

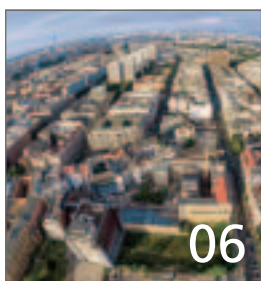
motion

01.2016

THE MAGAZINE WITH DRIVE



“Feel THE POWER“
OF A NEW GENERATION



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Amazing telescopic technology with huge application potential

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Dear readers,

the trend in the industry has already been going in the direction of networking for several years. The components used in the machines and systems are increasingly more intelligent – they receive commands and communicate in real-time with higher level process control technology via field bus systems such as EtherCAT. An approach in which the “driving force” plays an important part in automation, drive systems and in particular the controllers. We have taken appropriate action to develop a new generation of Motion Controller which leaves nothing to be desired in this respect. Read more on this on our product news on page 22.

progenoX GmbH has also taken a new and promising approach with the development of their “Zippermast”. Find out how the exceptional construction principle of this innovative telescopic technology is supported by using DC-micromotors from FAULHABER.

In this edition, you can also read about how the world’s most lifelike bionic hand prosthesis was developed in five years of intensive cooperation, the key role our drive solutions play in anaesthesia and ventilation systems and how two motors from FAULHABER can bring organisation into industrial switch cabinets.

Look forward to these and many other exciting topics.

Sincerely

Dr. Fritz Faulhaber
Managing Partner

Issue 01.2016

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NEW

POWER & CONTROL. THE NEW SERIES 1024 ... SR

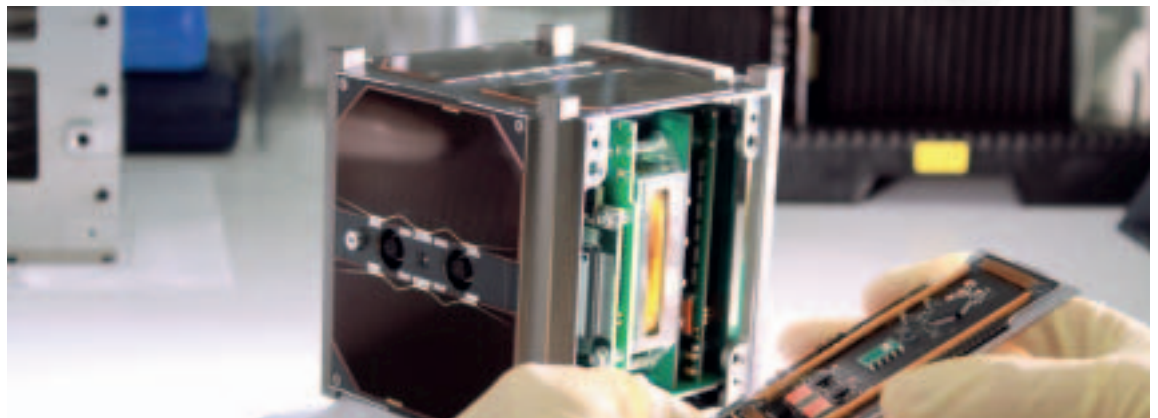
Precise control dynamics is guaranteed with the precious-metal commutated model series SR from FAULHABER. Power is added in an extremely impressive way with the new motor series 1024 ... SR. Equipped with the appropriate gearhead, the series 1024 ... SR (diameter 10 mm) reaches an output torque of 300 mNm. This corresponds to roughly double the power of comparable motors from other manufacturers. The series 1024 ... SR handles different loads with quiet and smooth running and a low noise and vibration level and can be optimally adapted to demanding applications such as portable

devices or optical equipment using a matching range of gearheads, encoders as well as speed and motion controllers.



FURTHER INFORMATION

www.faulhaber.com/news



SMALL UWE FROM ORBIT

UWE is a series of so-called Pico satellites with an edge length of 10 cm and a weight of only one kilo. Thanks to the most innovative technology, these tiny satellites have been orbiting for more than 2 years and transmitting data to Earth from a height of 800 km. UWE is a research project by students from Würzburg studying aerospace engineering in the field of miniaturisation technology. The knowledge gained by UWE is intended to provide improved communication with "large" satellites which, for example, can provide three-dimensional images of

the effected area after earthquakes. FAULHABER is pleased to be on-board with this mission and to support UWE in regards to powerful micro drive technology.

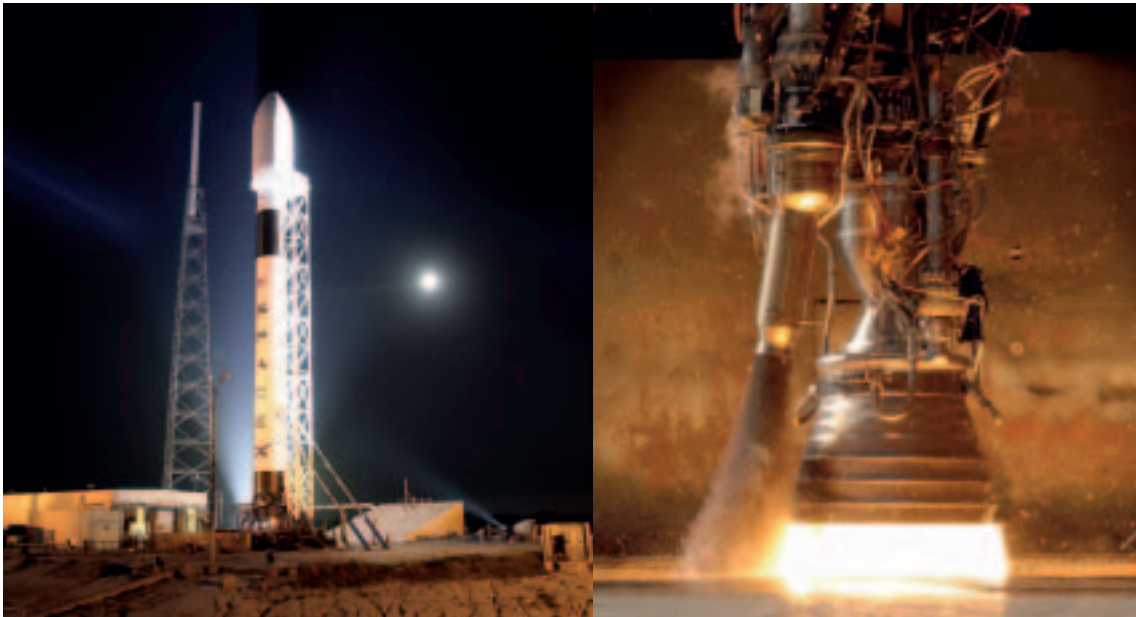
FURTHER INFORMATION

www.telematik-zentrum.de
www.faulhaber.com/news

SUCCESSFUL ROCKET RECYCLING

The carrier rocket Falcon 9 from commercial astronautic company SpaceX is a pioneering achievement in space travel. Falcon 9 started at Cape Canaveral in Florida, released eleven satellites at a height of 200 km and floated back to Earth in an arc where it landed back in an upright position approximately 10 minutes after take-off. In order to make the carrier rocket

even more economical, work is in progress to minimise the fuel burned during operation. A specially developed fuel-trim valve, powered by robust and reliable FAULHABER servomotors, provides the optimal mixing ratio in real-time.



FURTHER INFORMATION

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Images:
Space Exploration Technologies

NEW

HIGH PRECISION – THANKS TO THE OPTICAL MEASURING PRINCIPLE

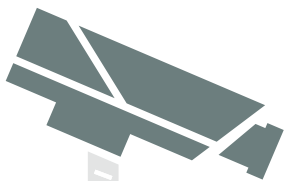
The new IER3 and IERS3 encoders from FAULHABER impress with their high signal quality and resolution as well as an exceptionally compact size. An innovative single-chip solution is responsible for the latter which makes it possible to combine LED's, photo detectors, analysis unit and interpolation levels in a minimum of space. This only increased the length of the motors by 15.5 – 18.5 mm. With the highest resolution of its class, the IER3 makes a clear statement - up to 10,000 lines per revolution makes it possible to achieve very high control dynamics and particularly precise speed control. The new encoders

are therefore the ideal solution for high-precision positioning applications such as in medical and measuring technology, semiconductor production, laboratory automation or in optical systems. Thanks to its resistance to strong magnetic fields, they are also suitable for applications in tomography or image processing.



FURTHER INFORMATION

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ZIPPERMAST –

Tape measure MEETS zip

The remote-controlled caterpillar vehicle with the bobbycar format stops just in front of the head-high wall. Then, a mast extends upwards from its interior on top of which a small camera is mounted. A few moments later, it has an unhindered view of the events behind the wall. The Bavarian company progenoX supplies the vehicle for unmanned exploration. The highlight: the extremely compact “Zippermast” which consists of three interlocked steel tapes according to the zipper principle. A motor from FAULHABER provides the unique design with reliable retraction and extension.

12 METERS
↑



“Whoever sees the Zippermast for the first time is amazed at how high it can be extended”, says Frank Woodcock, General Manager of progenoX. Because the housing where the mast is hidden is very small: the smallest model, the ZM4, is just 15 centimetres high and the standard model, the ZM8, is 25 centimetres. How far the mast can be extended can be seen from the model number – it corresponds to the height in feet. In the case of ZM8, which is easy to carry with its weight of seven kilograms, the mast extends to around two and a half metres. The mast of the ZM40 reaches a height of more than 12 metres.

Inspiration from the tape measure

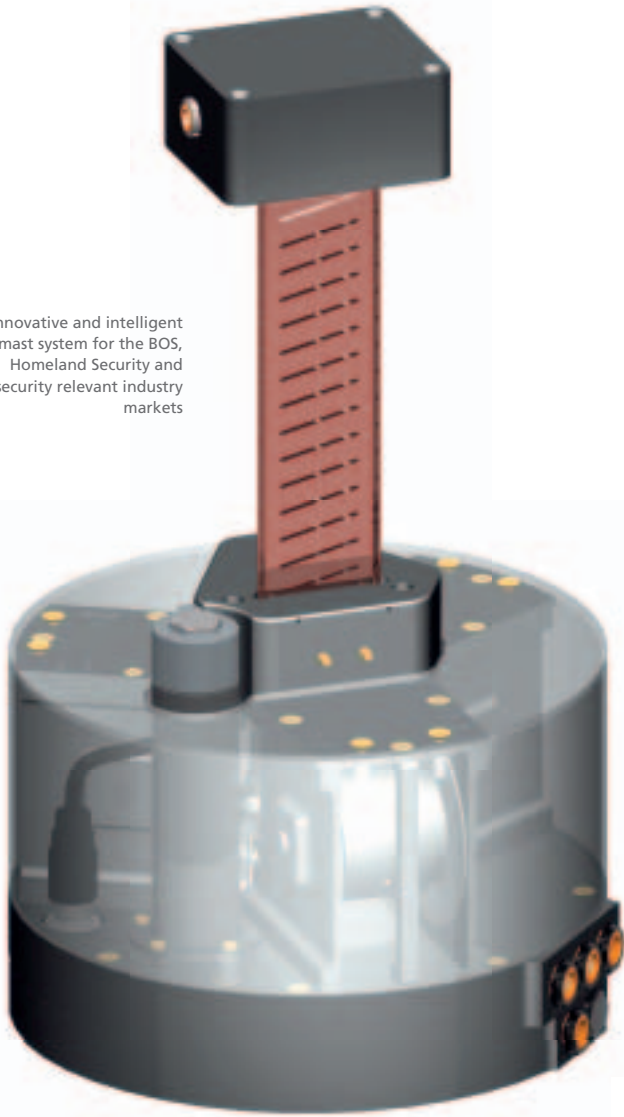
The trigger for the development of the innovative telescope technology was a request from the American armed forces. They were searching for a particularly compact and robust system which can be used on unmanned vehicles. For the

design of the Zippermast, its developer, George Woodruff, was inspired by the metal tape measure which is under tension due to its curvature and can therefore be extended without kinking. Woodruff used three steel tapes and interlinked them when extending according to the zipper principle. In this way, the flexible tapes become a stable mast.

The three tapes made out of spring-tempered stainless steel are wrapped around coils and arranged in relation to each other at angles of 120 degrees. A guiding spindle, which is in the middle of this triangle, grips the tapes in the bevelled slots provided. The tapes are rolled upwards by the rotation of the guiding spindle. Their jagged outer edges interlock with each other. The Zippermast can be extended to any position in-between. No additional locking mechanism is required to hold this position: the weight of the tapes and the load rest on the guiding spindle's thread which can only be moved by rotation, like the nut on a screw.

“When I saw the Zippermast for the first time, I was immediately excited by the design principle”, recalls Frank Woodcock. He acquired the technology in the USA in 2012 and brought it to Germany. He reworked the telescopic mast with his team from progenoX and got it ready for series production. Customers are mainly the so-called blue-light organisations such as the fire service, emergency service, disaster control, civil defence and the police. They mostly deploy the masts for monitoring and surveillance purposes – hence in the area for which it was originally designed. But the Zippermast has also proven itself to be useful at other tasks, such as inspecting pipes and shafts. Thus, it is used in nuclear power plants in order to search the ventilation systems for cracks and foreign objects.

Innovative and intelligent
mast system for the BOS,
Homeland Security and
security relevant industry
markets

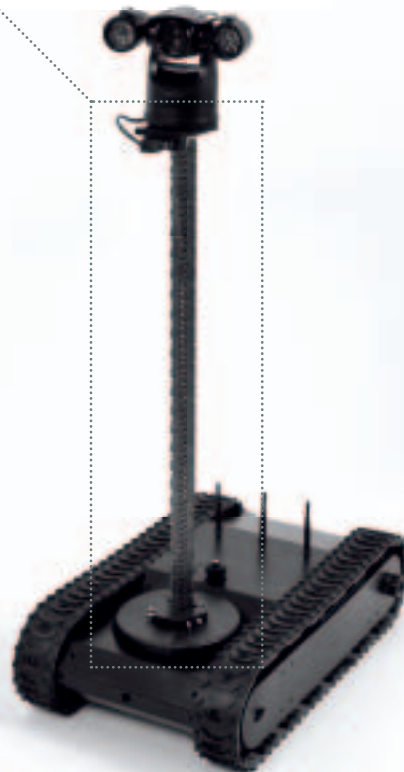


Saves space and is stable

Thanks to the coiled tapes, the Zippermast finds space in very small housing. Another advantage of this design: the diameter of the Zippermasts remains constant in any position across its entire length – unlike telescopic masts which consists of components nested into each other. Thus, enough space in the interior of the masts remains to lead the cable through the guiding spindle to the head and be protected from outside influences.

Furthermore, its design principle makes the Zippermast extremely stable. This sturdiness is increased further by heat treatment of the steel tapes. To do this, coiled tapes are heated on the coils and subsequently cooled again. The crystal structure of the steel adapts itself to this position and seeks to adopt it. Tension is therefore generated by rolling up the tapes which further stabilises the mast. Thanks to its stability, the Zippermast can also extend horizontally and be loaded.

STURDINESS DUE TO HEAT TREATMENT OF THE STEEL TAPES



The compact and mobile design is more favourable for conspirative use

Suitable for the high seas and outer space

progenoX has done a lot to make the Zippermast fit for everyday use. The steel tapes are coated with a special surface coating in order to minimise wear. The guiding spindle is hardened in a heating process, the electronics moulded. Furthermore, the originally used spindle motor has been replaced. "When selecting the optimal drive, we received outstanding technical support from FAULHABER", emphasises Frank Woodcock.

As the Zippermast is often used under the most severe conditions, it must have a particularly robust and long-lasting motor. Furthermore, it was important to achieve very high performance at low volumes. "The motor which drives the guiding spindle, had to find space between two of the three coiled steel tapes and could only have at most a diameter of 32 millimetres", recollects Andreas Eiler, who supervised the project at FAULHABER. Nevertheless, the DC-micromotor had to deliver high output torque in order to extend the mast quickly even when loaded. They therefore jointly decided to use a FAULHABER DC-micromotor. This provides a rated torque of 120 mNm with its powerful rare-earth magnets. The Zippermast also requires a very powerful drive. Here, the choice fell on a FAULHABER planetary gearhead. "They are made solely from steel components", emphasises Andreas Eiler.

With this, the motor can also work reliably under the most adverse conditions and it has an extremely robust housing made from highly-resistant plastic. The DC-micromotor thereby fulfils the requirements for protection class IP68, keeps both dust as well as water away and is resistant to chemicals, UV and infra-red radiation. The FAULHABER DC-micromotor also drives the sea-water resistant variants of the Zip-



permast which can be integrated, for example, in a buoy in the sea. Woodcock even believes application in space is conceivable, he has already applied to participate on two projects. "The Zippermast can be used as a boom for small and medium-sized satellites antennas or optical devices, for example. In addition, we are working together with the company ODG-ARGO who supply robot vehicles to the space agencies NASA and CSA. We have just installed the Zippermast on one of the ARGO robots which may be used for a planned Mars mission. I figure we have a good chance to be involved in one of these space projects."

DC-MICROMOTOR

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



FURTHER INFORMATION

ZIPPERMAST GmbH
www.zippermast.de
www.progenox.com

FAULHABER Germany
www.faulhaber.com

PROSTHETICS

Innovation

GOES

HAND IN HAND





Tie shoelaces, fold bed linen, tear open a bag of crisps – the list of things that are difficult to do with one hand goes on and on. People with a congenital amputation or who have lost a hand due to an accident are confronted with such obstacles every day. To make daily life easier, the British company Steeper developed the Bebionic myoelectric hand prosthesis. Powerful FAULHABER motors ensure that the prosthesis can grip without any problems, quickly and firmly and maintain a constant gripping force.



The Bebionic myoelectric prosthesis weighs between 400 and 600 grams and is about as heavy as a natural hand.



Functional prostheses are known to most of us only in science fiction films which give the artificial extremities superhuman strength. By contrast, bionic hand prostheses do not make the wearer a superhero in real life. But they can make many things possible for them which are normal for most people.

Intuitive movement

The Bebionic myoelectric prosthesis weighs between 400 and 600 grams and is about as heavy as a natural hand. It is controlled by small electrical signals in the body. These are generated by muscle contractions and can be measured with electrodes on the skin – the same way as an ECG in heart diagnostics. Two electrodes, that are integrated into the prosthesis shaft, detect the myoelectric signals and forward them to the control electronics. These signals are amplified and used to activate the five small electric motors (one for each finger) that move the fingers and thumb – the hand opens or closes itself. As a result, the strength of the muscle contraction controls the speed and the gripping force: a weak signal generates a slow movement, a strong signal generates a quick movement.

The muscles which are used to open and close the hand prosthesis are actually responsible for the movement of the wrist in a natural hand. Its wearer must learn that it now has a different function. "The human brain is unbelievably adaptable. After a short amount of time, people perform the movement intuitively like how car drivers step on the brake when they want to stop," says Ted Varley, Technical Director at Steeper.



14 WAYS TO GRIP



Each finger is moved by its own electric motor

Additional motors for more control

The first myoelectric hand came onto the market at the start of the 1980s. They were driven by a single motor and only had a simple gripping mechanism: thumb, index and middle fingers could be closed for a pincer grip. Ring and small fingers were only available for cosmetic reasons and had no gripping force. This concept was fundamentally changed for the Bebionic hand about ten years ago. "We determined that people accept lower gripping force per finger if they get more flexibility," explains Ted Varley. To control the individual fingers, each finger on the Bebionic hand is equipped with its own electric motor. The four motors for the fingers are located in the palm of the hand, the fifth in the thumb itself. Encoders are integrated into the motors which precisely detect the position of the finger at any time.

Thanks to individual control, the fingers can be arranged into a total of 14 different grip patterns. With the key grip, which moves the thumb up and down with the fingers flexed, you can hold flat items such as plates, keys or bank cards. With the hook grip, heavy loads of up to 25 kilograms can be carried, the outstretched index finger permits the use of key-

boards and remote controls. With the power grip, the thumb is in the opposite position and all fingers close until they encounter resistance. This is used to clasp irregularly shaped objects such as wine glasses. "This position looks much more natural than a pincer grip. The grip is also more stable if all fingers are used," stresses Varley.

Increased self-esteem

The bionic hand makes many everyday activities easier. "Actually, it often are the small things which become easier with the prosthesis. To sum up, it leads to a clearly improved quality of life," explains Ted Varley. Furthermore, the artificial hand also has a psychological effect: "Many users report that their feeling of self worth has increased with the Bebionic as they encounter interest and fascination with their new high-tech prosthesis."

In this context, the attractive design of the prosthesis also plays an important role. "Our approach was rather unusual in prosthetics with the development of the third generation of Bebionic: We first

developed the housing and then searched for solutions such as how the individual components can be housed,” emphasises Varley. “Five years ago, this would not have been possible for the small hand – the technology wasn’t advanced enough.” Also, the DC-micromotors of series 1024 SR that were predestined for this application were still in the development phase when Steeper turned to FAULHABER with this project in 2013. The project teams on both sides then expedited the development of the motor series and hand prosthesis at the same time. Regular meetings of the STEEPER and FAULHABER development teams took place in Great Britain and Switzerland. The intermediary of the meetings and the exclusive sales partner of FAULHABER in Great Britain, Electro Mechanical Systems (EMS), also took part. This intensive cooperation ultimately resulted in a motor with an exceptional power-volume ratio and tailor-made drive for the thumb which has brought this intense cooperation during development to a successful conclusion.

Top marks for performance

The new DC-micromotor of the 1024 SR series is actually the best of its class and the most powerful for its size on the market. With a diameter of 10 mm and a length of 24 mm, it delivers a stall torque rating of 4.6 mNm. It offers a consistently high torque across the entire speed range as a result of the flat speed/torque curve. The strong performance, among others, is made possible by the development of a new coil design which contains 60 percent more copper than its predecessor and has been combined with a powerful rare-earth magnet. In order to make the movement as quiet as possible, the artificial hand uses tailor-made planetary gearheads of series 10/1. “A significant challenge was the development of the linear drive system which had to be integrated into the thumb”, says Tiziano Bordonzotti, Sales Engineer at FAULHABER MINIMOTOR. Thanks to high-precision 4 point bea-

rings from FAULHABER’s subsidiary, Micro Precision Systems (MPS), it was possible to make the drive significantly shorter than the competition. The unique features of the 4 point bearing make it possible for it to withstand the high axial forces necessary for the application despite the smaller dimensions compared to alternative bearing systems. The entire thumb drive can withstand an axial force of up to 300 N with an overall length of less than 49 mm.

Ted Varley is excited by the result of the collaboration: “The Bebionic hand in size S is the most realistic myoelectric hand prosthesis on the market. It would not have been possible to realise this project without close cooperation with the committed project team of FAULHABER.”

DC-MICROMOTOR

1024 SR series
 Ø 10 mm, length 24 mm
 Output torque 1.3 mNm



The Bebionic hand in size S is the most realistic myoelectric hand prosthesis on the market.

FURTHER INFORMATION

bebionic
www.bebionic.com

FAULHABER Switzerland
www.faulhaber.com

INDUSTRIAL TOOLS & EQUIPMENT

PERFECT
PRINTED IMAGES
WITH LONG-TERM
GUARANTEE



PrintJet ADVANCED for industrial switch cabinet labelling

Where does this cable lead again? An industrial company simply cannot afford this question. Whether it is the power supply for the climate system or the safety circuit for the assembly line, it must be recognised in the switch cabinet at a glance - even ten years after installation. The company Weidmüller from Detmold develops and produces marker systems, among other things, that ensure this. Its inkjet labelling system "PrintJet ADVANCED" is the only device that can print on both metal and plastic (colour) for these purposes. Two FAULHABER motors take care of precise transportation of material through the print unit and fusing unit.



Everything literally comes together in the switch cabinet: cables, fuses, relays, transformers and connection points. Only when everything is properly connected to each other, can electricians and electronics do their job correctly and sustain the operation. The plans for the wiring are of course done on computers today. The planning system also produces the contents for labelling the components at the same time. Weidmüller has developed its own M-Print® PRO software which takes this data and forwards it to industrial-compatible specialised printers in the appropriate format.

Polymerisation under heat

The latest generation of Weidmüller printer, the PrintJet ADVANCED, is also designated with the internal-company abbreviation, PJA. It has four printing cartridges, black, cyan, magenta and yellow which are applied via the print head onto the printed material in the multipass process. This is where the similarities to the common office printer come to an end. The ink is an in-house development and anything but the usual printer ink. It is water-based similar to conventional ink but it is specially designed for non-absorbent surfaces.

No moisture is transferred to the surface as what happens when printing on paper. Instead, it is fixed in place and polymerised using heat exposure. In doing

so, the molecules in the ink combine into long, stable chains. This reaction is triggered by infra-red light and temperature. Afterwards, the imprint is wash and scratch resistant, withstands petrol, drilling oil, hand sweat, acetone, a multitude of solvents and detergents as well as most chemicals. The polymerisation process thus determines the durability of the imprint.

"The imprinted plastic or metal marker travel through a fusing unit with infra-red radiators and are exposed to a defined temperature for a few seconds. This process takes a bit longer with metal markers", says Michael Gockel, Lead Developer for markers and tools at Weidmüller, describing the fusing process. "When doing this, it is a matter of having a precise, reproducible passage in order to guarantee that the amount of heat that is applied is consistent. If the cards pass through too quickly, the fusing remains incomplete, the ink would not be sufficiently firm. In the opposite case, too much heat would be applied and the material would be subjected to unnecessarily high temperatures."

So that neither of these things happen, the motor that transports the cards through the fusing unit must run absolutely evenly. This is implemented at this point by a so-called flat rotor motor that is only 7 mm long, the FAULHABER DC motor 2619. An integrated speed controller ensures that the speed is consistent and its high output torque also ensures

The imprinted plastic or metal marker travel through a fusing unit with infra-red radiators and are exposed to a defined temperature for a few seconds.

that there is uniform power output even under load. Together with the 12 mm long gearhead, the entire drive measures less than two centimetres – a crucial advantage since a lot of technology is housed in the smallest space in the housing of the special printer. The length of the drive would be two to three times longer with conventional technology.

Perfect speed control

At the beginning of a print job, a multcard containing up to 200 individual labels falls out of the integrated magazine onto a conveyor and is transported into the start position before printing. "Previously, we used a simple motor at this point for this short transport whose speed could fluctuate by up to 20 % of the set point. This deviation was extremely difficult to be compensated for. Thanks to a new motor from FAULHABER, we can now save ourselves this effort and additional adjustments during transportation is no longer needed."

The already mentioned motor from the fusing unit also synchronises the transportation of the cards through the print unit. The requirements there are quite similar as in the fusing unit. The start position is checked during referencing, the card in the print unit advances and printing starts.

"Material and labels are precisely placed by referencing", explains Michael Gockel. "So that the print head always reaches the correct position, transportation of the multcard must be carried out absolutely precise."

The coupling of print unit and fusing unit, that previously had to be separately controlled, now functions without problem since the two identical motors for the "printing and fusing" areas ensure that there is a smooth transition without further support. "Their performance data is integrated into the control software", explains the development manager. "Reliable function of the drive makes each additional control or program adjustment redundant – they automatically run synchronously."



DC-GEARMOTOR

Series 2619...SR IE2-16
Ø 26 mm, length 19.2 mm
Output torque 100 mNm



The already mentioned motor from the fusing unit also synchronises the transportation of the cards through the print unit.



Customer-specific modification

Experts from FAULHABER were also involved with the development of the PJA. They did not just provide the usual detailed advice and application-specific design of the drive. "So that it is perfectly suited to the printer, we did some modifications to the motor", reports Thomas Kraus, who supervised the project at FAULHABER. "Among other things, we adapted the connector and the stranded wire, fitted the cable with a strain relief, modified the length of the motor output shaft and fitted a surface to it for attaching a wheel. Furthermore, we have re-parameterised the control board and adjusted the control frequency to get the best possible concentricity. The unit therefore provides an integrated speed control function which, for example, ensures that the plastic and metal cards, which have different weights, are always consistently transported at the correct speed." Michael Gockel remembers the technical exchange well: "The collaboration was very intensive and extremely successful."

PERFECT SPEED CONTROL

FURTHER INFORMATION

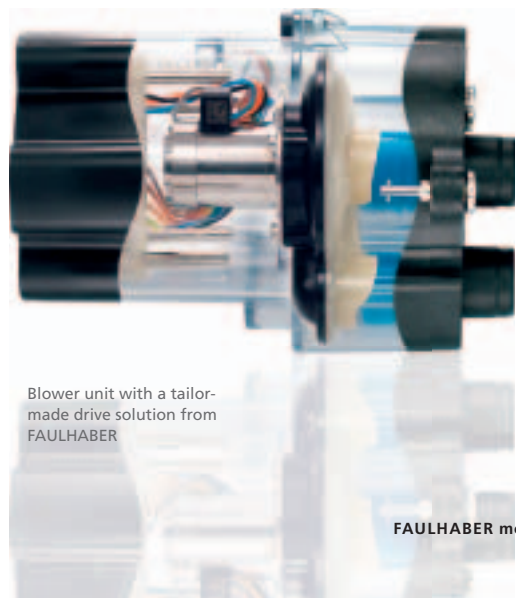
Weidmüller Interface GmbH & Co. KG
www.weidmueller.de

FAULHABER Germany
www.faulhaber.com



AIR _{IS} life

There are many experiences we would happily do without. Operations under general anaesthetic and with artificial respiration are definitely one of them. Compared with previous generations, we have a crucial advantage as medical technology has been developing at breath-taking speed in the last few years. In this way anaesthesia and ventilation systems make a major contribution to making the anaesthesia that is needed for operations safer and gentler. Perfectly-tuned drive solutions play a key role for these demanding systems.



Blower unit with a tailor-made drive solution from FAULHABER



Anaesthesia machine makes the entire spectrum – from sophisticated ventilation therapy to the monitoring, integration of infusion technology and automation of sub-functions – possible with a single system.



A typical example of the performance capability of modern medical technology is provided by the Zeus Infinity Empowered (IE) anaesthesia machine from Dräger which makes the entire spectrum – from sophisticated ventilation therapy to the monitoring, integration of infusion technology and automation of sub-functions – possible with a single system.

Interchangeable and sterilisable turbine unit

With a turbine ventilator, the device can also be operated as a closed anaesthesia system with full rebreathing. The precise metering of the anaesthetic gas in the closed system reduces the uptake of the gas and anaesthetic. In addition, the turbine-based ventilation allows the patient to breathe freely (spontaneous breathing) at all times. Both adults as well as children and newborns can therefore be adequately ventilated through the entire anaesthesia. The turbine unit, often identified as a blower unit, can be exchanged with ease when necessary and is autoclavable, i.e. it is sterilised after intensive treatment with hot steam at 134 °C.

However, high demands are put on the used components as the turbine, drive and co. must withstand the hot steam. The choice of material is in no way trivial. All components installed in the turbine unit may only be made from biocompatible materials as they come into direct contact with the breathing air of the patient. Furthermore, compact dimensions are required so that the unit can be well integrated into the anaesthesia machine and is easy to handle when replacing and cleaning. A high power density for the motor used is also necessary – in addition to biocompatibility and reliability.

Challenging requirement profile

These requirements cannot be realised with “off the shelf” components. “We have finally found a competent partner for the development of the turbine unit for our Zeus IE in FAULHABER who have won us over not only with their technical knowledge of drives but also their system expertise,” rejoices Torsten Theede, Global Commodity Manager Electronics at Dräger. “During development, we worked together very closely from the beginning and now the specialists from Schönaich provide us with the entire ready-to-install unit which consists 100 % of components that have been specially tailored to our application.”

The blower unit offers a brushless DC-Motor as a basis for the drive. The motors from the FAULHABER program are designed for extreme operating conditions and are therefore happily used anywhere where high reliability, precise function and a long service life are demanded. Typical features also include very smooth-running operation, low audible noise, high performance and dynamics in a compact size. Nevertheless, the drive that was needed for the blower unit still posed a major challenge to the developers: after all, a little powerhouse was needed that accelerates in milliseconds and slows down again just as quick. “This is important so that the patient is not forced to breath against the machine,” explains Theede. “The blower unit and with it the drive must therefore react extremely quickly and precisely.”

The little powerhouse with special features

The challenges have been met and the result is impressive. The tailor-made brushless DC-Motor for the blower unit is housed in a robust stainless steel housing and is only 24 mm in diameter and 46 mm long. Still, to come to the desired performance data, the magnets and sheets used had to be optimised. That only biocompatible lubricants and adhesives could be used and the entire unit must be autoclavable, made the selection of material a challenging task. For example, when selecting the ball bearings, the developer worked together with external special-

ists in order to find the optimal material pairing with biocompatible lubricants for extremely high speeds.

The system is also impressive from a mechanical point of view: the impeller pump, which generates the air current, is mounted directly onto the motor. The electrical connections are embedded into the external casting compound. Furthermore, an EPROM has been integrated into the casting compound from which the drive history and even the number of operating hours performed can be read, if necessary, in addition to the series number. The signals from the Hall sensors integrated into the motor are processed by the primary system controller which actuates the motor according to the anaesthesia and ventilation requirements.

The entire blower unit has a diameter of 120 mm and only is 220 mm long. "It has since performed very well in practical use," rejoices Theede. "Collaboration has continued and the turbine unit for our Perseus A500 anaesthesia work station also originated from working together with the drive specialists from Schönaich. This system also offers sophisticated ventilation strategies which support the spontaneous breathing of the patients at all times and has also been employed successfully in many clinics for several years. "Of course, the tailor-made drive solution of the blower unit also contributed to this", concludes Theede.



With the Perseus A500 from Dräger, anaesthesia work stations can be precisely configured so that it optimally supports the work procedures



Forward-looking ventilation for anaesthesia

FURTHER INFORMATION

Drägerwerk AG & Co. KGaA
www.draeger.com

FAULHABER Germany
www.faulhaber.com

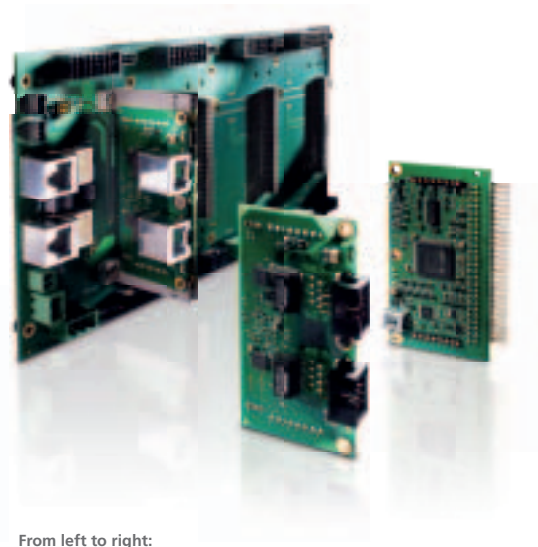
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“Feel THE POWER”

OF A NEW GENERATION



Drive technology plays an important role within the context of networked industry, after all, automation is not possible without a “driving force”. The new approach has far reaching consequences particularly for control technology: decentralised intelligence, capacity for real-time communication with higher level process control technology, maximum compatibility regarding the drive technology used as well as maximum flexibility and scalability with the application areas are the primary requirements of today. FAULHABER has taken appropriate action and developed a new generation of motion controllers which leaves nothing to be desired in this respect.



From left to right:

Standard Motion Controller in housing and with plug connectors

Motherboard with four slots for controller MC 5004

Board version of the Motion Controller for direct installation into the customer application

The new Motion Controllers of generation V3.0 from FAULHABER are versatile, highly-dynamic positioning controllers. Not limited to, but perfectly optimised for the FAULHABER drive program, it extracts the maximum from any FAULHABER drive – whether DC-micromotors, brushless motors or Linear DC-servomotors. However, what exactly does the new generation of controllers represent?

Wide product range

As the tasks and operation environments of micro motors and controllers are very complex and varied, there are three different device variants for market launch: The MC 5005 and MC 5010 motion controllers with housing and plug connectors are designed for use in switch cabinets or in devices. The MC 5004 variant is designed for use in existing housing as an open plug-in card. In combination with an optionally available motherboard, this variant as an engineering tool makes it easy to get started in multi-axis applications.

Furthermore, the new generation is available for use directly in the automation environment as well as an integrated variant in the form of a complete drive solution. The compact Motion Control Systems from FAULHABER combine powerful servomotors and intelligent control technology in the smallest possible space. A sophisticated modular system makes it possible to combine the new Motion Controller with diverse brushless DC-servomotors in a standardised housing that fulfils the requirements of protection classification IP54 with an optional

sealing ring. Already pre-assembled, these Motion Control Systems are connected via round connectors as per industry standards.

High degree of functionality

Two encoder interfaces are now available as standard and can be connected to the optical and incremental encoder, absolute encoder or the digital and analogue Hall sensors in the motor. In addition, analogue or PWM signals can now also be used as position and speed feedback. The Motion Controllers of generation V3.0 already offer at least three digital inputs, two flexible analogue inputs and two digital outputs which can also be directly actuated by the holding brakes.

Another reference encoder for positioning settings (gearing mode) can also be connected via the inputs or a pulse/dir signal for setting the position.

Motion Controller Generation V3.0

Motor supply:	0 to 50 V
Voltages for the electronics supply:	between 12 and 50 V
Continuous current:	max. 10 A, whereby peak currents of up to 30 A are possible
Speed range:	0 to 30,000 rpm (motors with sinus commutation) 0 to 60,000 rpm (motors with block commutation).



Motion Control System
with integrated motor and controller

Alternatively, the movement of the drive can be synchronised to an ongoing movement via the reference encoder and the touch-probe input. Setting the PWM setpoint is possible via field bus, USB interface, discrete inputs or sequential programmes. Thereby, up to eight sequential programmes written in BASIC can be saved in the motion controllers; one of which can be selected as an auto-start option.

Simple start-up

Special attention has been placed on simple start-up of the new Motion Controllers. Significantly improved user software is therefore available; the electrical connection is made easier by a consistent plug concept and a comprehensive selection of cable accessories. There is a new more powerful yet easy to use programming environment for the applications and autarkic usage areas without a higher level controller. Furthermore, hardware and software offer further possibilities when necessary and can also be adapted to customer specifications.

Motion Manager version 6 is presented with a fully new "look and feel" that can be downloaded from the FAULHABER's website for free. Familiar functions such as the graphical analysis of internal signals have been further developed. A software oscilloscope for processes directly in the controller as well as many other functions via graphical dialogues are now also available. Initial start-up is completed within five minutes due to the assistant functions for connection establishment, motor selection and controller configuration. Further graphical dialogues support the user with the fine-tuning of the application and when testing the different operating modes. Diagnostic functions make continuous monitoring of

the drive possible. Operating procedures such as for start-up or for periodic tests can be automated via Visual Basic. Project administration is also new which combines the settings and data of a new drive into one project file and thus simplifies versioning and maintenance.

Optimally networked

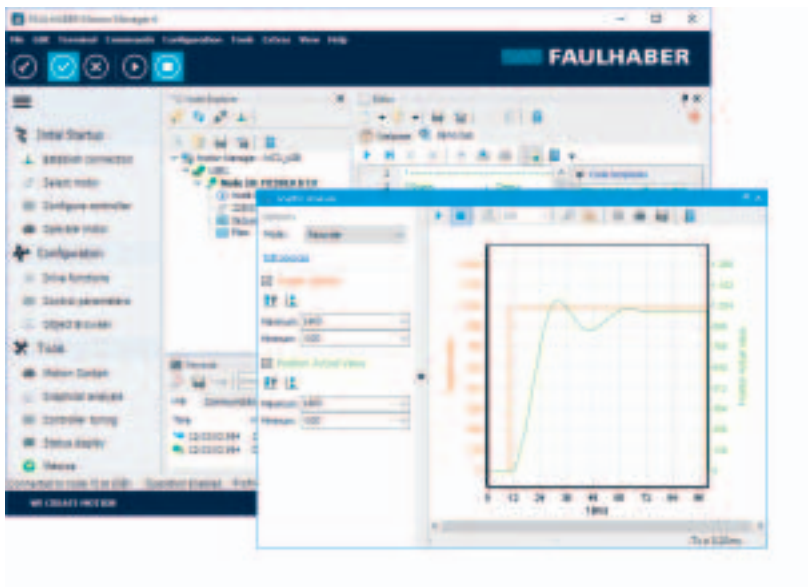
Also in regards to communication, the new Motion Controllers leave nothing to be desired. A total of four interfaces are available for different tasks. For example, configuration occurs via an USB interface. RS232 and CANopen are provided as standard field buses for connection to the automation technology. In addition, EtherCAT with CoE (CANopen over EtherCAT) is now also an option. The following applies: all functions and operating modes are available via all interfaces and the configuration is based on the CANopen servo-drive profile (CiA 402). The cyclic modes CSP, CSV and CST from the CANopen / EtherCAT environment that are normally used for synchronised operation of multiple axes are also supported when doing this.





The project team (from left to right):

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New Motion Manager 6 with a completely updated user
interface and many new functions

FURTHER INFORMATION

FAULHABER
www.faulhaber.com/mc/en

A NEW ROOF that does THE BUSINESS



FAULHABER puts first solar power system into operation

The sun is an impressive energy source: every year it radiates up to 10,000 times more energy onto the Earth than the world's population requires. Photovoltaic systems use this light energy and convert it in an environmentally friendly way directly into electrical energy. FAULHABER is now also focussing on the power of the sun for generating power at Schönaich.



The technicians at revotec energy GmbH from Leonberg installed 576 individual modules onto the FAULHABER GmbH roof on a surface of 928 square meters in autumn 2015. That is about the size of three and a half tennis courts. The modules are elevated on the flat roof at an incline of 10° and thereby cannot be seen from below. One half of the modules is aligned to the east (92°) the other half to the west (272°). Unlike before, east-west alignment is preferred to south-facing alignment, because experience has shown that the yield is better with this arrangement.

100 percent for our own requirements

The generator energy is 147,339 kilowatt hours per year. This is the equivalent of the average annual consumption of 30 four-person households in Germany. 100 % percent of the energy generated by this first photovoltaic system at Schönaich is used for our own requirements. The proportion of overall power consumption that is covered by solar power within the company is 5.9 % at the infeed point in buildings I and II. Factor in all three buildings at Schönaich and this comes to 4.3 % of total power consumption from the new system.

Focus on climate protection

Reducing harmful CO₂ emissions and make sparing use of energy sources are among the guiding principles of FAULHABER's sustainability strategy. The company implements this of its own volition and in a conscientious way. This already applies to product development: because FAULHABER drive systems have high efficiency at low energy requirements and thereby contribute to climate protection. And furthermore, the entrepreneurial actions of FAULHABER are characterised by the desire to continuously and actively improve environmental protection. The certification of the environmental management system in accordance with ISO 14001 emphasises these claims. As far as concrete implementation is concerned, this means maintaining material and energy efficiency

Overview of the specifications

Individual modules: 576

Surface area: 928 m²

Generator power: 161.28 kWp

Generator energy: 147,339 kWh/year

Proportion of internal consumption: 100 %

CO₂ emissions prevented: 88,341 kg/year

928 m²

576
MODULES



147,339 kWh/year



during production, exploiting the potential of recycling and also taking environmental aspects into consideration in the infrastructure of the production facilities.

88 tonnes of CO₂ are cut

Since the flat roof of one of the buildings at FAULHABER was due for renovation, it seemed logical to find a forward-looking solution which also included climate protection. Over 88,300 kilograms of CO₂ emissions can be cut every year with the new photovoltaic system. Furthermore, the system's interface modules are designed in such a way that a possible extension onto the adjacent roof can be connected up. A monitor in FAULHABER's reception area informs employees and guests about the system's current performance data and the amount of electricity that has been fed in since commissioning.

FURTHER INFORMATION

revotec energy GmbH
www.revotec-energy.de

FAULHABER Deutschland
www.faulhaber.com/de/de/ueber-faulhaber/sustainability

PREVIEW

FREE CLIMBING with SAFETY



A belayer is essential for survival when working at dizzying heights or in climbing sports - but not anymore! With the Electronic Partner for Individual Climbing, "EPIC", state-of-the-art drive technology is finding its way into the fall protection area. The SKYLOTEC EPIC, the product's full name, powered by AUROCO, is the first fully-automatic system which makes it possible to climb without a belayer. It is revolutionising safety of industrial climbers, such as high-bay warehouses, container ports, on wind turbines as well as in climbing sports. Look forward to finding out more about why innovative FAULHABER technology has been relied on from the prototype to the series manufacturer of the battery-operated and portable SKYLOTEC EPIC in the next issue of motion.



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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