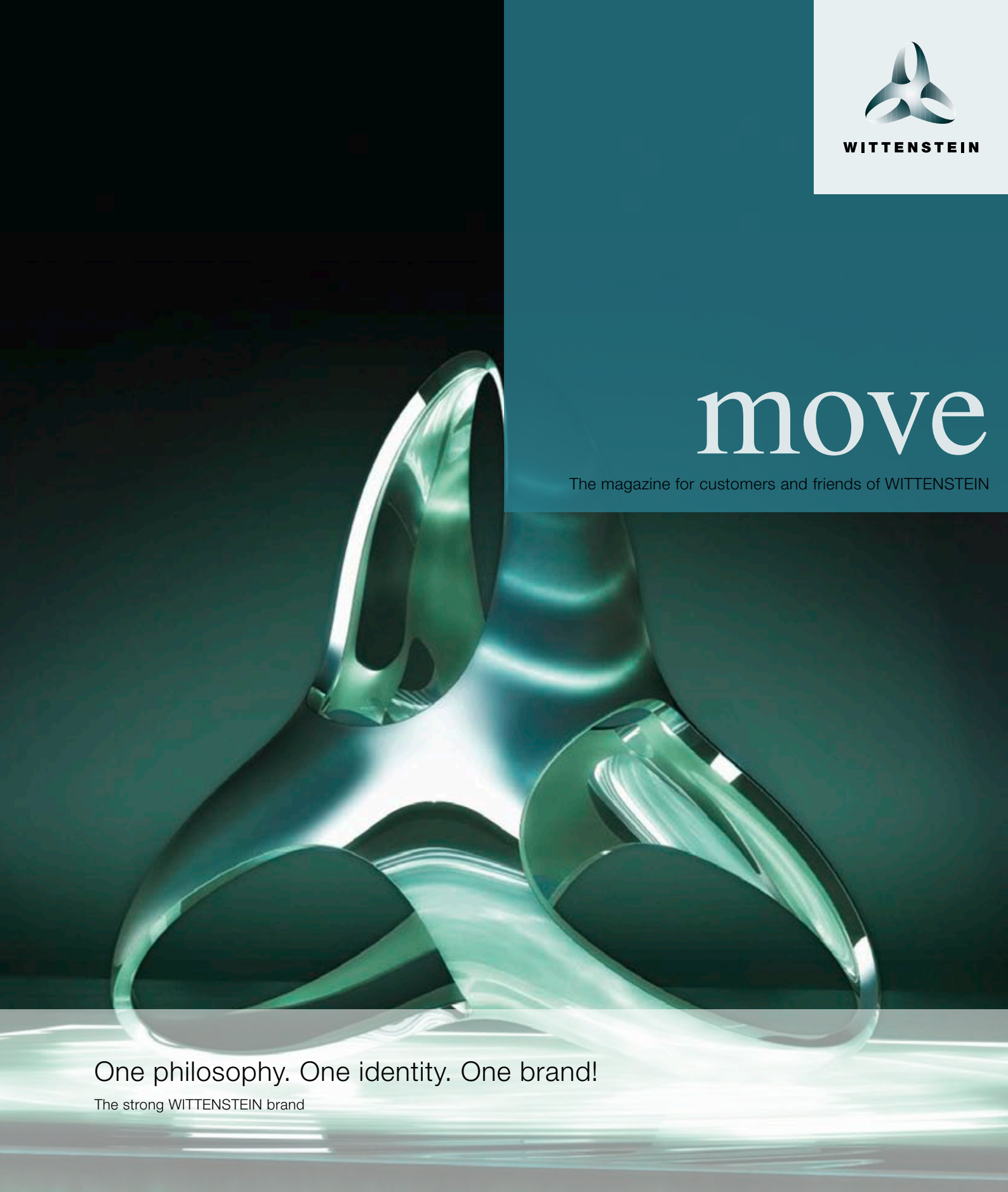
WITTENSTEIN

# move

The magazine for customers and friends of WITTENSTEIN



## One philosophy. One identity. One brand!

The strong WITTENSTEIN brand

1 July · 2008

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## Masthead

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## Content

# Dear readers,

Welcome to the first issue of „move“, our new customer magazine that will help us broaden and deepen our relationship with the many partners and friends of the WITTENSTEIN Group. „move“ will take the place of the old „alpha newsletter“, which some of you have been familiar with for years. The title „move“ was chosen to reflect our core competence: „intelligent drive systems“. This new magazine will keep you regularly informed about the varied fields in which the companies of the WITTENSTEIN Group operate. Our high-tech products are in action all over the world wherever systems and parts have to be driven and controlled with utmost precision – from machine building through aerospace to medical technology. You profit from a wealth of experience encompassing all aspects of mechatronic drive technology that we hope will provide you with interesting food for thought. As a globally successful enterprise whose products perform reliably and precisely in countless blue chip applications, we are aware of our immense responsibility. We keep a keen eye on the future in our everyday lives, thinking and work. Together with the other four values of our company philosophy – trust, openness, innovation and change – our tradition of responsibility forms the basis for our corporate principles.

For us at WITTENSTEIN, „being one with the future“ is not an empty slogan but a maxim that we constantly strive to embody in our relationship with customers and suppliers. With effect from July 1, 2008 the WITTENSTEIN Group and all Business Units will operate under a single umbrella brand: WITTENSTEIN. The standardised logo and the new company colour will underline – both internally and externally – the rich diversity of our portfolio that will in future be integrated under a common corporate strategy. We would like to take this opportunity to emphasise that we are not restructuring the company group. Our number one priority are still our customers – they always have been and they always will be.

On this note, we look forward to continuing our fruitful dialogue with you in an environment of mutual trust as the foundation for our shared success. I wish you pleasant reading with the new magazine.

Karl-Heinz Schwarz
Spokesman of the Board of WITTENSTEIN AG

# **One** philosophy.
# **One** identity.
# **One** brand!

We are all WITTENSTEIN:
on July 1, 2008 our company acquired an internationally standardised brand identity. All Business Units and worldwide subsidiaries will in future be united under the WITTENSTEIN brand. When WITTENSTEIN AG, headquartered in Igersheim-Harthausen (South-West Germany), was established in 2001, the foundation was laid for a globally operating corporate group – an ambitious project that is now being taken an important step further.

The transition from a set of individual company brands to a globally standardised identity with strong Business Units and subsidiaries is a logical result of our Group's increased convergence and muscle. With some 60 subsidiaries and agents in 40 countries around the world, WITTENSTEIN is uniquely identifiable with its claim „WITTENSTEIN – being one with the future".

This claim embodies a lofty goal – a company that aspires to be one with the future must contemplate tomorrow's solutions today! We believe we are firmly on the right road.

**Fit for the world market**

The standardised brand identity will fit our company for the world market and the central challenges of the future. Manfred Wittenstein, President of WITTENSTEIN, has made his name synonymous with excellent precision and innovative products: „Our aim is to demonstrate how every single WITTENSTEIN product is the outcome of several decades of experience and development work that today profits all Business Units. Our know-how and our core competencies are pooled in a common development and production platform. We leverage these synergy effects to the benefit of our customers."

Manfred Wittenstein is also President of the German Engineering Federation (VDMA) – and hence the top representative of one of Germany's leading branches of industry. The umbrella association for more than 929,000 jobs and sales of 195 billion euros in 2007, VDMA is the country's biggest industrial employer.

**New names – familiar services**

With effect from July 1, 2008 the WITTENSTEIN subsidiary alpha getriebebau GmbH, established in 1984, will be known as WITTENSTEIN alpha GmbH.

Our six other Business Units – WITTENSTEIN electronics GmbH, WITTENSTEIN motion control GmbH, WITTENSTEIN cyber motor GmbH, WITTENSTEIN intens GmbH, WITTENSTEIN bastian GmbH and WITTENSTEIN aerospace & simulation GmbH – will keep their existing names but appear in the new corporate colour under the standardised WITTENSTEIN logo („three wings"). Also from July 1, all international subsidiaries will be renamed WITTENSTEIN (plus the legal form for each country, for example WITTENSTEIN S.P.A. in Italy instead of the present alpha riduttori s.p.a.).

WITTENSTEIN

WITTENSTEIN | alpha

WITTENSTEIN | electronics

WITTENSTEIN | motion control

WITTENSTEIN | cyber motor

WITTENSTEIN | intens

WITTENSTEIN | bastian

WITTENSTEIN | aerospace & simulation

**Products for challenging applications**

Our products are in action wherever systems and parts have to be driven and controlled with utmost precision. High-precision planetary gearheads, complete electromechanical drive systems and AC servo systems and motors, to name but a few, are developed, produced and marketed by more than 1200 employees in every corner of the globe. The products sold by our seven Business Units are typically used in robotic systems, machine tools, the packaging industry, materials handling and process engineering, Formula One racing, paper and printing presses, medical technology and aerospace.

**The mainstays of our success**

Acknowledged technological expertise and a tradition of innovativeness are the mainstays of our company's success. With our fundamental orientation towards intelligent, mechatronic drive systems and a blend of micro and macro technologies, we will continue to develop our core know-how and competencies. Our company is a setter and promoter of trends in the development, production and marketing of components. 85 percent of all WITTENSTEIN products sold are less than five years old. Every tenth euro is spent on, and 12 percent of employees engaged in, research and development.

**Satisfied customers worldwide**

It is our declared objective to make our customers even more successful. We tirelessly endeavour to justify the trust they place in the pioneering technical expertise, total reliability and premium quality of WITTENSTEIN services. As an innovative mechatronics specialist, we owe this success in no small part to our first-rate team of employees spanning roughly 60 locations and agents all over the globe.

Without their enthusiasm, dedication and know-how, all past and future achievements of our young and dynamic company would be unthinkable. We promise to uphold our commitment to being a world class global partner for the customers of our intelligent mechatronic drive technology, servo systems and components in the years to come.


IDUNA
und Finanzen
Herzlich willkommen
SIGNAL IDUNA

# RoboKeeper

## Qualified for Euro 2008 – WITTENSTEIN alpha‘s drive technology adds fuel to the goalkeeper debate with a new name

Report: Andreas Kaiser I Photo by courtesy of 4attention

Imagine the following situation: as manager of the German national team, you are lucky enough to be able call up a goalkeeper who not only saves almost any penalty on the line but never loses his cool or utters a critical word. Wouldn‘t that be a fantastic position to be in? Believe it or not, this perfect goalkeeper really does exist! And his inimitable reliability and speed are thanks to WITTENSTEIN alpha technology. RoboKeeper is a highly acclaimed sports personality. And the secret of his success was finally revealed following a tough test of his performance at the Ideas Expo in Hanover in October 2007: RoboKeeper‘s virtual invincibility – and his formidable reputation as the world‘s best penalty killer – is attributable in no small part to the TPM+ drive concept developed by WITTENSTEIN motion control (WMC).

The 6’5” tall RoboKeeper has none of the airs and graces of his star colleagues and never gives anything less than his all in the game. He dives into the far corner of the goal in just 0.3 seconds and holds balls coming at him at speeds of up to 65 mph. He has already demonstrated his speed at numerous football matches, sports fairs and events.

More information:
**www.robokeeper.com or www.fraunhofer.de**

# **TPM+** –
# the heart of the RoboKeeper

In the course of this nine-day event, the „ace keeper“ – who measures six foot five from his fingertips to his toes – faced a total of 8000 would-be scorers, among them Lower Saxony state premier Christian Wulff and Federal Minister for Family Affairs Ursula von der Leyen. Out of 10,000 shots at goal, RoboKeeper let in just 500.

**Fast and precise thanks to TPM+ and engineering support**

This unprecedentedly fast and precise goalkeeper was developed and built by the Fraunhofer Institute for Material Flow and Logistics (IML) in Dortmund. The research team was advised and supported regarding the engineering for the complete drive unit by alpha sales engineer Andreas Kaiser of our Engineering Office West in Oberhausen. Thomas Nied, an experienced solution architect at WITTENSTEIN motion control, steered the drive to maximum dynamic performance by optimising the traverse profiles and the parameter settings in the field.

**Motor/gearhead combination is the key**

RoboKeeper is basically an outsized Tipp-Kick figure mounted on a gearhead/motor combination. Above the goal are two cameras that recognise the ball and follow its trajectory. Using this data, the image processing software calculates the ball‘s probable point of entry into the goal. It sends this information to the motor control, which turns the goalkeeper to the angle required to save the shot. All this takes place in a fraction of a second – if the penalty shooter kicks the ball hard, it can easily reach a speed of 65 mph, equivalent to about a hundred feet a second. It covers the 36 feet to the centre of the goal in just 0.4 seconds and needs only marginally longer (0.42 seconds) to complete the 38 feet to either of the top corners. RoboKeeper‘s working conditions are even more difficult than usual, however, because the distance between the penalty spot and the goal is no more than two or three yards, depending where he is standing.

**WITTENSTEIN as sole supplier**

These figures clearly illustrate the dynamic requirements the system – including the servo actuator, of course – has to meet. A mere 0.3 seconds are all that is available to move the fifteen-pound goalkeeper, comprised of a foam body and an aluminium spine, into the right position.

WITTENSTEIN was the only supplier capable of delivering the motor/gearhead combination (TPM+ 110 with a ratio of 61) necessary to turn RoboKeeper into a true “penalty killer”. The performance displayed by the image processing computer is no less impressive: each of the two cameras takes a staggering 60 photographs a second. Five images, which the software evaluates in a tenth of a second, are needed to calculate the ball‘s trajectory. The motor starts to turn just 50 milliseconds (0.05 seconds) after the kick has been delivered. It reaches its final speed (33 mph at the fingertips) 0.07

seconds later. This acceleration is 17 times faster than that of a Formula One racing car. The time to brake the motor from maximum speed to standstill is exactly the same, namely 70 milliseconds.

All in all, the robot is 15 milliseconds faster than the ball. Put another way, RoboKeeper is ready and waiting when the ball is still 45 cm away from the goal line. With this kind of reaction speed, he would have no trouble saving pen-alty shots in the German Bundesliga.

**RoboKeeper versus Dédé**

Irrefutable proof of RoboKeeper's enormous talent was provided in a duel with Dédé, the Brazilian professional who plays for Borussia Dortmund. RTL documented this exciting challenge on nationwide television – interested customers are welcome to ask their responsible WITTENSTEIN alpha sales engineer for a copy of the video. To stand a chance of beating the robot, the ball must either cross the line spot on in one of the top corners or approach it at a speed of more than 65 mph – neither of which happens that often.

**Two years to develop**

It took almost two years to develop RoboKeeper, the idea for which was originally conceived during the last World Cup. "Research meets entertainment" was the motto of the development team, led by Fraunhofer IML Director Prof. Michael ten Hompel. Their efforts have meanwhile been rewarded by numerous enquiries from journalists and a packed diary for the new keeper. Amongst other things, he is due to feature in the European Football Championships (Euro 2008) from June 7 to 29, with several firm bookings at venues in Switzerland and Austria. His job won't be to boost one of the competing teams, however, but to take part in promotional and marketing activities.

His exclusive marketing rights are held by the sports marketing and event agency 4attention (www.4attention.de) in Cologne. And of course, RoboKeeper also has his own website (www.robokeeper.com), offering further useful information, details of his forthcoming match schedule and videos of his best performances.

**Award winning performance**

RoboKeeper does not only excel between the goalposts. Together with his creator, Andreas Kaiser, the high-speed robot won first prize in the "Application Award" competition at the "VII International WITTENSTEIN Sales Meeting 2007", when 150 sales engineers from around the globe paid a visit to Harthausen. High-tech from WITTENSTEIN alpha is more than simply dynamic and precise, in other words. It also has the stamina and fitness required for everyday applications – in modern machines or in the world's best penalty killer.

# FITBONE®

## Mechatronics drives bone growth

Report: Roman Stauch I Photos: WITTENSTEIN intens

**The FITBONE® intramedullary distraction nail corrects leg length discrepancies with mechatronic actuator / Internal synergy effects leveraged**

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**Miniaturisation, integration, network, intelligence** – WITTENSTEIN‘s MINI strategy is a motor for synergies, as modern medicine can testify. The world‘s only fully implantable FITBONE® intramedullary distraction nail with an integrated mechatronic actuator that is both adjustable and controllable – enabling leg length inequalities to be corrected precisely and virtually painlessly – is the outcome of collaborative efforts on the part of the Group‘s Business Units.

It was originally discovered back in the mid-19th century that bone length growth can also occur in adults under certain circumstances. This phenomenon, referred to as callus distraction, is based on the same principle as bone growth in children and adolescents. So-called growth plates, which are invaded by bone cells, form during the development phase between the joint pieces and the long bones of the upper and lower extremities. When growth is complete – generally around the age of nineteen – these plates close. The formation of bone tissue (callus) was initially observed by physicians several centuries ago as part of fracture healing processes. To prevent the legs from shortening due to muscular spasms following fractures of the long bones, special tensioning and fixing devices were invented way back in the Middle Ages. These paved the way for the first – though unfortunately vain – attempts to stimulate long bone growth with a view to correcting leg length discrepancies or deformities. The basic principle has remained unchanged to this day: the long bone is cut in two and fixed, so that an artificial growth plate – in which new bone tissue forms – remains at the site of fracture. However, it was not until the early 21st century that WITTENSTEIN intens, based in Igersheim (South-West Germany), succeeded in developing an implantable FITBONE® intramedullary distraction nail characterised by unprecedented, reproducible precision that facilitates virtually painless treatment of patients. The FITBONE® intramedullary distraction nail is born. In 1988, researchers at Ludwig-Maximilians University in Munich embarked on a project that would enable the advantages of callus distraction to be exploited without the drawbacks of external fixators. The FITBONE® intramedullary distraction nail is the only leg lengthening nail in the world with an integrated mechatronic miniature actuator that is both adjustable and controllable.

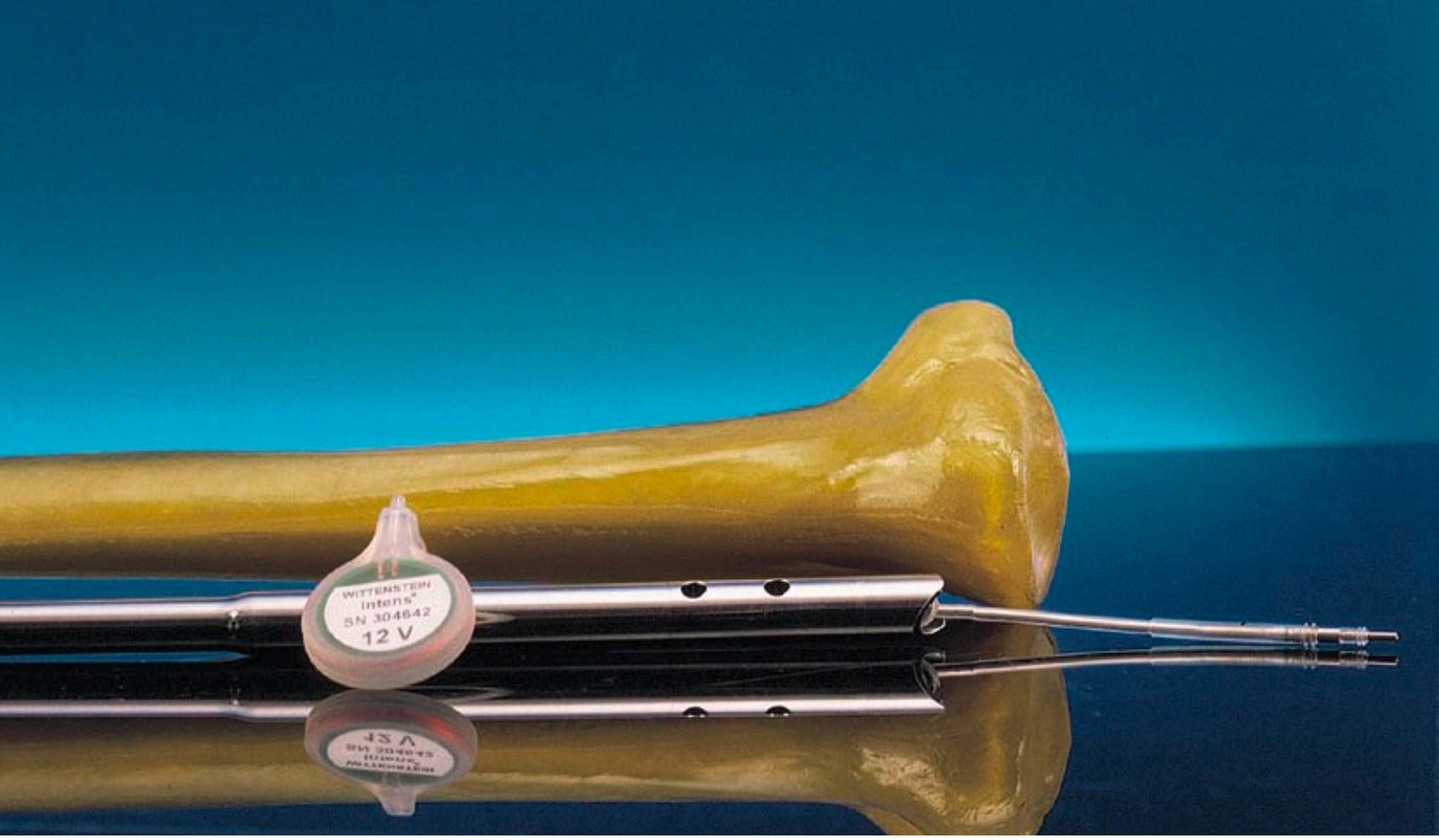
**Design and principle**

Since space is very restricted, the intramedullary distraction nail is designed with a high integration density and a corresponding degree of miniaturisation. It is nevertheless imperative that the FITBONE® can withstand the heavy loads that occur in the femur and tibia. During the distraction phase, almost the entire strain must be borne by the nail. The load on the implant is then gradually reduced during the consolidation phase until the newly formed bone has completely hardened. Translating requirements such as these into a fully functional product is one of the WITTENSTEIN Group‘s core

The following are typical indications for the use of the FITBONE® intramedullary distraction nail:

- Congenital leg length inequalities
- Leg length discrepancies due to an accident or trauma
- One-sided impaired growth
- One-sided abnormal growth
- Poliomyelitis
- Tumours / sarcomas
- Pseudarthroses

The intramedullary distraction nail is also used to treat two-sided growth retardation or dwarfism as well as to lengthen amputation stumps.




competencies. In this particular instance, expert know-how was pooled from the areas of actuators, electronics, sensors and software.

Located inside the FITBONE® – which has a diameter of 10 mm and an overall length of 245 mm (shorter versions have been realized as well) – are a miniaturised motor-gear-head combination, a planetary roller screw, a corresponding anti-rotation mechanism and the seal for the telescopic tube. The modular design permits easy adaptation to the installation space available in the bone as well as to the required distraction length. Femur extensions up to 85 mm and fibia extensions up to 65 mm can currently be achieved.
The „connection“ to the outside is established by coupling high-frequency power. The intramedullary nail is equipped with a receiver that is installed in the subcutaneous adipose tissue. The control unit – the remote station – contains a transmitter head. To connect the power supply and start the lengthening process, the patient simply places the control unit on the skin for a short time and couple energy.

The limits of miniaturisation have still not been reached. In the meantime, it would also be technically feasibly to integrate force and position sensors – including the necessary electronics – in the same space as the intramedullary distraction nail. The reciprocal exchange of information between the implant and the external control electronics takes place via a telemetric connection. Finally, the integration of the receiver aerial in the intramedullary nail simplifies not just the implantation itself but also the subsequent removal of the implant on completion of the treatment.

**Medical benefits and improved quality of life throughout the treatment phase**

The intramedullary distraction nail permits far more comfortable treatment than any alternative method. The risk of infection is almost zero. This minimally invasive surgery technique results in only small scars – also an advantage from a cosmetic point of view. The actual lengthening is practically painless.

The numerous advantages of this treatment method extend beyond purely medical aspects, however: the hospitalisation period after surgery is significantly reduced, so that re-integration into regular school, domestic or working life is possible at an earlier stage and with fewer problems.
Patients are able to wear their ordinary clothes, take a shower or bath and generally lead a more or less normal life. The only real restriction concerns the maximum load on the operated leg – and the need to take physiotherapy seriously.

Characteristics:
- No transcutaneous connection from the outside
- Wireless, transcutaneous power transmission
- Controllable bone lengthening
- No infections
- Good cosmetic result

**Treatment schedule for leg lengthening**

The operation is performed under general anaesthetic. The artificial fracture – the new growth plate – is then stabilised with the FITBONE® intramedullary distraction nail. The patient is able to get out of bed with help and manage a few steps on crutches only one day after the operation. On the sixth post-operation day the distraction phase begins. The patient receives precise instruction in the use of the microcomputer together with a personal treatment schedule. The FITBONE® actuator can be activated up to three times a day, depending on specific circumstances. The bone segments are normally moved apart at a maximum daily rate of one millimetre.

In addition to each patient‘s individual progress, active co-operation is the single biggest factor influencing the lengthening success. Strict discipline with regard to physiotherapeutic measures is vital along with personalised exercises to tension the soft parts – after all, the muscles, blood vessels, ligaments, tendons and nerves need to be extended too. Once the desired lengthening distance has been achieved, the leg lengths are measured exactly and any necessary adjustments carried out. The load on the leg can now be increased slowly but steadily. This phase inevitably depends on the length of the gap and the patient‘s individual healing progress. The mandatory removal of the implant is undertaken after around one or two years. A hospitalisation period of three to four days is envisaged. In Germany, the cost of FITBONE® treatment is usually financed by the social insurance system in medically indicated cases.

**Mechatronics helps young tumour patients**

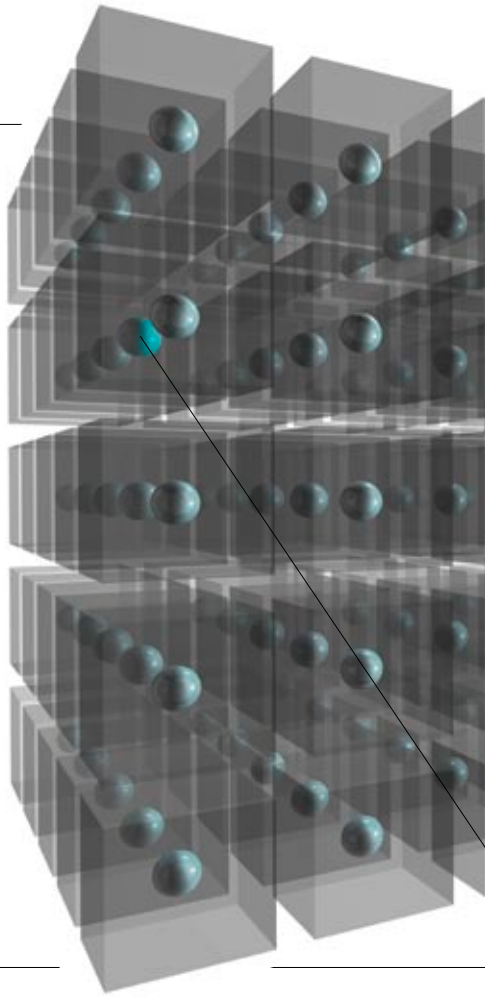
The most common form of malignant bone cancer among children and adolescents is the osteosarcoma. It mainly attacks the long bones in the legs or upper arms close to the joints. More than half of all cases diagnosed occur around the knee, with the result that the growth plates are also affected. Patients are treated with a combination of chemotherapy and the complete surgical removal of the infiltrated bones and surrounding tissue. Whereas amputations used to be almost compulsory, the use of special surgical techniques nowadays enables doctors to salvage the limbs of more and more patients. Assuming good progress is made, the patient can then be given an endoprosthesis. As soon as the healthy leg starts to grow again – usually after the chemotherapy has been completed – the length discrepancy compared to the operated leg becomes increasingly marked throughout the growth phase. Instead of compensating this inequality with a follow-up operation, relief can now be provided with another WITTENSTEIN intens product – the mechatronic growth endoprosthesis. The endoprosthesis developed in collaboration with implantcast GmbH, at home in the North German town of Buxtehude, and Munich Professor Rainer Baumgart is based on the proven distraction principle of the FITBONE® technology and does not lengthen the bone but the prosthesis. The telescopic lengthening device has a diameter of 16 mm and is suitable for distraction lengths from 50 to 100 mm.

Owing to the special design of the planetary roller screw, this endoprosthesis is exceptionally compact and short – an immense advantage for implantations. The treatment procedure is similar to that with the FITBONE intramedullary distraction nail. Leg length differences are corrected with the aid of a microcomputer in small, comfortable steps either ambulatorily or with a short stay in hospital. Ideally, if the patient makes good healing progress, the growth endoprosthesis can later even stimulate the callus growth of the remaining, healthy bone.

**Visions within reach**

The development work goes on – and our cooperation with expert partners continues to inspire new ideas and approaches. The newest projects at WITTENSTEIN intens concern novel applications in the field of inductive power and data transmission such as intelligent implants, „navigation systems“ for minimally invasive surgery and haptic feedback systems for robot assisted surgery.

# “Intelligent” calculation and sizing of drive trains with cymex® 3.1



**Newest version of the alpha sizing tool / 40 percent better performance achieved with broad knowledge base**

In the olden days, the only way for engineers to size and design different drive trains of servo controlled machines was to use complex mathematical formulae. Not only did this tend to be extremely time-consuming, it was also not particularly accurate owing to the difficulty of including multidimensional perspectives in an analysis of this kind. For the last ten years, design experts have profited immensely from cymex®, the sizing tool from WITTENSTEIN alpha GmbH, which handles these complicated tasks quickly, easily and reliably. The new Version 3.1 now also integrates the technical know-how of the entire Group as the basis for all calculations.

The problems associated with calculations of movement and load profiles increases parallel to their complexity. Traditional calculation methods fail to provide the necessary depth of detail. This is where cymex®, the drive sizing software, comes in: this tool allows you to determine and select the drive component design that is best adapted to the application at hand.

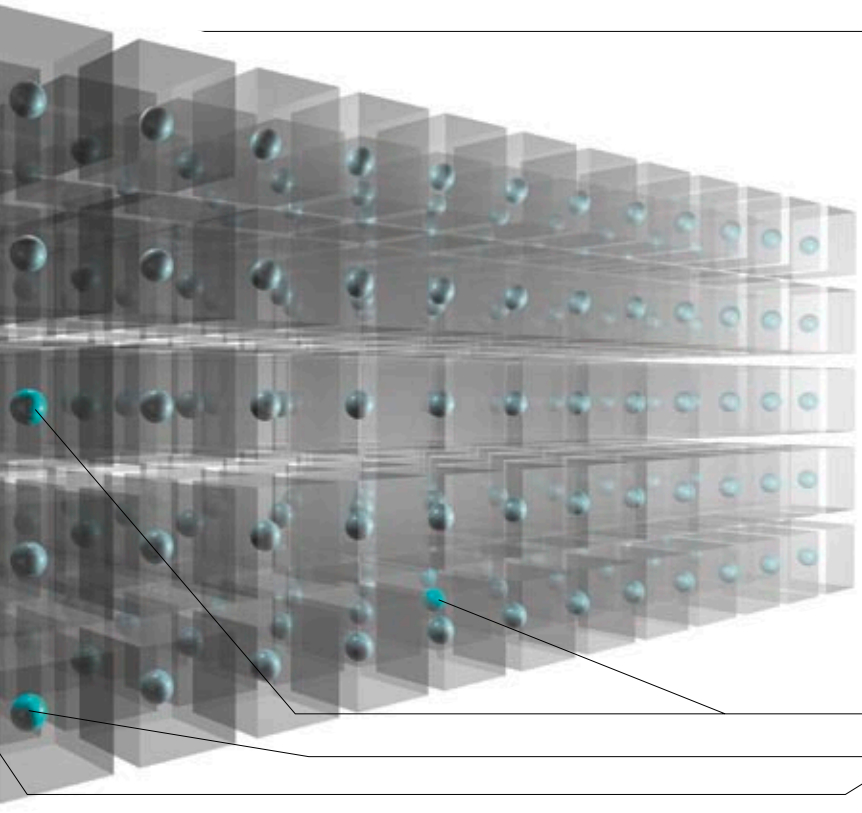
**cymex®: Proven yet brand new**

cymex® provides developers and designers with comprehensive support spanning every aspect of drive sizing. The system has been enjoyed a reputation as the ultimate solution in this area for more than a decade. Calculation and sizing experts praise the WITTENSTEIN alpha software tool above all for its high speed, intuitive operation and absolute precision. Sizing an application, motor and gearhead – in other words, the complete drive train of a machine – becomes child’s play with cymex®, and the effectiveness of their interaction can be easily assessed. Exact calculations are enormously simplified by standard applications. Belt, tape, spindle, rotary table and rack & pinion drives are predefined and can be skilfully integrated in the calculations in this way. Customer-specific parameters as well as any other important influencing factors are extensively considered, assuring not only a reliable and efficient design but also a perfect drive system.

One particularly interesting feature of cymex® is its scalability: from standard geometric alignments – which gearhead and which attached components best match my motor? – through the design of simple or complex movement profiles to optimised positioning accuracy or energy consumption.

**cymex® 3.1: “intelligent” software**

The newest version – cymex® 3.1 – has been enhanced even further and the label “intelligent” is certainly no exaggeration. The software combines the amassed experience of WITTEN-



cymex®, the innovative sizing software from the alpha stable, reduces routine work to a minimum and assures a maximum degree of innovativeness. cymex® 3.1 Motion Edition lets you design a complete drive train (application - gearhead - motor) quickly, easily and reliably with only a few mouse clicks.

With more than **7000 motors** from a variety of manufacturers, the cymex® database is the biggest library of its kind anywhere in the world.

**cymex®**

STEIN alpha getriebebau with specialist know-how in areas such as system simulation, FEM calculations, sensor technology and QA inspections as the basis for its sizing calculations. The design space for the gearhead load limits is thus simultaneously extended in several dimensions.

The outcome: **up to 40 percent better performance**, leading to increased reliability in drive train design, an improved power yield, smaller gearheads and greater cost efficiency. The value "T2Cymex" in the alpha catalogue is just one reflection of the sizing tool's unique importance.

**"Extended design space" offers key benefits!**

The significantly higher performance – up to 40 percent compared to the catalogue – speaks for itself. Owing to the multidimensional design principle, drive trains can be optimally and reliably sized regardless of the application. Using an offline CAD generator, 3D data of the motor and gearheads – including all attached components – can then be created in a matter of seconds and instantly imported into the design environment.

Users can reap the benefits of the world's biggest motor database with more than 7000 different types plus all alpha products like gearheads, bellows couplings and torque limiters. A wizard provides intuitive and systematic support for the selection of the most suitable components. Input modules for creating simple or complex movement and load profiles, an integrated bearing life and shaft calculation, predefined standard applications, functions for importing movement profiles from third-party programs and the documentation of all application and technical data in Word files with a few simple mouse clicks round off the impressive features of the cymex® software.

**Your chance to become a cymex® professional!**

Knowledge is useless unless it is applied. In the framework of the WITTENSTEIN Academy, WITTENSTEIN alpha clients are therefore invited to take advantage of special seminars on a broad range of drive engineering topics as well as on the use of our cymex® software. The portfolio covers everything from one-day seminars for cymex® novices to expert training for power users.

Customers and other interested persons wishing to enrol are requested either to get in touch directly with their usual contact at WITTENSTEIN alpha or to send an e-mail to Stefanie Klingert of the cymex®-Team at cymex@wittenstein.de.

# Just like in real life

Report: Michael Knoblauch I Photos: WITTENSTEIN aerospace & simulation

Active stick from WITTENSTEIN aerospace & simulation takes the place of conventional joysticks / Stress on pilots eased because dangerous situations are recognised faster

Modern joysticks can do far more than simply pass on information entered by the pilot. “Active sticks” – the name given to the latest generation – adapt to individual flight missions and can alert the cockpit to hazards reliably.

WITTENSTEIN aerospace & simulation GmbH‘s active stick was originally designed for use in flight simulators. In the meantime, however, this control unit – which has been optimised in cooperation with BAE Systems – also has so many advantages for real aircraft that the T-50 Golden Eagle, the South Korean supersonic trainer, has already been equipped with active sticks from the Igersheim stable.

**From virtual simulation to the real cockpit**

When a flight simulator simulates the real world, the real technology is traditionally transposed into the virtual training world. The simulation technology has therefore always aimed to be a map of the technology in the real aircraft. The development of the active stick has overturned this philosophy. The technology was initially realised by WITTENSTEIN aerospace & simulation specifically for simulation applications like this and gradually also gained acceptance in the cockpits of real training aircraft.

The way in which the reactions of each aircraft are passed on to the pilot via the active stick as flight computer feedback through flight models is particularly fascinating. It would not be exaggerating to claim that in this field an almost “historic” evolution has culminated in the active stick. Prior to the invention of servo assisted systems, the pilot used to feel the aerodynamic forces of the control surfaces directly on the joystick via control rods and cables. The above-mentioned servo technology, also known as “fly-by-wire”, was a further step in the development of flight control. The pilot no longer receives any direct mechanical feedback because the rudders are controlled by hydraulic actuators. The joystick is not connected to the rudders and is consequently a passive system featuring mechanical spring devices and a standardised force characteristic. It is not possible to simulate any aerodynamic forces with this control system, in other words. Fly-by-wire is the standard method of flight control in modern aircraft cockpits.The active stick takes this technology a crucial step further: since it can be explicitly programmed for a particular aircraft type, it can supply the pilot with (vitally) important additional information through different joystick movements.

The full benefit of the WITTENSTEIN control unit is revealed in high-end training aircraft. The joysticks of the two pilots can be programmed, and electronically linked, in such a way that all movements executed by the second crew member with the active stick in a fly-by-wire control system are directly communicated to both the instructor and the student. Master-slave applications (instructor-student function) in flight training can likewise be programmed without any problems. Various downloadable software programs can be adapted to the student pilot‘s actual skill level. The requirements can be increased accordingly as they acquire more practical experience. The reduction in weight and physical volume that results from dispensing with control rods is another advantage that ultimately also has a positive impact on the emissions produced.

**Continuous, systematic development since 1999**

WITTENSTEIN aerospace & simulation GmbH has been developing active sticks since 1999. They were initially employed in simulators for American combat aircraft. In the meantime, these sticks are also used in other simulators for fixed-wing airplanes and rotorcraft, for example in the US Army‘s AVCATT for training complex helicopter missions. Active stick systems are not just reliable and compact, in other words, but also extremely flexible. The fact an the active stick can be freely and reconfigurably programmed permits different action-reaction models: if a passenger aircraft veers off course, tripping a

vibration alarm on the stick, the pilot of another plane flying over the same area on a crisis mission is alerted to the danger by means of this vibration or similar haptic information. The active stick system is synchronised with the flight computer, enabling the pilot to concentrate on the most important task of all, namely flying. This system improves safety and saves lives in both civilian and military use!

The integrated technology with brushless motors and planetary gearheads in several different sizes, originally developed for robotics applications, is of course mainly intended for the high end of the market. However, the insights gained there also benefit all other WITTENSTEIN customers because the results can be applied to the series production of gearheads, servo motors and electromechanical drive systems, for instance. The potential of WITTENSTEIN aerospace & simulation‘s active sidestick is nowhere near exhausted. An excellent future awaits the system in many other cockpits all over the world – and the demand curve continues to rise at a steady angle.

# Anniversary in Belgium

Report: Anne Roels I Photos: WITTENSTEIN aerospace & simulation

This year WITTENSTEIN benelux (formerly alpha Benelux) exists 5 years. The subsidiary of WITTENSTEIN alpha which is responsible for the sales in the Netherlands, Belgium and Luxemburg was founded on the third of April 2003. In those 5 years the turnover almost doubled and the number of employees has risen from 2 to 7, (8 in the near future).

# WITTENSTEIN breaks into South-East European markets

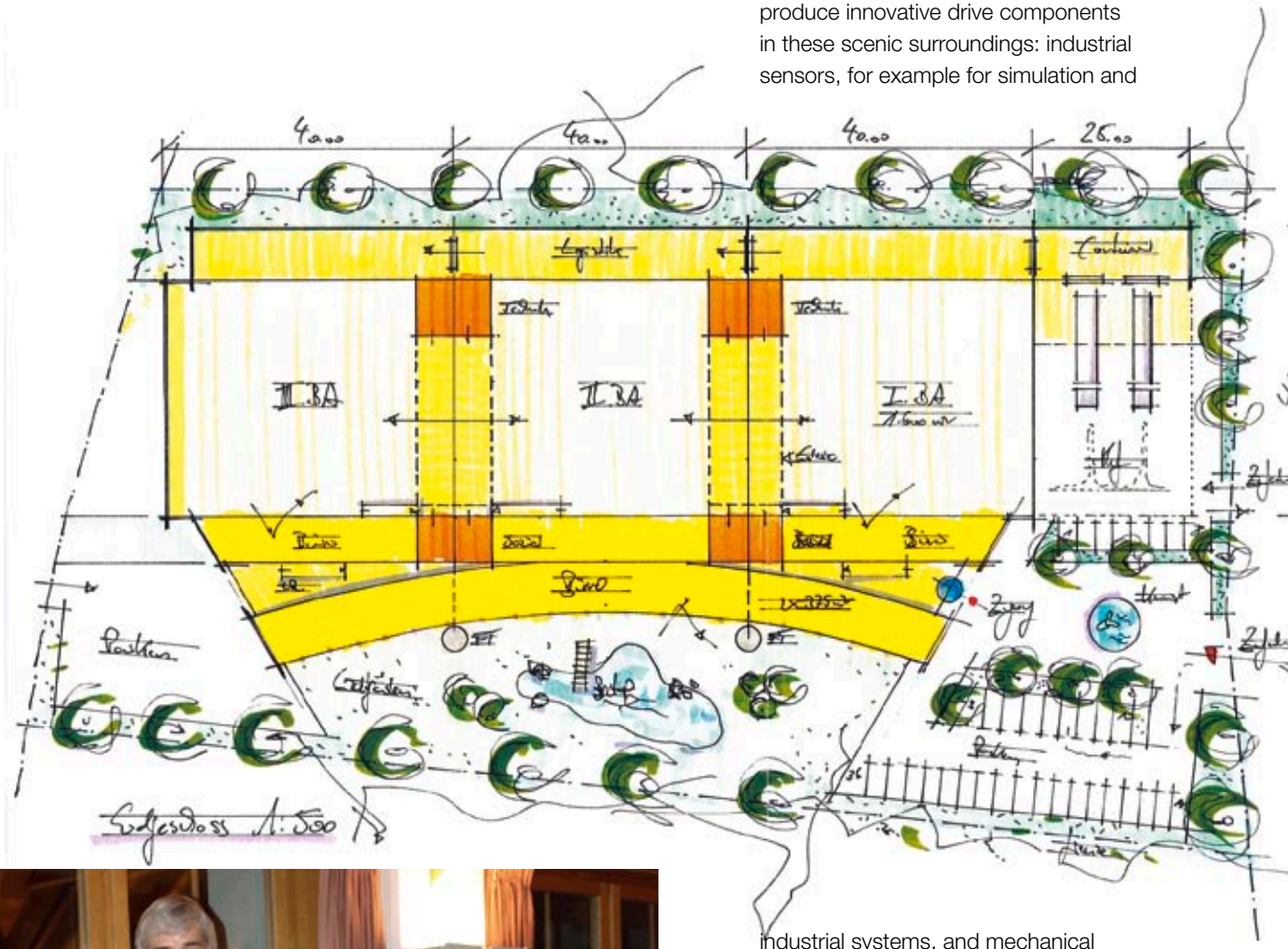
Report: Helmut Ortmeier I Photo: WITTENSTEIN transilvania


The inauguration of our new production facility in Sura Mica (not far from Sibiu) on June 19, 2008 marks the launch of operative business – the manufacture of drive components, initially with 15 employees – at WITTENSTEIN's Romanian subsidiary. From its Sibiu base, WITTENSTEIN aims to break into the lucrative markets of Eastern (Ukraine, Belarus) and South-Eastern Europe (Bulgaria, Turkey) and will systematically strengthen the site's role as a hub. Plans are already in the pipeline to extend the facility to an impressive 11,000 square metres in the next few years, with space for up to 400 staff. WITTENSTEIN will invest a total of 15 to 20 million euros in the „Sura Mica" industrial park, which is also known by the German name of „Kleinscheuern".

# Grüsch site set to expand

Report: Dr.-Ing. Anna-Katharina Wittenstein I
Photo: WITTENSTEIN schweiz

WITTENSTEIN AG's Swiss subsidiary is set to expand at its Grüsch site: there are plans to erect a new building measuring around 3000 m² on 35 acres of land by the end 2009. Up to 50 employees will in future develop and produce innovative drive components in these scenic surroundings: industrial sensors, for example for simulation and industrial systems, and mechanical drive components for machine tools and assembly robots. WITTENSTEIN intends to invest about 17 million Swiss francs at its Swiss location over the next five years. The company currently resides in INNOZET Grüsch, a centre for startup companies. As a worldwide centre of competence for sensor technology within the WITTENSTEIN Group, the Grüsch plant will develop, apply and market sensors and sensor components for simulation and industrial systems.



Delighted at the "green light" for the joint construction project (from left to right): Dr. Ulrich Gadient, Member of the Administrative Board of WITTENSTEIN Switzerland, Georg Niggli, Chairman of Grüsch Local Council, Dr.-Ing. Anna-Katharina Wittenstein and Manfred Wittenstein

# Hard treatment – the heat is on at WITTENSTEIN bastian

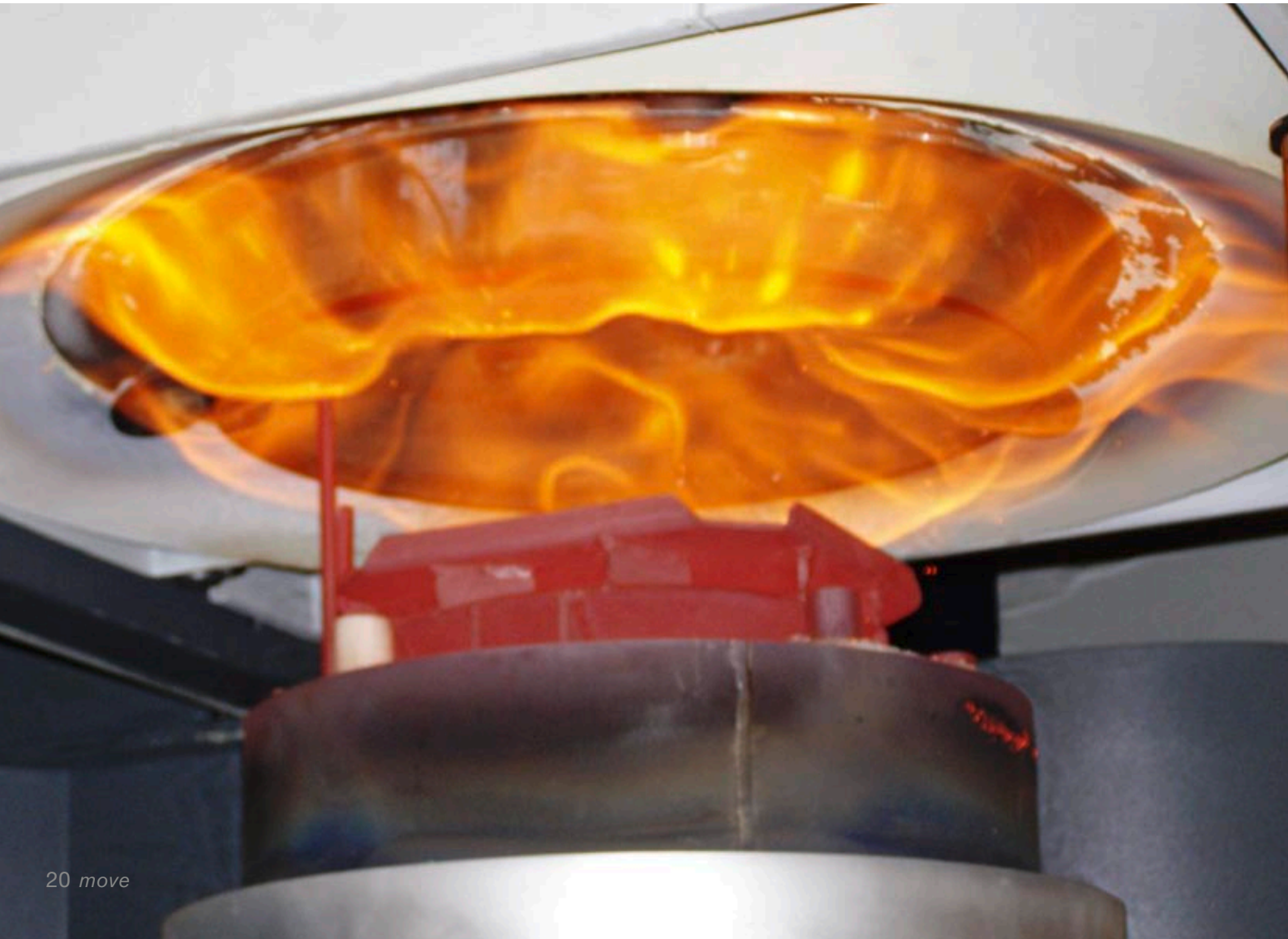
Report: Claus Stoll I Photo: WITTENSTEIN bastian

Another core process under the WITTENSTEIN umbrella / New heat treatment plant up and running since February

Another core process under the WITTENSTEIN umbrella / New heat treatment plant up and running since February. A new heat treatment plant went into operation at WITTENSTEIN bastian GmbH (Fellbach, near Stuttgart) at the beginning of February. As a result, one of the central core processes necessary to manufacture gearing parts can in future be carried out within the company. This increased degree of vertical integration will protect the continued high quality of our products.The extensive specialised know-how that is needed to harden gearing parts can now remain within the WITTENSTEIN walls, helping us maintain that all-important edge over our competitors. At the same time, however, the high quality stipulated for these parts can only be guaranteed if the hardening process – including heat treatment – is one hundred percent controllable.

**Two bell furnaces**

Series production takes place in two bell furnaces. The parts



to be hardened are initially enriched with carbon at 930°C, then cooled down again "abruptly" – in other words quenched – in a molten salt bath. They are placed on a kind of transport platform for this purpose and the electrically heated bell furnace is raised. The parts are subsequently heated to the temperature setpoint, enriched and quenched. Following this, they must be cleaned to remove any salt residues from the surfaces. In the final heat treatment step – referred to as tempering – they are reheated to approximately 170°C. This serves to reduce their brittleness and make them even more resistant in daily duty. Greater flexibility to respond to specific client needs and the above-mentioned ability to assure the high quality insisted on for the gearing parts are further advantages of the new heat treatment plant.

**Monitoring in our own test lab**

Quality controls are carried out in bastian's own test lab, so that if any variations occur in the production process, we can respond promptly and efficiently to iron them out. We are equipped to handle the complete spectrum of standard hardness tests, such as Vickers HV, Rockwell HRC and Brinell HB. Microstructure analyses, damage analyses and weld inspections are performed under a microscope. The detection of grinding burn by nital etching is another important station in the test series.

**Tougher than the rest in daily use**

The material passes through several temperature stages with different residence times during the heat treatment cycle. It is then cooled down at different rates in different media, depending on the process. The possible processes range from furnace cooling to rapid quenching designed to achieve defined technical properties (strength, hardness, toughness, structure).

Since the parts to be hardened at WITTENSTEIN bastian are used for gearings, surface hardening was chosen to achieve the required high internal toughness of the workpieces. By using this method, only the surface is actually hardened and hence made resistant to wear. Another key benefit of the application is that the compressive residual stresses produced in the surface of the gearing parts result in long-term vibration resistance.

**Technology with many specific benefits**

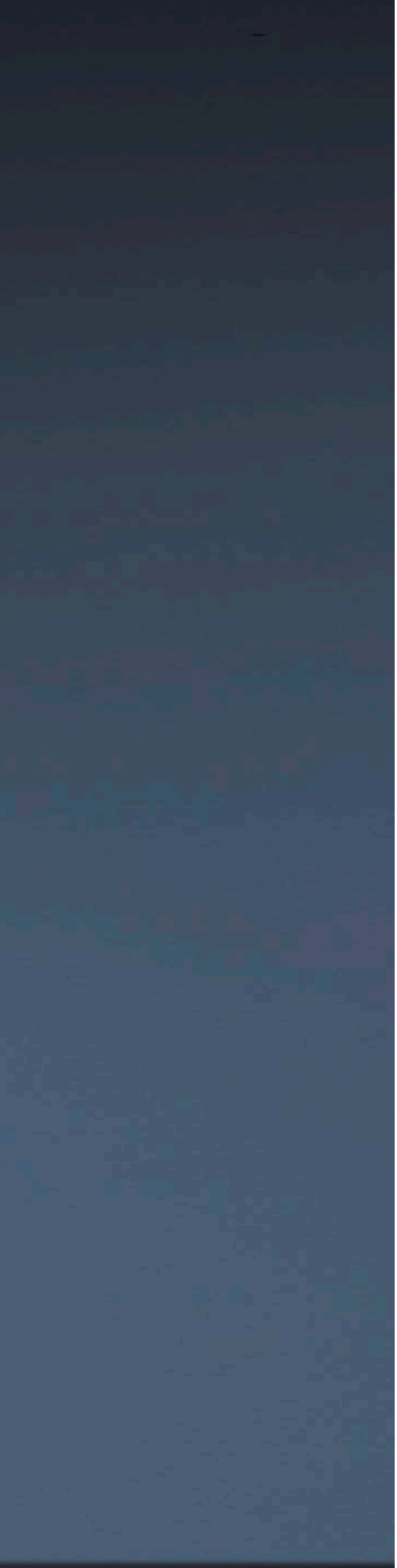
So much for the basic principle behind the technology. Karlheinz Pfaff explains why it is employed at WITTENSTEIN bastian: "We opted for this heat treatment plant because it permits a short process time per 0.1 millimetre depth of hardening, enabling the process to be controlled quickly and precisely. What's more, the aftertreatment in the molten salt bath allows quenching with only minimal distortion. Finally, the complete plant is so highly automated that unmanned operation is possible 24 hours a day".

**The underlying strategy**

The implementation strategy for the plant and the technology's main advantages are summed up by Sales Manager Claus Stoll: "Hardening in-house is more cost-intensive than outsourcing. However, the WITTENSTEIN philosophy is for core processes to remain within the confines of the company, to prevent basic technical know-how that is crucial to our competitive success from getting into the wrong hands.

WITTENSTEIN bastian additionally benefits time-wise if the hardening process is integrated. The internal hardening plant is an important milestone on the road to our vision of 'a complete gear wheel in 24 hours'. It enables us to process even small batch sizes fast and flexibly, and thanks to the minimised grinding stock allowances we can also manufacture more efficiently. Last but not least, confidentiality is always an important issue. Our motor racing customers, for example, demand absolute discretion in connection with all parts destined for their vehicles. And careful handling of high-precision gearings is essential along the entire process chain. Transport damages are virtually eliminated, in other words, and quality consistency guaranteed end-to-end. In the final analysis, that's what counts for both us and our customers".


DEBUT 2008



The common chord struck by culture and the visual and vocal arts is echoed in the triad of industry, society and cultural awareness. In both cases it is not the individual note but the simultaneous sounding of different pitches that creates the music.

Report: Dr. Karl Dietrich Gräwe
Jury Chairman DEBUT 2008 and SWR2 presenter |
Photos WITTENSTEIN / WAJS

The interplay of contrasting elements is equally essential to all forms of social interaction. Richard Wagner brought his rich life experience and genius to bear on the complex of “life and art based on sound economic and financial foundations”. He wrote an exhilarating four-and-a-half hour opera on just this theme, full of plot-driven consonances and dissonances which are finally resolved into a happy end in the denouement: “The Mastersingers of Nuremberg”.

As we all know, every finale is always preceded by a debut. Or in our particular case DEBUT 2008, which is not fixated on its finale but which places equal value on the intermediary steps that link the competition’s beginning and end. It may be some consolation for today’s aspiring mastersingers around the world to remember that, in Wagner’s tale, the candidate’s debut attempt does not at first meet with the general approbation of listeners. The important aspect for Wagner was that while the members of the guild of mastersingers would ultimately judge the song contest, the people too would have a say in its outcome.

This is far more than simply a fairy tale from Germany’s dim and distant past. Contemporary composers working on the same philosophic and discursive scale as Wagner ought surely to feel challenged to write an opera or an episodic cycle of music dramas called the “Die Meister-SängerInnen” – a more emancipated title that would embrace both male and female vocalists! The singers we have in mind, of course, are the ones confronting each other in a singing competition in Bad Mergentheim, Weikersheim and Igersheim. The 2008 contest will begin on October 12 with a lieder recital and end on October 18 with the awarding of the prizes and a gala


Engineering as a stepping stone to a career in opera: Burcu Uyar (centre), winner of DEBUT 2006, is currently "Queen of the Night" in Mozart's "Magic Flute" at the German National Opera House in Berlin. Olga Peretyatko (left), runner-up, has since performed to enthusiastic audiences at the Théâtre des Champs-Elysées in Paris and the Stanislavsky Theatre in Moscow. Right: Tae-Joong Yang (third place)

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| Initiator of DEBUT: | Manfred Wittenstein |
| Managing Directors: | Klaus Spitzley, Ulrich Boelcke |
| Distinguished jury: | Chairman Dr. Karl Dietrich Gräwe |
| Prizes worth more than € 30,000 | |
| - Winners' awards (gold, silver, bronze): Viktoria statues specially designed by Viennese artist Ernst Fuchs<br>- Special prizes, e.g. engagements | |
| Patron: | Günther H. Oettinger, Baden-Württemberg state premier |
| Representative: | Prof. Dr. Wolfgang Reinhart MdL, Minister of Federation and European affairs and head of the state chancellery |
| February 1 to June 30, 2008 | Period for applications |
| July 1, 2008 | DEBUT 2008 will be showcased at the "Stallwächter Party", the traditional summer celebration of the state of Baden-Württemberg, in Berlin |
| October 12 to 18, 2008 | Competition week in Weikersheim and Bad Mergentheim with approximately 50 participants |
| October 12, 2008 | Lieder recital "Arie & Canzoni" with Burcu Uyar (Turkey), winner of DEBUT 2006 |
| October 16, 2008 | Opera question time in the WITTENSTEIN talent arena |
| October 18, 2008 | Gala concert with finalists, host: Jan Hofer, Senior Newsreader on ARD's television news |

concert given by the finalists. Yet this is just the beginning and end of a musical and singing crescendo that will build up throughout an entire week. The competition itself will draw considerable power from painstaking preparation, intense concentration and the challenge of mastering pre-performance butterflies. During the course of the week the immeasurable and priceless added value of practical musical experience, growing self-knowledge and pedagogical insights will all melt together into a harmonious whole of social gatherings and friendly encounters. DEBUT 2008 offers the professors, mentors and teachers accompanying young singers on their voyage of discovery into the world of song at universities, colleges of music, academies, conservatoires or schools or in private tuition an opportunity to test out their performance and gain understandings that can be put to use in their own teaching practice. DEBUT 2008: a kind of "Olympic Games" with a character all of its own. An Olympic contest for singers only, in which all those eager to learn, gather experience and win prizes and awards are cordially invited to take part. Manfred Wittenstein, whose normal professional role is as President of WITTENSTEIN AG in Igersheim, and his team turned a dream into reality six years ago. WITTENSTEIN AG is equally committed, as it were, to terrestrial and interplanetary progress. This may well have inspired the initiator to combine his ideas about the earth, celestial stars and singing stars in one single harmonious event. He launched the European Opera Singing Competition DEBUT, which was held for the first time in 2002 – a competition of rare talent which he has not only consistently supported ever since but also intends to continue promoting in the future. The Baden-Württemberg state premier has acted as sponsor of this business and musical initiative since its inception.

DEBUT Concerts GmbH was established specifically to promote this artistic competition, which takes place every two years and will be staged for the fourth time in 2008 financed without public funds. Art will again encounter art this year in a more resplendent setting than ever before. Not only will competition participants be measuring their talents against each other and delighting listeners with their bel canto technique against the Tauber Valley's charming backdrop of rolling hills in surroundings that fittingly heighten mood and sharpen perceptions, and not only will the event organisation and catering service provide an optimum competitive environment for every single candidate. The A and B preliminary rounds will also be held for the first time in the incomparably inspiring atmosphere of Weikersheim Castle. The conditions are such that, while not every singer will be able to claim ultimate victory, they will all come away from the event as winners. The singer who won the previous competition traditionally contributes their own concert evening to the new event: this year's concert will be given by the 2006 winner, Burcu Uyar from Turkey. The jury will once again be made up of personalities with a variety of professional backgrounds – practising singers, singing tutors, theatre professionals and culture journalists. Representatives from concert agencies and the media will be listening intently, on the lookout for the potential stars of tomorrow and the coming years. Jan Hofer, Senior Newsreader on ARD's television news, will act as host and turn the final concert into an entertaining gala. After pitting their talents (and nerves) against each other in the final round, the competition winners will once again be presented with their gold, silver and bronze awards, designed especially for the occasion by the famous Viennese graphic artist, painter and sculptor Ernst Fuchs, in the Wandelhalle of the Bad Mergentheim Kurhaus. Art renews its encounter with art.

## Countdown to DEBUT 2008!

# FAIRS AND EXHIBITIONS 2008/2009

**Medizin Innovativ**, Nuremberg (Germany)
WITTENSTEIN intens GmbH, Congress & Exhibition
July 9 - 10, 2008

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**Semi**, San Francisco (USA)
WITTENSTEIN Inc. / WITTENSTEIN motion control GmbH
July 15 - 17, 2008

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**IMTS 08**, Chicago (USA)
WITTENSTEIN Inc. / WITTENSTEIN motion control GmbH
September 8 - 13, 2008

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**AMB**, Stuttgart (Germany)
International Exhibition for Metal Working
WITTENSTEIN alpha GmbH / WITTENSTEIN bastian GmbH
September 9 - 13, 2008

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**MSV**, Brno (Czech Republic)
International Engineering Fair
Agent: Consenta spol.s.r.o
September 15 - 19, 2008

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**MOTEK**, Stuttgart
International Trade Fair for Assembly and Handling Technology
WITTENSTEIN alpha GmbH, WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH and WITTENSTEIN electronics GmbH
September 22 - 25, 2008

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**Aandrijftechniek**, Utrecht (Netherlands)
International Trade Fair for Drive Technology
WITTENSTEIN BVBA
September 30 - October 3, 2008

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**Mechanical Elements Fair Kansai**, Osaka (Japan)
WITTENSTEIN ltd.
October 1 - 3, 2008

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**BI-MU**, Milan (Italy)
International Trade Fair for Machine Tools
WITTENSTEIN S.P.A.
October 3 - 7, 2008

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**MiNaT**, Stuttgart (Germany)
International Trade Fair for Micro and Nano Technologies
WITTENSTEIN cyber motor GmbH
October 7 - 9, 2008

**Mocon**, Ghent (Belgium)
WITTENSTEIN BVBA
October 14 - 15, 2008

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**Pack Expo**, Chicago (USA)
WITTENSTEIN Inc. / WITTENSTEIN motion control GmbH
November 9 - 13, 2008

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**Emballage**, Paris (France)
WITTENSTEIN S.a.r.l.
November 17 - 21, 2008

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**Automation Fair 08**, Nashville (USA)
WITTENSTEIN Inc. / WITTENSTEIN motion control GmbH
November 19 - 20, 2008

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**SPS/IPC/Drives**, Nuremberg (Germany)
Electric Automation, Systems and Components, Exhibition & Conference
WITTENSTEIN alpha GmbH, WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH and WITTENSTEIN electronics GmbH
November 25 - 27, 2008

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**IITSEC 08**, Orlando (USA)
Interservice/Industry Training,
Simulation & Education Conference
WITTENSTEIN aerospace & simulation Inc.
November 26 - 29, 2008

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**SCS**, Paris (France)
Systems, Components, Solutions
WITTENSTEIN S.a.r.l.
December 2 - 5, 2008

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**WIN**, Istanbul (Turkey)
Electric Automation, Systems and Components, Exhibition & Conference
WITTENSTEIN alpha GmbH
February 2009

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**Intec**, Leipzig (Germany)
Trade Fair for Manufacturing, Tool and Special-Purpose Machine Construction
WITTENSTEIN alpha GmbH
February 24 - 27, 2009

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**Ipack-Ima**, Milan (Italy)
Processing, Packaging and Material Handling
WITTENSTEIN S.P.A.
March 24 - 28, 2009