are therefore produced in large quantities on what are known as “wafers”, which are silicon sheets measuring between 100 and 300 mm, and are then separated. Specific surface treatment of the wafers is just as likely to involve the atmospheric absorption of phosphorus and boron compounds as chemical vapor deposition (CVD) at low pressure. Tempress Systems B.V. from Vaassen in the Netherlands have deve-

developed a highly flexible range of horizontal furnaces that offer chip manufacturers a high degree of flexibility. The furnaces are used for mass producing quality solar cells based on wafers. Robust microdrives developed by microdrive expert FAULHABER from Schönaich near Stuttgart are used to load the individual furnace pipes. They also automatically close the furnace doors, which is a crucial safety function as highly reactive chemicals are used in the furnaces.

### **Made-to-measure wafer treatment**

Production methods change in the electronics industry quicker than virtually any other sector. So all the systems used need to have the capacity to adapt flexibly to a wide range of different production requirements. The horizontal furnaces put these industry requirements into practice with consummate perfection. The four reaction furnace chambers are arranged horizontally above one another and are loaded with 156 mm x 156 mm wafers for the production of solar cells. There are around 400 to 500 wafers per pipe, so it takes just a single process to coat up to 1500 wafers per hour. In solar panel production, the surface area of a wafer can later be used to generate an average of 4 W of energy. If you consider that an average house roof has around 50 panels producing around 200 W each, the production output of the Tempress furnace represents solar electrical performance of 30 to 35 MW per year. High throughput levels allow cost-effective mass production of solar cells. Depending on the procedure, the furnaces either work under normal pressure or in a vacuum, with temperatures ranging between 380 and

1380 °C. Because the wafer sheets are expensive, process reliability is crucial, and all the components need to satisfy exacting requirements. The Tempress Data Management System allows a wide range of parameters to be configured, from temperature management through precise gas measurement to pressure control. There is a special loading system which loads and unloads the individual furnace pipes. Microdrives are used as actuators. The main requirements of the drive are a high level of torque from a very compact drive, plus precision positioning. It is also imperative that the drives are extremely reliable. After all, errors can be very expensive because of the high cost levels and the use of corrosive chemicals. The robust design of the planetary gearheads was also a decisive factor here. Other benefits of the actuators selected by the company included the compact design of the complete drive, with the matching encoder, and its dynamism and intuitive controls.

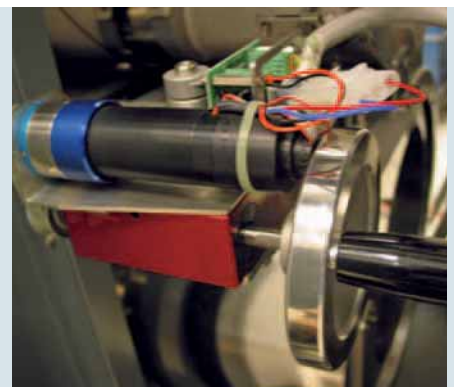
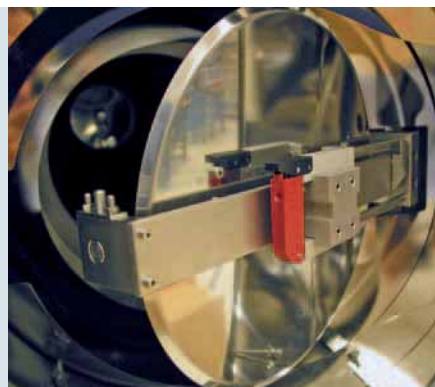
### **Microdrives – robust and precise**

Various drive solutions from the FAULHABER range are deployed in the different furnaces. The loading systems, for example, use a DC-Microdrive. The diameter-compliant planetary gearheads reduce the speed and at the same time increase the drive torque. Depending on the design (normal or heavy-loader), the drives used have a diameter of 32 or 38 mm and metal planetary gearheads with transformation ratios of 14:1 or 3.71:1. In both versions, there are plug-in encoders which allow precise positioning of the wafers in the system based on 256 pulses per revolution of the motor shaft. The gear transformation also increases

the precision of the drive shaft. There are even more exacting requirements for the safety-critical function of closing the furnace door. A reliable locking system must be guaranteed in order to ensure that gas cannot escape from the furnace pipes. This is why, as well as a motor with encoder and planetary gearheads, some models also have electromagnetic brakes installed. These guarantee that the doors close safely even in the event of a power outage. The brake unit also plugs into the 32 mm motor, with the whole unit – including the motor – measuring just 72.5 mm.

Modern microdrives offer all the functions of larger drives within a compact space. Whether it's encoders, gearheads or brakes, virtually all components are now available in miniaturized form. Their best-in-class design guarantees high levels of process reliability.

[www.  
tempress.nl  
faulhaber.nl](http://www.tempress.nl)





# Faulhaber expands into China

OPENING OF NEW OFFICE

China is acknowledged as one of the most ancient advanced civilizations and has evolved into what is today the third largest trading nation in the world. Taicang is one of the country's flourishing locations.

The Taicang Economic Development Area lies between Shanghai and Suzhou, near the Yangtze River. The city, though small by Chinese standards, has a well-developed infrastructure with perfect connections to waterways, air transport and rail routes, as well as offering high availability of skilled personnel. Because of this, around 1,200 companies, of which as many as 130 are German SMEs, have invested there since the creation of the Development Area in 1991.



Dr. Fritz Faulhaber, President FAULHABER China (left), Ernst Pfister MdL, State Minister of Economics for Baden-Württemberg





In October 2010 FAULHABER also opened its first branch in Taicang, enabling even better provision of products and services to customers in China, and opening up new Asian markets for drive systems.

The office, conference and storage premises of the new FAULHABER branch are situated on the fifth floor of a modern office building and cover an area of around 310 square meters. The opening of the new location was marked by a celebratory

ceremony attended by representatives of local authorities, the trade and industry minister for the federal state of Baden-Württemberg, Ernst Pfister, accompanied by a delegation from Germany, and customers and partners of the FAULHABER Group.



Sun Jinquan, Director of the Administration Committee of Taicang Economy Development Area (right)



### FAULHABER at EXPO Shanghai

The World EXPO has been taking place in Shanghai, a metropolis of many millions, since May 2010. The exhibition covers an area of 5.28 square kilometers on either side of the Huangpu river. With its pavilion entitled "balancity", Germany has introduced itself as a versatile, imaginative nation, an innovative and forward-looking country, and one which at the same time

attaches great importance to preserving its roots and sustaining its traditions.

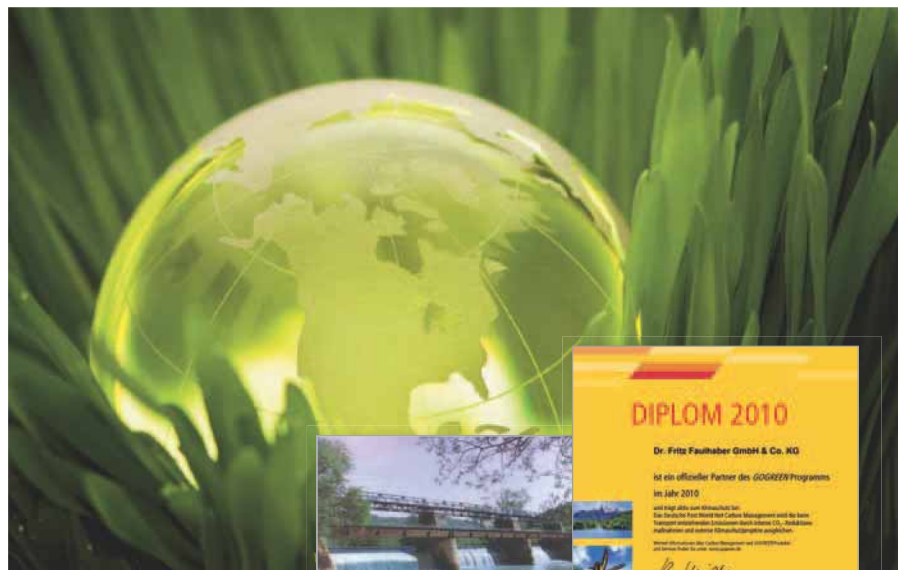
From the beginning of May to the end of October each German federal state had the opportunity to individually introduce itself to World EXPO visitors over several days in and around the German pavilion, in each case with a program illustrative of its region. Baden-Württemberg's presentation was a blend of the traditional

and the modern. An organ player, a girl in Black Forest regional costume and a mask carver reflected the traditional aspects of the federal state. Baden-Württemberg underscored its eminent position amongst Europe's most modern high-tech locations with a selection of futuristic products and technologies such as the Porsche Cayenne Hybrid, the Mercedes S 400 Hybrid, the EnBW "El Moto" electric scooter and drive systems by FAULHABER, which were presented for visitors at the event area.



## FAULHABER goes Green

Committed to protecting and preserving the natural ecosystem, FAULHABER has remained faithful to its mission of further improving its environmental footprint. The official document issued by Deutsche Post DHL within the context of its GO GREEN climate protection program certifies that all emissions created by the transport of goods and postal deliveries attributable to the Schönaich site will be offset by internal CO<sub>2</sub> reduction measures and external climate protection projects. Additionally, the EnBW "Green Quality" certificate documents the origin of 4,400 MWh of electricity to be generated from renewable energies in 2011 on behalf of Dr. Fritz Faulhaber GmbH & Co. KG. Both programs underscore FAULHABER's active involvement in sustainable environmental management and the company's commitment to the responsible use of natural resources.



[www.dpdhl-gogreen.de](http://www.dpdhl-gogreen.de)

## NEW PRODUCTS

### Small drive, mega performance

#### The new linear DC-Servomotor Series LM 0830

This highly dynamic direct drive is the latest addition to the FAULHABER range of linear drive solutions based on the company's pioneering QUICKSHAFT® technology. Measuring 8 x 12 x 30 mm and weighing just 17 g, the LM 0830 achieves up to 2.74 N linear force over a stroke length of between 15 and 40 mm, which makes it the perfect solution for cyclical movements and positioning tasks in the tightest of spaces.



	LM 0830 ... 01
Continuous force [N]	1,03
Peak force [N]	2,74
Stroke length [mm]	15 / 40
Repeatability [µm]	40
Precision [µm]	120 / 140
Speed [m/s]	1,8 / 2,4

- Excellent power-to-volume ratio
- Smooth, consistent axial movement across the entire stroke length
- Integrated feedback system with three analog Hall sensors
- Simple application via external Motion Controller with RS232 or CAN interface



## Power and precision

### The new Piezo LEGS® series

PiezoMotor has extended its product range by including newly developed high-performance drives. The Piezo LEGS® Linear LT20 series is perfect for laser and optical applications, achieving a maximum stall force of 20 N at a resolution as low as < 1 nm. The Piezo LEGS® BL01S and BL02S series are capable of achieving stall and holding forces in excess of 450 N.



Piezo LEGS®	LT 20	BL01S-11	BL02S-11
Stroke, max. [mm]	12,8	20	20
Maximum speed [mm/s]	15	> 0,3	> 0,2
Resolution [nm]	< 1	< 1	< 1
Stall force [N]	20	300	450
Holding force [N]	22	> 300 [mNm]	> 450 [mNm]

- Direct linear drive without gears or lead screws
- No power used in hold position
- Available in designs suitable for high-vacuum and non-magnetic environments
- High precision and power density

## World's smallest drive with integrated Motion Controller

### Brushless 4-Pole DC-Servomotors Series 2232/2250...BX4 CSD/CCD

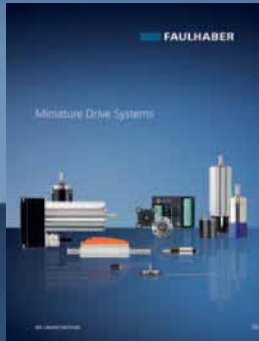
The innovative drive solution boasts a compact design with an integrated slimline Motion Controller, as well as offering all the benefits of cutting-edge BX4 technology. Combining a long service life and high torque without cogging, the electronically commutated motor is the perfect solution for challenging applications.

	2232...BX4CSD/CCD	2250...BX4CSD/CCD
Diameter [mm]	22	22
Length [mm]	32	50
Nominal voltage [V]	24	24
Contin. torque [mNm]	18	35
Stall torque [mNm]	57	110



- World's smallest drive with integrated slimline Motion Controller
- Modular construction, available in two sizes
- Maximum performance-to-volume ratio through innovative design
- Controlled via RS232 or CAN interface





### Drive Systems catalogue 2010-2011

In its new catalog, FAULHABER presents its versatile product range for small and ultra-miniature drive systems on 420 pages. Clear performance tables and comprehensive technical information facilitate the selection, leading straight to detailed descriptions and technical data for the individual components.

- ☐ Please send me the new Drive Systems catalogue

## More info? Our pleasure!

Company

First name, Last name

Dpt./Function

Street

Postal Code/Town

Phone

Fax

E-mail

- ☐ Please remove my name from your mailing list
- ☐ In future, please send me "FAULHABER info" as an electronic newsletter (instead of the printed version)

Simply complete this form and fax it to us: + 49 (0) 70 31/638-8322.

## Hagar the Horrible

