



WITTENSTEIN

# move

The magazine for customers and partners of WITTENSTEIN AG

## PIONEERS SET NEW BENCHMARKS

Precision and dynamics in high speed handling

Fit for life thanks to FITBONE®

# move

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### Masthead

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Dear readers,

Day in, day out engineers at WITTENSTEIN do everything they can to further extend our position as innovation leader in the field of mechatronic drive technology. The desire to secure and maintain a clear competitive lead for our customers with our products is the motivation that pushes us forward. Unconventional ideas and the never-ending search for improvements which make that all-important difference play a key role. The replacement of one central drive with several decentralized drives is a typical example here: Kronos trusts in HIGH TORQUE gearheads made by WITTENSTEIN alpha on its stretch blow moulders for PET bottles. You can find out why on pages 4 to 7 of this magazine – or on the WITTENSTEIN Group's brand new website. The site has just been completely relaunched for all our Business Units and now boasts a unified design as well as a fundamentally modified structure and content. We invite you to take a look at the new [www.wittenstein.de](http://www.wittenstein.de). We promise it will be worth your while!

Engineers are also artists – says a man for whom engineering is a passion. His life's work has now been honoured with the VDI's highest award for outstanding professional services in the field of science and technology: Dr. Manfred Wittenstein, Chairman of the Supervisory Board

of WITTENSTEIN AG, is the latest holder of the Grashof medal. Our passion for innovation is also reflected in our innovation culture: WITTENSTEIN's investments in research and development are well above the average for the industry. This deep commitment received further recognition only a few months ago when our new Galaxie® Drive System, with its revolutionary inner workings, was proclaimed winner of the internationally renowned HERMES AWARD. It's an invention which fills us with pride.

These distinctions herald in the WITTENSTEIN Group's 2015 autumn trade fair season. "Pioneers set new benchmarks" is not only the title of this latest issue of our customer magazine; it will also be the motto for our exhibit at the upcoming Motek show in Stuttgart. We look forward to meeting you at our booth in Hall 8, Stand 8121.

Just a few weeks later, from November 24 to 26, we will be on the road again, this time at SPS IPC Drives in Nuremberg, Europe's leading exhibition for electric automation. Responding to fluctuating needs in constantly evolving markets, WITTENSTEIN alpha has come up with a new product family. Please pay us a visit and see for yourself!

Dr. Bernd Schimpf

Michael Müller

Philipp Guth

Managing Directors of WITTENSTEIN alpha GmbH



## **Precision and performance** in high speed handling

Mineral water, soft drinks, beer – more and more beverages are bottled today in lightweight, unbreakable PET containers. These are produced at breakneck speed: the Krones Contiform 3 series of stretch blow moulders impresses with up to 81,000 bottles per hour. [TP+ 050 HIGH TORQUE low-backlash planetary gearheads](#) guarantee maximum precision and dynamics when preforms and containers are handled at high speed.

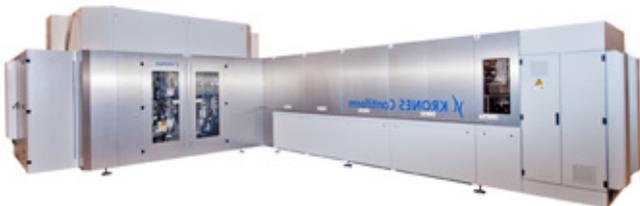


Millions of PET bottles are manufactured and filled worldwide every day on Krones machines – for example by soft drink manufacturers.

The Krones Group, headquartered in Neutraubling (South Germany), develops and manufactures machines and complete lines for process, filling and packaging technology. "Our clients see us as an all-round vendor where mechanical engineering, line expertise, process engineering, microbiology and information technology have been harmoniously integrated for optimum synergies", explains Thomas Höllriegel, Team Leader Plastics Technology at Krones. Every day, millions of bottles, cans and special-shaped containers are handled worldwide on Krones lines, particularly in breweries, the soft-drinks sector and at producers of still or sparkling wines and spirits. High speed is a precondition of maximum productivity in all these applications – and all the machine components have to engage with one another without any loss of momentum.



PET preforms on their way to the blowing wheel, where they are placed in moulds to be moulded into containers by compressed air and heat



The stretch blow moulders in the Kronen Contiform 3 series impress with up to 81,000 PET bottles per hour.

### From thumb-sized preform to 3.5 l bottle

81,000 bottles an hour – equivalent to two bottles in less than the blink of an eye – the Contiform 3 makes each bottle so fast that the human brain simply can't keep up. Depending on the design, this stretch blow moulder can handle containers with a volume of 0.1 to 3.5 litres. The process is basically identical. The prefabricated preforms are first carried through a linear oven, where they are heated

up to their optimum processing temperature. From there they are transferred by the grippers on an infeed starwheel to the blowing wheel, where they are placed in moulds to be moulded into containers by compressed air and heat. The finished bottles are then removed from the blowing station by the outfeed starwheel and fed to an air conveyor, which takes them to the filler. Each of the machine's transfer systems is equipped with individual servo actuators as well as low-backlash planetary gearheads made by WITTENSTEIN alpha – for good reason.

### TP\* 050 HIGH TORQUE: Optimized with maximum torsional rigidity and minimum torsional backlash

"The highest possible positioning accuracy, even if the torques at the transfer starwheels vary considerably – that was the central challenge our planetary gearheads had to address", says Markus Kleinhenz, a sales engineer at WITTENSTEIN alpha, looking back. "That's why we decided to equip the drives for the Contiform 3 with

The high torsional rigidity and minimal torsional backlash also ensure maximum positioning accuracy in the blowing wheel's outfeed starwheel – even at high speeds and with strong torque variations.

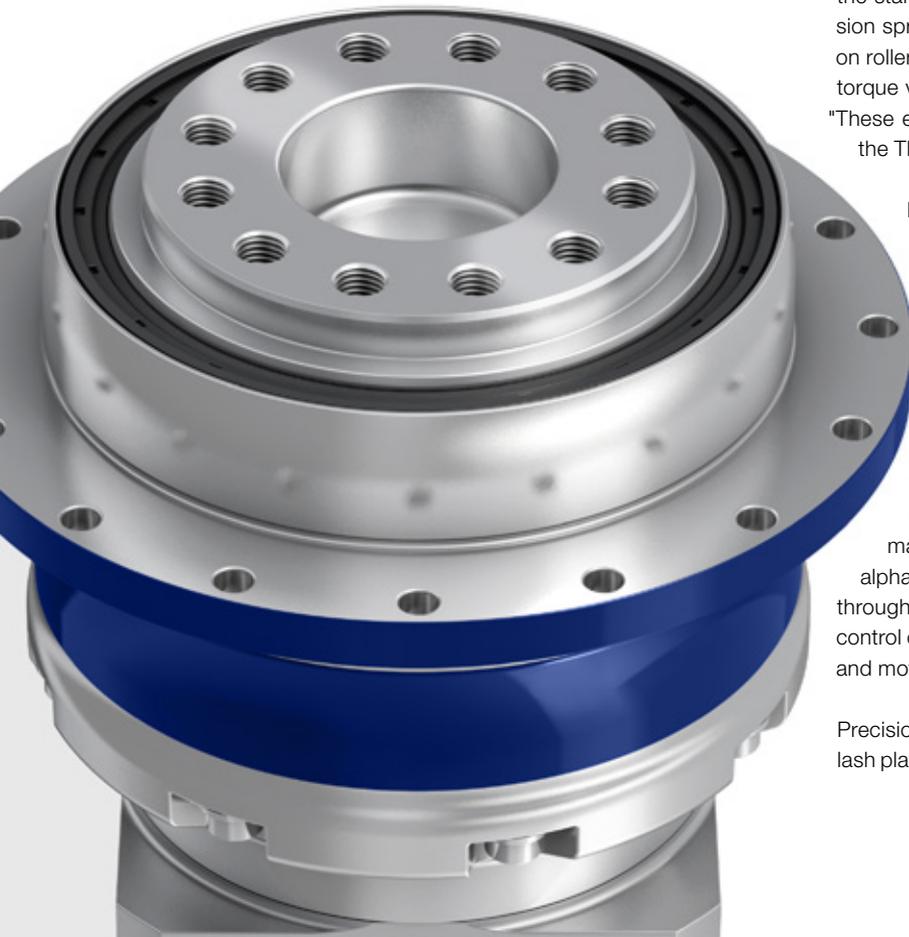


»The highest possible positioning accuracy, even if the torques at the transfer starwheels vary considerably – that was the central challenge our planetary gearheads had to address.«

MARKUS KLEINHENZ, SALES ENGINEER AT WITTENSTEIN ALPHA GMBH

In addition to high dynamics, TP+ 050 HIGH TORQUE low-backlash planetary gearheads also provide maximum torsional rigidity and minimum torsional backlash – crucial for precise handling in high speed applications.

## TP+ 050



low-backlash planetary gearheads in the TP+ 050 HIGH TORQUE series", Höllriegel adds. Both the infeed and the outfeed starwheel which are used to move the PET preforms have an integral gearhead in the column. In addition to high dynamics, these gearheads also provide maximum torsional rigidity and minimum torsional backlash. These are crucial characteristics without which ultra-precise handling of the preforms and bottles at high speed would be impossible in continuous operation. The high dynamic loads associated with the starwheel movement further complicate the situation: "The tension springs in the grippers of the transfer starwheels, which move on rollers in a cam track and prevent edge changes, result in strong torque variations in the system", Kleinhenz continues and confirms: "These effects are compensated thanks to the extreme stiffness of the TP+ gearheads".

### Heat dissipation for a "cool" working atmosphere

One particularly "hot problem" for the engineers who designed the transmission technology concerned the thermal stress at the blowing wheel's infeed starwheel. The Contiform 3's linear oven transfers the PET preforms here at temperatures up to 120°C. The heat from these preforms and the starwheel column motor leads to high thermal loads on the entire drive unit. "In continuous operation, the temperature at the gearhead housing can exceed the specified 90°C limit", Kleinhenz reports. To rule out this possibility and simultaneously lessen the thermal stresses on the motor in this application, WITTENSTEIN alpha developed a special adapter plate with water flowing through it. When connected to the machine's existing temperature control circuit, it effectively reduces the temperature at the gearhead and motor.

Precision, dynamics, availability – WITTENSTEIN alpha's low-backlash planetary gearheads get PET preforms into top shape at Kronos.



»WITTENSTEIN has proved that with courage, creativity and determination a completely new kind of gearhead can be created.«

PROFESSOR JOHANNA WANKA,  
FEDERAL MINISTER OF EDUCATION AND RESEARCH

## HERMES AWARD 2015 And the winner is...



The "Oscar for engineers" goes to WITTENSTEIN

Oscar and HERMES – two awards for outstanding achievements: Whereas the annual Academy Awards are handed out to the best cinema films and their makers, the coveted technology prize is reserved for industrial companies and especially impressive feats of engineering.

WITTENSTEIN's revolutionary Galaxie® Drive System is unquestionably an outstanding innovation – and an ingenious idea that was selected this year from a field of almost seventy entrants from ten different countries. It was submitted by a manufacturer which has been synonymous for many years with drive engineering expertise. The media were unanimous in their praise following the world premiere at the Hannover Messe last spring: "A new era", "You won't find it in any textbook", "A new performance universe". Experts and the HERMES AWARD jury were in total agreement: "The high performance Galaxie® Drive System is an outstanding development and a prime example of Germany's innovative drive. WITTENSTEIN has proved that with courage, creativity and determination a completely new kind of gearhead can be created. The company has also succeeded in embodying the future of industry –

the networking of production and services – in its gearbox", said Professor Johanna Wanka, Federal Minister of Education and Research, in her address at the award ceremony in the presence of Chancellor Merkel.

Thomas Bayer, Galaxie's inventor and Head of Galaxie Drive Systems at WITTENSTEIN AG, is also firmly convinced: "The Galaxie® Drive System will open more new doors for development engineers than any invention during the last several decades. The first customer projects have already confirmed Galaxie's® standing as the enabler for the next generation in high performance engineering." Bayer cites one specific reason for his huge pride in receiving the award: "It demonstrates that even in the digital age, springboard innovations are still possible, even when it comes to the basic fundamentals of motion in industrial drives."



**Official opening of the HANNOVER MESSE** on April 12, 2014 at the Hannover Congress Centre (HCC). From left to right: His Excellency Narendra Damodardas Modi (Prime Minister of the Republic of India), Dr. Angela Merkel (Chancellor of the Federal Republic of Germany), Stephan Weil (state premier of Lower Saxony)

**Presentation ceremony for the winners of the HERMES AWARD 2015:** Dr. Manfred Wittenstein, Chairman of the Supervisory Board of WITTENSTEIN AG (3rd from right), and Thomas Bayer, Head of Galaxie Drive Systems at WITTENSTEIN AG (2nd from right), with Professor Johanna Wanka, Federal Minister of Education and Research (2nd from left), Professor Wolfgang Wahlster, Scientific Director of the German Research Center for Artificial Intelligence (DFKI) and Chairman of the HERMES AWARD jury (left), Stephan Weil, state premier of Lower Saxony (3rd from left) and Dr. Jochen Köckler, Member of the Managing Board at Deutsche Messe (right)



## An ingenious idea

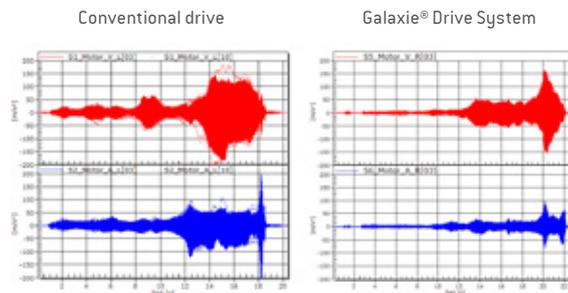
The radically new gear tooth principle is based on the **logarithmic spiral** – which occurs in nature in the form of a snail's shell, for example. Professor Wanka expressed this very succinctly in her own words: "Everyone knows what a gear wheel looks like – and now, out of the blue, we're suddenly confronted with the idea of building a gear with moving teeth. You won't find it in any textbook, but it works!" For the first time ever, a gearhead dispenses completely with a gear wheel – instead, each of the teeth involved in torque conversion is an independent and dynamic entity, which is supported by a needle roller bearing, grouped around a two or three-cam input polygon and guided along the teeth of a ring gear. As a result of this ingenious concept, almost all of the teeth now engage simultaneously. Thanks to the new engagement principle, the tooth contact is no longer a line but a surface.



Profiling rotationally symmetric parts such as motor shafts or spindles is a core competency of Profiroll Technologies GmbH. Since integrating the Galaxie® Drive System in its Rollex spline rolling machines, the company has significantly increased its productivity. The **extremely high torsional rigidity** of the Galaxie® Drive System has played a vital part in this efficiency leap. It is the result of a revolutionary kinematic principle – and almost **six times higher** than with any other type of gearhead. This feature of Galaxie® particularly impressed Profiroll's machine designers.

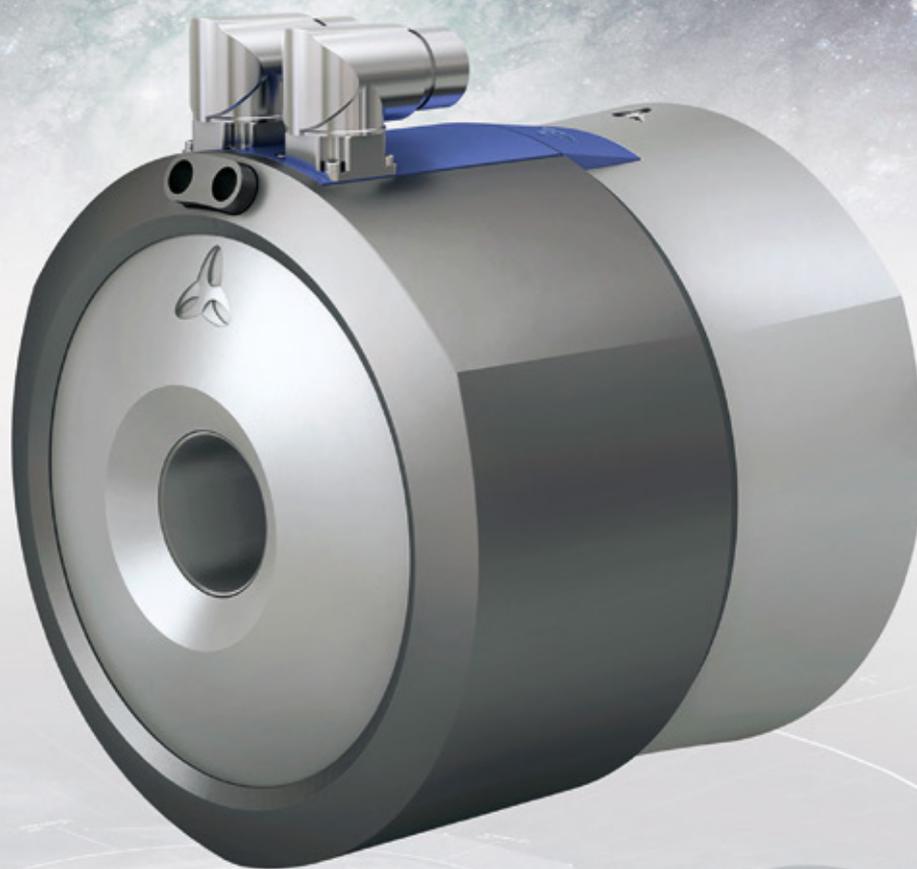
## Galaxie® improves the productivity of profile rolling machines

Galaxie® significantly reduces vibration compared to conventional drives.



### Profiroll Technologies: A partner for professional profile rolling

Profiroll Technologies GmbH of Bad Döben (East Germany) is a leading manufacturer whose machines are used, amongst other things, in the automotive / aeronautic supplier industries to profile rotationally symmetric parts using cold forming technology. "The Rollex series enables profile rolling of splines onto symmetrical shafts", explains Dr. Stephan Kohlsmann, General Manager of Profiroll Technologies GmbH. "The rolling process is based on the circular die principle. The workpiece is positioned inside the work area, clamped between centres. The rolling slide infeed then starts up, causing the circular CNC dies on the slides to penetrate the workpiece and cold-form the required spline profile. Top quality serrated, hobbled or hollow splines are the result."



Modelled on the universe:  
Spiral nebulae and Galaxie® both follow the  
principle of the logarithmic spiral.

**Vibration in the powertrain is a productivity killer**

Until now, however, severe vibration in the entire powertrain has been unavoidable with certain types of spline depending on the machining speed. "In the past, this used to mean significantly reducing the rolling speed for these particular parts in order to meet the high quality and dimensional accuracy requirements", Kohlsmann recalls. It was the old cycloid gear that was causing the vibration: the torsional rigidity at high moments of inertia was not sufficient, leading to excessive powertrain vibration. "We didn't want to switch to another standard gear type because any improvement in the torsional stiffness would have had negative impacts on other performance features", he continues.

This is not the case with the Galaxie® Drive System. "Improvements to one feature are not at the expense of other performance parameters like freedom from wear and backlash, dynamic positioning accuracy

or load carrying capacity – on the contrary, it beats all similar sized gearhead series – often hands down – in all important technical details", claims Volker Sprenger, Head of Sales Galaxie Drive Systems.

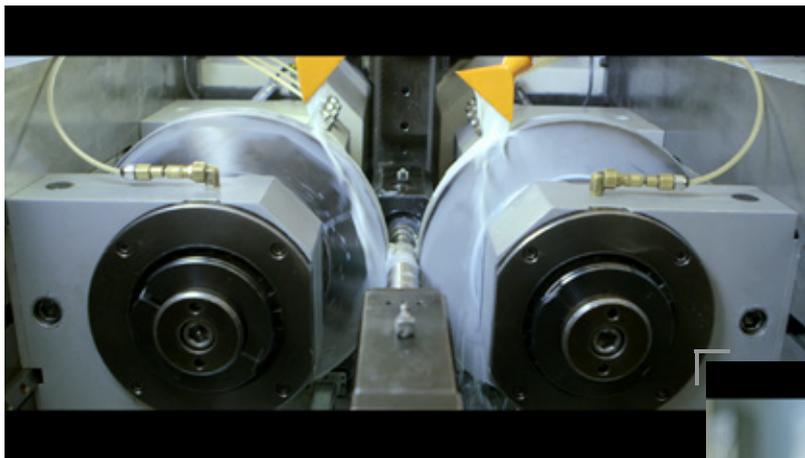
**Galaxie®: extremely quiet running at any speed**

The integration in Profiroll Technologies spline rolling machines demonstrates most impressively how the Galaxie® Drive System can dramatically improve performance features. Its extreme torsional rigidity, which is almost six times higher than with any other type of gearhead, is crucial in this application. There are practically no bending lengths owing to the special design principle. At the same time, the teeth in contact are automatically aligned because they are guided cylindrically in the tooth carrier, leading to optimal engagement with the internal gear teeth. The outcome: a gearhead that combines absolute freedom from backlash with maximum torsional stiffness.

Productivity increases

**40%**

If the process speed is increased by "only" 1.5 times, productivity shoots up 40%.



The Galaxie® Drive System in action at Profiroll



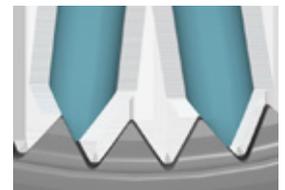
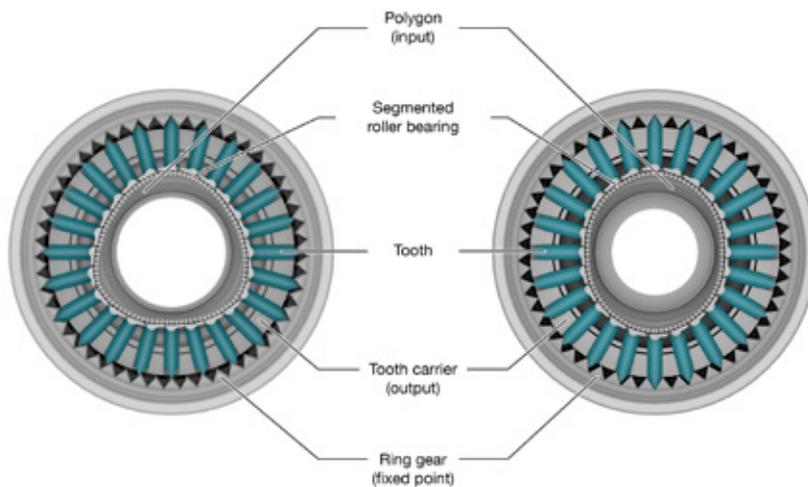
»It beats all similar sized gearhead series – often hands down – in all important technical details.«

VOLKER SPRENGER,  
HEAD OF SALES GALAXIE DRIVE SYSTEMS, WITTENSTEIN AG

The basic idea behind the Galaxie's® kinematics: each of the segmented teeth is an independent and dynamic entity, which is supported by a needle

Profiroll customers in many different industries – from automotive and supplies through linear technology, aviation and rolling contact bearings to energy – value the superior performance and productivity they get from the Galaxie® Drive which helps them move into a new performance universe.

The teeth in contact are automatically aligned because they are guided cylindrically in the tooth carrier, leading to optimal engagement with the internal gear teeth.



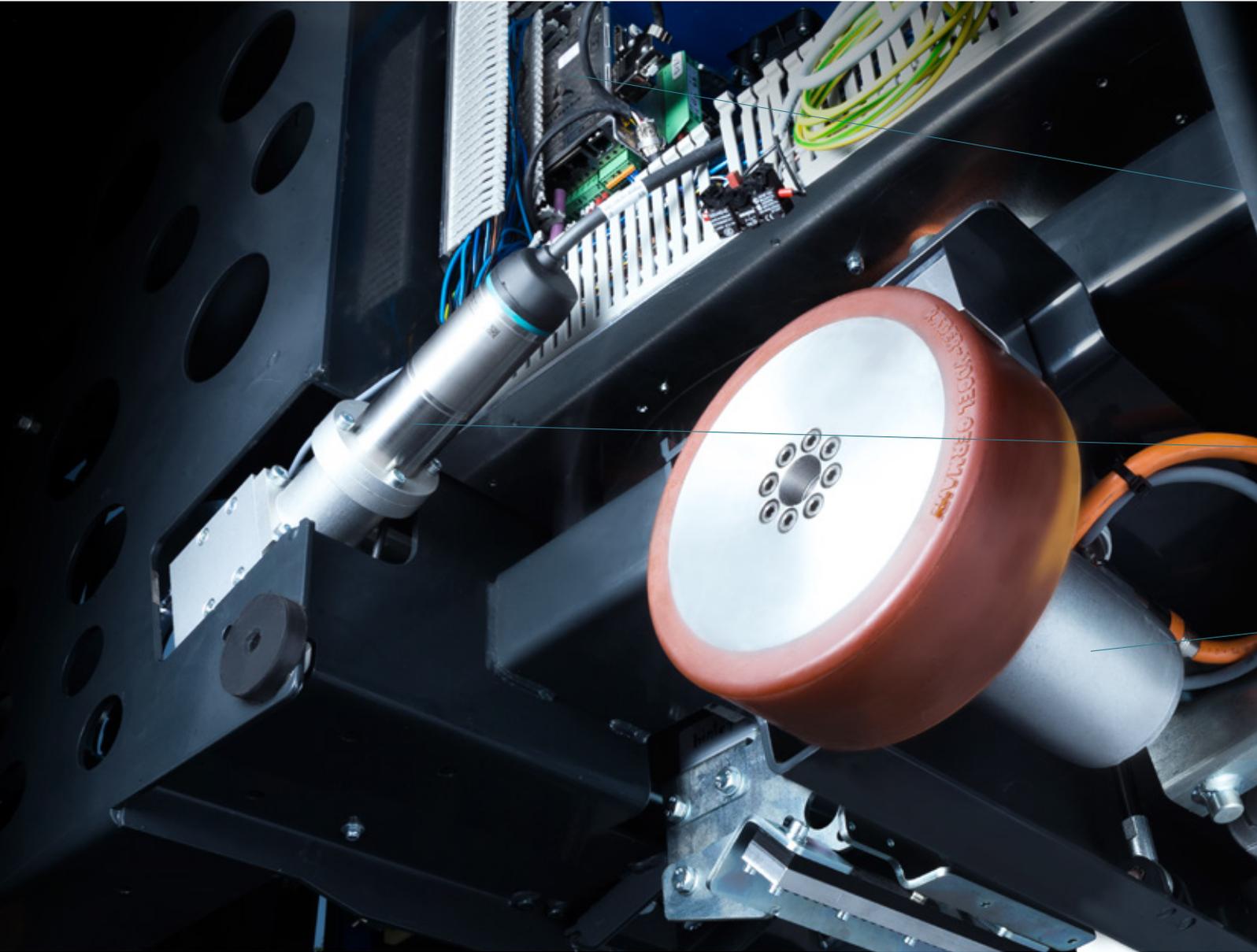
**Success through co-engineering**

In theory, this was exactly what Profiroll was looking for – yet would it also turn out to be true in practice? To make sure they were on the right track, WITTENSTEIN's engineers had to become thoroughly familiar with spline rolling techniques. "We were then able to understand how the process interacts with the Galaxie® Drive System and model it together in such a way that the technical benefits for the Rollex were visible", Sprenger states.

Once the Galaxie® Drive System was integrated in the first pilot machine, the rolling speed was continuously increased in tests with selected critical parts – until it eventually exceeded 120% compared to the old baseline. Supplementary calculations showed that if the process speed is increased by "only" 1.5 times, productivity shoots up 40%. "While non-productive time remained constant, the number of machinable workpieces rose from 4 parts per minute to 5.1 – in other words 29% more", Kohlsmann confirms.

# Automated guided vehicle systems **intelligently driven**

Compact, powerful and energy efficient – these are the key requirements specified for the drive components of automated guided vehicle (AGV) systems. BeeWaTec trusts absolutely in integrated system solutions from WITTENSTEIN motion control.



## **Motion control intelligently designed**

At the heart of the Traction Drive System (TAS) is simco® drive, the smart servo drive which is also integrated in the brushless DC motor. "As a servo drive for the Traction Drive System, it's perfect because it enables high-precision torque control as well as high dynamics in the current control loop", explains Nadine Hehn of Product Management at WITTENSTEIN motion control GmbH. "The AGV system can therefore execute travel and positioning motions very

fast and very accurately." When used as a brushless DC motor for handling tasks, simco® drive considerably simplifies the control of axis movements where objects are picked up, clamped or set down again by an AGV. "These are often complex, single-axis movements which can be generated optimally by a control system with distributed intelligence, in other words directly by the simco® drive", elaborates Dr. Oliver Barth, Assistant to the Executive Management at WITTENSTEIN motion control. Transferring the intelligence to the

## Install it, switch it on and go – Integral AGV drive solutions in plug-and-play design are where the future lies.



### simco® drive

Intelligent servo drive for a wide range of applications in AGV systems: traction and gripping motions in the AGV are controlled easily and precisely.

### cyber® dynamic line

Forms a perfect team with simco® drive: single-cable solution, high dynamics and quick start-up help increase productivity.

### Traction Drive System

An efficient combination of a highly integrated actuator with a smart servo amplifier, additional speed encoder and service brake as a simple, power-dense drive solution for automated guided vehicles.

motion controller greatly eases the load on the vehicle control system when realizing axis movements. BeeWaTec, the AGV manufacturer, has a policy of choosing actuator solutions based on smart servo drives for this reason.

### BeeWaTec: specific expertise in compact AGV systems

BeeWaTec GmbH, based in south-west Germany, forms part of a group with around 190 staff and is extremely successful in the AGV

sector as a supplier of autonomous forklift trucks, haulers and transport vehicles. The company offers complete system solutions for in-house logistics, from AGVs through milk runs to complex manufacturing and logistics systems. "Modular mini systems are very much in demand at present", says Jens Walter, who is on BeeWaTec's Executive Management together with Joachim Walter. "Many features of our Bee\_Mini, for instance, are scalable such as the load capacity, custom add-ons and drive technology or battery and communication technology. "That's why we can deliver even made-to-measure AGV systems as low-cost solutions without having to forego high-end system technology in the vehicles."

### Compact motor-controller unit for optimal load restraint

A brand new vehicle for transporting stacked containers underlines this claim: "We're the first to have developed this kind of transport concept for an overall weight of 150 kg", Joachim Walter reports. Up to five containers with a maximum of 30 kg each are stacked on a base frame with casters. Jens Walter describes the special design: "The vehicle picks up the stacked unit in one go". As soon as the container is completely in the vehicle, the shutter closes and the load is secured by the clamping mechanism." The drive system which is used to clamp the containers in the vehicle comprises a brushless DC motor in the cyber® dynamic line family and a simco® drive with IP20 protection. "This brushless DC motor system clamps the stacked container unit by force control", Joachim Walter continues. A motion task with all the necessary parameters was programmed locally by BeeWaTec for this purpose in the servo drive using MotionGUI.

### Traction drive in plug-and-play design

BeeWaTec is also treading new paths with its traction drives – with the Traction Drive System (TAS) as a complete, easy-to-integrate actuator unit. Each group of components comprises a TPM+ servo actuator and a simco® drive. "Thanks to various optional features, we can tailor the design of the actuator systems to the requirements of each individual customer or application", says Jens Walter. "What's more, by presetting the actuator system parameters in our MotionGUI software, we can integrate them in the vehicle quickly and easily." Both the servo drive and the servo actuator are unbeatably compact and power-dense. The Traction Drive System facilitates flatter, narrower and lighter vehicles. A further advantage is that the high energy efficiency permits long driving cycles without charging, so that vehicle availability is higher.

### One-stop engineering reduces time and cost risks

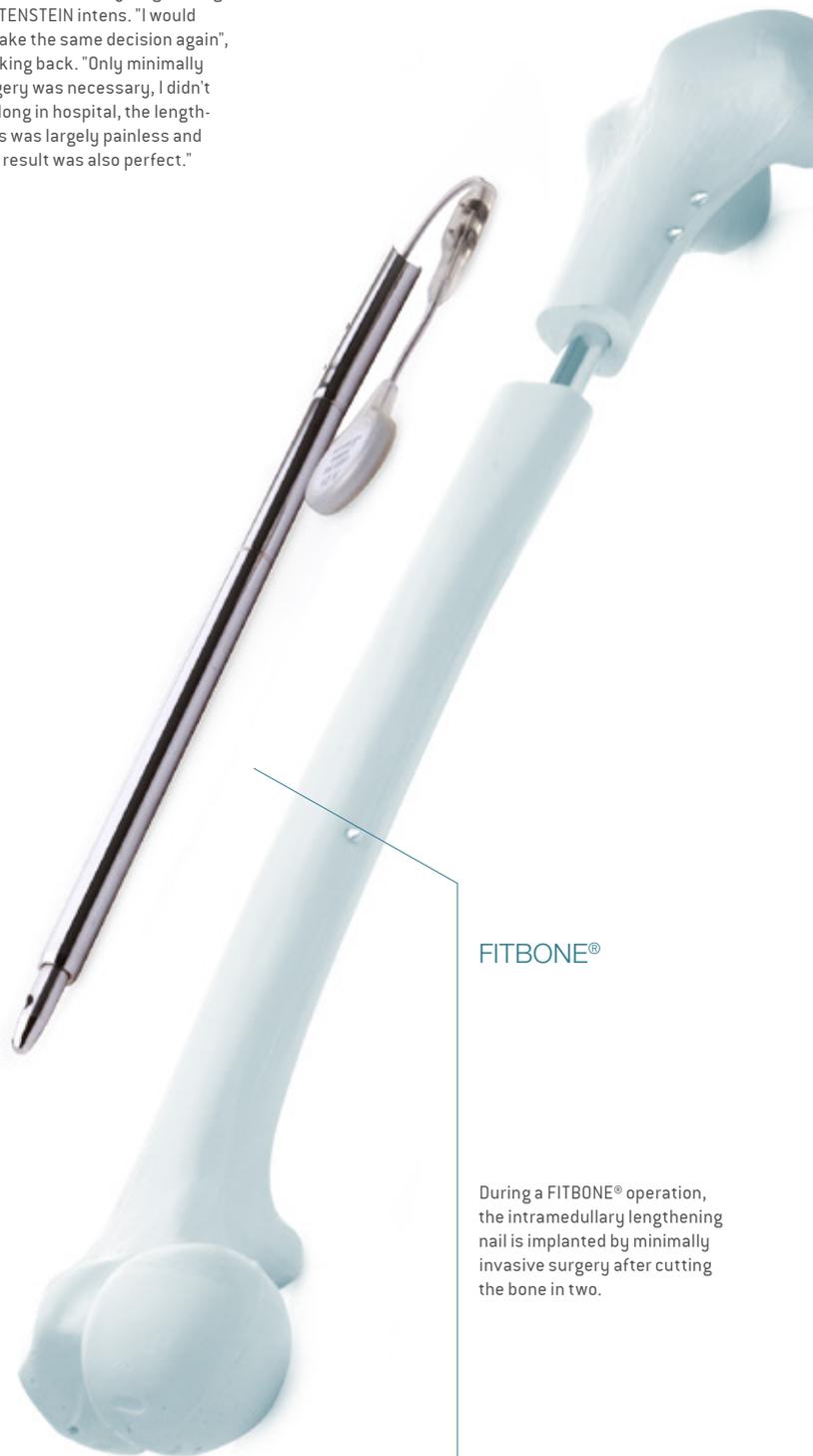
The fact that both actuator solutions could be purchased from a single supplier was a crucial argument for BeeWaTec: Joachim and Jens Walter speak with one voice: "We always prefer to work with system partners like WITTENSTEIN motion control". "One-stop consulting, plus the integral design and optimal interaction of the actuator and control technology, enables us to eliminate interface risks – and hence extra costs and unnecessary lost time – during the planning and production phases of our AGV systems."



Fit for life **thanks to FITBONE®**

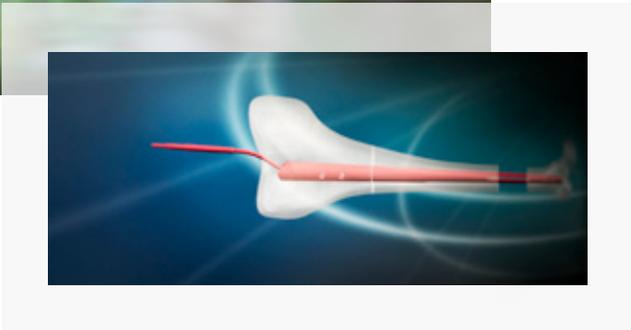
Hiking, sports, playing with her son, nice clothes and fashionable shoes – all of these things add to [Martina Kappes'](#) quality of life. They are pleasures which she was forced to do without for many years owing to a congenital leg length discrepancy.

Martina Kappes is an attractive young woman who decided in her mid-twenties to have her shorter leg lengthened with FITBONE®, the intramedullary lengthening nail from WITTENSTEIN Intens. "I would absolutely make the same decision again", she says, looking back. "Only minimally invasive surgery was necessary, I didn't have to stay long in hospital, the lengthening process was largely painless and the cosmetic result was also perfect."

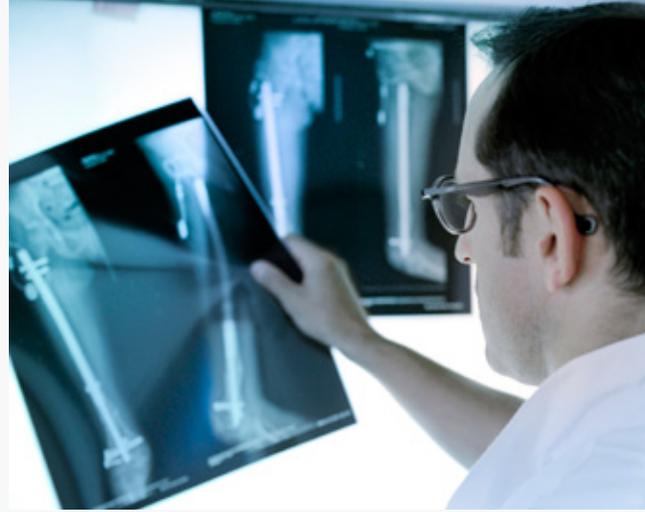


FITBONE®

During a FITBONE® operation, the intramedullary lengthening nail is implanted by minimally invasive surgery after cutting the bone in two.



The FITBONE® intramedullary lengthening nail is only implanted by experienced surgeons.



»FITBONE® is a fully implantable system that combines uncomplicated treatment with excellent cosmetic results.«

PROFESSOR RAINER BAUMGART,  
CENTER FOR CORRECTIVE AND RECONSTRUCTIVE SURGERY  
OF EXTREMITIES (ZEM) GERMANY IN MUNICH



Martina Kappes reports in a video on her experience with FITBONE®.



"Part of the concept is to have at least one COE with experienced surgeons in each country where this kind of operation is carried out regularly", Professor Baumgart explains.

### Functional shoes, not fashion footwear

When Martina Kappes was six years old, her paediatrician discovered that her right leg was about two centimetres shorter than her left. What followed would probably class as a major disaster for any young girl: instead of wearing pretty shoes like her friends, she was forced to put up with unfashionable orthopaedic footwear. The leg length discrepancy increased year after year as she grew up into a young woman. "It had become four centimetres by the time I was 16", Martina remembers. "As time went by, I also started to feel the negative effects of the shorter leg more and more: pain in my back, hips and knees."

### FITBONE®: short operation, virtually no pain, no ugly scarring

There are probably almost no patients who actually jump for joy when their doctor tells them they need an operation – and Martina Kappes certainly wasn't one of them. She expressed a number of fears: a complicated operation, a painful healing process, awkward fixators on her leg, a long hospitalization period, restricted mobility and a reduced ability to participate in everyday work and leisure activities. "When I learned that thanks to FITBONE® a solution also

exists without any of those impairments, I was incredibly relieved", Martina recalls. She first heard about it from her husband, who works for WITTENSTEIN and told her all about the intramedullary lengthening nail. "FITBONE® is a fully implantable system that combines uncomplicated treatment with excellent cosmetic results", explains Professor Rainer Baumgart of the Center for Corrective and Reconstructive Surgery of Extremities (ZEM) Germany in Munich. It didn't take Martina long to be convinced of the FITBONE® principle: the intramedullary lengthening nail is completely implanted in the bone as a keyhole operation, in other words as a minimally invasive procedure with only tiny cuts. This has several advantages for the patient: small-to-very small scars, no external fixators and no risk of infection at the body exit points.

### Wheelchair-free convalescence

Only twenty-four hours later, the leg had recovered sufficiently to bear at least part of Martina Kappes' weight again and she was able to attempt her first steps with crutches. She was discharged from hospital within a few days and subsequently controlled the distraction process herself in the comfort of her own home. She was provided with a handy little external control set for this purpose, which



View of the WITTENSTEIN intens cleanroom, where the FITBONE® intramedullary lengthening nail is made.

activates the motor in the intramedullary nail and carefully extends it. "About one millimetre every day, to make sure the bone growth is just right and doesn't cause any pain" Martina adds. The bone in her thigh was gradually lengthened in this way until after approximately five months, the treatment was completed and the leg length discrepancy compensated. "Throughout the treatment period I was able to lead a normal life without pain and without being restricted by a wheelchair, for instance", Martina reports.

#### **Safe procedure performed by experienced FITBONE® surgeons**

The FITBONE® was removed again after about a year. Both the procedure itself and the implant insertion took place at ZEM Germany in Munich – a so-called Center of Excellence (COE). All FITBONE® operations at the COEs are performed by highly specialized surgeons with years of experience in the correction of leg length discrepancies and special training from WITTENSTEIN intens in the use of the intramedullary lengthening nail. "Part of the concept is to have at least one COE with experienced surgeons in each country where this kind of operation is carried out regularly", Professor Baumgart explains.



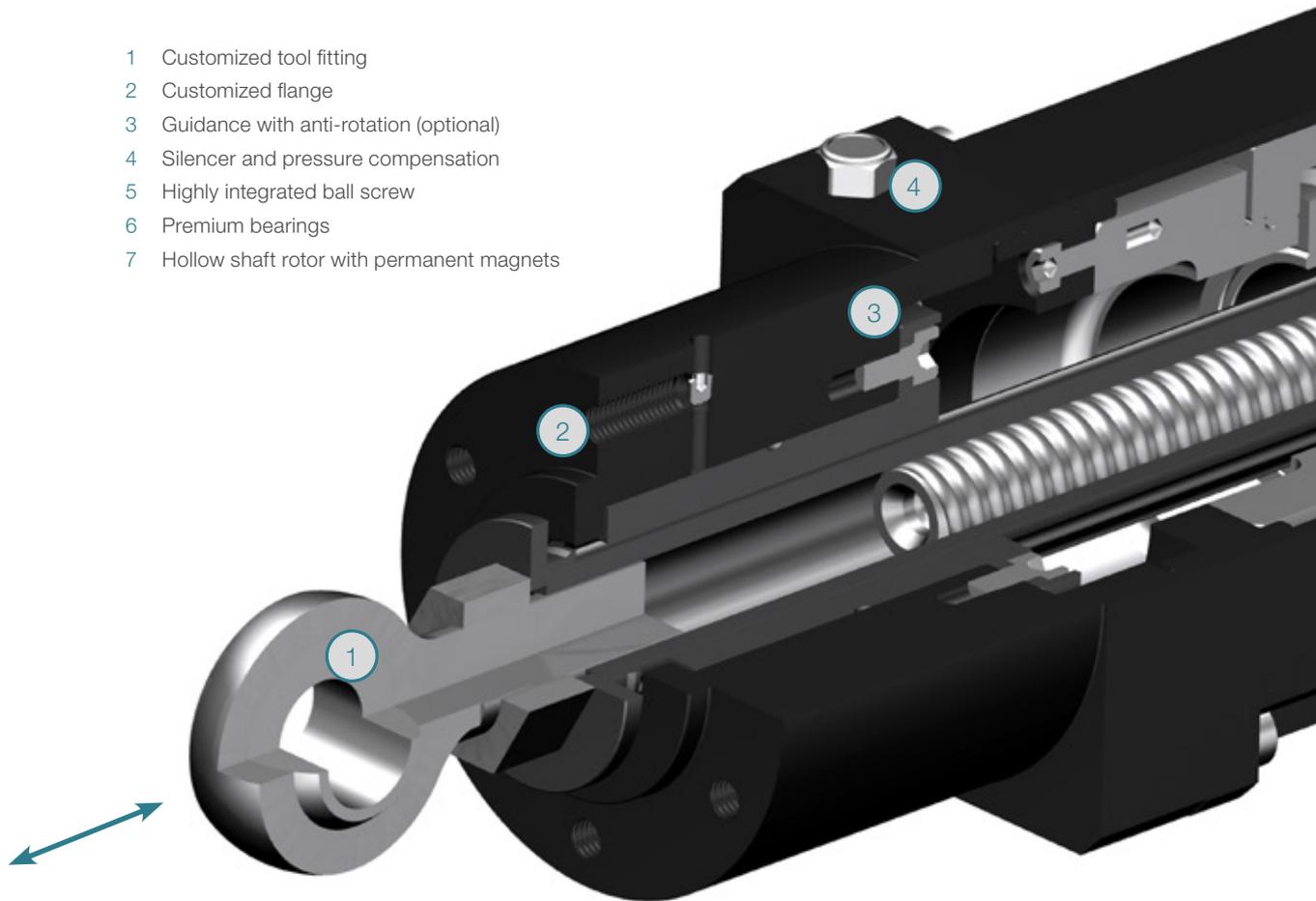
**The unique COE concept gave Martina Kappes the confidence she needed:** Several thousand FITBONE® systems have been implanted to date, and in almost every case they have proved to be technically reliable and the operation non-critical – even where complicated procedures are necessary, FITBONE® is an excellent product. With appropriate preoperative planning and surgical techniques, it is possible to carry out axial and torsional corrections as part of limb lengthening in a single operation. "That certainly eases the decision to go under the knife", Martina confesses.

She hasn't once regretted undergoing the FITBONE® procedure. "I would absolutely make the same decision again and I wholeheartedly recommend it to anyone suffering from the same problem. At the very latest when you can walk straight again without feeling pain, you are grateful for the new quality of life the FITBONE® system gives you."

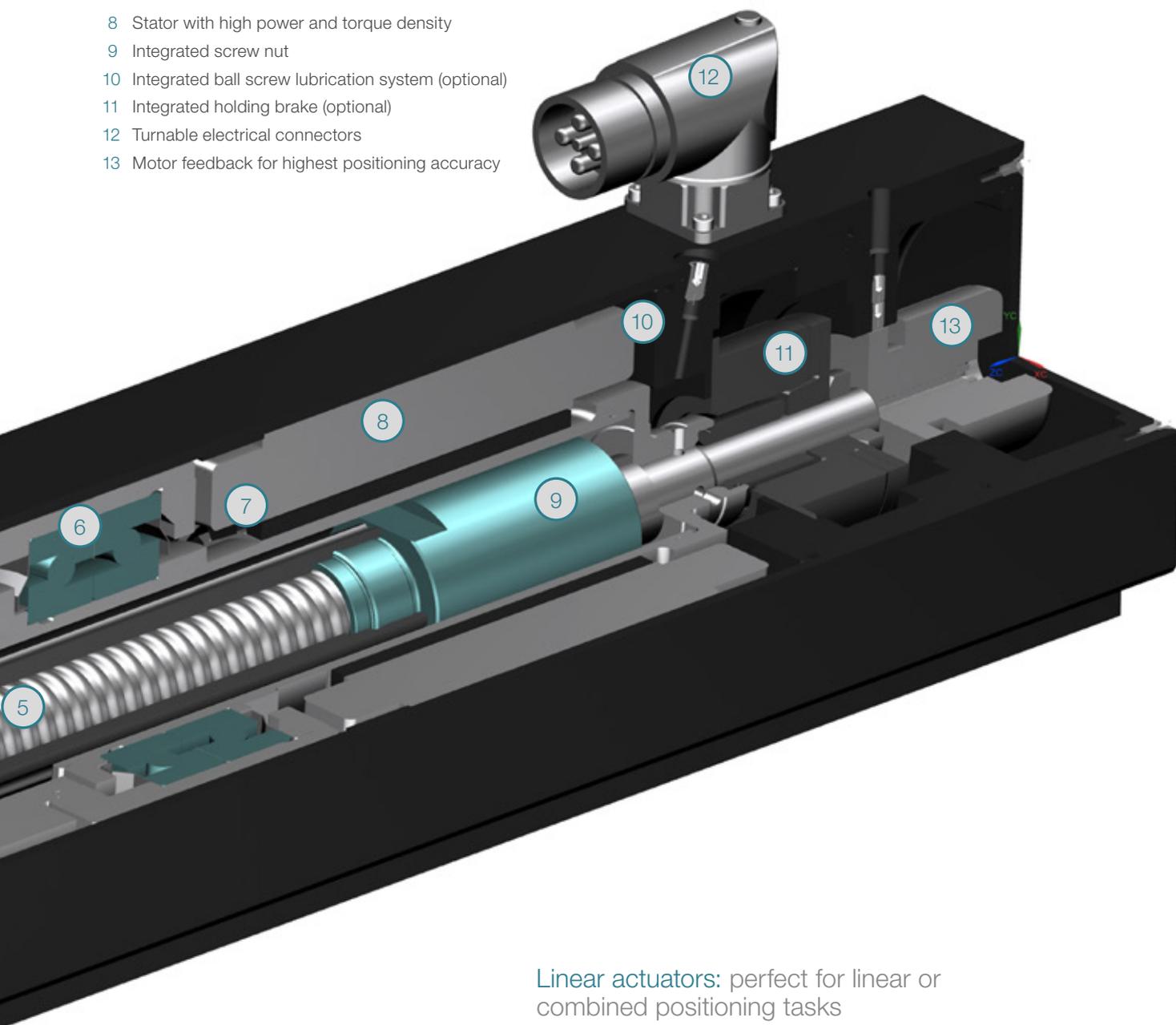
Converting rotational into linear movements – that's the basic function of any linear actuator. Yet the cyber® force motors from WITTENSTEIN cyber motor deliver far more than just this elementary performance. Thanks to their individual design and high power density, they open up novel solutions – in everyday industrial use as well as in rough environmental conditions.

## Linear actuators: **definitely not off the rack**

- 1 Customized tool fitting
- 2 Customized flange
- 3 Guidance with anti-rotation (optional)
- 4 Silencer and pressure compensation
- 5 Highly integrated ball screw
- 6 Premium bearings
- 7 Hollow shaft rotor with permanent magnets



- 8 Stator with high power and torque density
- 9 Integrated screw nut
- 10 Integrated ball screw lubrication system (optional)
- 11 Integrated holding brake (optional)
- 12 Turnable electrical connectors
- 13 Motor feedback for highest positioning accuracy



### Linear actuators: perfect for linear or combined positioning tasks

All linear actuators in the cyber® force motors portfolio can be supplied in three variants. “When only limited space is available for installation, our highly compact linear motors with a highly integrated ball screw are the best choice”, explains Carolin Ank, Product Manager at WITTENSTEIN cyber motor GmbH. Another advantage is that thanks to their patented lubrication system, these motors require virtually no maintenance and allow the ball screw to be re-greased without disassembly. And at the customer's request, WITTENSTEIN cyber motor can also develop a solution that is completely maintenance-free.

## Highly compact linear actuators with...

### ...integrated screw

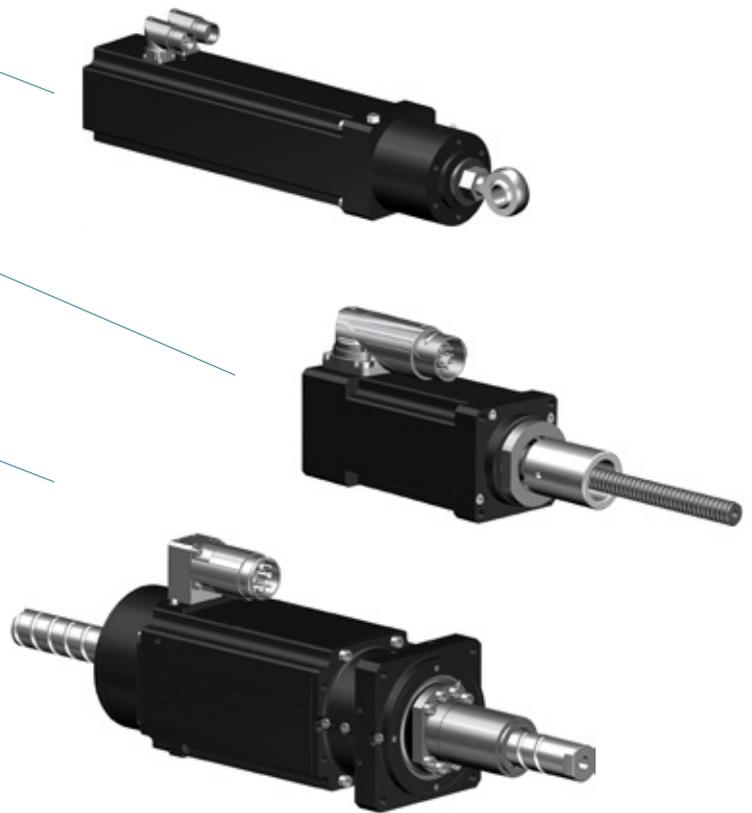
When installation space is scarce, highly compact linear actuators with a highly integrated ball screw and rigid bearings are the best choice.

### ...directly driven screw

Owing to their special design principle, these electromechanical cylinders are a financially attractive alternative for all applications where space is not an issue.

### ...endless screw

Hollow shaft actuators with an endless screw are ideal for applications with an "endless" stroke.



## Rough conditions

When particularly rough conditions demand a special design, screw-type actuators are ready to confront the challenges: operating environments up to 300°C, for example, radiation fields up to 10<sup>7</sup> Gy or operating pressure down to 10<sup>-8</sup> mbar are not a problem. Other variants are specially rated for applications in hazardous areas or suitable for food and beverage contact. Customized actuator designs are a must here because the equipment has to be thoroughly cleaned and disinfected.



Electromechanical cylinders with a directly driven motor shaft, designed as a ball screw shaft, are another option. Owing to their special design principle, they are a financially attractive alternative which is perfect for all highly dynamic applications where space is not an issue. Whereas the stroke of both these variants is defined by the screw length, hollow shaft actuators with an endless screw are suitable for applications with an "endless" stroke – even with compact sizes.

### Rotary and linear motion in one

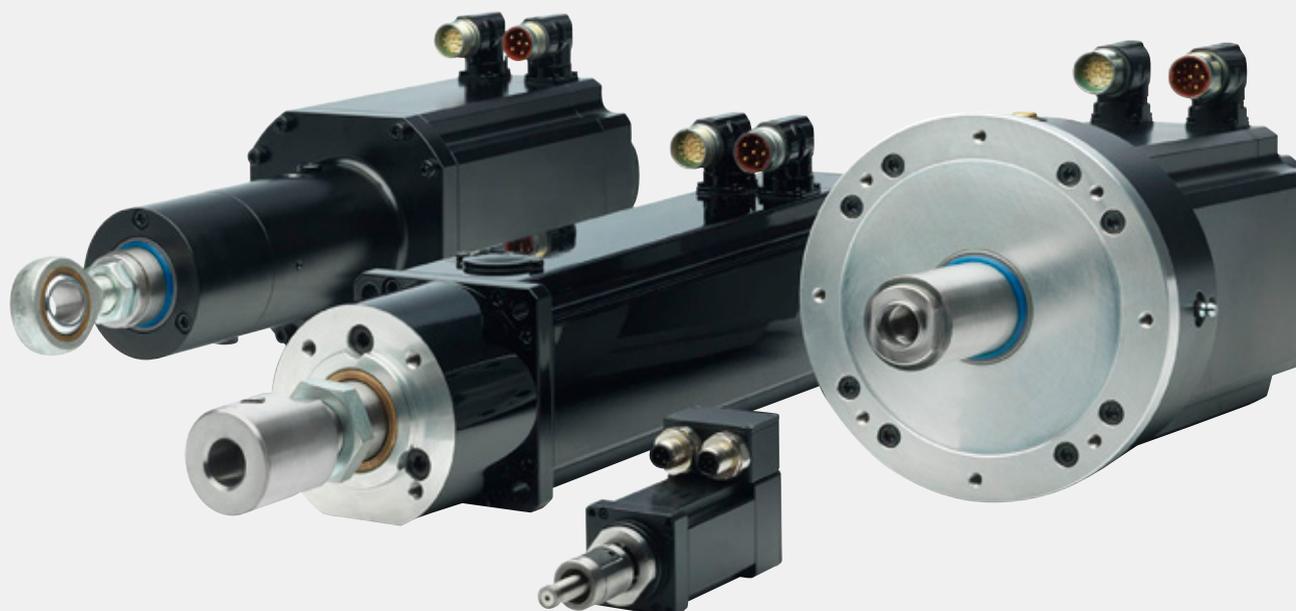
For positioning tasks where both a linear and a rotary motion are required, the combined linear-rotary actuators of cyber<sup>®</sup> force motors with two actuators in one housing are the ideal solution. The two motions can be controlled independently of one another – and the compact design of the linear-rotary actuators simplifies their mechanical integration.

### Customized design for optimal performance

Rather than systems off the rack – with all the inevitable technical compromises – WITTENSTEIN cyber motor builds screw-type actuators based on a modular system with customized sizing and configuration. Flange sizes from 40 mm to 270 mm and a maximum force of 750 kN are possible as well as other, bespoke sizes. Ank describes the procedure: "To ensure



Discover more  
about cyber® force motors.



**Highly compact, high torque, customized** –  
three outstanding attributes of the linear actuators used for cyber® force motors.

that these fully integrated actuator units perform optimally, all duty cycles and requirements are individually calculated using a software sizing tool". The design can also take account of customized or application-specific components, so that a feasibility assessment and a made-to-measure implementation concept can be submitted to the client within a few days. Thanks to the modular design, for instance, several different motor encoders can be realized for position control and the actuators connected to any standard industrial controller. From there, it's only a short step to the first functional model and a rapid production ramp-up – especially since WITTENSTEIN cyber motor can make use of proven, approved and certified servo motors manufactured in-house. The special WITTENSTEIN quality standards for design, production and functional testing guarantee optimal reliability in the most diverse applications.

#### **Optimal availability in standard or extreme applications**

Highly compact, high torque, customized – three outstanding attributes of the linear actuators used for cyber® force motors in a wide range of applications. They are just as impressive at assembly workstations as they are in complex mating and pressing processes, in capping systems for filling and packing food and beverage products, when reshaping plastic film or metal sheets or for closing and dispensing axes in injection moulding machines.

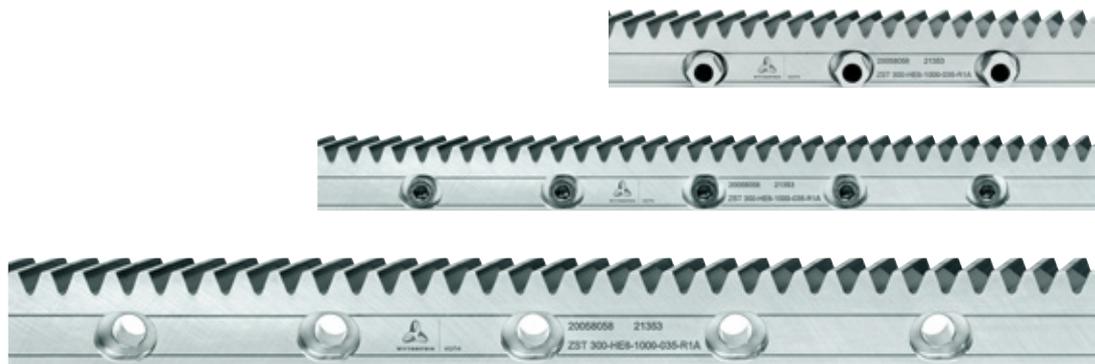
The linear and combined linear-rotary actuators of cyber® force motors are well established as compact, ready-to-mount and technically and commercially optimized solutions. Due to their modular design, these actuators can be adapted to almost any requirements. They meet the needs of the applications without compromises – and with real benefits for customers.

If your colleagues welcome you every morning with a cheerful "Grüezi", the chances are you work in Switzerland – like the 38 WITTENSTEIN sales, development and production staff in Grüşch (a small village in the Grisons canton). WITTENSTEIN first moved into premises there back in the year 2000 and for the last five years the production and administrative building in Trutwisstrasse 1 has been home to the Group's centre of competence for racks.

## High-tech production in a mountain valley

WITTENSTEIN Switzerland celebrates 15 years

The Group's competence centre for racks is situated in Grüşch, not far from the regional capital of Chur in the Alpine Rhine valley.



Originally set up mainly as a Swiss sales company for the WITTENSTEIN Group, WITTENSTEIN AG (Switzerland) has meanwhile been part of the industry community referred to as "made in Grüşch" for 15 years. This WITTENSTEIN subsidiary initially shared the same roof as INNOZET, a burgeoning centre for start-up companies, in creative proximity to TRUMPF, another resident. However, it did not take long to gain a foothold in the Swiss market with innovative, high quality, drive technology. A new building on an adjoining site for WITTENSTEIN's sole use was officially opened in 2010; an elegant, light-filled structure costing 17 million Swiss francs and clearly visible from afar, it marked the start of a new development phase. With 2000 square metres of production space and 1000 square metres of offices, there is now ample room for the three business segments which are the specialities of WITTENSTEIN Switzerland and General Manager Gerhard Horn: the manufacture of premium racks, the development and production of sensor technology

and the sale of innovative drive solutions from the WITTENSTEIN Group's complete product portfolio. "We set great store by a building in which production and offices are in close physical proximity. Staff in Production, Development and Sales can get together at short notice to discuss new ideas or tackle any problems which arise. When I look back today, I think you could say we succeeded", says Dr. Anna-Katharina Wittenstein, Chairperson of the Board. She chooses the imagery of the surrounding mountain landscape to formulate the current – and altogether ambitious – production target: "We're aiming this year to build enough racks to reach all the way from Grüşch to the top of our local Schesaplana mountain – 18 times over!"

Incidentally, the close cooperation with INNOZET has continued right through to the present: 200 square metres in Trutwisstrasse 1 are let out to the Grisons Start-up Foundation.



Group photo to celebrate the 15th anniversary of WITTENSTEIN AG in Grüşch: (front row, from left to right) Professor Dieter Spath (Member of the Board of Directors as well as Chairman of the Board and CEO, WITTENSTEIN AG, Germany), Dr. Anna-Katharina Wittenstein (Chairperson of the Board), Dr. Brigitta Gadiant (former Member of the National Council); (second row, from left to right): Klaus Spitzley and Dr. Ulrich Immler (Members of the Board of Directors), Gerhard Horn (General Manager, WITTENSTEIN AG, Switzerland, 5th from left)

»We're aiming this year to build enough racks to reach all the way from Grüşch to the top of our local Schesaplana mountain – 18 times over!«

DR. ANNA-KATHARINA WITTENSTEIN, CHAIRPERSON OF THE BOARD



A new assembly line for high-end gearheads in the SP+ and TP+ series recently went into operation at WITTENSTEIN North America. The investment is a central element of the WITTENSTEIN Group's globalization strategy which simultaneously lays the foundation for future growth at the Bartlett facility in Illinois.

## German engineering – made in the USA

WITTENSTEIN sets benchmarks for local production



Very pleased with the new assembly line in Bartlett (from left to right): Dr. Lars Aldinger (Executive Vice President Production and Logistics) and Anthony DeCore (Team Leader Assembly) with Assemblers Kevin Sanches and Enrico Cunanan



## "Local production"

The decision clearly underlines the importance of the North American market for WITTENSTEIN. Ever since alpha gear drives Inc. was founded – in 1992, sowing the seeds for what is today WITTENSTEIN North America with 95 staff on the payroll – it has practised a forward-looking philosophy of creating added value close to where its customers are located. A modular assembly line for the LP gearhead series was gradually established, first in Elk Grove Village and later in Bartlett, near Chicago. It was successively upgraded over the years to a full-blown assembly line. Parallel to this, the proportion of components manufactured locally was continuously increased. The production of mechatronic systems expanded to match: the portfolio meanwhile also includes mechatronic drive systems for safety technology as well as aerospace simulators.

### Realignment: "fit for growth"

As part of the realignment, WITTENSTEIN managed to bring its Bartlett production processes into line with the requirements of twenty-first century North America in just 8 months. Priority was given to accelerating the supply chain to the end customer. All value flows were designed for efficiency and speed and local production capacities extended, to enable the Assembly department to be provided with parts even faster, more flexibly and more efficiently. Today, high-tech production facilities with automated peripherals ensure a high output and consistently high quality. WITTENSTEIN also invested in improved order processing reliability. All material and equipment are labelled with QR codes to allow them to be uniquely identified at any time.

### Local production of high-end SP<sup>+</sup> and TP<sup>+</sup> gearheads

The present lean, stable value chain has been crucial for the success of the new SP<sup>+</sup> and TP<sup>+</sup> gearhead assembly line. Designed according to lean manufacturing principles, this line places the emphasis even more firmly on the customer: since the beginning of the year, production on two assembly lines has been aligned to each client's own pace, with the result that customer-specific modifications can be realized promptly and just as easily as orders from key accounts. The majority of products for the North American market are thus manufactured locally. It's a situation that is much appreciated by

customers because end-to-end assembly in the country concerned means better flexibility and responsiveness while simultaneously shortening delivery times. "We're very proud of the fact that we can now make our main gearhead lines – LP<sup>+</sup>, CP, SP<sup>+</sup> and TP<sup>+</sup> – to order on the spot in the U.S. Customer proximity is no longer simply a slogan. The supply chain the customer has been substantially accelerated", says Dr. Lars Aldinger, Executive Vice President Production & Logistics and as such responsible for the production facility in North America. "Preferred series – like the LP<sup>+</sup> gearheads – are shipped within 24 hours of the order being placed."

### Customer retention through quality and service

The assembly line and its networked workstations conform to the high WITTENSTEIN quality standards in every respect: "To make sure our high level of quality worldwide is also maintained at the Bartlett production site, we provided a few weeks of intensive training to assembly and engineering staff at our German headquarters. That helped us get our new line up and running fast and successfully. It will also empower us in the long term to make gearheads that comply with the very highest quality and availability requirements", explains Anthony DeCore, Team Leader Assembly in Bartlett. Peter Riehle, President and CEO of WITTENSTEIN North America, is no less enthusiastic: "The market has reacted extremely positively to our expanded production and service capacities. Our customers are grateful for the far shorter delivery times and the high flexibility no matter what the volume. Another important criterion is that our service technicians can provide prompt on-site support where necessary and reduce machine downtime to a minimum by getting spare parts out there very fast."

WITTENSTEIN North America will continue to strengthen its customer service systematically, from the custom-tailored delivery of products to the place of use through private labels and prepacking as well as electronic order data tracking to web based information in the framework of our Industry 4.0 activities.

Flexibility, prompt deliveries, quality and service – WITTENSTEIN North America proves that creating added value locally helps put our customers in the fast track.

New structure, new content, new look: Our website is now consistently aligned to our customers' needs. The modern design is optimized for mobile devices and the navigation and content have likewise been revised accordingly.

## Experience WITTENSTEIN on the web in a new way! **Click now and take a look inside!**



Of course, it's the fresh, open look that instantly catches the eye, but the structure and technology of our website have been modified at the same time. Future visitors will profit from fast, direct access to the WITTENSTEIN Group's various products, services and Business Units. You can access topics and solutions on several different levels – for example products, fields of expertise or applications –

depending on your personal preferences. For the first time, all WITTENSTEIN products are combined on a central overview page with a filter function. The majority of the product pictures were created as 3D renderings, with the result that they can be rotated through 360°. Supplementary product information and CAD data can now also be downloaded directly from the product pages – or

Our Careers pages, which you can access directly on [www.wittenstein-jobs.de](http://www.wittenstein-jobs.de), offer many exciting prospects for technical and managerial specialists as well as students and school leavers. You can get a glimpse there of working life at WITTENSTEIN and embark on a virtual tour of our Igersheim-Harthausen facility.

[www.wittenstein.de](http://www.wittenstein.de)



Many of the photographs show our staff at work or getting to grips with fascinating challenges.



Experience the new website on different devices.

in several different languages from the central Download area. Most of the new content can be found under Company and Expertise. In future, these pages will be used more and more to report on specific, successful customer applications and demonstrate how the WITTENSTEIN Group's innovative vitality is manifested in practice. **We hope you enjoy browsing!**



The VDI's highest award for outstanding professional services in the field of science and technology

## The engineer as an artist

### Grashof medal for Dr. Manfred Wittenstein

What have Carl Bosch, Alfred Krupp, August Wilhelm Maybach, Ferdinand Porsche, Werner von Siemens and Ferdinand von Zeppelin got in common? Firstly, their engineering achievements are legendary. Secondly, they are all holders of the commemorative medal originally presented by the Association of German Engineers (VDI) in 1894 in memory of Franz Grashof, the VDI's co-founder and long-time Director. It is widely regarded as the highest award to engineers for outstanding professional services in the field of science and technology. Dr. Manfred Wittenstein is the most recent recipient of this prestigious accolade.



»There is no doubt in my mind that engineers are also artists; after all, they too must be creative and they have to come up with new things. High creative potential is vital.«

DR. MANFRED WITTENSTEIN,  
CHAIRMAN OF THE SUPERVISORY BOARD, WITTENSTEIN AG

The VDI's Grashof medal was originally presented in 1894 in memory of Franz Grashof (Professor of Theoretical Machine Design at Karlsruhe Institute of Technology as well as co-founder and first Director of the VDI from 1856 to 1890). It is an award made to engineers for outstanding professional services in the field of science and technology. Embossed in gold, the medal depicts Franz Grashof on the front with the recipient's name and the year on the reverse.

The German Engineering Federation (VDMA) was delighted with the prestigious award for its former President (until 2010):

"He is one of the foremost engineers and entrepreneurs of our time – a man of vision with the courage to innovate. His commitment to excellent engineering achievements, innovation and intelligent production sets an outstanding example.

Dr. Wittenstein has been dedicated to the advancement of the German engineering industry for many years now. He is a sought-after advisor on innovation policy at a regional, national and European level. His name is synonymous with social responsibility and a holistic innovation culture, founded on the self-perception of Germany's culture of technology and inspired by a respectful, cosmopolitan outlook", said Hartmut Rauert, the VDMA's Deputy Executive Director.

»As engineers, we have a fundamental mission to make people's lives easier, to build tools that get people ahead. Industry 4.0 is the best example. Our goal is to be at the forefront of this trend.«

DR. MANFRED WITTENSTEIN



Dr. Manfred Wittenstein (right) was recently honoured with the VDI's Grashof medal for his life's work: this distinguished award was presented to him by VDI President Dr. Udo Ungeheuer (left) at the 27th German Engineers' Convention.

**"Thinking Generations – Innovations for Germany"** – the motto for this year's German Engineers' Convention, which provided a worthy backdrop for the award ceremony, could not have been better chosen for Dr. Manfred Wittenstein, aged 73, the newest recipient of the Grashof commemorative medal. Long acknowledged as a visionary among machine builders, Dr. Wittenstein transformed the family firm he took over from his father in 1979 – which at the time was still specialized in the manufacture of double chainstitch machines for glovemaking – into a successful global player in the field of mechatronics and drive technology.

According to Wittenstein, for whom engineering is a passion, "his" profession is one that holds considerable meaning: "I take the view that an engineer combines the image of an artist and a master who succeeds in bringing creative competencies to life and in putting them to practical use in an interdisciplinary dialogue. To serve people with controllable technology and develop tools that overcome the challenges of the future – it's a wonderful task which awaits the

next generation of young engineers. I take pleasure in accepting this award on behalf of all staff – in anticipation that it will guide and motivate us to continue acting with courage in the years to come", the Chairman of the WITTENSTEIN AG Supervisory Board commented on receiving the prize for his life's work.

He formulated his own personal hope for Germany's future as a manufacturing location and innovation leader with an image borrowed from nature: "The contribution being made by German engineers as industry launches into a new, digitized and networked era is perhaps not yet fully clear. We are currently experiencing the water lily principle as Industry 4.0 takes off." In winter, there is not a single flower to be seen in the pond, yet in summer the entire surface bursts into bloom as if by magic. Processes that have been hidden from view for several months suddenly become visible to everyone. "To abide by this metaphor", Wittenstein continued, "we're now in the middle of spring".

## Technology. Not a question of age!

A WITTENSTEIN initiative:  
Youth Technology Learning Centre

Air is "not nothing": although normally invisible, it exerts a tremendous force on its surroundings. The insatiable desire of children, teenagers and young adults to understand natural phenomena such as this – by experimenting, building models and trying things out – can now be satisfied under professional guidance.



The "Jugendtechnischule Taubertal" (Tauber Valley Youth Technology Learning Centre) was set up by WITTENSTEIN AG in cooperation with regional partners in industry and the general public. This new, independent, extracurricular education initiative supplements the company's traditional commitment to youth advancement in the areas of mathematics, informatics, the natural sciences and technology: the annual scholarship for school leavers aspiring to study a science subject and the "Creative Young Minds" competition for fledgling inventors have now been joined by a creative "little sister".

### You can't begin soon enough

Just in time for the start of the new 2015/16 school year, boys and girls from pre-school age upwards now have a chance to gain their first playful insights into the huge world of modern technology and engineering. "There are plenty of out-of-school activities for children and young people to try out in other areas like sports", says Karin Markert of WITTENSTEIN AG. A manager in the company's Human Resources department, she has collaborated extensively with Xaver Schützenmeier, who works as a trainer, on the development of the new project. "A lot of youngsters leave our region when they finish





The Tauber Valley Youth Technology Learning Centre aims to arouse curiosity and a fascination for technical details. Its programme is targeted at various age groups – from pre-school children to young adults – and is equally suited for boys and girls.



A variety of workshops, courses and projects are offered by the Tauber Valley Youth Technology Learning Centre in cooperation with partners in industry, schools, kindergartens and the general public. The world of technology is explained by playful means: those taking part have a chance to deepen and expand their knowledge, develop practical skills, creativity and inventive spirit and in some cases gain a glimpse of the opportunities for a future career.

[www.jugendtechnikschule-taubertal.de](http://www.jugendtechnikschule-taubertal.de)

school and don't return after they've completed their degree. If we can succeed in arousing the enthusiasm of just a few of them for delving into the mysteries of science and tinkering around to find a solution at an early age – and if we can show them which career opportunities that can open up for them locally – it will be a win-win situation. The initiative will benefit us, other companies in the region, the region itself and above all the young adults who are persuaded to return maybe several years later to the place they call home as highly qualified specialists.

Encouraging creativity and inventive spirit has long been a matter close to the heart of Dr. Manfred Wittenstein, the proprietor of WITTENSTEIN AG. The official opening of the Tauber Valley Youth Technology Learning Centre moreover represents the fulfilment of a promise he made on the occasion of his 70th birthday: instead of gifts he asked for donations for his newest project to promote unconventional methods for youth advancement. The Centre receives financial support from the WITTENSTEIN Foundation; the first exciting, practically relevant workshops and courses have already begun there under professional guidance. Iris Lange-Schmalz, the Centre's

Director who also oversees the "Creative Young Minds" competition for budding inventors, is delighted at the success of the preliminary test runs: "We had an awful lot of visitors to our 'Technology Days' in the spring. That's why we decided to publicize the new programme in Bad Mergentheim Castle. Incidentally, we've been lucky enough to be given the use of rooms there belonging to the Bad Mergentheim Campus of Baden-Württemberg Cooperative State University Mosbach."

It won't be long now before the Centre gets properly off the ground with the first project phase this autumn. The programme of activities is certainly very tempting: "Experiments with a splash – let's build a squirt gun. How do water pumps and turbines work?" "Hot wire – let's build a game of dexterity with an electronic circuit", "Sharpener robot – the school butler", "Let's build a traffic light" or "Old tractors – technology meets driving pleasure". Plus, of course, the workshop we mentioned at the very beginning called "Experiments with air". It's a safe bet that the new Tauber Valley Youth Technology Learning Centre will soon be exerting a tremendous force on its surroundings too!



## Trade fair calendar 2015/16

### Motek

Stuttgart (Germany)  
WITTENSTEIN Group  
October 5 to 8, 2015

### EMO

Milan (Italy)  
WITTENSTEIN S.P.A.  
October 5 to 10, 2015

### M-Tech

Osaka (Japan)  
WITTENSTEIN Ltd.  
October 7 to 9, 2015

### Interlift

Augsburg (Germany)  
WITTENSTEIN alpha GmbH  
October 13 to 16, 2015

### Euroexpo

Örnköldsvik (Sweden)  
WITTENSTEIN AB  
October 21 to 22, 2015

### Engineering Design Show

Coventry (UK)  
WITTENSTEIN Ltd.  
October 21 to 22, 2015

### CeMAT

Shanghai (China)  
WITTENSTEIN (Hangzhou) Co., Ltd.  
October 27 to 30, 2015

### CIIF

Shanghai (China)  
WITTENSTEIN (Hangzhou) Co., Ltd.  
November 3 to 7, 2015

### Robomatica

Madrid (Spain)  
WITTENSTEIN S.L.U.  
November 4 to 5, 2015

### FMB

Bad Salzungen (Germany)  
WITTENSTEIN Group  
November 4 to 6, 2015

### Elmia Subcontractor

Jönköping (Sweden)  
WITTENSTEIN AB  
November 10 to 13, 2015

### Automation Fair

Chicago/IL (USA)  
WITTENSTEIN Inc.  
November 18 to 19, 2015



WITTENSTEIN is represented at numerous trade fairs and exhibitions worldwide.  
**We look forward to meeting you!**

#### SPS IPC Drives

*Nuremberg (Germany)*  
*WITTENSTEIN Group*  
**November 24 to 26, 2015**

#### Euroexpo

*Luleå (Sweden)*  
*WITTENSTEIN AB*  
**November 25 to 26, 2015**

#### I/ITSEC

*Orlando/FL (USA)*  
*WITTENSTEIN Inc.*  
**November 30 to December 4, 2015**

#### Subsea UK

*Aberdeen (UK)*  
*WITTENSTEIN motion control GmbH*  
**February 3 to 5, 2016**

#### LogiMAT

*Stuttgart (Germany)*  
*WITTENSTEIN motion control GmbH*  
**March 8 to 10, 2016**

#### WIN Automation

*Istanbul (Turkey)*  
*WITTENSTEIN alpha GmbH*  
**March 17 to 20, 2016**

#### Drives & Controls

*Birmingham (UK)*  
*WITTENSTEIN Ltd.*  
**April 12 to 14, 2016**

#### Hannover Messe

*Hanover (Germany)*  
*Industrial Automation*  
*WITTENSTEIN Group*  
**April 25 to 29, 2016**



Current trade fair  
calendar

