

LTI | INNOVATION

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MotionOne
- bringing motion to automation!

MotionOne

LTI presents new automation system MotionOne at Hannover Messe 2011

China

LTI China increasingly successful – a strong partner for our customers

Photovoltaics

Strong growth of LTI REEnergy on international markets

Hidden Champions

The term „Hidden Champions“ refers to relatively unknown small or medium-sized businesses which are market leaders in their particular sector. The term was principally framed by Professor Dr. Hermann Simon, who taught at the Johannes Gutenberg University of Mainz from 1989 to 1995. His book „Hidden Champions of the 21st Century“ presents a systematic analysis of 500 of „the world’s best unknown companies“.



In it, Simon establishes three criteria by which a business can be identified as a „Hidden Champion“:

- It must be among the top three on the world market – or be the number one in Europe – in the specific sector.
- Its annual sales are less than three billion Euro.
- It is little known among the public at large and on the market.

The ranks of the Hidden Champions include many small and medium-sized businesses – often family companies such as the LTI Group – which are major economic players without enjoying the recognition levels of larger corporations. They operate in the so-called „hinterland“ of the value creation chain – and that is often the reason for their success.

The term can also be interpreted differently, however. Many of the products developed by the LTI Group can quite justifiably be described as „Hidden Champions“ because they are often hidden inside a machine or item of plant, performing a key technical function while remaining invisible to the casual observer. Nevertheless, their special attributes often provide customers with a key competitive edge.

Examples include integrated magnetic measuring systems for robust, precise and dynamic measurement of linear or rotary movement, electrical currents or magnetic fields. Drive controllers to adjust the pitch of wind turbines and efficient inverters in solar photovoltaic plants are among applications which impose the highest demands in terms of reliability under extreme environmental conditions. In the machinery and plant manufacturing sector especially, many established vendors rely on LTI PLCs, drive controllers and motors to safeguard their own long-term success on the market. They are able to utilize the continuous innovation, consistent reliability and wide-ranging technology and applications know-how of the LTI Group companies. So we, too, are Hidden Champions.

A handwritten signature in black ink that reads "Rolf Slatter". The signature is written in a cursive, flowing style.

Dr. Rolf Slatter

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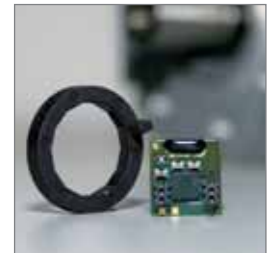
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NEW!
5 in 1



5 in 1 with MotionOne

The modular automation system MotionOne combines five areas of expertise to create a single, unified solution. With Motion Control, Drives, HMI Panels, Safety and User Tools, LTI offers everything you need for your automation.

LTI | DRIVES



LTi achieves 42 % sales jump

The LTi Group had a very successful 2010. At over 150 million Euro, LTi's 2010 sales were more than 42 % up on the previous year. This marks a strong return to growth for the LTi Group, and the trend is forecast to continue in 2011, with projected sales of 187 million Euro representing a further significant jump of 25 %. „Even in the crisis year 2009, and on through 2010, we continued to invest in new fields of business and new products, as well as recruiting numerous engineers in both years. We have invested in areas which promise to generate healthy business volumes in future, enabling us to maintain present rates of sales growth over the coming years.“ Dr. Wolfgang Lust, Managing Partner of LTi Holding GmbH & Co. KG.



New LTi distributor in UK

With effect from November 2010 Motor Technology Ltd. is LTi's new distribution partner in the UK. LTi DRIVES Head of Sales international Jens Thielmann comments: „In Motor Technology Ltd. we have found a very experienced partner in the servo drives field“. Motor Technology Ltd. was founded in 1985, and has been successfully selling high-performance products to the automation and controls sector for over 25 years. In addition to its head office in the Manchester area, the company also operates a second sales office near Bristol. Managing director Andrew Fallows is sure that this new cooperation agreement will enable him to offer his customers even better automation solutions.



LTi presents new automation concept

LTi DRIVES has already in the past demonstrated its ability to deliver highly dynamic and precise motion control solutions for applications in industrial automation. Drive control has now grown into an all-embracing automation concept. As an outward sign of that strategic development, at the Hannover Messe 2011 trade fair LTi DRIVES will for the first time be showing in Hall 9 (stand A54), the main automation hall. Visitors can look forward to finding out all about LTi's highly successful ongoing development. The product portfolio embodying the company's comprehensive automation concept combines five areas of expertise to create a single, unified solution: automation of complex movements; precise and dynamic drive engineering; scaleable HMI panel solutions; programming in line with market standards; and a high-end safety concept.



Source: Anja Fischer, SPS-MAGAZIN

Interview: Dr.-Ing. Josef Wiesing and
Ralf Prechtel, directors of LTI

LTI reorganizes as solutions provider

From motion-based drive engineering to control engineering

The history of the LTI Group began 40 years ago with the founding of Lust Antriebstechnik GmbH. At that time production was focused on drives for vacuum turbines. This was later followed by proprietary frequency inverter and servocontroller series. In the mid 1990s LTI began integrating motion control into its drive systems. We discussed the future of the business with of LTI DRIVES directors Dr.-Ing. Josef Wiesing, head of Development and Product Management, and Ralf Prechtel, head of Sales and Applications.

LTI is historically a drive engineering company. What will its future strategy be?

Ralf Prechtel: From now on LTI will be a full-service vendor of automation solutions. We started in drive engineering – motors and servocontrollers – and are progressing via motion-based drive engineering to control engineering. So we will in future be combining drive,

control and safety engineering all from a single source. Already today, we are supplying complete solutions for the photovoltaic industry and together with andron complete systems for machine tools.

What does a control solution from LTI look like?

Ralf Prechtel: A control solution from LTI includes operator control unit, drive system and the control, the heart of the entire unit – plus an optional safety control. Our products are targeted at machinery manufacturers making production machines focused primarily on motion control.

How has LTI accumulated its expertise as a solutions provider?

Dr.-Ing. Josef Wiesing: We have over 15 years' experience in control engineering. We have developed and marketed a number of proprietary systems in-house. To date, all our solutions have been integrated into drives. We have acquired the know-how in designing and programming these control systems over recent years, and

we are as a result now in a position to provide our customers with all the expert advice they need. About four years ago we began developing safety control systems in accordance with the latest safety standards. We established dedicated teams in the Development and Applications departments as well as building up specialist know-how in Sales to be able to handle all questions relating to safety engineering. We have an extensive portfolio of safety products, with various safety controls, and in the safe motion control field we offer a complete product range with safe I/Os. Around three years ago, through our acquisition of the andron business, we also began working on CNC controls for machine tools. In fact, we believe that area is the elite segment when it comes to control engineering. If you can master that – including visualization, configuration issues, and the ability to deliver highly dynamic precision drive systems – you can truly claim to have the know-how needed to be able to offer good control solutions in other machines too. With this know-how, as a third pillar of our operations alongside CNC and safety controls we are now able also to offer control systems for general motion control applications.

What do you do better than other companies?

Dr.-Ing. Josef Wiesing: In terms of drive engineering, we are strong in the market segments in which the demands imposed cannot be met with standard products. We see the control engineering sector as the same. With the new automation system and our components we have the technological basis to deliver custom solutions in the control sector too. Such custom solutions are the perfect fit for us particularly when they incorporate motion control. That is an area in which we are very strong and have lots of experience. No motion control task can be too complex for us: the more complex the better.

What new products in the sector will you be presenting at the Hannover Messe fair?

Ralf Prechtel: We will be presenting the MotionOne control system. At its heart is the ControlOne control component, equipped with a scaleable processor. We will also be showing a variety of display and operator control units to complement ControlOne in Hanover. And there will also be I/Os and software libraries on show. Later we will be introducing upgrades to the ControlOne's package of features. Another product on show at Hannover Messe will be the new CNC control from andron.

Can you reveal to us a few more details about your new products?

Dr.-Ing. Josef Wiesing: The ControlOne control system is based on CoDeSys. We have built up extensive motion control function libraries based on CoDeSys integration into the drives over recent years. We are now able to make further use of them. As the connection to the drives in normal machine-building we use the CAN and Ethercat buses in our closed system. For machine tools we are now launching Sercos III onto the market through the new andron control 3060. All these bus systems are also available in our drives.

Smart Efficiency is the keynote topic of this year's Hannover Messe. What role does energy efficiency play in your new products and automation solutions?

Dr.-Ing. Josef Wiesing: Thanks to our work in the photovoltaic sector we are specialists in energy recuperation to feed power back into the grid. In highly dynamic servo applications especially, that offers a good alternative to the loss of kinetic energy which occurs when using braking resistors. We offer power supply units with regenerative capability across a wide power range for our servocontroller series, and we are doing the very best that can be done in terms of enhancing the energy efficiency of production machinery.

This interview was conducted in February 2011 by Anja Fischer from SPS Magazin for its HMI Special 2011. ■

↓ ControlOne



5 in 1 with MotionOne

The new modular automation system of LTI



THE PORTFOLIO of products and services offered by LTI has been undergoing a period of change recently. Firstly, the company developed a concept involving the provision of complete machine safety solutions for machinery manufacturers. This flexible solution incorporates a programmable autonomous or drive-integrated safety control from LTI.

LTI is also now already capable of delivering complete solutions for the machine tool segment, up to and including spindle systems. This offer also includes a specially tailored central high-end CNC controller from andron GmbH, an LTI Group company specializing in the machine tool segment.

At the 2011 Hannover Messe industrial trade fair LTI will be presenting a new variation on its solutions expertise: the familiar highly dynamic drive systems and safety en-

„In developing new solutions, we are intelligently combining tried and proven technologies with new innovations“

(Dr. J. Wiesing, Managing Director LTI DRIVES)

gineering, complemented by universal automation components. This will enable LTI in future to create automation solutions for machinery manufacturing customers. The package includes controls in a power range from 400MHz and extends torque an industrial PC platform with an Intel dual-core processor. High-end visualization systems for stationary installation or for mobile use are driving the trend towards increasing user-friendly operator control of machinery. State-of-the-art touch-screen displays in diagonal sizes from 4.2" to 15" and featuring stylish designs provide the basis for technology of the future.

Every machine solution needs flexible connectivity within the application. LTI is meeting that need based on a broad range of high-quality expansion modules, enabling systems to be configured with digital and analog inputs and outputs and with temperature measurement, position sensing and interfacing modules.

The configuration and programming of the IEC sequence control and the visualization system is implemented from one frame, based on familiar market standards such as CoDeSys, with no need for lengthy induction training.

Thanks to the comprehensive system integration, users are guaranteed optimum, easy interfacing of components such as drive controllers.

With the strategic expansion of its product portfolio LTI has entered on a path which poses new, sustained challenges to keep on advancing. In response to those challenges, the company is already working on upgrades to its automation system, continuing to set the trend in terms of compact design and ease of use.

Andreas Kling, Product Manager, LTI DRIVES ■



New possibilities in laser micro-machining

LASER MICRO-MACHINING is becoming increasingly important due to its use in meeting the rising functional demands of production engineering. Typical applications include drilling holes with diameters of just 20 to 300 μm , surface texturing, and high-efficiency machining of materials such as tungsten carbide or diamond.

The GL.3/5 machine tool from GFH GmbH for the first time combines precision dynamic motion with the requirements of short-pulse laser technology. This enables machining such as deep engraving as well as the production of micro-size holes with large aspect ratios. The GFH product relies on the CNC controller from andron GmbH and ServoOne drive controllers from LTI.

The andron CNC controller is the only one of its kind to meet the requirement of integration into the user software. „Integration of the CNC controller into a proprietary user software program was essential for us in order to successfully serve the laser micro-machining market in future,“ comments Anton Pauli, Managing Director of GFH GmbH. Having done so, the GL.3/5 can now be applied in all areas of laser micro-machining. Moreover, thanks to its technical advancement the plant is also superior to conventional production techniques such as micro-milling and EDM for many applications in terms of quality and cost. Areas of application extend from medical technology, through tool and die making, to material forming and optics.



The CNC controller's dual-processor design means the user software and the NC

software run synchronously. All machining operations can be centrally programmed, enabling the laser to be controlled from the real-time core of the controller. The NC data processing is implemented separately from the user software. The position and speed reference values are transmitted over the SERCOS field bus to the drives with a sampling time of 125 μs . The ServoOne drive controllers working in conjunction with the andron CNC controller are optimally matched to the dynamic demands of the machine tool industry. The high control quality, dynamics and accuracy of the ServoOne guaran-



tees outstanding surface quality and contouring even at maximum machining speed.

The flexible design concept of the GL.3/5 means it can be closely tailored to specific applications. „This flexibility allows us to offer machine kinematics for a very broad span of applications, which is ultimately of benefit to our customers,“ Pauli asserts. The approach means that development costs are not borne by one customer alone, so the purchase price is kept down.

*With the kind consent of GFH GmbH
www.gfh-gmbh.com*

Martin Stockinger, Product Manager, LTI DRIVES ■

▲ The GL.3/5 can be applied in all areas of laser micro-machining.
Source: GFH GmbH

LTI China increasingly successful:



IT WAS BACK in 2005 that LTI began operating in China – initially by establishing a representative office in Shanghai. A successful start saw the next step in gaining a foothold on the market just a year later, with the founding in 2006 of two independent companies:

LTI Drive Systems (Shanghai) Co., Ltd. specializes in the sales of drive and automation products, providing full sales and service backup from concept design advice through to commissioning and optimization of production machinery. The applications departments in China are even able to write custom programs for machine controls as part of their service package.

The second company, LTI Reenergy Systems (Shanghai) Co., Ltd., is a manufacturer, distributor and expert systems consultant serving the renewable energy market. A first production line for pitch systems, to adjust the rotor blades of wind turbines, was set up in the company's very first year of existence, 2006. Today the focus of the renewables business is on inverters for the solar power (photovoltaic) sector.

China: A new market demands new approaches

Even before it began operating in China, LTI was aware that the Chinese market could not be approached in the same way as the market with which we are all familiar in Europe. The drive and automation components on the Chinese market mostly employ different interfaces and technology functions, which back in 2005 were largely supplied by Japanese manufacturers, as is still broadly the

case today. As one example, open-collector interfaces are often used in China for digital I/O processing and for communications between PLCs and drive controllers. This is a standard which in Europe was abandoned about 10 years ago in favour of active driver blocks and field bus interfaces.

It was clear that it would be difficult to penetrate the Chinese market across a broad front solely based on products developed for Europe. Consequently, LTI decided to develop a servocontroller system tailored specially to

the needs of customers on the Chinese market. By carrying out the development work in Germany, the know-how and product-related experience of the German development team could be utilized to deliver a product which not only provides conformance to market standards but also offers a number of unique selling points which its competitors do not have – both in terms of technology and in terms of product quality, with ultra-low failure rates and long life.

While developing that system – about which more later – a number of key accounts were nevertheless already being acquired in China for the established European c-line product family.

Pricing requirements, closeness to the customer and optimum service

To assure fast delivery times at the best possible terms, the company additionally began producing, testing and, as necessary, repairing equipment for the Chinese market locally in Shanghai.

By establishing two independent companies in China, LTI underlined its clear awareness of the great importance of the Chinese market for the ongoing development of its international business. This is a particular area of concern to the company, because the corporate philosophy is based on maintaining a close focus on the needs and interests of customers. And customers profit from a partner who is close at hand, who is producing on their markets, and who understands the differing needs of those markets and meets them accordingly. Thus the step to establish an additional production facility was part of a consistent approach to developing and building business interests in China.

Since 2007 China has provided a base for component mounting on control and power boards, a source of mechanical components such as housings and heat sinks, a centre for assembly of complete units, as well as a facility for testing under the same conditions as back at the production plant in Germany, packing and repairs when necessary. This means customers are able to obtain the same products and services, in the same high quality, directly from the two production centres (Germany and



↑ Headquarters LTI CHINA in Shanghai



>> A strong partner for our customers

China), without being subject to risks such as fluctuations in exchange rates and supply bottlenecks.

ServoC: a well-conceived drive system for the Chinese market

As one of the above-mentioned products developed specially for the Chinese market, the ServoC drive system went into production in China back in 2008. It comprises a system of drive controllers in four sizes, covering a power range from 200 watts up to three kilowatts. Its special features are market-standard digital I/O interfaces (open-collector); electronic gearing via master encoder/encoder simulation interface; integrated PLC; cam plate; touch-probe; table driving sets; ultra-high-precision control algorithms for current (torque), speed and position; and system motors attuned to the full power range, with data sets embedded in the system firmware. The system is sold all across the Asian market, and has already acquired a broad customer base. As a result, 2011 production is once again forecast to rise by a three-digit percentage, as it has in previous years.

Global corporate and product strategy bringing success

The success which the ServoC drive system has already achieved demonstrates that acting to fulfill the differing needs of customers in Asia was the right move in order to gain a foothold on the Asian market and to establish the LTI name there based on the same attributes which have already worked so well for it in Europe: as a provider of reliable, robust, technology-leading drive and automation technology.



◀ ServoC from LTI

In Europe, the first page in a new chapter of the company's history has already been opened. With the acquisition of CNC specialist andron in 2008 and spindle expert Fiege in 2009, all the prerequisites were put in place for LTI to establish itself as a specialist and system supplier in the machine tool segment: high-end CNC control; precision spindles; the ServoOne high-end drive system with complete machine safety control, all from a single source.



↓ System solution for machine tools

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A further strategic move in the development of automation systems will come in April 2011 with the launch of the MotionOne product in Europe. The system consists of graduated computing power configurations of PLCs, expansion modules (I/O, field bus, encoder evaluation, ...), operator panels, safety control, drive controllers, motors, as well as a wide-ranging package of backup services.

The fact that this corporate strategy is a global one is demonstrated by the product launch in China following just one month later, in May 2011. And as evidence of the strong demand in anticipation of it, the first pilot customers have already been designated to start running complete machines with MotionOne as soon as the product launches onto the market.

Renewables and mobile drive electronics as markets of the future

LTI Reenergy rapidly became a world market leader in its field with its successful first products, pitch systems to adjust the rotor blades of wind turbines.

Another, newly developed system is the PVmaster. It is a central inverter for generating electricity from solar energy, available in a power output range from 33 kW and 1 MW.

LTI DRIVES, too, is developing new products for future markets. Working in close cooperation with customers, its Mobile Power division is developing through to production maturity a range of drive electronics systems specially for mobile applications, such as in lift vehicles, construction machinery and leisure mobiles.

The Photovoltaic and Mobile Power segments have also been serving the Chinese market too, since 2009 and 2010 respectively, and the company's products and services have met with an enthusiastic response from customers there.

Above-average growth enabling steady expansion of business

In less than six years, LTI in China has grown from a single representative office into two international concerns offering leading-edge products and technologies. In the first year the Chinese arm of the business marketed products made in Europe. Now the company runs its own production facility, with capacities currently for 20,000 drive controllers a year in single-shift operation, a large warehouse area, in-house repair centre, applications office and laboratory.

LTI Automation System

Point-To-Point 	CAM / Flying Saw / Flying Knife 	Synchronized Axis 		
Control Systems 	Extension Modules 	Panels 	Tools 	
ServoOne 	c-line 	SMC 	Motors 	Services 

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The company currently employs 67 people in China: in general management, sales, applications, production, purchasing, process engineering, accounts, human resources, administration and quality management. Alongside the headquarters in Shanghai, there are sales and applications engineering offices in Beijing, Guangzhou and Shenzhen. This network covers the main centres of Chinese industry in the north, east, south and south-west of the country. As a result, closeness to the customer, short response times and maximum flexibility are guaranteed at all times.

The close cooperation between head office back in Germany – from which all product developments stem – and the production and distribution centres in China guarantees customers reliable, leading-edge technology products, regardless of whether their machine is made in Europe or in Asia. They are all able to rely on one strong partner: LTI.

Klaus Selbach, Product Manager, LTI DRIVES ■

LTI Drive Systems (Shanghai) Co. Ltd / LTI Reenergy Systems (Shanghai) Co. Ltd. • www.lt-i.com.cn

- Year of foundation: 2006
- Headquarters: Shanghai
- Branch offices: Peking, Guangzhou, Shenzhen
- Employees: appr. 70
- Fields of activity: Drive Technology and Automation (amongst others: machine tools, textile machines, plastic injection-moulding machines, electric mobility, Renewable Energies (photovoltaics large-scale inverters)
- General Manager: Dr. Ing. Yongfan Wang

The compact multi-talent from the ServoONE family is a



A tried and proven product in a new garb

PROFIBUS-DP-V1 in the ServoOne junior

ALTHOUGH THE ServoOne junior was developed specially for use with the latest real-time Ethernet-based field bus systems, and is a leader within that segment, it now – thanks in part to high demand – additionally provides a field bus interface to the tried and proven 20-year-old PROFIBUS-DP-V1 technology.

Since the highly refined PROFIBUS field bus technology and associated know-how has long been widespread throughout the world, provided performance requirements allow new machines are still being fitted out with it today, despite the strong competition from bus systems such as EtherCAT, Sercos III or ProfiNet, whose market shares are advancing rapidly.

The PROFIBUS-DP-V1 in the ServoOne junior was integrated in accordance with the internationally standardized PROFIdrive profile. This provided the „junior“ with a system of cyclic data exchange of reference and actual values for various speed or position control modes. Jerk-limited motion profile generation, jog



mode or axis referencing is implemented by way of axis-integrated technology functions. Acyclic data exchange of parameters and synchronization of multiple axes via Freeze and Sync mode is also possible.

The ServoOne junior effortlessly combines cost-effectiveness, minimal size and maximum functionality. Maximum performance with rated currents of 3.0-8.0 A at 230 V and 2.0-6.5 A at 400 V is offered by a range of three compact designs. Thanks to its 300 % overload capacity, the ServoOne junior is ideally suited to highly dynamic motion tasks. Its SIL 3-certified STO function also enables it to be integrated into the latest machine safety concepts.

The ServoOne junior is integrated into the ServoOne family, which comprises a range of mutually compatible



RAMPF mixing system for precision mixing and dosing

drive systems with rated currents from 2 to 450 A. The wide range of single-axis drives or multi-axis systems featuring environmentally friendly DC supply units with integrated sinusoidal mains feedback is suitable for any application.

RAMPF Dosiertechnik relies on ServoOne junior

With some 2,000 system solutions on the market worldwide, the RAMPF Dosiertechnik company based in Zimmern ob Rottweil, south-west Germany, is a leading manufacturer of low-pressure mixing and dispensing systems. As a provider of innovative systems for the processing of single, dual and multi-component reaction resin systems such as polyurethane, silicone or epoxy, RAMPF Dosiertechnik serves a customer base in a range of different sectors including automotive, electrical and electronics, domestic appliance manufacturers and the filters industry. A key element in the success of the company, which has been a member of the international RAMPF group since 2003, is the broad spread of its product portfolio. Its range extends from simple hand-held



star in a wide variety of highly demanding applications



units through to fully automated production plant.

RAMPF employs the ServoOne junior with PROFIBUS to drive its mixing and dispensing units, in both speed and position controlled mode. Decisive factors in its choice were the compact design and outstanding motor control

of the system, as well as its integrated STO functionality. Another very important selection criterion was the possibility to implement Ethernet-based field buses in the same unit in future.

Jörg Brinkemper, Product Manager, LTI DRIVES ■

Compact precision drives in operation at Montech

MONTECH AG MARKETS modular standard components for the automation of complex conveying, assembly and production processes. The company's product range comprises conventional conveyor belts and automation components as well as a proprietary profile system. As a specialist in standardized, tailored conveying and transport systems, Montech offers an ideal combination of custom solution and a high degree of standardization.



Precision drives nowadays have to be installed in extremely tight spaces inside machinery. This demands close development cooperation between the drive supplier and the machine manufacturer.

The ease of handling of the drive units means Montech's end-user customer is able to run them unaided.

Wolfgang Kapp, Sales, LTI DRIVES, Switzerland ■

As servomotors, in particular, are installed inside the mechanical structure, adequate cooling poses a challenge. In this application we deployed our miniature servomotors LSN050 from LTI Drives GmbH. This enabled us to optimize the space inside the mechanism. The drive controller we are using is our ServoOne junior. It allowed us to meet our customer's requirements perfectly in terms of both size and functionality. The integrated EtherCAT interface provides real-time data traffic between the installed drive controllers.



Tried and proven time and again – the c-line DRIVES series from LTI

C-LINE DRIVES is a positioning series from LTI DRIVES which has been successful on the market for many years. The series has developed continuously through a wide variety of applications in industry, in photovoltaic plants and wind turbines, in high-vacuum and medical technology. The success history of c-line DRIVES is also continuing apace on emerging global markets such as in China.

The positioning series in the power range from 750 W to 110kW comprises positioning controllers, motor components and a safety control. The series has been shaped by its wide-ranging applications in many different locations over the years. Those applications encompass not only the industrial sector, including high-precision positioning and speed solutions. They also extend into the field of renewable energy, including the capability to operate under extreme environmental conditions, such as in offshore wind turbines, where rough seas, salty air and extreme temperatures demand highly robust hardware.

Other applications in medical technology pose challenges to the controller series in the form of strong magnetic fields, such as in the case of a computer tomograph.

Positioning applications in high vacuum at less than 10^{-7} mbar also demand special solutions.

As one example, c-line DRIVES are employed in a plant producing computer hard disks. As part of the process, a „rotor“ runs through the high vacuum within 300 ms. At the transition from one vacuum chamber to the next the drive has to pass through a gate which renders continuous mechanical guidance impossible.

And of course safety applications, demanding close knowledge of relevant standards and a wealth of solution options, are also a firmly established part of the c-line series.

Along with its robust hardware, it is above all the functionality of the c-line series which has made it so successful and adaptable:

- Parallel evaluation of two encoder systems for point-precision positioning
- Speed and torque pre-control structures for highly dynamic motion
- Integrated safety functionality such as STO (Safe Torque Off to SIL3 and PLe) as the basis for safety applications
- Integrated application capability based on PLCs and technology controllers
- Fast, efficient, low-cost field bus interfacing
- DriveManager PC-based service and diagnostics software, providing intuitive, user-friendly operation
- Integrated mains filter, braking chopper electronics and braking resistor

The success of this series is a great credit to LTI's staff, who bring high technical expertise and great passion to bear in developing and marketing c-line DRIVES.

Norbert Meyer, Product Manager, LTI DRIVES ■



Impressive stage control at Opéra Garnier

THERE IS LOTS to see in Paris. One of the special attractions a visit to the French capital has to offer is a performance at the famous Opéra Garnier. Covering an area of 11,237 square metres, it used to be the largest opera house in the world, until it was surpassed by the new modern Opéra Bastille – likewise in Paris – in 1989.

Opened in 1875, the Opéra Garnier was later to become the original setting of the Phantom of the Opera story. The backdrop to the story was provided by a series of mysterious noises from down below during the early performances, along with a never solved incident, on May 20th, 1896, when the counterweight of the eight-tonne chandelier crashed down, killing the 56-year-old concierge Madame Chomette. In 1911, Gaston Leroux wrote a novel based on the story. It was followed by more than 10 film versions, and in 1986 came the London premier of the world-famous „Phantom of the Opera“ musical by Andrew Lloyd Webber.

The Opéra Garnier is one of the most beautiful buildings in Paris. Its inner workings are highly impressive too. Beneath its stage there are six floors filled with sophisticated technical equipment, all of which underwent a process of modernization during 2010. The stage elements can be variably adjusted for any scene of a performance.

Large numbers of drive motors raise stairs, or even hilly landscapes, out of the stage floor in a matter of seconds. For other scenes the stage can be made to rotate in a circle. All of these movements are powered



↑ View to the stage of Opéra Garnier

by more than 120 drives from the c-line DRIVES range by LTI. They ensure that all movements are executed precisely, reliably, safely and quietly. The c-line DRIVES provide silent running particularly during those crucial scenes when the action on-stage is very quiet. The project was carried out by Transtechnik, LTI's distributor in France.

Tip: The next time you visit Paris, go along to the Opéra Garnier to see c-line DRIVES from LTI in action. The upcoming schedule offers some exciting attractions:

16th June – 16th July 2011: *Così fan tutte* by Wolfgang Amadeus Mozart

11th Sep. – 8th Oct. 2011: *L'italiana in Algeri* by Gioacchino Rossini

For more details visit www.operadeparis.fr



Jens Thielmann, Head of Sales international, LTI DRIVES ■



← Behind the scenes: high-tech from LTI

Silgahalle in Wängi: First compact PV station in Switzerland



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THE SILGAHALLE in Wängi, a small village in eastern Switzerland, has been fitted out with PV modules over an area of 3519 m² and on two east and west facing roofs. The total installed power is 509.12 kWp. The electricity is fed into the grid by a 500 kW AC rated power output PVmaster compact inverter station PVMC0500 EN from LTI REEnergy.

The standard version of the PVMC0500 is fitted with a medium-voltage (MV) switchboard to supply the medium-voltage grid. As there is a very well configured local low-voltage grid however, the medium-voltage system was not required. So the special feature of the PVmaster compact station is its ability to supply the 400 V low-voltage grid. In place of a MV switchboard, a local electrical contractor of Dobler AG installed a low-voltage switchboard into the station, complete with a meter and the necessary protection, in accordance with the specifications of the local Wängi electricity company.

The photovoltaic plant is currently the largest in the region. It will generate 430,000 kWh of green power a year – despite being in a less than optimum location (shaded by the forest during the Winter months). The generated power will be purchased by Swissgrid over the next 20 years at a guaranteed grid supply tariff. The project was planned and executed by Windgate AG based in the canton of Zurich. The operator/investor/contracting partner is Felix & Co AG. The landowner is P. & R. Frei GmbH.

The first power from the PV plant was fed into the grid in mid-December 2010. This was just in time to qualify for the 20-year guaranteed supply tariff available up to the end of 2010. It took around two and a half months to install the PV plant, sometimes under difficult condi-



↑ Heavy snowfall complicated the installation

tions. There was heavy snow in December, which posed a major challenge with regard to the installation of the solar panels in particular. The initial commissioning run carried out under those conditions was not easy either, as a 30 cm covering of snow first had to be cleared from the PV modules. The cooperation and spirit of partnership among all involved in this project was outstanding.

With the kind consent of WindGate AG

Martin Brawand , Managing Director, LTI DRIVES, Switzerland*

*Felipe Ugarte** , Sales, LTI DRIVES, Switzerland* ■



PVmaster: 2010 most successful year in Italy

2010 WAS THE MOST successful year for LTI ITALiA since the launch of the PVmaster central inverter series onto the Italian photovoltaic (PV) market. Since the last Italian trade show Solarexpo in May 2010, more than 350 PVmaster central inverters, with a total volume of over 25 MW, have been deployed on projects in Italy.

The first photovoltaic project in 2010 was successfully completed together with our cooperation partner ESCO Solare in Termoli on Italy's south-east coast. It involved installing 2,299 crystalline modules – delivering a total power output of 620.73 kWp – to replace the old roof of a local food company. Six PVmaster units, each with a 100 kW AC rated power output, have been installed to convert the direct current supplied by the modules into alternating current and feed it into the public grid. As part of the same project LTI ITALiA supplied 12 intelligent generator terminal boxes to monitor the current flow of the connected strings.



The generator terminal boxes also capture data on the insolation, the air temperature and the module temperature from the sensors placed in the PV plant. This data is sent to the PVmaster, evaluated and stored in the data logger together with the current, voltage, power and energy data.

The data can be transmitted to an external server – such as the customer portal at www.pvmaster.de – using the PVmaster's integrated FTP Client functionality.

More photovoltaic parks fitted out with PVmaster central inverters, with power outputs between 33 kW and 1 MW, have been put into operation in Italy since May 2010. In 2011 the largest PV plant fitted out by LTI ITALiA to date will be going online. It will see 36 PVmaster units, with a total rated power output of 2.8 MW AC, generating renewable energy from the sun's rays.

Aldo Bucci, Sales Manager, LTI ITALiA ■



LTi REEnergy China achieving continued success with photovoltaic

OVER 100,000 visitors from Asia, Europe and America gathered in February at the Shanghai New International Expo Center for the 5th SNEC International Photovoltaic Power Generation Conference and Exhibition (SNEC PV Power Expo). The event featured more than 1,800 exhibitors from over 60 countries across 13 halls covering a total area of more than 200,000 square metres. LTi REEnergy China was among the exhibitors in Shanghai, with an impressive presentation.

One of the fastest growing companies in the LTi Group, LTi REEnergy has been operating in the renewable energy sector for over a decade. Over that time, the business which grew out of the core electronic drive engineering operation has achieved major success in the wind power, biomass and photovoltaic fields.

It has been successfully selling its PVmaster photovoltaic central inverter in China since 2008. What Chinese customers most appreciate about the LTi inverter is its high reliability and efficiency in converting the direct current generated by the PV power plant into alternating current to be fed into the public grid. The PVmaster is supplied in a range of sizes, either as a component unit or as a turnkey inverter station, enabling it to be adapted perfectly to the different conditions of the PV generator.



At SNEC, LTi presented two PVmaster cabinet models with 250 kW and 500 kW AC rated power output. Visitors were impressed by the high quality of the innovative central inverter series and by the great success which it is enjoying. LTi staff were on hand to provide detailed information and high-quality advice, offering further impressive proof of the expertise and skills of the LTi Group's Chinese business unit.

Jasmin Jing Jin, LTi REEnergy China ■

Electro-mobility - Mobile power on practical trial

BY COMING OUT on top among the 140 competitors in the Automotive X Prize in the USA, an international contest to develop the most efficient vehicle powered by an alternative drive system, the TW4XP (Three Wheeler for X Prize) team demonstrated electro-mobility on a practical level (We reported in issue 26 back in November 2010). The low power consumption of the purely electrically powered vehicle is thanks partly to its design features and partly to its skilled coordination of drive train components.

The TW4XP team is using a high-pole three-phase current torque motor type TF13 developed by the OSWALD electric motors company in Miltenberg to meet the specific needs of a traction drive. The water-cooled electric motor was rated for high water inlet temperatures and correspondingly high peak temperatures. Thanks to its high torque, the direct drive system requires no additional mechanical gear elements on-board the vehicle. In contrast to a combustion engine, the torque of an electric motor is available right from starting off. The direct transmission of the driving momentum to the vehicle's two rear wheels thus saves energy, space and money. The available space in the hollow shaft typical of torque motors was used by TW4XP to house a differential. As a result, the drive shafts are fitted on both sides directly into the motor. The 94 % efficiency level and the high overload capability of the synchronous motors, together

with the high-efficiency Mobile Power power unit from LTI DRIVES, permit optimum utilization of the valuable energy stored in the battery.



The Mobile Power unit performs a range of control functions on-board the vehicle, as well as handling the battery management. The topology of the drive train was designed so that the

battery can be charged optionally in single-phase or three-phase mode, without need of additional charging electronics. That saves on weight, because the existing power electronics is used in two different ways. The scalable Mobile Power units support the synchronous motors of relevance for electro-mobility with and without embedded magnets as well as asynchronous and reluctance motors.

*With the kind assistance of
OSWALD Elektromotoren GmbH
www.oswald.de*

*Volker Kuhoff, Key Account Manager,
LTI DRIVES*



↑ The TW4XP at eCartec in October 2010

Mechanical expertise – LEViTEC



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MAGNETIC BEARING mounted systems form highly complex mechatronic units comprising both mechanical and electronic components. At LEViTEC, the LTI Group's specialist in mechatronics and magnetic bearing technology, all processes – from development, through production to testing – are subject to the demands of maximum precision.

The company's technical qualifications for the development of its highly customized products include a high degree of mechanical expertise. From strength calculations – such as of rotating elements, rotor dynamics analyses (such as disturbing vibration) – through to speed optimization, a wide range of analytical methods and FEM simulation techniques are employed in engineering systems in line with the specific requirements of an application.

As the process of developing the highly complex solutions often extends to the very limits of what is physically feasible, materials with special properties are sometimes needed. These not only have to be found, but must then also be readily available for mass production.

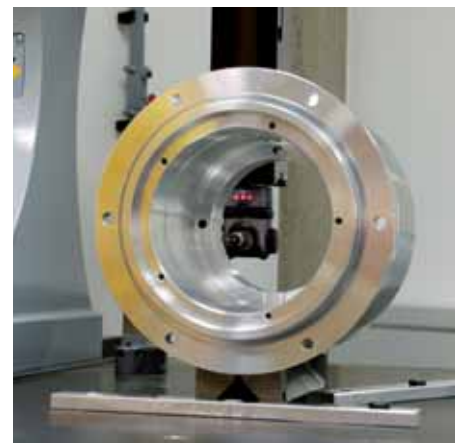
High-precision manufacturing and testing is carried out by LEViTEC in-house

In subsequent component production – a process played out largely on a micrometre scale – maximum accuracy is the main challenge. A major advantage for LEViTEC in this is that it not only carries out development and manufacturing in-house, but also conducts testing of critical components at its own facility, including with the aid of a 3D measuring machine. Fast-rotating shafts – at the heart of magnetic bearing mounted drive systems – are particularly subject to heavy stress, so high-precision manufacturing is key in terms of their quality. In late 2010 LEViTEC also began manufacturing shafts in-house. As a result, this highly demanding and sensitive process is now fully under the company's internal control and monitoring systems. This is continually delivering new findings which can be rapidly and directly incorporated into the development of new products. It also means that any non-conformance can be quickly identified and remedied.

In order to ensure that the latest scientific findings are incorporated into its own products, LEViTEC collaborates closely with leading German and international colleges and universities.

Know-how transfer is also practised within the LTI Group. One example is the routine design and production working

group meetings with LTI spindle manufacturer Fiege, based in Röllbach, aimed at driving forward and optimizing joint development efforts.



↑ From top to bottom: CNC grinding machine, 3D measuring machine, touchprobe during measurement

Matthias Kroll*, Managing Director, LEViTEC

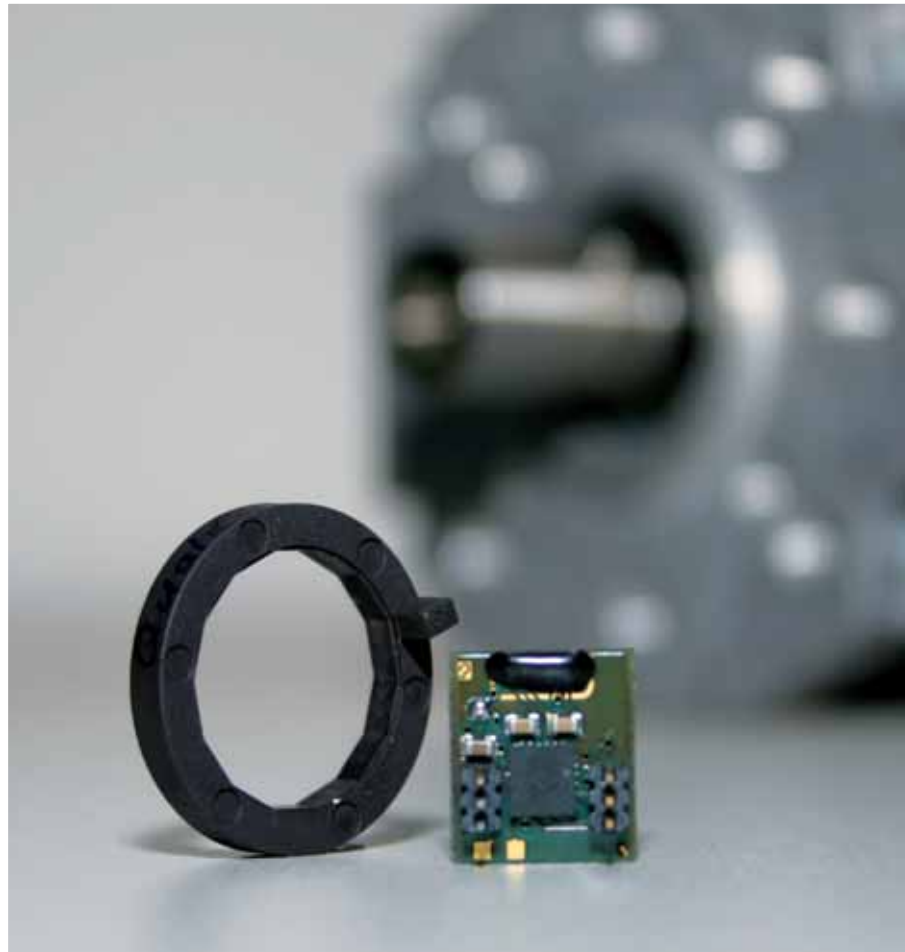
Dr. Christian Redemann**, Design Department Manager, LEViTEC

Magnetic sensors for embedded measurement systems

IN MANY AREAS in industrial automation a trend towards decentralized drive technology is underway. In wood-working machines, packaging or printing machines for example numerous intelligent actuators consisting of servo actuators with modular electronics “on-board” are applied. They make the life of the user easier in many respects: they require less cabling, they reduce installation work, they reduce the processing and memory capacity of the SPS and also save on programming effort.

All these actuators have in common that the applied sensor technology within the encoder plays a key role in order to forward the required angle information to the integrated electronics, to manage the extended task package and to enable different operating modes – speed, position and torque control.

Sensitec supplies the new EWS16 encoder kits to the industrial automation sector. The encoder is positioned exactly at the mechanical interface between motor and integrated electronics. The encoder kit consists of two components: first of all, there is a magnetic pole ring made of injection moulded magnetic material with 32 poles, which is mounted directly on the motor shaft. It is equipped with 2 code tracks to provide the incremental angle signal and a reference signal. Secondly it comprises an electronic board, which is mounted directly on the integrated power electronics board within the motor housing. This board is equipped with two MR-sensor chips and an interpolation ASIC for further signal processing. An anisotropic MR sensor supplies the incremental angle information and the reference signal is provided by an MR sensor. Both sensors are responsive to a change of the magnetic field direction if the magnetic pole ring rotates on the motor shaft.



Optical solutions often are not suitable due to the required compact design, the demanding environmental conditions, the high operating temperatures or the limited space. Magnetic solutions based on Hall sensors often cannot fulfil the requirements regarding the resolution and accuracy as well as temperature stability.

↑ The combination of the compact MR encoder kit EWS16 from Sensitec with a powerful motor results in an intelligent power package.

Dr. Rolf Slatter, Managing Partner / CEO, Sensitec ■

FAIR

FAIR	DATE/LOCATION	EXHIBITOR
PV America US-American Fair for Photovoltaics www.pvamericaexpo.com	03.04. – 05.04.2011 Philadelphia, USA	LTi REEnergy USA
Hannover Messe 2011 Internationale Industriemesse www.hannovermesse.de	04.04. – 08.04.2011 Hannover, Germany	LTi DRIVES LEVITEC Sensitec
China International Photovoltaic Industry International Fair for www.cipvexpo.cn	08.04. – 10.04.2011 Beijing, China	LTi REEnergy China
CIMT 2011 Internationale Werkzeugmaschinen Messe www.cimtshow.com	11.04. – 16.04.2011 Beijing, China	Fiege
Energissima Swiss Fair for Renewable Energies and New Technologies www.energissima.ch	13.04. – 16.04.2011 Fribourg, Switzerland	LTi DRIVES Switzerland
SOLAREXPO International Exhibition and Conference for Renewable Energies www.solarexpo.com	04.05. – 06.05.2011 Verona, Italy	LTi REEnergy
PCIM Europe 2011 The international Trade Fair and Conference for Power Electronics and Intelligent Motion www.mesago.de/de/PCIM/home	17.05. – 19.05.2011 Nürnberg, Germany	Sensitec
SPS/IPC/DRIVES/ITALIA Fair for Electric Automation Technology www.sps-italia.net	24.05. – 26.05.2011 Parma, Italy	LTi DRIVES
Sensor + Test 2011 The Measurement Fair www.sensor-test.de	07.06. – 09.06.2011 Nürnberg, Germany	Sensitec LUST Hybrid-Technik
Intersolar Europe International Trade Fair for Photovoltaics and Solar Thermal Technology www.intersolar.de	08.06. – 10.06.2011 München, Germany	LTi REEnergy
EMO World's premier trade fair for Metalworking www.emo-hannover.de	19.09. – 24.09.2011 Hannover, Germany	LTi DRIVES LEVITEC andron Fiege
SMART AUTOMATION Fair for Industrial Automation www.smart-automation.at	04.10. – 06.10.2011 Linz, Austria	LTi AUSTRIA

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