WITTENSTEIN

# move

The magazine for customers and partners of WITTENSTEIN AG


## WITTENSTEIN alpha GmbH

## Designing efficiency and designing efficiently

11 October · 2013

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## Masthead

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## Contents

10 years of
WITTENSTEIN aerospace & simulation GmbH
Interview with Christoph Heine — 4

“efficiency engineering”
WITTENSTEIN alpha GmbH — 6

Dialogue with an astronaut
Prof. Dr. Ernst Messerschmid visits WITTENSTEIN — 8

New SC+ right-angle gearhead family
WITTENSTEIN alpha GmbH — 10

Planetary gearheads in certified hygienic design
WITTENSTEIN alpha GmbH — 14

Gearheads direct from the printer
The truth behind the 3D printing hype — 16

“Ungrippable” objects gripped and
positioned safely
attocube systems AG — 18

Mechatronics on the sea bed
WITTENSTEIN motion control GmbH — 22

A sustainable partnership turns five
WITTENSTEIN Spain — 24

WITTENSTEIN news — 26

Trade fair calendar 2013/14 — 27

# Dear readers,

If Aristotle, the Greek philosopher, were to appear on a modern TV chat show alongside managers and economists, he wouldn't need much preparation; all he'd have to do would be to dig out a few entries from his two-and-a-half thousand year-old notes and translate them into the language of the media. His verdict on the omnipresent sceptics and prophets of doom seated around him would be reminiscent of ancient Greece – yet still be just as relevant today: "We can't change the wind but we can set the sails correctly".

And he would be absolutely right: the economy is still in a state of considerable uncertainty, with signals and trends alternating constantly between shadows and light. It's up to all of us to set the sails correctly. Our particular sail is our claim of unconditional excellence in the field of mechatronic drive technology. When it comes to technology, product quality and support, the claim we pursue is an ambitious commitment to sustained world-class performance. In the fiscal year just ended, we definitely set our sail correctly – the increase in the WITTENSTEIN Group's sales to 241 million euros is proof that we are on the right course.

Excellence is the outcome of ability and expertise – not forgetting quality. The starting point is a concept for performing at the highest possible level in a particular field. You have a right to demand this excellence from WITTENSTEIN as a matter of course! Yet what we normally take for granted isn't entrenched in the public awareness automatically.

With this in mind, WITTENSTEIN alpha GmbH – our biggest subsidiary – has resolved to bundle its distinctive attributes, already widely established in the market, in a strong corporate principle: WITTENSTEIN alpha products, systems, engineering services and processes will in future be identified with a new "efficiency engineering" seal for optimal customized solutions. Let me give you an example: our redesigned rack installation technique has halved the time required to fix the racks to the machine bed. This will be just one of the numerous innovations on show at Motek 2013, the 32nd international trade fair for automation in production and assembly.

This autumn, the new WITTENSTEIN Innovation Factory at our company headquarters will enter the final construction phase. We hope to move into our new Mechatronics Centre in the spring of 2014. We see this new building as a visible sign of our commitment to make efficient and effective use of the resources at our disposal – today and tomorrow.

Karl-Heinz Schwarz Spokesman of the Management Board WITTENSTEIN AG

## *move* talks to:

# Christoph Heine

**Measured in "aviation years", the company has only just turned a teenager – WITTENSTEIN aerospace & simulation GmbH. Yet the modern aerospace industry would be unthinkable without its innovative, highly precise and robust actuator systems.**

More than fifty staff are currently employed in research, development and production in the UK, the US and Germany. General Manager Christoph Heine looks back on the company's ten-year history.

***move:*** Almost every small boy wants to be a pilot at some time or other. Was that also a childhood dream of yours?
**Christoph Heine:** Of course! I only really developed a serious interest in the aerospace industry after graduating from university though, when I took part in a trainee programme run by the Diehl Group. I've been fascinated by the incredible complexity and reliability of aircraft ever since. To take a simple example, cars are designed for a total service life of 3000 hours. Passenger planes pass that milestone after just six months. Unfortunately, the general public only gets to hear about it when something breaks down. This first impression is soon put into perspective when you remember that around two hundred different technical systems, many of them highly complicated, not only have to work continuously on board a commercial aircraft but also interact. There can't be a single person in the world today who understands absolutely every aspect of an aeroplane, but it's great fun being in a position to make a contribution.

***move:*** WITTENSTEIN aerospace & simulation was established in 2003 – can you recall how it all began?
**Christoph Heine:** The ground was laid by various one-off activities undertaken by the Group in the aviation sector; in the end, they were considered to be so promising that it was only logical to bundle and strengthen them under a separate roof.

***move:*** Are there any particular highlights that occur to you spontaneously?
**Christoph Heine:** It was orders for two systems in the Airbus A380 that finally led to the company being founded; we then received a license to operate from the German Civil Aviation Authority within a surprisingly short time. We're also involved again in the A350. Last year's space flight by the "SHEFEX II" sounding rocket was probably the icing on the cake that made all our efforts worthwhile. We designed an actuator with control electronics for the control surfaces in one fell swoop, as it were, using a completely new gearhead technology that had never previously been employed in this way – doing everything under space and re-entry conditions. That must be about the toughest challenge of all for any actuator to operate in – and the results were quite spectacular.

Christoph Heine
General Manager, WITTENSTEIN
aerospace & simulation GmbH

***move:*** Different product lifecycles apply in the aviation world compared to the manufacturing industry. Could you explain what the differences are and why they exist?

**Christoph Heine:** That's a rather ambivalent subject: I object to the way the aviation sector is commonly held to be resistant to innovation. This is mainly due to the very long product lifecycles, which can be up to fifty years or more. On the other hand, it's precisely this durability that compels manufacturers and suppliers to industrialize their innovations when a new aircraft prototype is developed.

Apart from a certain visual similarity, the Airbus A350 bears absolutely no resemblance to the A330 which came out only twenty years ago. There's an enormous pressure to innovate during the design and tendering phases, but once the product has been approved it stays on the market for years.

***move:*** What does it take to succeed in the industry?

**Christoph Heine:** You need both the chaotic dissidents in the Development department and the trusty, incorruptible engineers in Quality Assurance. We're basically operating in a so-called "farming business": we need to plough the land for a long time first, realize multiple options and cooperate in a variety of ways if we want to succeed. The biggest aircraft makers only come up with a totally new plane about once every ten years. If you miss the boat, you don't get another chance for the next decade or so. It's not a fast-moving business at all.

***move:*** Could you tell us about a few exciting projects you're involved in right now?

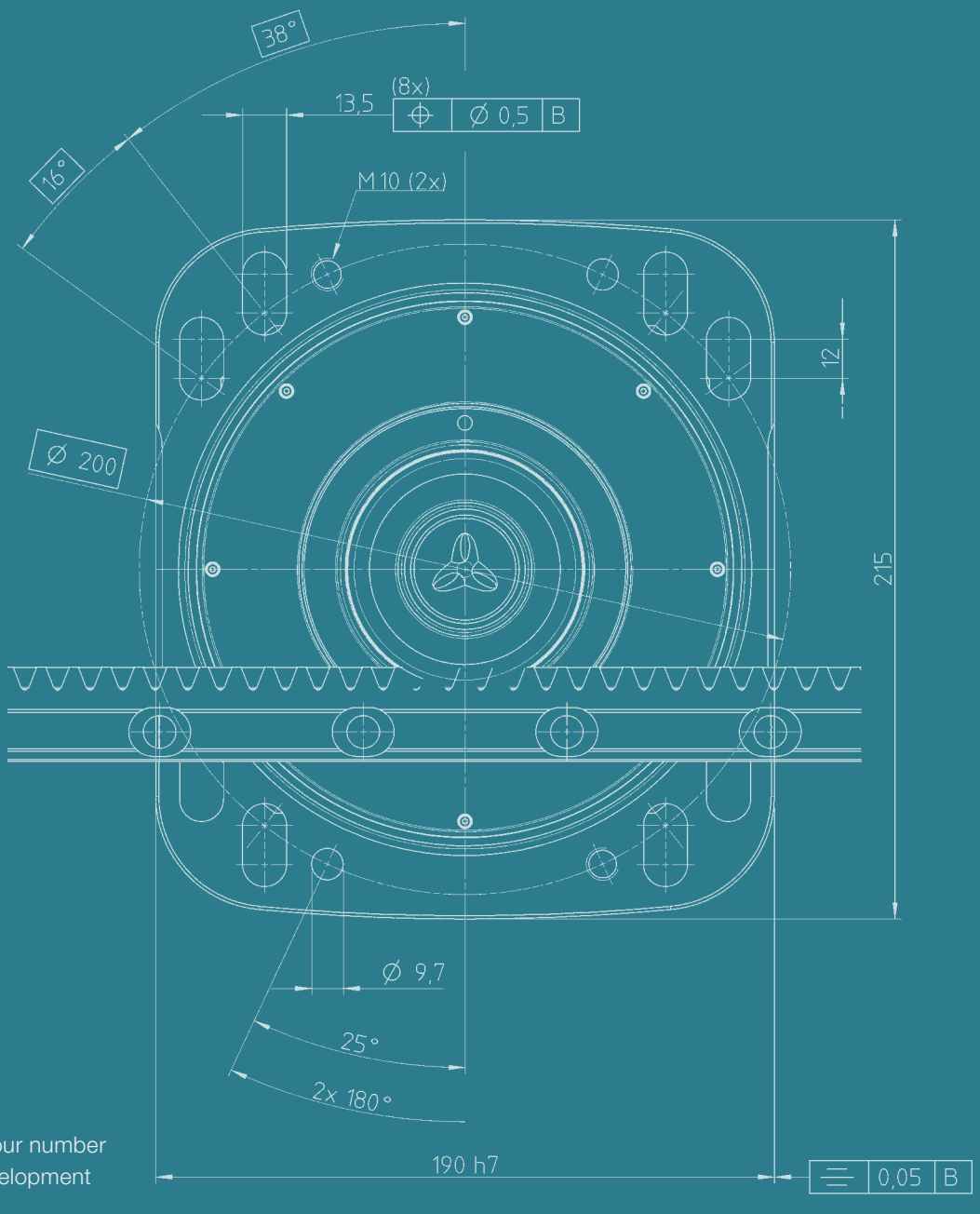
**Christoph Heine:** Most of the new projects we're currently working on are protected by nondisclosure agreements – that's the way the industry works – but without giving too much away we'll be shipping actuators for helicopter avionic systems very soon. Once again, we're succeeding where many of our competitors have given up.

***move:*** What does the future hold for WITTENSTEIN's "aerospace subsidiary"?

**Christoph Heine:** If you take a look at the majority of successful aviation suppliers in Germany, it's noticeable that a sizable proportion of them are family owned firms. It could be that these companies tend to be more interested in long-term, sustainable business relationships, even if a lot of perseverance is called for initially.

In the not-too-distant future, I'd like to see WITTENSTEIN mentioned in the same breath as other illustrious names in the German aviation industry such as Diehl, Liebherr or Recaro. There's also a good deal of international potential waiting to be tapped, especially in America. In short, there's plenty of work to be done and we certainly won't have time to get bored!

# Be better and stay better – **that’s “efficiency engineering”**




Efficient from the outset:
The benefits for customers are our number one priority – from the initial development stage to the final application.

**“Perfect is the enemy of good” – there’s no denying that there’s a lot of truth in this statement. Yet how is it relevant for a company like WITTENSTEIN alpha, which over the past few decades has evolved into a quality brand with solutions for many different markets? Is there anything left to be improved? And if so, how? An analysis of our internal processes and a look at the big picture provided the answer, which was aptly christened “efficiency engineering” by WITTENSTEIN alpha and will in future be visualized as a quality label.**

### What does efficiency mean in practice?

Effectiveness and efficiency are two terms that not only sound similar but also have a similar meaning – though with a fundamental difference linked to effort and achievement. Let me give a simple example: to use a Ming vase to kill a fly on the wall would almost certainly be effective. On the other hand, a lot of expensive china would inevitably be broken in the process. A simple fly swatter would be far cheaper, repeatable and more economical with resources – in other words, it would be a more efficient solution for this particular purpose. The term efficiency also correlates effort and achievement when applied to the world of WITTENSTEIN alpha. It implies the accomplishment of defined results to the benefit of the customer using as few resources as possible.

### “efficiency engineering” helps excite customers

WITTENSTEIN alpha serves global markets and in many cases global customers. They seek expert partners offering not only a suitable technology portfolio but also global presence, availability, support and services. They are searching for more than merely innovative and powerful products; optimized machine concepts, software, tools and processes are equally in demand. Within this context WITTENSTEIN alpha interprets “efficiency engineering” as the pursuit of efficiency on all levels: products, systems and solutions, technologies, the advice provided to customers and strategies for meeting highly diverse requirements – indeed in every facet of business relationships. The goal is to inspire customers enduringly and deliver the maximum possible, measurable benefits.

### Designing efficiency, designing efficiently – two examples

The two examples described below are intended to illustrate what “efficiency engineering” means in practice. WITTENSTEIN alpha has just optimized its rack installation concept. When the traditional method of first fixing the racks with screw clamps and then bolting them tight was examined in detail, it was discovered that customers can cut their assembly time by up to fifty percent by mounting the racks directly to the machine bed without any additional aids. The new solution – slotted holes and eccentric screws – significantly improves the installation process and leads to increased safety as well as saving time.

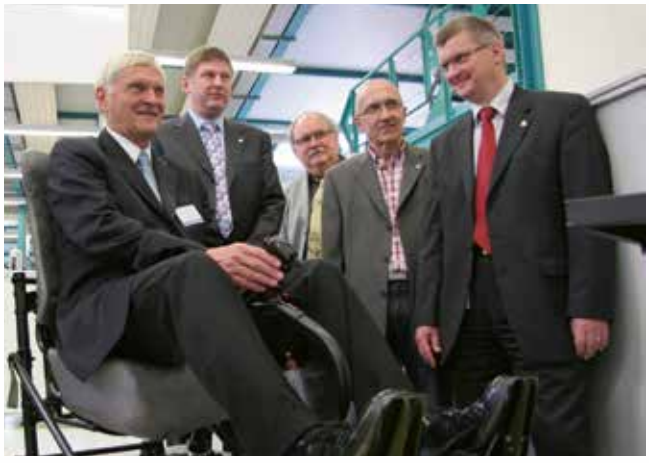
The new SC+ right-angle gearhead family – about which you can read more later in this issue – demonstrates “efficiency engineering” from the initial development stage to the final application. Improved performance data, optimal use of resources, intelligent design features and a functional design language – efficiency has now been made visible thanks to this unique combination. More specifically, all of this translates into less weight and easier handling for the fitter because the housing is made of aluminium housing, unprecedented mounting flexibility – the gearheads can be installed in any position – and a design that unites elegance with functionality for perfect integration into open machine concepts.

Experience “efficiency engineering” live at WITTENSTEIN’s Motek stand: Come along and visit us in Hall 9, Stand 9121.

# “Astronauts from Earth are destined to live on Mars”

**In 1985 Professor Ernst Messerschmid became only the third German to fly into space when he spent a week in the “Challenger” space shuttle as an astronaut-researcher as part of the D1 Spacelab mission. Never before had a real astronaut paid a visit to WITTENSTEIN – until very recently.**

Born in Reutlingen (Germany) in 1945, Ernst Messerschmid is a renowned physicist and Professor of Astronautics and Space Stations who has continued to build strong networks between science and industry to this day, for example at the Stuttgart Institute of Space Systems where amongst other things he develops strategies and scenarios for manned missions to LEO (low earth orbit) asteroids and Mars. As Head of the ESA’s European Astronaut Centre from 2000 to 2005, he was responsible for the selection, training, flight operations and medical care of European astronauts, who lived and worked in the International Space Station (ISS) for several months at a time.



Investigate, understand, integrate – Messerschmid cites three key reasons why exploratory missions into outer space are still important. His answer to the question of life on the Red Planet is diplomatic: “One thing’s for sure – astronauts from Earth are destined to live on Mars”.

Ernst Messerschmid turned out to be a true polymath who gets his audience on board effortlessly for his personal journey into weightlessness. First and foremost, of course, gravity-free conditions are the ideal test environment for all kinds of technical and medical experiments. Yet despite their undeniable passion for science, in the end astronaut-researchers evidently share exactly the same emotions as their fellow humans who gaze in wonder back home on Earth: »The most exciting part is when you climb out of the space station.«

The former astronaut took advantage of his visit to WITTENSTEIN to glean as much information as possible about the company’s portfolio of products and solutions for the aerospace and medtech industries. When the time came to tour the production shops – where haptic simulation systems for trainee pilots or innovative motors for spacecraft like the flight control unit for SHEFEX II, the high altitude sounding rocket, are developed – Ernst Messerschmid was in his element...

A real live astronaut at the WITTENSTEIN flight simulator (from left): Professor Ernst Messerschmid with his hosts Christoph Heine (General Manager, WITTENSTEIN aerospace & simulation GmbH), Thomas Bayer (Head of Generating Process Management, WITTENSTEIN AG), Manfred Wolfart (WITTENSTEIN AG Plant Manager in Harthausen) and Dr. Frank Michel (Director of Research & Strategic Development, WITTENSTEIN AG).

“The most exciting part is when you climb out of the space station.”

Inspiring:
The dialogue with former astronaut Ernst Messerschmid has helped WITTENSTEIN »broaden its horizons«.

# Powerful, quiet, precise

New right-angle gearheads from WITTENSTEIN alpha

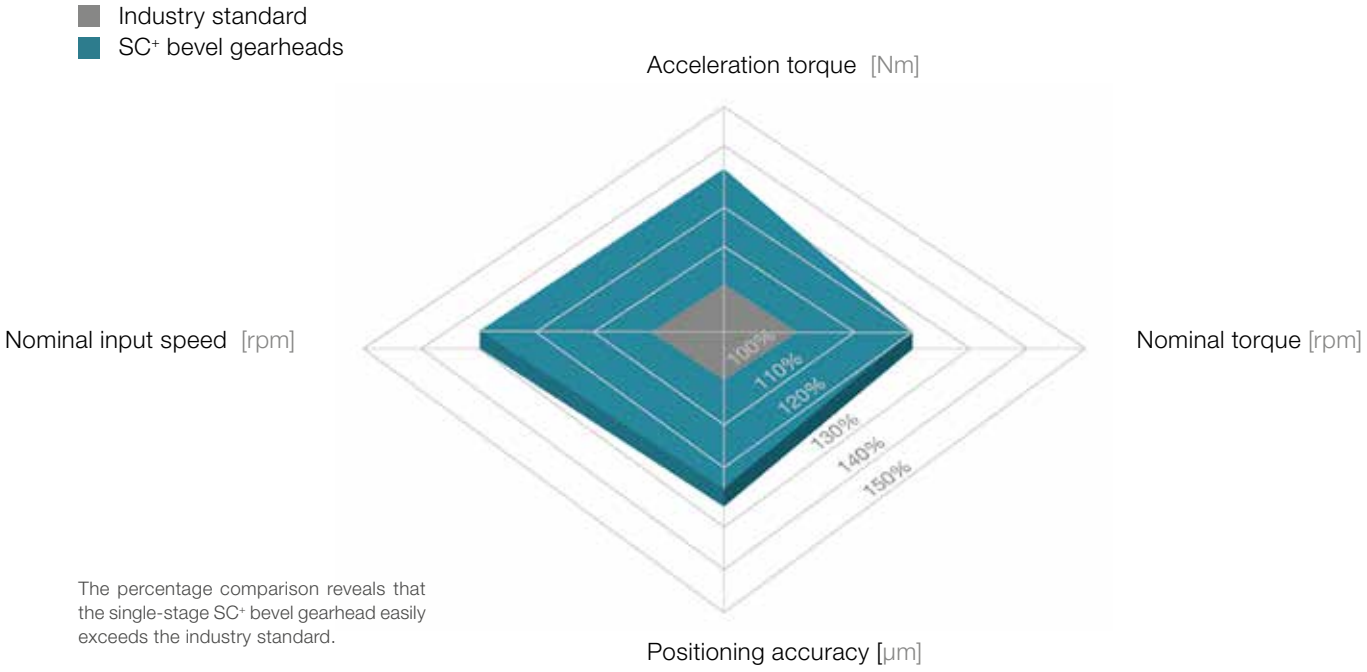
Extremely powerful solutions for applications with a low reduction ratio: the SPC+, SC+ and TPC+ gearhead types

Manuel Peter
Product Engineer, WITTENSTEIN alpha GmbH

**WITTENSTEIN alpha's new right-angle gearhead family has already caused something of a stir at the EMO 2013 exhibition in Hanover: with its complex gearing technology based on WITTENSTEIN bastian's engineering and manufacturing expertise, novel bearing design and ingenious lubrication concept, it guarantees supreme performance in challenging applications, for example in packaging lines, machine tools or printing presses. The single-stage version of the bevel gearhead even beats the current industry standard with its outstanding performance data.**

**Right-angle gearheads: ideal when mounting space is scarce**

The power socket right behind the cabinet? That can be a very good idea if the cable of an electrical appliance's plug connector goes off at an angle and is laid where there happens to be room. And that's exactly how it is with right-angle gearheads: they're the model of choice whenever mounting space in a motor shaft extension is at a premium. The right-angle stage makes the drive shorter – in some cases considerably – and allows precise integration, even if an ultra-compact solution is called for. Right-angle bevel gearheads – like the new SC+ – are offered in a single-stage version for low reduction ratios of 1:1 or 1:2.




The percentage comparison reveals that the single-stage SC⁺ bevel gearhead easily exceeds the industry standard.

An excellent example of “efficiency engineering”

WITTENSTEIN alpha has plans to strengthen its corporate principle of holistic solutions and end-to-end customer support by going on the offensive with the “efficiency engineering” quality label. The new right-angle gearheads are a good example of this strategy. Performance data and optimal use of resources were not the only development aspects; intelligent design and a functional design language can be equally important “efficiency engineering” elements. Amongst other things, the new right-angle gearheads feature a one-piece aluminium housing, which means significantly less weight and permits easier handling by the fitter, for example. The structure and arrangement of the interior facilitates a lubrication concept that enables the lifelong lubricated gearheads to be mounted in any position regardless of the amount of oil. The mistakes that sometimes occurred due to ordering gearhead variants with a fixed position are now effectively ruled out, as are start-up errors such as the addition of too little or too much lube oil – to the advantage of both the manufacturer and the customer. The design combines elegance with functionality – especially when the new right-angle gearheads are integrated into an open system concept with non-encapsulated drive units, in other words where the machine elements and motors are visible.

# **A new standard** is set

New right-angle gearheads from WITTENSTEIN alpha

SPC+

SC+

Optimal function and form: the new right-angle gearheads from WITTENSTEIN alpha with “efficiency engineering” throughout – from the torque to the design

TPC+

**Powerful, quiet and precise**

A whole series of innovations have been incorporated into WITTENSTEIN alpha’s new bevel gearhead family – all with the aim of making it more powerful, quieter and more precise. When it came to designing the pinions and crown wheels of these new right-angle gearheads, the development team opted for toothing that would reduce frictional losses to a minimum, guarantee almost silent running and improve the load carrying capacity. This is particularly evidenced by the high permissible torques, low operating noise and good transmission capability. In combination with the novel bearing design and ingenious lubrication concept, these characteristics result in gearheads with between 95% and 97% efficiency. All in all, the optimized design concept has enabled noise emission to be reduced by 6 dB(A) – equivalent to a quarter of the previous level.

SPC+

The two-stage versions in the SC+ series cover larger reduction ratio ranges: between 1:4 and 1:10 in the case of the SPC+ right-angle gearhead with shaft output or the TPC+ with flanged output.

**New industry standard for low reduction ratios**

30% more nominal speed, 20% better acceleration and nominal torques and even less torsional backlash – with its outstanding performance data, the single-stage version of WITTENSTEIN alpha's new bevel gearheads exceeds the current industry standard in this reduction ratio range. The two-stage gearheads are similarly impressive, for instance with their optimized acceleration torques and minimal circumferential backlash.

# World première

Planetary gearheads
in certified hygienic design

No chance for germs: Electropolished surfaces minimize the risk of product residue adhesion.

**Mere freedom from dirt is not enough in food processing and beverage bottling applications – hygienically clean conditions are a must to prevent the machines used there from endangering human health. If germs are allowed to multiply and get inside the product, consumers could be at risk.**

The price of these high hygienic requirements, however, is regular cleaning and disinfection – with chemicals and processes that "don't beat about the bush". WITTENSTEIN alpha has systematically addressed these customer demands, leading to the world's first low-backlash planetary gearheads in hygienic design. And that's not all: they're the first gearheads of their kind – once again, worldwide – to be certified by the EHEDG (European Hygienic Engineering & Design Group).

Short, compact, hygienic: These low-backlash planetary gearheads create novel design options under hygienic conditions. The single-stage version (front) permits reduction ratios up to i=10 while the two-stage version (behind) can be used up to i=100; both are available in sizes 015, 025 and 035.

Thomas Krämer
Product Manager, WITTENSTEIN alpha GmbH

*As the first and only manufacturer worldwide, WITTENSTEIN alpha has set a unique, brand new benchmark with its certified Hygienic Design series.*

**No chance for germs thanks to optimized materials and design**

The ability to drive reliably in a hygienically clean environment was the chief development objective for the new Hygienic Design gearhead series. Yet what does that mean in practice? How can you tell whether a drive has a hygienic design simply from looking at it? Hygienic design begins with the housing. Our Hygienic Design gearheads have a housing that is completely free of edges, dead spaces and gaps that could provide a breeding ground for bacteria or microorganisms and hence act as dirt traps. Ultra-tough, low-carbon stainless steel approved by the FDA (US Food & Drug Administration) was selected as the material. This special steel grade offers excellent resistance to chlorinated alkaline foam cleaners and disinfectants containing hypochlorite. The electropolished, stainless steel surfaces comply with even the strictest requirements in the food and pharmaceutical industries, with a surface quality of well under 1 µm – any irregularities can no longer be detected by feel but only using a microscope. This is bad news for bacteria and microorganisms because the smooth surface minimizes the risk of product residue adhesion – in future, germs won't stand a chance. The same applies when it comes to the adapter plate and cover ring of the planetary gearheads, which were designed according to similar criteria.

WITTENSTEIN alpha's choice of Teflon for the seals guarantees easy, reliable cleaning. Anyone who loves to cook in their spare time will be well aware of the benefits of this material, which is officially known as polytetrafluoroethylene or PTFE: good resistance to heat and a wide range of chemical substances combines with an optimal non-stick effect for surface properties that likewise conform to the very highest hygiene standards.

**What does hygienic design mean in practice?**

The planetary gearheads in the EHEDG certified Hygienic Design series boast several advantages. The measures customarily resorted to in the fight against germs, microorganisms and dirt traps, like the encapsulation of complete drive units, are often heat critical and can now be dispensed with. That saves costs and opens up exciting new opportunities in terms of design.

Thanks to the hygienic design, regular cleaning and disinfection of the gearheads, and indeed the entire machine, is much more straightforward, cheaper and – equally important from the product safety point of view – free from risk. Maintenance and servicing, too.

# **Gearheads** direct from the printer

## The truth behind the 3D printing hype

**In a just-published book called “The Future” Al Gore, ex-Vice President of the USA, compares the conveyor belts introduced by Henry Ford over a century ago in 1908 with the 3D printing revolution we are currently experiencing.**

This technology extends traditional two-dimensional printing processes by placing thin layers of varying thicknesses one on top of the other to realize three-dimensional structures. 3D printing is firmly established in modern industry – for example, in WITTENSTEIN’s Prototype Production department. The engines of innovation for 3D printing are located on the other side of the Atlantic. The world-leading Massachusetts Institute of Technology (MIT) has a special laboratory where students can apply their skills to stunning inventions, for example in the area of model assembly. Architects also benefit: they can use CAD drawings to build.

The 3D printer makes even complex samples in a very short time on the basis of a CAD model

“The aim is to make fully functional planetary gearheads directly on the 3D printer that can then be used as functional models.”

Eberhard Wunderlich
Manager Prototype Production, WITTENSTEIN AG

The models built using this 3D printer allow WITTENSTEIN’s designers to optimize new products at an early stage before they are presented to the customer. Additive manufacturing – also known as rapid prototyping – saves valuable development time.

Professor Jan Borchers, an information scientist at RWTH Aachen University, is one of Germany’s leading researchers in this technology. Visitors to his laboratory delight in the chance to try out 3D printing. When asked to explain its growing importance, he replies: “3D printing has been around for a while now and many companies use it for rapid prototyping”. Existing CAD data is converted directly into moulds to obtain plastic or metal workpieces. Borchers compares the trend in the 3D printing market with the advance of laser printers: “When they first appeared on the scene, they cost a few hundred thousand euros; today, you can buy them very cheaply”.

**Ideal for prototype production**

Eberhard Wunderlich, Manager Prototype Production at WITTENSTEIN, has already made the transition to 3D printing. The usual procedure is that one of his designers has an idea and makes a CAD model of it. The 3D printer lets him produce a finished sample in a very short time, often in a high-performance plastic like ABS. Internal tests are then carried out to determine the prototype’s suitability for real applications. Wunderlich predicts significant developments in areas such as printed circuit boards or conductive plastics and mould making. The aim is to make fully functional planetary gearheads directly on the 3D printer that can then be used as functional models.

**Everyday applications**

3D printers for home use work slightly differently: they melt plastics in the same way as a glue applicator and spray the material onto a plate to produce a three-dimensional structure. A solid plastic body is created as the plate moves down and the nozzle moves up. These movements are no more than a fraction of a millimetre. The material is deposited layer by layer until the 3D plastic mould described by the CAD data is complete.

Borchers mentions the ability to make spare parts directly on site as one potential application. Faulty household appliances could be repaired on the spot with the help of a 3D printer – using data that was previously downloaded from the manufacturer’s website. Energy-intensive transport processes would be rendered superfluous. So far, however, it has not been possible to achieve the same quality as when plastic parts are made the conventional way.

Steve Rommel is Group Leader responsible for additive manufacturing at the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart. He has observed a hype among end customers that is meanwhile self-perpetuating as printers for home use become increasingly widespread and affordable. At present, Rommel mainly perceives benefits for small, complex parts produced in small to medium batches as a result of additive manufacturing in three dimensions. Especially when the internal geometries can’t be made any other way, 3D printing represents a good alternative to mass production. It is also a very useful option if highly customized parts are called for.

# “Ungrippable” objects

## gripped, moved and positioned safely

**Have you ever tried to stack single grains of sand one on top of the other using tweezers or sort pollen dust according to the plant from which it originates? It’s hard enough attempting to recognize such minute objects with the naked eye, let alone grasp even tinier nano particles with your fingers or “normal” aids. Yet countless research laboratories frequently face exactly this problem, for instance if human cells no more than a fraction of a millimetre in size have to be picked up or positioned individually.**

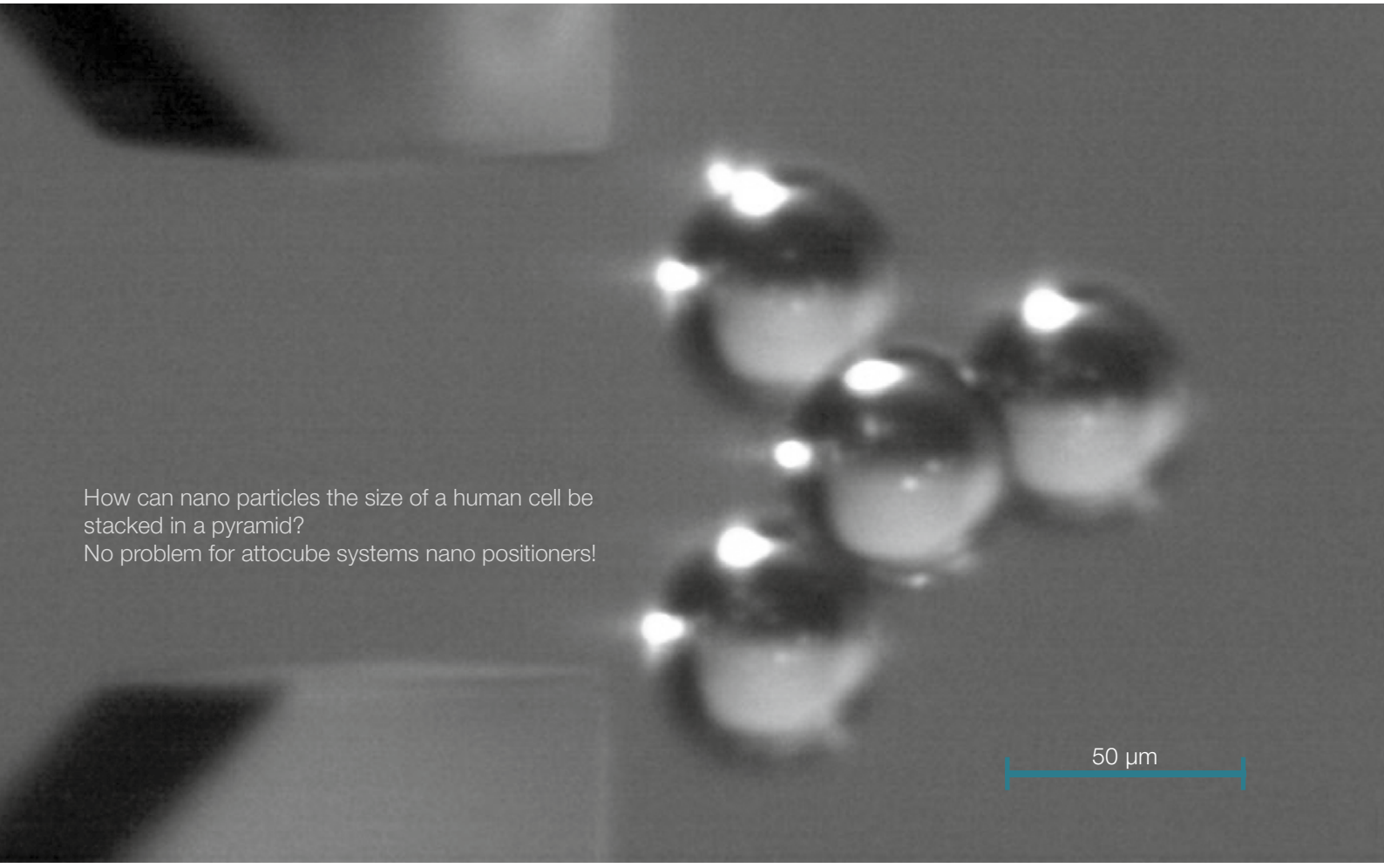
An international team of researchers led by PD Stefan Thalhammer (Helmholtz Research Centre, Munich) and Professor Mandayam A. Srinivasan (MIT – Massachusetts Institute of Technology, Boston) has succeeded in developing a solution to precisely this challenge based on products designed by nano technology specialists at attocube systems in Munich.

Barely bigger than a dice, these titanium micro motors help researchers examine surfaces and structures with atomic resolution using special microscope systems.

Nano motors made by attocube systems position even the tiniest objects ultra-precisely and extremely flexibly: nanometre xyz coordinates are pinpointed in all three axes while rotating motors locate angles accurately in microdegrees.

attocube
pioneers of precision

attocube systems AG has been part of the WITTENSTEIN Group since 2007. Patented servo motors and interferometer sensors for nano-precise positioning are developed, manufactured and marketed by around sixty experts at its Munich facility. Today, attocube systems is rapidly conquering the industrial market with special micro motors and interferometers to satisfy even the most challenging requirements in micro materials processing, optical technology or semiconductors and life sciences.




**Adaptation of the basic gearhead principle**

This problem was solved by adapting the basic gearhead principle – the obvious approach for attocube systems as a subsidiary of the WITTENSTEIN Group. A gearhead is defined as a complex machine element that enables the three motion quantities – displacement, velocity and acceleration – to be varied independently of one another. The researchers involved in the project used high-precision micro motors made by attocube to develop a so-called micromanipulator: this scales down the movement of a human hand in the centimetre range, allowing objects to be positioned by a gripper with nanometre precision – in the same way as a gearhead converts or reduces motion quantities.

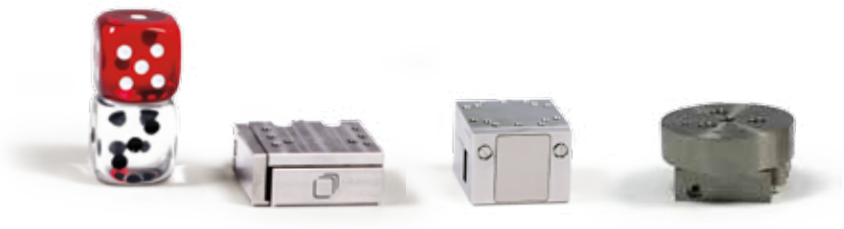
Scaling down the hand movement is only part of the solution, however: in the opposite direction, a force sensor mounted on the gripper provides haptic feedback whenever a particle is picked up, moved and positioned.

This microscopic force is then scaled up again and exerted on the operator's fingers. At the same time, the movement is visualized on a display by means of an optical microscope. It sounds simple but the technology is extremely complex; after all, the particles to be moved are only 10 to 100 µm in size – nano objects much finer than a human hair.

**Precise access using a joystick**

The micromanipulation system firstly comprises a haptic interface, activated by the sense of touch, in the form of a joystick. The interface detects the movement of the human hand and sends it to the micromanipulator's controller. This second system module is responsible for moving the microgripper in all three dimensions and adjusting its angle. These movements are executed by micro motors made by attocube systems. The force and displacement information is integrated and evaluated in an arithmetic unit. The electronics used

Invisible to the naked eye – yet meanwhile grippable under a microscope thanks to attocube technology: these nano beads are no more than 50 µm in diameter while human cells measure just 10 to 20 µm.



The haptic feedback provided by the joystick tells the researchers when the gripper makes contact with the nano particles. The gripper is controlled by the attocube positioners with nano precision in all three dimensions. A rotator (right) enables the gripper angle to be adjusted.

to control the gripper motions were also provided by attocube. A stereo microscope simultaneously records the position of the objects and detects when they are picked up or moved, enabling these events to be visualized on the display. The operator is supported not only visually but also haptically: the joystick is programmed so that a resistance is felt as soon as the cell is gripped.

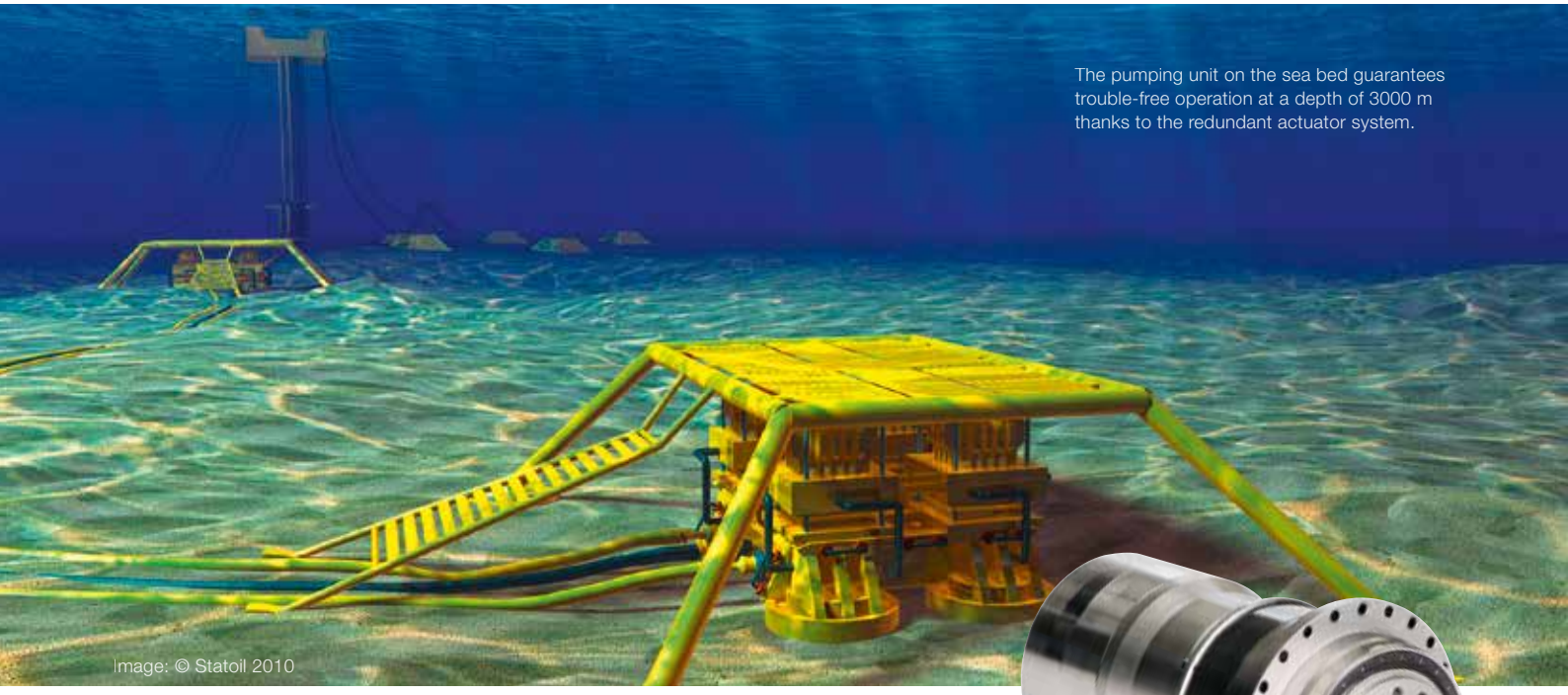
This results in a totally intuitive, realistic “look & feel” that makes it difficult to believe that the objects being moved are not normal sized particles but nano.

**Awards** for excellence in nano technology

attocube systems enjoys an excellent reputation in the world of nano technology. The Munich company provides a working environment in which innovative ideas can prosper and advanced technology be developed under ideal conditions. One key reason for this inspirational atmosphere is that the firm’s sixty or so strong team – physicists, engineers, chemists, IT specialists, product developers and designers – work side by side with colleagues from seventeen different countries.
The fact that when an idea is put into practice, its author accompanies the new product from development right through to marketing additionally contributes to a good innovation climate. It comes as no surprise to learn that attocube systems has already won numerous accolades for its achievements, including the German Startup Award and the Bavarian Innovation Award. The latest honour was conferred only three months ago: on July 5, 2013 Ranga Yogeshwar, journalist and presenter of the “Wissen vor 8” (Knowledge Before 8) science programme on German television, congratulated Dr. Dirk Haft, founder and CEO of attocube systems AG, on being named runner-up among the nation’s most innovative small and medium-sized enterprises as he handed him the “TOP 100” Innovation Seal of Approval.


attocube founder Dr. Dirk Haft is presented with the “Top Innovator 2013” award by science journalist Ranga Yogeshwar.

# Plankton and pioneering solutions
## coexist as good neighbours

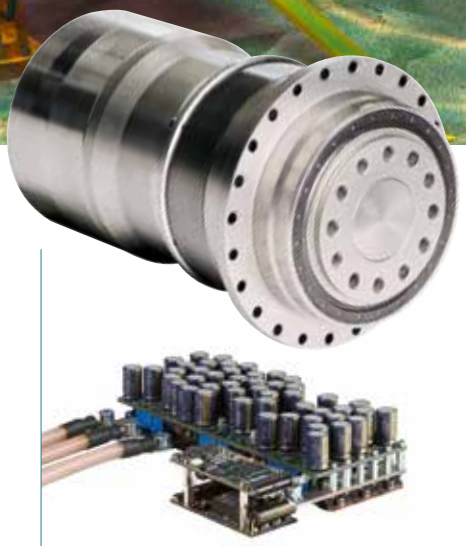


The pumping unit on the sea bed guarantees trouble-free operation at a depth of 3000 m thanks to the redundant actuator system.

Image: © Statoil 2010

**Who needs mechatronics on the sea bed?**
Certainly not the deep-sea fish or plankton that are exposed to a pressure of 300 bar 3000 metres below the surface. On the other hand, the benefits for oil and gas extraction at this huge depth are immense because valve actuator technology made by WITTENSTEIN motion control's Speciality Technologies Business Division enables fossil fuels to be pumped safely and efficiently without harming the environment. Yet what made innovators from rural Igersheim decide to venture into submarine regions?

**WITTENSTEIN motion control turns 20**
WITTENSTEIN motion control GmbH was founded by Dr. Manfred Wittenstein, today President of WITTENSTEIN AG, together with Hans-Hermann Spohr in February 1993. A dedicated team of development and sales staff has been built up around them over the years. Their creed is to get the company ahead with a blend of smart actuators and pioneering spirit. It soon became clear that the market for the solutions meanwhile referred to as mechatronic systems is divided into two distinct segments: industrial systems focus mainly on industry-specific applications while speciality technologies are required for long-term, highly customized projects. The company's first two Business Divisions were set up to meet these needs, followed later by four separate Business Units: WITTENSTEIN cyber motor, WITTENSTEIN intens, WITTENSTEIN aerospace & simulation and WITTENSTEIN electronics. All of them were originally integrated in WITTENSTEIN motion control. This year marks the company's twentieth anniversary – congratulations!



The TPMA motor-gearhead combination and the WITTENSTEIN-made control and power electronics allow oil to be pumped from the sea bed through pipelines to the surface in a controlled way.

»I wouldn't have missed all those incredibly exciting experiences during my twenty years as General Manager of WITTENSTEIN motion control for the world: in addition to the fascination of breaking into new technological worlds, I am also grateful for the chance to spend a sizeable part of my professional career collaborating with partners in such diverse industries.«

Hans-Hermann Spohr

**Smooth handover in the Executive Management**

The past twenty years of WITTENSTEIN motion control would have been unthinkable without the visions and commitment of founding General Manager Hans-Hermann Spohr. The recruitment of Patrik Hug to the Executive Management with effect from June 1, 2013 will ensure a smooth handover of managerial responsibilities. Mr. Spohr, who will step down as General Manager in the autumn of 2013, will retain close links with the company in an advisory capacity.

»WITTENSTEIN motion control and its three Business Divisions – Industrial Systems, tool drives and Speciality Technologies – offer exactly the right mix of products to continue expanding our mechatronic systems business. I look forward to the challenges that process will bring and to strengthening the collaborative partnerships with our customers.«

Patrik Hug

**Conquering the sea bed in the new millennium**

The only way to offshore deposits of oil and gas is down – deep down. At 3000 metres, for example, bioluminescence emitted by fish and bacteria takes the place of sunlight, the temperature is close to freezing and the water pressure is 300 times atmospheric. Sometimes, very occasionally, you can watch a sperm whale as it passes by. It's no wonder that less is known about the bottom of the sea, which covers more than seventy percent of our Planet Earth, than about the surface of the moon. Yet all this did nothing to deter the intrepid pioneers in WITTENSTEIN motion control's Speciality Technologies Business Division. The first prototypes of a valve and pump actuator for pumping oil from the sea bed to the water surface were installed as long ago as 2001. Five years and several development steps later, the first complete oil field was equipped with mechatronic valve actuator systems made in Igersheim. This meant a technology shift away from hydraulic actuators with expensive, several mile-long pipelines with the serious risk of pollution that inevitably arose in case of leakage and the severely limited options for communication and control. The valve and pump actuator manufactured by WITTENSTEIN motion control is free from any such drawbacks. Its redundant design assures maximum availability and functional reliability as well as trouble-free operation for at least twenty-five years. The actuators are designed to meet the highest possible safety requirements, and have been classified and certified accordingly by an independent institute. From an economic point of view, the sea bed mechatronics from the Igersheim stable open the door for novel oil and gas extraction strategies that will result in deposits being utilized more efficiently and for longer.

# ¡Congratulación!

## WITTENSTEIN Spain turns five

1

**WITTENSTEIN Spain turns five – so what?**

The WITTENSTEIN Group has many international subsidiaries – yet WITTENSTEIN S.L.U. has a particularly interesting story to tell. The last five years have been very exciting for a number of reasons. The company is headquartered in Barcelona, the Catalonian capital, with a second office in the Basque city of San Sebastian, and its five staff work incredibly hard to win the enthusiasm of Spanish machine tool, packaging and automation firms for WITTENSTEIN and its products. Their success is unquestionably impressive: profits have risen every year since the subsidiary first opened.

2

**A long-term partnership that is more than a mere business relationship**

The number “5” has a special relevance for WITTENSTEIN S.L.U.: the company has been in existence for five years, a team of five people have made it what it is today – and the campaign to sponsor five children worldwide is visible evidence of their compassion for others. Each person on the payroll has consented to take on a sponsorship for one of the five youngsters below, who hail from five different countries. Small presents and personal messages on the children’s birthdays are a central part of this unusual commitment, yet the financial aspect is every bit as important. WITTENSTEIN S.L.U. has reached an agreement with its customers to dispense with promotional gifts and give-aways – and instead assign all the money saved in this way to the sponsorship project. It will be used primarily for infrastructure investments and thus directly benefit the children and their environments.

Djeliya · Mali · Aged 9
Junior · Uganda · Aged 7
Leslie · Ecuador · Aged 4
Ricardo · Nicaragua · Aged 8
Saniya · India · Aged 3

»Ever since I started work at WITTENSTEIN S.L.U., it's gone without saying that our budget for give-aways is donated to social projects or aid organizations. The cheque we handed over to a Barcelona hospital for children suffering from cancer is just one example. When we turned five this year, we decided to transform this tradition into a long-term commitment. We all identify with the idea and we're very excited about sponsoring the children. I hope a lot of other companies will follow suit by helping people who are particularly in need of support.«

Xabier Guruceta Garmendia,
Sales Engineer, WITTENSTEIN S.L.U.

The WITTENSTEIN Spain team (from left):
Cinta Gordon Rico, Thorsten Weiss, Jessica Virolde Morales, Xabier Rodriguez Jàuregui, Xabier Guruceta Garmendia

3

**Why Barcelona, why the Basque Country?**

Anyone who opens an international subsidiary needs to consider several crucial factors: short lines of communication with customers, an efficient infrastructure, adequate availability of specialist personnel and easy access to professional support, e.g. lawyers and banks, preferably with a command of both German and the local language. Barcelona offers all of that – which is why it was chosen as the home of WITTENSTEIN S.L.U. Catalonia and the Basque Country are Spain's industrial heartland, accounting for more than 90% of the company's total sales – short lines make a difference, in other words. Barcelona also boasts a perfect transport infrastructure and excellent chances of finding qualified staff. Headquarters in Barcelona and an outpost in San Sebastian – "muy bien".

4

**Innovations open the door to markets**

The Spaniards are currently feeling a strong economic headwind. Spanish industry is also suffering badly. What's more, customers in Spain are often searching for a solution to a core problem. Features that serve to add value are only rarely relevant. Against this background WITTENSTEIN S.L.U. regularly scores points with innovations. In a project involving packaging for flat screens, the company fused a powerful, ultra-compact motor-gearhead combination with smart sensorics in a single unit. Two things were achieved in this way: firstly, the screens are never damaged despite being packed automatically because the forces are monitored by the sensorics throughout the process. Secondly, thanks to this novel solution, the end customer is able to do without expensive safety technology in the form of light barriers and perimeter fencing, because the highly sensitive force sensors respond instantly by switching off the machine if anyone gets their hands caught in the grippers.

5

**Optimism and cohesion: learning from the Spanish mentality**

As a result of the tight economic climate, concern about their jobs currently dictates the thoughts and actions of people all over Spain. There are two principal explanations why these worries have not yet led to the total collapse of social and personal structures. For one thing, the Spanish are notoriously optimistic: no matter how faint the light at the end of the tunnel, they never lose faith. For another, family cohesion is very strong. It evidently prevents Spanish society – in which two million households have no income of their own – from falling apart, even though there is virtually no system of state benefits as there is in Germany. In the company-staff-customer family, WITTENSTEIN S.L.U., too, puts its trust in optimism and cohesion.

## The Best of German Engineering

More than 2000 out of the 3100 mainly small or medium-sized member companies within the VDMA are showcased in „The Best of German Engineering“, an encyclopaedic work compiled by the German Engineering Federation together with Deutsche Standards Editionen, the specialist business publisher. Featuring a long list of portraits of individual companies, including WITTENSTEIN AG, this volume offers an unprecedented and concise overview of Germany‘s engineering sector and its enormous diversity – from hidden champions who are up among the world‘s elite in highly specialized niche markets through owners of illustrious brands to global players at home on all continents. In addition, essays by several high-profile writers describe exciting solutions for improving energy efficiency, realizing new energy concepts, overcoming raw material shortages or avoiding emissions plus topics such as megacities, Industry 4.0, etc. An English translation of the book will appear shortly.


1176 pages, hardcover with dust jacket
€ 49 / ISBN: 978-3-8163-0646-7

## Photography competition:
»ENTREPRENEUR 4.0 AWARD«

4.0

ENTREPRENEUR 4.0 AWARD 2014 | PORTRAYING VISIONS

THE PHOTOGRAPHY AWARD ON SHAPING THE FUTURE IN THE CONTEXT OF THE 4TH INDUSTRIAL REVOLUTION

enter stage

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“To see the world with different eyes” – this is the goal of the “ENTREPRENEUR 4.0 Award” initiated by Dr. Manfred Wittenstein together with IMMAGIS – Fine Art Photography.

Renowned artists from all over the world are currently submitting their entries for this competition, in which the winners will be selected by an interdisciplinary jury. Interested members of the general public will also have an opportunity to vote for the submitted works online. The award ceremony will take place in the context of a major exhibition at the “WITTENSTEIN Innovation Factory”, which will officially open in the spring of 2014.

This artistic competition will examine the role of entrepreneurial activity against the background of the 4th Industrial Revolution and worldwide social change; it is hoped that its evocative images will foster higher sensitivity and public awareness with regard to new standards and values as well as criteria for action applicable both to business enterprises and to society as a whole. The task of the photographers is to sharpen our senses for new opportunities that go beyond didactic concepts and starry-eyed “save the world” scenarios.

# TRADE FAIR CALENDAR 2013/14 (selection)

**Motek,** Stuttgart (Germany)
International Trade Fair for Assembly and Handling Technology
WITTENSTEIN alpha GmbH,
WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH,
WITTENSTEIN bastian GmbH
Hall 9, Stand 9121
**October 7 to 10, 2013**

**Hanover Fair,** Hanover (Germany)
Industrial Automation
WITTENSTEIN Group
**April 7 to 11, 2014**

**Forum Maschinenbau,** Bad Salzuflen (Germany)
Trade Fair for Suppliers in the Machinery Manufacturing Industry
WITTENSTEIN alpha GmbH,
WITTENSTEIN motion control GmbH
Hall 20, Stand B36
**November 6 to 8, 2013**

**OTC,** Houston (Texas / USA)
International Offshore Technology Conference
WITTENSTEIN motion control GmbH
**April 28 to May 1, 2014**

**SPS IPC Drives,** Nuremberg (Germany)
Exhibition for Electric Automation – Systems & Components
WITTENSTEIN alpha GmbH,
WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH,
WITTENSTEIN electronics GmbH,
WITTENSTEIN bastian GmbH
Hall 4, Stand 221
**November 26 to 28, 2013**

**components,** Dusseldorf (Germany)
Platform for Components and Automation Solutions – Especially for the Packaging Industry
WITTENSTEIN alpha GmbH,
WITTENSTEIN motion control GmbH,
WITTENSTEIN cyber motor GmbH
**May 8 to 10, 2014**

**LogiMAT,** Stuttgart (Germany)
International Trade Fair for Distribution, Materials Handling and Information Flow
WITTENSTEIN motion control GmbH
**February 25 to 27, 2014**

**Eurosatory,** Paris (France)
International Exhibition for Land and Land-Air Defence
WITTENSTEIN motion control GmbH
**June 16 to 20, 2014**


efficiency
engineering