

POWER

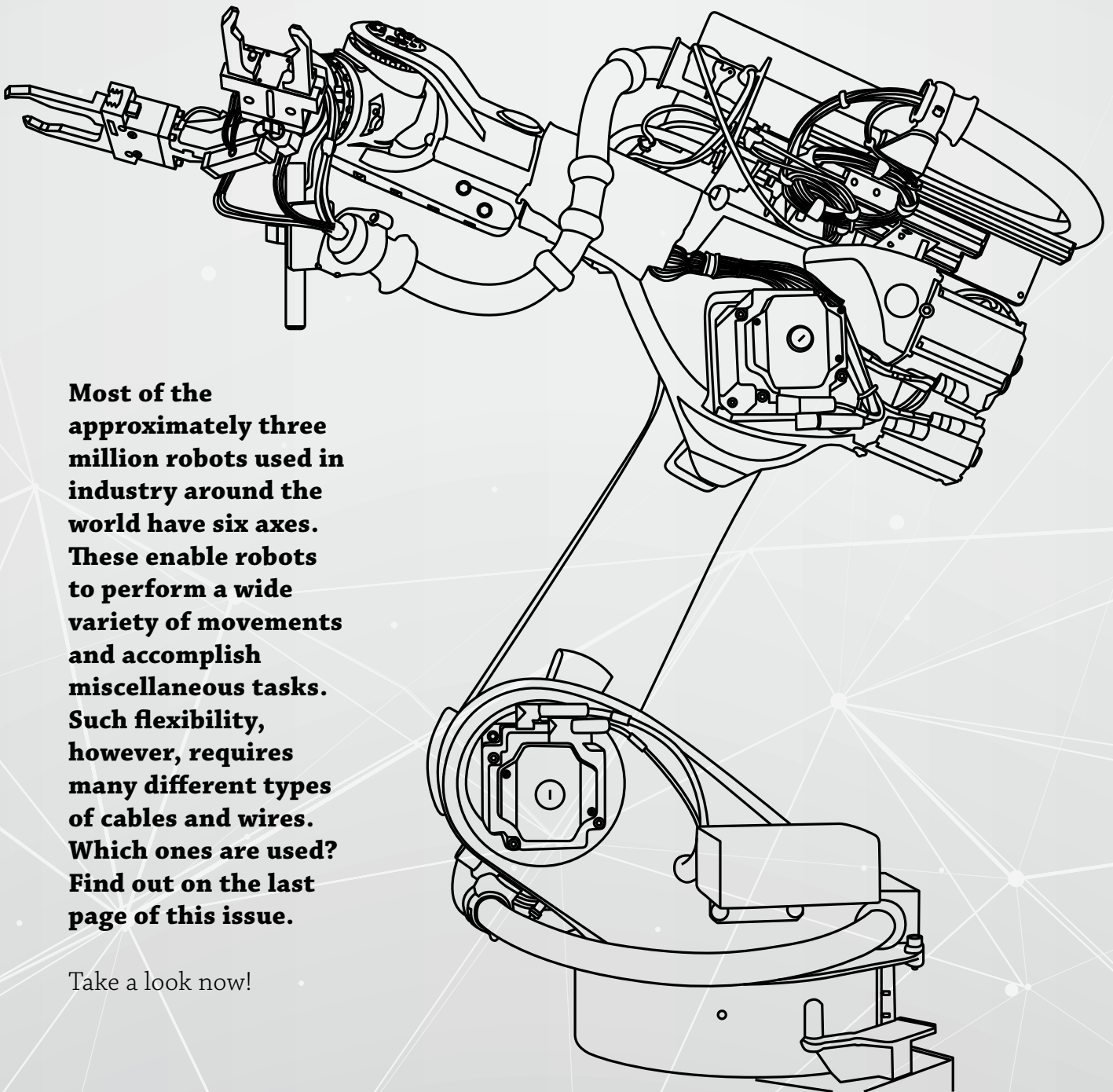
#12

On the Spot

**ROBOFLEX cables used
in robot-supported laser
processing** page 14



We Bring Robots to Life



Most of the approximately three million robots used in industry around the world have six axes. These enable robots to perform a wide variety of movements and accomplish miscellaneous tasks. Such flexibility, however, requires many different types of cables and wires. Which ones are used? Find out on the last page of this issue.

Take a look now!





Dear Reader,

A lot has happened since the last issue of our POWER magazine, published in autumn 2019: a global pandemic, disruptions to international supply chains, the return of inflation and, last but not least, the war in Ukraine. These are turbulent times that have created numerous uncertainties, including economic uncertainty.

I am pleased to report that, despite all the challenges, HELUKABEL is able to look back on a year of growth. In 2021, we recorded a turnover of 796 million euros, the largest in the company's history. One of the reasons for this healthy growth is the ongoing diversification of our business and the broadening of our product portfolio: with the acquisitions of EKD Systems and Sangel Systemtechnik, we are progressively becoming a system provider for electrical connection technology – with the aim of developing custom solutions that meet the miscellaneous requirements of our customers and key industries.

One key industry where we see great potential for the future is robotics. In a discussion between experts, we explored the special characteristics and trends shaping this exciting industry – you can find the corresponding article on page 8 of this issue. On page 14, you can read about how our customer, Scansonic, uses our cables and wires in highly specialised laser optics that are applied, for instance, in the automotive industry for robot-assisted welding and brazing/soldering.

We have compiled many other interesting articles and news for you from around the HELUKABEL world. I am very pleased that our POWER magazine is finally back from its COVID enforced break, and hope that you enjoy reading and browsing through our magazine!

Yours faithfully,
Marc Luksch, Managing Director, HELUKABEL GmbH



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In Brief

New Services & Resources

SIMPLE, STRAIGHT-FORWARD CABLE SHOPPING

As of this year, HELUKABEL is offering its customers in Germany the possibility to order cables, wires and accessories quickly and conveniently online. Intelligent filter and search functions help customers find the right products for each application – before placing these in the shopping cart with a single click.

During the development of the online shop, there was a strong focus on creating a user-friendly system: multiple shopping carts, for example, make it easy for customers to divide the products they wish to order per project, which facilitates the delivery of items to the right place at the right time. Standard off-the-shelf lengths or custom lengths of cables and wires can be ordered anytime from anywhere. Sign up now at shop.helukabel.com.

INDUSTRY SOLUTIONS AND EXPERT KNOWLEDGE

Are you looking for connection solutions specifically suited to your industry? You can easily find them in our various catalogues, flyers and brochures. Brand new: our catalogue for the oil and gas industry, our robotics flyer and our railway cable catalogue. For in-depth expert knowledge about your application, we also offer a selection of free white papers - for example, on the subject of ISOBUS cables for agriculture. All this and much more is available in our Download Centre at www.helukabel.com/downloads.



New Members of the HELUKABEL Group

This year, the addition of three companies to the HELUKABEL Group – EKD Systems, Sangel Systemtechnik and Primatex – has enhanced the group's capabilities. All three new members have a long-standing relationship with HELUKABEL, characterized by many years of successful cooperation. EKD Systems GmbH – formerly ekd gelenkrohr – is based in Erkrath near Düsseldorf, Germany, and specialises in the development and production of customised steel, stainless steel and plastic energy chains. Their focus is on application-specific system solutions designed according to customer requirements, available to order in small to medium-sized quantities. Sangel Systemtechnik GmbH, with its central headquarters in Bielefeld, Germany, and with other premises in Plovdiv, Bulgaria, is a leading manufacturer of high

quality industrial cable assemblies and complete system modules for machinery and plant engineering. For HELUKABEL, the acquisitions of EKD Systems and Sangel Systemtechnik broaden our product portfolio and are significant steps on our path towards becoming a system provider for electrical connection technology. With Primatex AS, located in Norway, HELUKABEL reinforces its market position in Scandinavia. In the Norwegian market, the company is known above all as a competent supplier of special cables and for its know-how in the field of sensor technology. HELUKABEL customers in the region benefit from shorter delivery times and an even more comprehensive service. The HELUKABEL Group therefore continues to grow – and we welcome all three new members to the family! ◀

2.200 employees

are now employed by the HELUKABEL Group - at 60 locations in 37 countries around the globe!

HELUKABEL Delivers Connection Cables for the World's Largest Mobile Ferris Wheel

From February to September in 2022, visitors were carried high into the sky by the "City Star" Ferris wheel, which was a guest in the middle of the Baroque city of Ludwigsburg, Germany. At 70 metres high, it is the largest mobile Ferris wheel in the world.

HELUKABEL supplied the connection cables powering the giant at short-notice and in record time – originally it looked like the planned start date could be in jeopardy due to the extremely long delivery times of wholesalers. Fortunately, the owner of Hauptmann Electrics, the company in charge of the project, approached HELUKABEL with the challenge – and thanks to our global distribution centre with more than 33,000 items in stock and located in the immediate vicinity, it was no problem to provide the required cables on time. ◀



Groundbreaking Ceremony in China

The HELUKABEL Group is expanding its production capacity in China: on 28 July 2022, work began on a second production facility and distribution centre. The new location is in Changzhou, approximately 200 kilometres west of the metropolis of Shanghai. The start of production is planned for 2024. China and the Asian Pacific region are particularly important markets for HELUKABEL. With a footprint of approximately 22,000 square metres and a cost of 30 million US dollars, the new facility is the biggest single investment outside of Germany in the company's history. In the future, this location will primarily manufacture flexible cables for industry and automation technology. ◀

Helping Ukrainian War Refugees

HELUKABEL employees have shown great solidarity with the people who were forced to flee their homes as a result of the war in Ukraine. Across our locations in Germany, more than 7,000 euros were raised in a campaign. This sum was then tripled by the company. The money has been used to deliver aid and support various projects dedicated to helping Ukrainian inhabitants and refugees who fled to Germany as well as to Ukraine's neighbouring countries. ◀





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A Major Sector for Cables

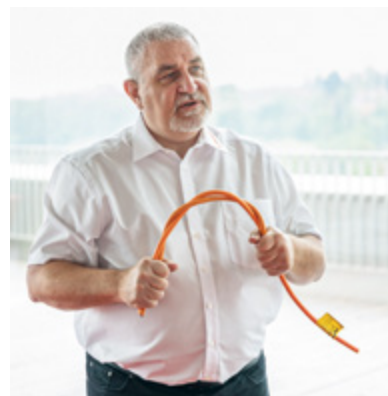
New applications in robotics are constantly emerging as the industry continues to develop new solutions to efficiently manage complex tasks. Consequently, robotics is a key industrial sector for HELUKABEL – cables and wires are, after all, indispensable in all types of robots. This is reason enough to closely look at the trends and challenges within robotics in a discussion between experts.

A particular image comes to mind when people talk about robots. But what actually is a robot and what is it not?

Prof. Dr.-Ing. Christian Wurrll: One definition specifies when a kinematic chain becomes a robot. It says that there should be at least three axes mechanically joined together. But there are lots of machines with only two axes – for example in the packaging industry – and these are also referred to as robots.

Ronald Benedek: But isn't a machine tool then also a robot? These usually have more than three moving axes.

Dr.-Ing. Werner Kraus: The difference is that a robot can be used for a variety of applications, whereas a machine tool is



Robotic cables have to withstand high mechanical stresses – torsion is particularly challenging. For this reason, our robotic cables are constructed very differently to other cables.

built for a specific purpose, for example for milling. So, what a robot is and what it isn't is open to interpretation. For instance, many manufacturers of driverless handling systems don't consider themselves to be robot manufacturers but logistics providers. The question of autonomy also plays an important role in the definition.

Benedek: The typical image that comes to mind when talking about robots is the industrial robot in the factory – a mechanical arm that moves and turns.

What role do cables and wires play in robotics, and what requirements must they fulfil?

Holger Dietz: Six-axis robots are extreme environments for cables: they must withstand bending, torsion, tensile loads as well as other conditions. Robots also operate in extreme temperatures and come into contact with dust, dirt, moisture and chemicals. This really is a particularly challenging environment.

Janik Ebner: Cables and connectors are critical components in robotics where there is a risk of failure after millions of movement cycles. It goes without saying that our robots are designed so that the cables never kink. But it's torsion in particular that can't be avoided in many applications.

Benedek: It is this aspect, above all, that makes robotics such a fascinating area for us as a cable manufacturer. In order to enable movement along their longitudinal axis, our robotic cables are constructed very differently to other cables. This begins with stranding and

goes beyond the conductor insulation and twisting to special foils and fleeces which are fitted into the cable to make them torsion resistant.

Vincenzo Rio: When it comes to robots used for welding, the issue of welding spark resistance also needs to be taken into account. We've been getting more and more inquiries lately about this, including ones from the automotive industry.

Dynamic loads are therefore the biggest challenge for components in robotics. How can a reliable performance be ensured and how can potential faults be detected early on?

Horst Messerer: Of course, we spend a lot of time thinking about the service life of our cables - but the cable is only one part of the robot. There are also electronic components that can break, or bearings and motors that can wear. Even data cables grow old over time and become more susceptible to faults. In applications with real time data transmission, packet or bit errors will eventually affect the performance of

the overall system. For example, it could affect the timing of a machine. But where the boundaries lie very much depends on each individual case. This is why condition monitoring of data cables is also a concern of ours.

Ebner: For predictive maintenance, diverse data, such as the distance travelled by the motors, is collected and transmitted from the robot. Based on empirical data, for example, it's possible to very accurately predict when an axis needs to be serviced or a tool needs to be replaced.

Dietz: Robots in the automotive sector

"Robotics is not a threat to human jobs, but rather an enhancement."

*Holger Dietz, Business Unit Manager,
Robotec-Systems GmbH*

– for example on welding lines – have a service life of up to 16 years. The right cables can cope with that without any problems. In addition, the topic of retrofitting robots is currently on the rise. Because the delivery times are sometimes very long for new models, there's a lot to be said for retrofitting and repairing old robots. It might also be a good idea to replace the cables at the same time.

Wurll: When a robot stops working properly, it's most likely due to a broken peripheral component such as a gripper or the welding technology. Their repair is the responsibility of the system integrator who fitted the robot with the components. Peripherals account for the bulk of the costs of most robotic systems. Therefore, this is where the focus should be when it comes to planning predictive maintenance.

The spatial separation between humans and robots is diminishing in many jobs – keyword cobots. In your opinion, what challenges are associated with this?

Kraus: One of the most important points is to avoid accidents as much as possible. After all, the risk of being injured by a cobot without a safety fence around it is significantly higher than by an industrial robot in a completely enclosed space. People working with robots need to be appropriately trained, for instance by passing a sort of “robot driving test”. The fact that robots are also capable of executing unexpected movements at any time is often over-

looked - this can quickly cause collisions. It's for this reason that the travel speed of cobots is significantly slower.

Dietz: There have been attempts to monitor the behaviour of cobots using cameras in order to evaluate collisions and prevent them in future. Depending on the application, data protection rights need to be observed here as workers might feel that they're under surveillance by such systems.

Ebner: It's also worth mentioning that even though it's possible to work collaboratively without spatial separation between the human and robot, there are plenty of operators who don't want to do this. As a consequence, in practice, cobots are often not used as cobots, i.e., as collaborative robots, in the true sense of the word, but as compact variants of the more traditional industrial robot.

Cobots and a new generation of easy-to-use industrial robots are facilitating the move to robotics for many operators. But when is the right time to invest in robotics and what benefits can be expected?

"The new generation of industrial robots is also interesting for medium-sized companies."

*Janik Ebner, Product Manager,
fruitcore robotics GmbH*

Ebner: This very much depends on the application in question. In general, cobots and a new generation of compact and easy-to-use industrial robots, like our HORST, are aimed at small and medium-sized companies, of whom, up to now, have only a small percentage of robots in use at all. It's not a matter of high-end applications but rather of gaining initial experience with the technology and discovering how to move



What is the state of research in robotics? Prof. Christian Wurll (l.) and Dr.-Ing. Werner Kraus provided exciting insights.





In the discussion between experts, current and future areas of application were equally addressed.

"The construction industry and agriculture can also benefit from robots."

*Prof. Dr.-Ing. Christian Wurll,
Karlsruhe University of Applied Sciences*

into this area in a straightforward and economically viable manner. It often starts off with the idea of procuring a robot, and the concrete application crystallises only later on – it's de facto the opposite of how it is with the traditional robots we are familiar with in the automotive industry, for example. Cobots and the new generation of industrial robots are also far more flexible and are not designed to repeat the same task over and over again for six or ten years. They offer a completely different level of accessibility, both in terms of price and in terms of set-up and operation. This is why we're convinced that there is still great potential here.

In the course of digitalisation, the question is asked time and again about whether automation and robotics will destroy jobs or create new ones instead. In which key technologies will jobs performed by humans be taken over by robots? Where do you see opportunities and possibilities for new jobs to be created through robotics and automation?

Dietz: I don't see robotics as a threat to human jobs, but rather as an enhancement. Here in Germany there's a shortage of skilled labour; it's getting more and more difficult to find qualified workers for many jobs. Robots can take over physically demanding or monotone jobs that humans don't like doing – and that seven days a week, 24 hours a day, without any breaks and to a high degree of accuracy. I think it's unlikely that jobs will disappear in these sectors because even today we don't have sufficient numbers of skilled workers. It

might be different in low wage countries where there's a greater availability of labour. On the other hand, new jobs are being generated for people to programme and operate robots. Providing adequate training for staff to do these jobs though is certainly a big problem for companies. This is something we'll have to tackle in the coming years.

Whether in medicine and care, in gastronomy, private households or for children's toys: the possible applications of robots seem almost unlimited, even outside of industry. Will we be surrounded by robots in all areas of life in 10, 20 or 50 years' time?

Benedek: I see a trend developing towards service robots. Robots will be deployed more and more in households, nursing homes and hospitals. For example, they'll help people to lift heavy objects or do other things that they can't do any more for health reasons. Robots already exist that autonomously go into hospital rooms, for instance, and disinfect them using UV light. I'm guessing there'll be one or the other sensible or nonsensical idea for robots aimed at helping private individuals rather than industry.

Dietz: I see a lot of potential in the medical sector as well. Assisting robots are already being developed to perform endoscopic operations, for example. Such operations usually involve up to four doctors standing close to each other around the patient. By contrast, the robot has up to four arms and is controlled via a console, monitor and camera – this allows for a much better

"Welding spark resistant cables are very much in high demand at the moment in robotics."

*Vincenzo Rio, Global Segment Manager
Robotic Cables, HELUKABEL GmbH*

overview. Physiotherapeutic treatments or adjustable operating theatre tables are other major up-and-coming areas of application. Moreover, the use of robots is obviously preferable when it comes to working in areas that pose a danger to health or life, such as bomb detonation or nuclear reactors.

Wurll: We're currently spending a lot of time on construction sites where we're working with a construction firm to develop a robot to build limestone walls. Robotics is also an interesting area for farming. We're in contact with a number of grab manufacturers who are contemplating automated strawberry or apple pickers. Outdoor suitability plays an important role here of course. The technology must work in all types of weather. Companies such as Google are investing huge amounts of money in so-called Everyday Robots. These are mobile platforms with arms that can straighten up chairs and clean tables in restaurants and cafés, for example. Whether they'll really take off in the sector is hard to say at the moment but they're definitely a new trending topic in gastronomy.

Kraus: I think the advances made by robotics in manual activities are significantly greater than those made in language-based interactions. There's an interesting parallel here to the evolution of human language skills, which developed noticeably

later than our dexterous skills. Similarly, in my opinion, it's going to be hard for us to model and master this in the form of artificial intelligence. That's why, it's my belief that the next robot revolution is going to be mobile platforms for use in logistics, for instance.

Wurll: There are already innovative approaches for loading lorries and swap bodies. An American supplier recently demonstrated a mobile platform with a custom-developed arm that had

been optimised for a swap body. The robot is capable of moving into the load carrier and localising and loading boxes using a telescopic conveyor. It doesn't necessarily do this more quickly than a human being, but it doesn't need any breaks. This means that there are already potential productivity benefits.

Kraus: Another application that's currently emerging at a very rapid pace is the welding robot. The shortage of skilled welders is particularly acute, and it doesn't matter if the robot moves slowly – welding has always been a job that takes time. One of the topics we're currently working on at the IPA is therefore the intelligent recognition of the beginning and end of a weld and making automatic adjustments based on weld tolerances. We reckon there's a lot of potential for robotics in welding. ◀

"Due to demographic changes, the demand for robots is also growing outside of manufacturing."

Dr.-Ing. Werner Kraus, Fraunhofer Institute for Manufacturing Engineering and Automation IPA

ABOUT THE PEOPLE



Prof. Dr.-Ing. Christian Wurll is Professor of Electrical Engineering and Automation in the Faculty of Management Science and Engineering at Karlsruhe University of Applied Sciences. His specialist area is robotics and automation engineering. He is also spokesman of the Institute of Applied Research. He previously worked at the robot manufacturer Kuka for 16 years.



Dr.-Ing. Werner Kraus is Head of Robot and Assistive Systems at the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart. Among other things, the institute is building a "Robotics Valley" in Baden-Württemberg with the aim of bringing together various players in the field of robotics.



Janik Ebner is Product Manager at fruitcore robotics GmbH. In 2018, the company based in Constance launched the HORST industrial robot onto the market, which particularly enabled small and medium-sized companies to have a simple and affordable entry into robotics.



Holger Dietz is Business Unit Manager at Robotec-Systems GmbH, a subsidiary of HELUKABEL. The Duisburg company specialises in hose packs and dress packs for media technology in industrial robotics. Dietz's previous job experience includes working for various machinery and plant engineering companies, including Kawasaki Robotics.



Ronald Benedek has been with HELUKABEL since 2008 and, in his role as Automation & Drives Team Leader, is in charge of topics relating to drive technology and robotics.



Vincenzo Rio has been reinforcing the team around Ronald Benedek since 2020 as Expert for Robotic Cables. His tasks include managing industry-specific product portfolios and supporting HELUKABEL's international subsidiaries.



Horst Messerer is Data, Network and Bus Technology Product Manager at HELUKABEL. Before joining the company in 2014, he had already worked in the cable industry for 28 years. He is also active in various bus and Ethernet associations and is very well-acquainted with current standards.

On the Spot: Focused and Precise

Why Scansonic chooses robotic cables from
HELUKABEL for their laser processing optics

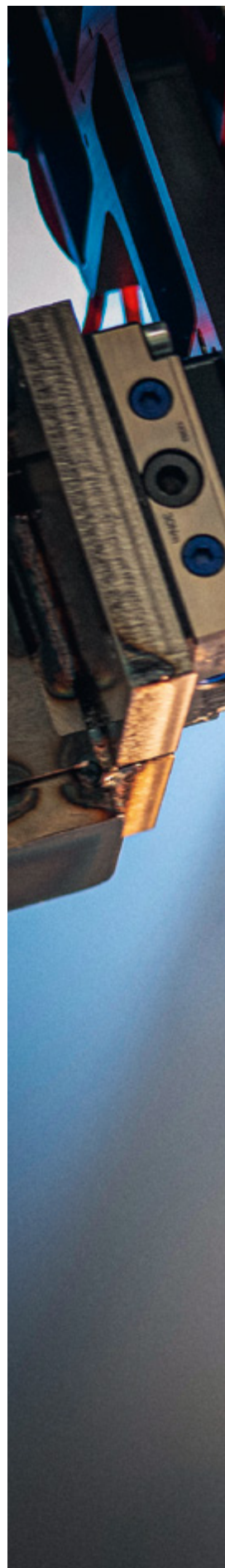
Scansonic MI GmbH specialises in optical systems for robot-assisted laser machining. The modules from the high-tech company in Berlin feature ROBOFLEX special cables from HELUKABEL. These cables withstand mechanical stresses such as bending and torsion, making them ideal for use in industrial robots in moving applications.

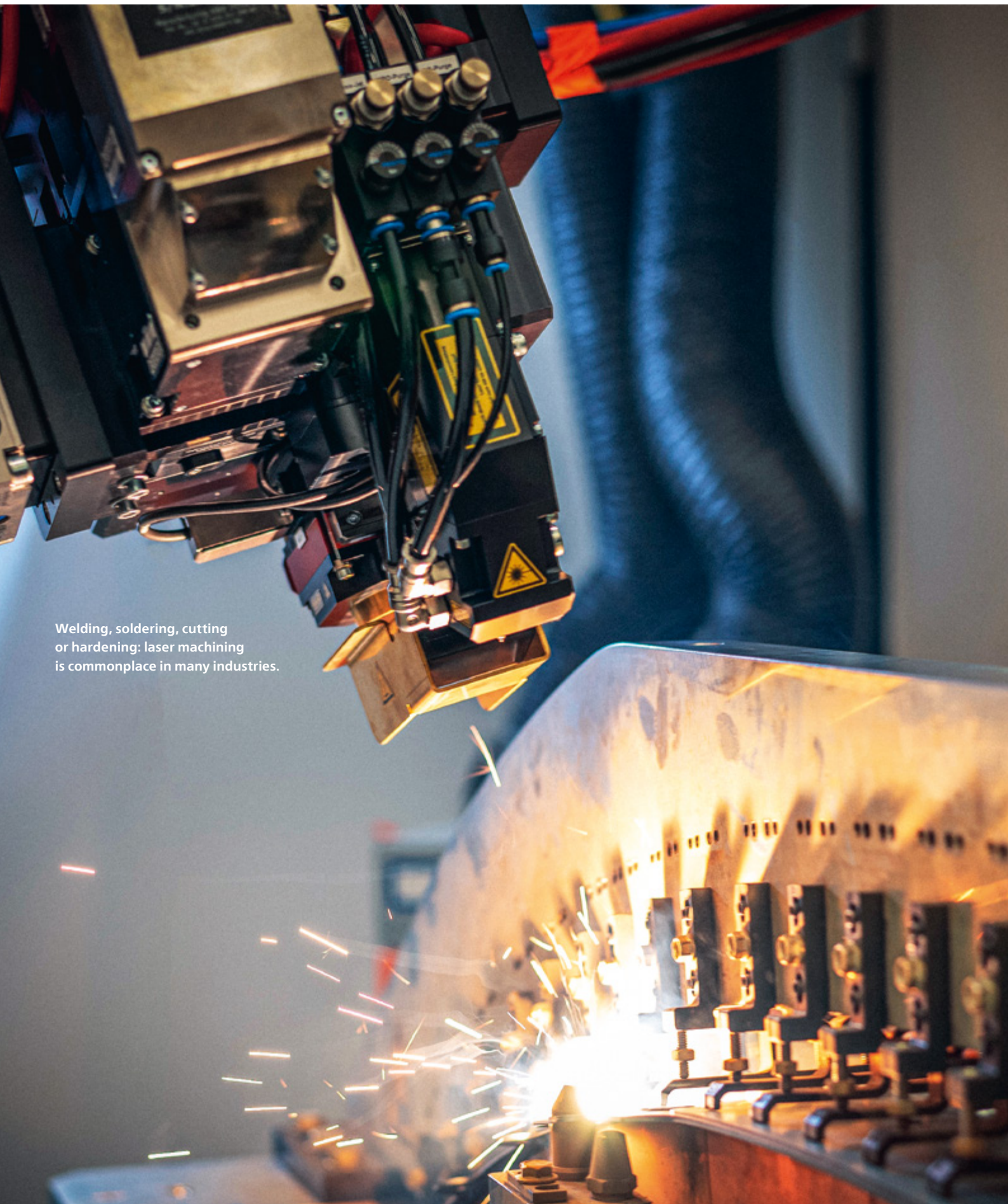
Laser machining is commonplace in many sectors nowadays – and for good reasons: welding, brazing/soldering, cutting or hardening with the aid of focused laser beams is cleaner, quicker and more precise than with most other manufacturing technologies. Lasers are especially popular where quality and appearance play a major role – for instance, in the joining of visible components in the automotive industry.

In order to fulfil the diverse and rigorous tasks of modern production plants, every laser requires special optics. These complex systems guide, change and focus the beam to carry out application-specific tasks. “The same laser can be used for joining materials as well as for cutting them,” explains Christian Schwerdt. He is the purchasing team leader at Scansonic MI GmbH, one of the leading manufacturers of laser processing optics. Founded in 2000, the Berlin-based company provides, among other things, solutions for welding, brazing/soldering, cutting and surface machining.

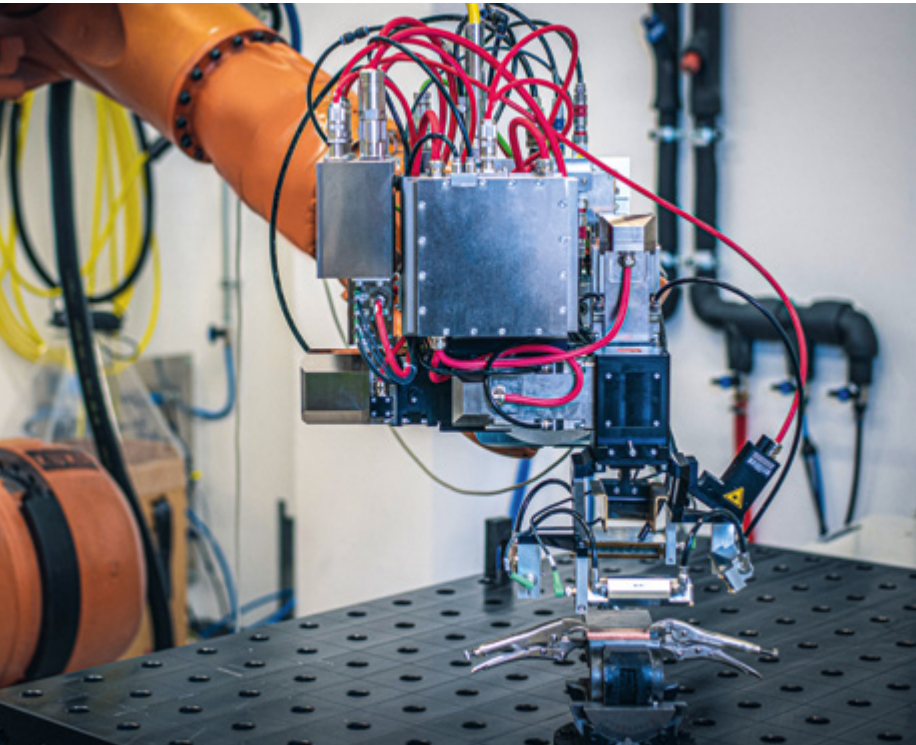
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HELUKABEL





Welding, soldering, cutting or hardening: laser machining is commonplace in many industries.



In laser processing optics, cables are used for power and data transmission as well as for connection to robots and control cabinets.

A MODULAR SYSTEM FOR SPECIAL REQUIREMENTS

Scansonic's success is based on a system consisting of different modules that are combined depending on the customer's specific requirements. "This enables us to realise unusual or highly specialised applications in an economical way," says Schwerdt. Such applications are becoming increasingly relevant in the rapidly growing e-mobility segment: "Regardless of whether it's electric motors, power electronics or batteries – laser welding is carried out on almost every component – and to an extremely high standard," the expert points out. "For example, seams must be gas-tight closed, join tiny components together or be free of any visible splashes or surface irregularities." Each application thus places a unique set of demands on the laser and its optics.

The systems are mounted on an industrial robot whose axes enable the desired motion sequences. Furthermore, Scansonic products are not tied to a specific robot manufacturer - they can be used universally. "In our in-house laser laboratory – one of the largest of its kind in the world – we have many different types of robots, which means we can



"This enables us to realise unusual or highly specialised applications in an economical way."

*Christian Schwerdt, Team Leader Purchasing,
Scansonic MI GmbH*

extensively develop and optimise prototypes of new applications for our optics," describes Schwerdt. This combination of know-how and flexibility makes Scansonic a sought-after partner for many renowned enterprises, from medium-sized companies to large corporations.

Cables are important components of laser processing optics. They transmit power and data through the systems and connect them via the robot to the switching cabinet. A reliable performance is of paramount importance as any fault can potentially lead to a costly production outage. At the same time, the cables are subject to constantly changing bending, torsion and tensile loads as a result of the robot's movements. Cables that are designed specifically for this area of application are therefore needed in order to avoid unwanted abrasion and cable damage when used in the long term.

DESIGNED FOR ROBOTS

Scansonic relies on HELUKABEL for these critical components. The leading provider of electrical connection technology, who has been one of the laser specialist's qualified supply partners for a

number of years now, equips the optical devices in Berlin with, among other products, four different types of robotic cables. These are based on the successful ROBOFLEX product family, which was especially designed for use on and with robots. “The cables have been made to withstand chemical and thermal stresses as well as mechanical loads such as torsion and bending,” explains Vincenzo Rio, Global Segment Manager for robotic cables at HELUKABEL. “There are also cable variations available on request that are resistant to oil and welding sparks.” The ROBOFLEX brand name includes sensor, data, control and motor cables and hence encompasses the entire application spectrum of cables in robotics.

The cables on the laser processing optics from Scansonic are custom made solutions. “HELUKABEL designed these exactly according to our specifications – from the number of wires to the respective cross sections and corresponding shielding to the characteristic blackberry red colour of our sheathing,” reports Christian Schwerdt. Among the cables are hybrid ones, capable of transmitting both power and data. “For us, this was a space and cost saving solution which is not typically available as an item in stock ready for immediate dispatch,” says Schwerdt. “HELUKABEL advised us very well on every new development and always found optimal solutions to our very precise requirements.”

Scansonic also procures various standard cables such as hook-up wires as well as glands and other accessories from HELUKABEL. Buyer Schwerdt not only appreciates the quality but also the reliable product availability: “We don't have large storage capacities ourselves which is why it's incredibly practical for us that HELUKABEL usually has all our products in stock and can deliver them quickly.” With a sales and distribution depot in Neuenhagen near Berlin, the company is indeed located in the immediate vicinity. Schwerdt positively emphasises HELUKABEL's high level of flexibility: “For example, if we need to change something like a UL approval for the American market, HELUKABEL is always there to provide us with fast and competent support.”

A SUPPLIER WHO LEAVES NO WISH UNFULFILLED

Thanks to this strong complete package, Scansonic is extremely satisfied with HELUKABEL. Schwerdt

has no doubt that the successful business partnership, which has existed for around 10 years, will continue into the future. “Due to the time-consuming and expensive qualification process, we don't particularly like to change our suppliers just for the sake of it,” he comments. “We would have no reason to do so with HELUKABEL. The quality, availability and service are just right – there's nothing that could be improved.” ◀



In its in-house laser laboratory, Scansonic develops and optimises new applications for its machining optics on different types of robots.

ABOUT SCANSONIC

Who: Scansonic provides specialist systems and solutions for laser welding, laser brazing/soldering and laser hardening, and also offers associated sensor technology and quality monitoring. Already back in 2000, the Berlin company set a new industry standard when it launched its first ever product: the innovative optical machining tool for laser brazing/soldering was the first of its kind to master very fine joints on car bodies.

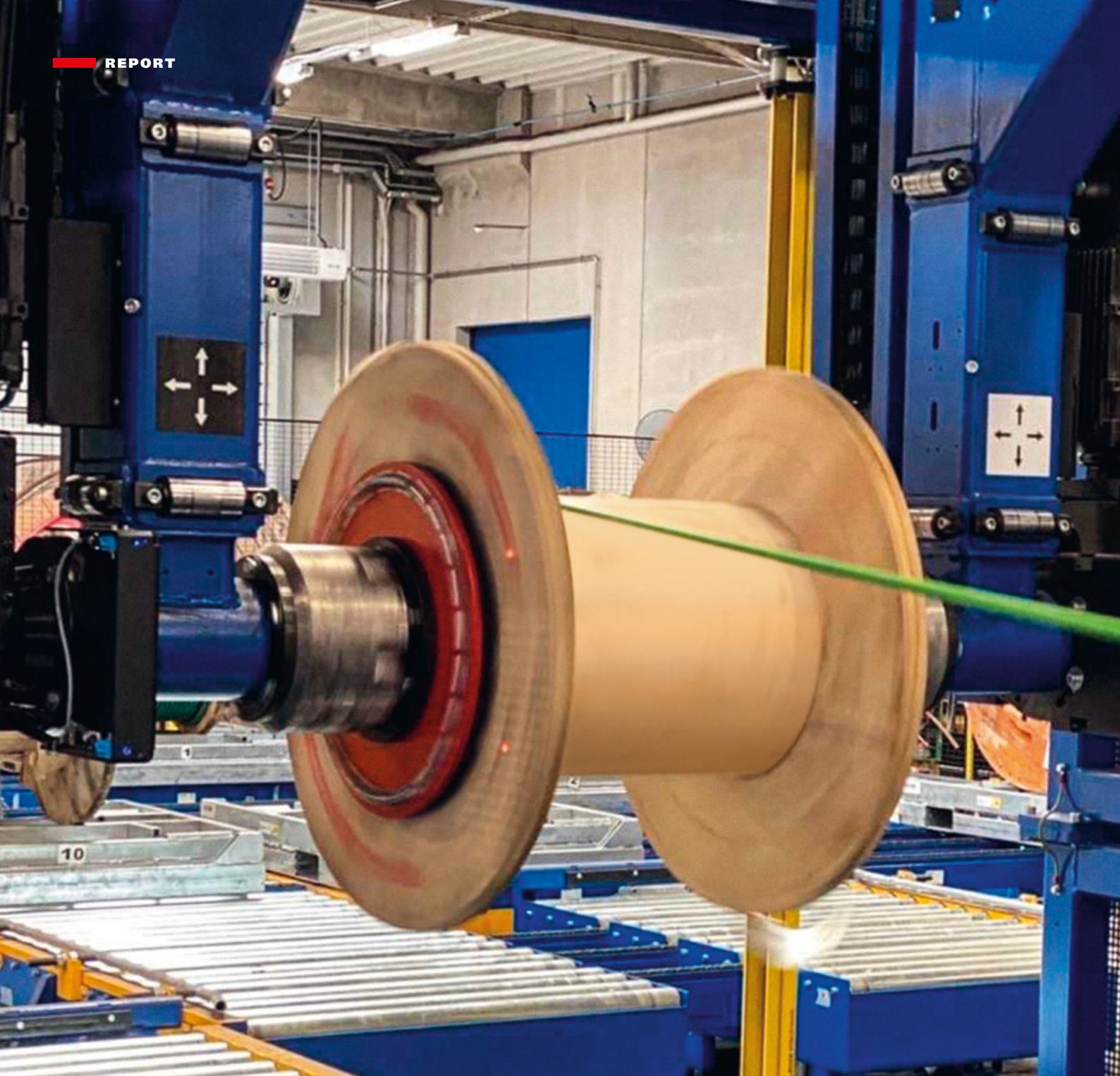
What: Scansonic products are particularly used in automotive construction, rail vehicle construction and in the energy sector. The company is a leading global supplier of laser-based systems for body assembly joints. Scansonic is part of the Berlin.Industrial. Group. (B.I.G.), a conglomerate of five technology enterprises each with their own focus.





MAGICAL CHRISTMAS LIGHTS AT WILHELMA

Since 2018, the Christmas Garden in Stuttgart has been one of the city's most popular attractions at Christmas time. From the end of November to the beginning of January, the grounds of the Wilhelma zoological-botanical garden are transformed at dusk into a magnificent glittering world of over ten million lights. On a two-kilometre-long circular route, elaborate and impressive installations with lighting, video projections and music invite visitors to be amazed and linger. This unique spectacle is possible thanks to a cooperation with HELUKABEL: we supplied several kilometres of H05RN-F, a connection cable for the installation of the sound systems, which also make the Christmas Garden an acoustic highlight. This harmonised rubber cable is characterised above all by its weather resistance and is therefore ideally suited for outdoor use - even in wet or freezing temperatures. The reliable technology ensures an optimal visitor experience!



Fast and Flawless Rewinding

The Danish electrical wholesaler Solar relies on automatic winding technology from KABELMAT



In its logistics centre in Vejen, Denmark, Solar has, among other machinery, three automatic rewinding machines from KABELMAT.

The Danish Solar Group has almost everything in its product range needed by construction and trade companies - including a large selection of cables and wires. In order to provide these to customers in the quantities they require, the company relies on winding technology from KABELMAT in its logistics centre in Vejen: three fully automatic AUTOLOG winding systems and several individual machines ensure efficient and gentle handling - even of sensitive optical fibres.

From screws to generators, from lamps to photovoltaic systems, from bathroom fittings to smart home systems: the Danish Solar Group's product range offers construction and trade companies everything they need to realise their projects. Established in 1919, the company is specialised in procurement as well as services related to electrical, heating and sanitary engineering, ventilation as well as air conditioning and energy solutions -

and is extremely successful in these areas. The Solar Group is not only active in Denmark, but also in Norway, Sweden, the Netherlands and Poland. In 2021, the company achieved a turnover of almost 12.4 billion Danish kroner (1.67 billion euros) with 2,900 employees.

TAILOR-MADE CABLES BASED ON CUSTOMER REQUIREMENTS

In addition to a modern logistics concept and excellent service, an extensive product range and high product availability are major strengths of the Solar Group. Their portfolio also includes a huge selection of cables and wires: from control and connection cables for industry and mechanical engineering, to cables for infrastructure and building technology, to fibre optic cables, telecommunications and data cables, no wish remains unfulfilled. "It is our ambition to make our customers' processes more efficient and sustainable," explains Kim Søllingvraa Nielsen, Team Leader Cables, Volume & Long Goods. "That's why we also supply cables and wires not only in standard lengths, but also tailored to customer requirements."

To this end, the company is also well prepared from a technical perspective: in its 45,000 square metre logistics centre in Vejen, Denmark, Solar has, among other machinery, three automatic wrapping lines. These machines unwind cables and wires from the manufacturers' and suppliers' large drums, which weigh several tonnes, and wind them onto smaller drums or into coils for boxes - precisely cut to the length ordered. "Considering the number of orders we handle, this process



A great advantage for employees is the high user comfort of the KABELMAT machines.



The product range of the Danish Solar Group also includes a huge selection of cables and wires.

would be impossible to do manually," Nielsen explains.

These systems were supplied and installed by HELUKABEL's subsidiary KABELMAT Wickeltechnik. "We used another supplier's machines until recently," Nielsen remembers. "However, they were getting old and no longer achieved the desired results in terms of quality and productivity." After visiting several manufacturers, those responsible at Solar finally decided on the AUTOLOG rewinding machines from KABELMAT.

AUTOMATIC CONTROL AVOIDS OPERATING ERRORS

The systems are made of several machines, each with a modular construction and available in different sizes: three PORTROL drum unwinders pick up the drum to be unwound with a quill and bring it into position. They are connected to a conveyor line, and so a drum can automatically be retrieved from the warehouse and transported to the drum unwinders. On the opposite side, two UMROL rewinders and a semi-automatic cable coiling machine from the RINGROL series wind the cables onto drums of different sizes and into boxes, while simultaneously measuring the correct length and cutting them to order. The unwinding and rewinding are controlled



"We were able to significantly increase our throughput with the new KABELMAT systems."

*Kim Søllingvraa Nielsen,
Team Leader Cables, Volume & Long
Goods at Solar Danmark*

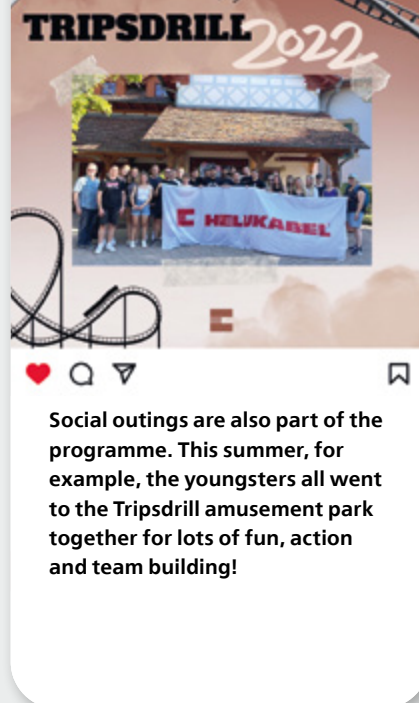
automatically, the system receives the order data via an interface to the ERP system. "This eliminates operating errors," emphasises Nielsen. Finally, the completed rolls and boxes only need to be removed with the forklift truck and prepared for shipping. "This saves a lot of time and manpower."

One particular challenge at Solar Danmark was the cutting of high-quality glass fibre cables: these should not be bent too much when being wound in order to avoid damage. "Therefore, we specially adapted the bending on the systems to ensure that no bending radii are too tight," explains Manfred Wössner, Sales Manager at KABELMAT. A so-called cable dancer system, which is positioned between the unwinder and rewriter, also compensates for speed fluctuations and thus reduces the tensile load on the cable. "This allows even sensitive products such as optical fibres to be cut to length and wound without any quality loss," adds Wössner.

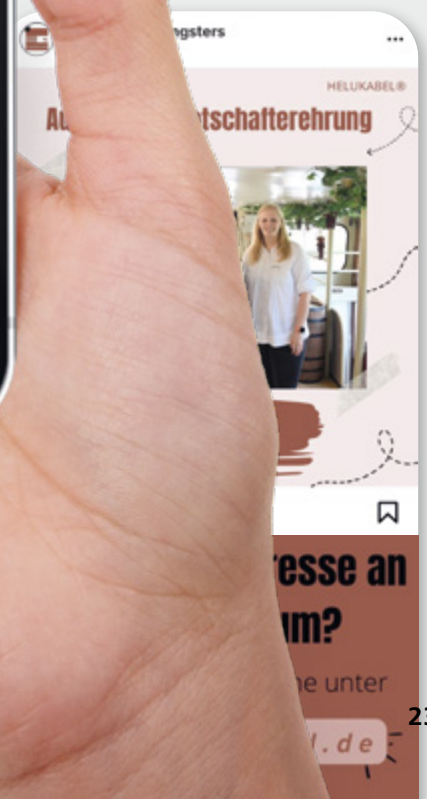
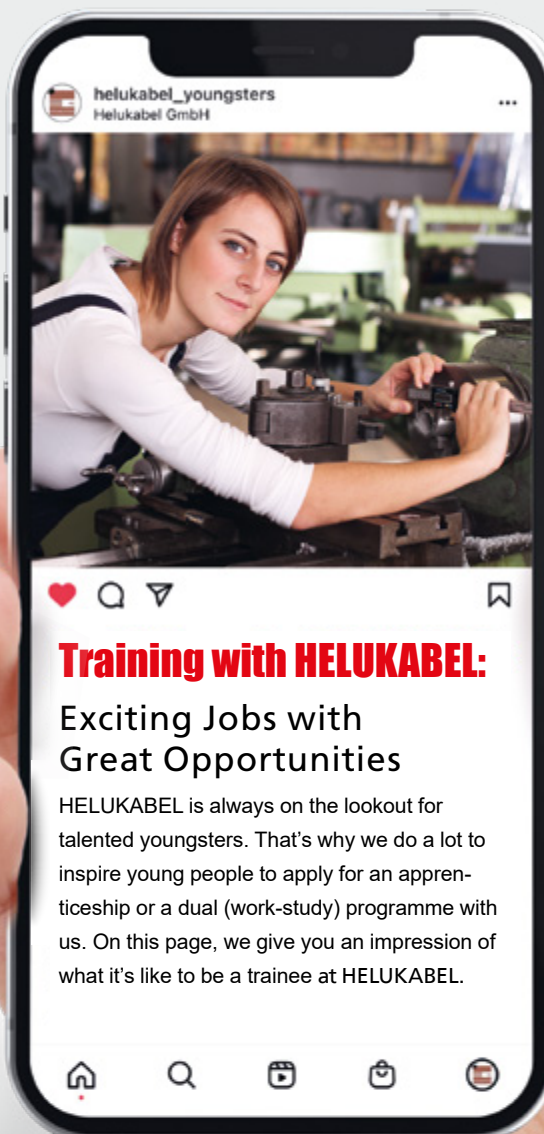
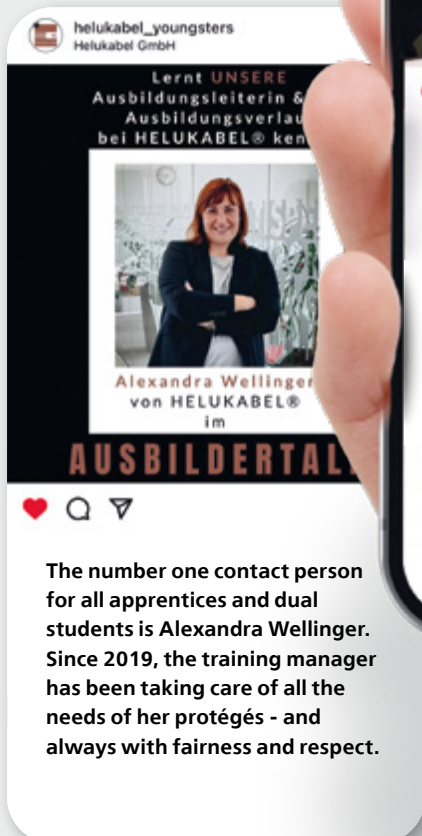
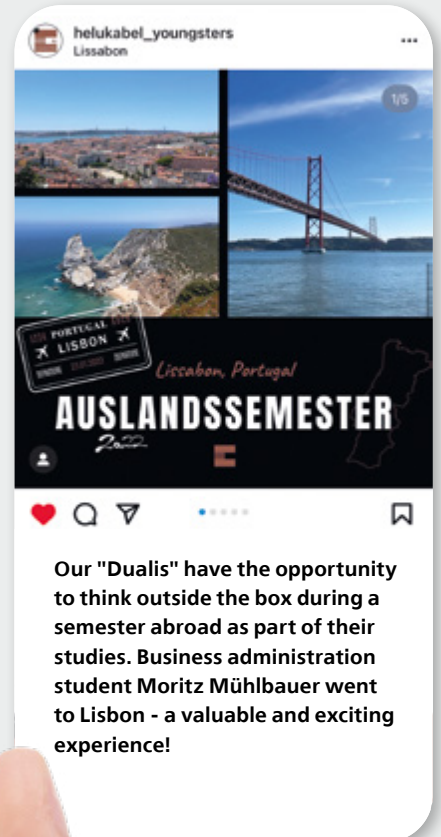
HIGHEST QUALITY AND MAXIMUM AVAILABILITY

In addition to the three fully automatic lines, Solar Danmark also uses three UMROL 1000 rewinders. On these more compact machines, the company can wind cables and wires into coils or onto smaller drums without having to use one of the rewinding lines - for orders with small batch sizes, for example. All KABELMAT machines are calibrated in accordance with the European Measuring Instruments Directive (MID) and are thus approved for use throughout Europe. Furthermore, they are equipped with data storage devices that allow all work steps to be traced back without any gaps. "All this ensures that we can offer our customers the highest quality and maximum availability," says team leader Nielsen happily. "It has been possible to significantly increase our throughput with the new equipment."

Another advantage is the user-friendliness of the KABELMAT machines: they are equipped with high-quality Siemens touch panels and have a Danish voice output - consequently, the changeover was a piece of cake for the staff. "We also received in-depth training from KABELMAT after commissioning, so no questions were left unanswered," says Nielsen, praising the cooperation. "We are completely satisfied with our new winding technology, and another machine is already being planned to further expand our capacity here." ◀



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“People are at the heart of our work.”

Since the beginning of 2022, Katja Lägeler is responsible for HELUKABEL's personnel department.

In an interview with her below, she describes the challenges facing personnel management, important factors for the successful recruitment of specialists and trainees, and why HELUKABEL's corporate culture particularly appeals to her.

Ms Lägeler, your department was recently renamed from “Human Resources” to “People and Culture”. What is the reason for this change?

We want to set new priorities in personnel work. Employees are of vital importance to the success of a company – and I think it's no longer in keeping with the times to talk about people as “human resources”. We want to create a new mindset here. We're asking ourselves questions such as: how can we create an employee experience that is as positive as possible? In our role as personnel officers, what can

we do to make sure that employees feel listened to, and that their questions and concerns have been understood? Employee well-being is at the heart of our work.

What are your responsibilities as Head of People and Culture? What does a typical workday look like?

Most often, my day involves a lot of communication – within my department as well as with other managerial staff and employees. It's often a matter of finding solutions and ideas to improve cooperation in certain areas. On other days, I

might have a brainstorming session with myself – to come up with new concepts for the reorientation of our personnel work, for example.

With its headquarters in Hemmingen, HELUKABEL is located in the middle of the strong economic region of Stuttgart, alongside other renowned and sometimes much bigger companies. As an employer, what do you have to do these days for long-term success in the race for sought-after specialists and trainees?

On one hand, you need a strong network – from experts in specialist departments that know the ins and outs of their market to a strong presence on social media and relevance among different target groups. On the other hand, it's important to actively communicate to the out-

side world about what makes the company special and what it has to offer. This begins with really simple things like the dress code: here you can wear what you want, which is far from being the case in many other companies – especially in big ones. At HELUKABEL we offer outstanding career development opportunities. If you want to see what it's like to work in another part of the company, you'll be given the full support to do so. Especially among young people, "purpose" plays an important role, that is to say: does the work I do have meaning and purpose? As a company that is active in growing industries of the future such as e-mobility and renewable energy, we are well-positioned from this standpoint.

Since the start of the COVID-19 pandemic – and even before then – the topic

of remote working has significantly grown in importance. To what extent is working from home changing the traditional workplace and what are some of its advantages and disadvantages?

I'm convinced that working from home has arrived and is here to stay. COVID-19 hasn't only provided an enormous technological boost, it's also changed the way many people think. When I started at HELUKABEL – in the middle of the pandemic – I realised that management fully trusted its employees to do their work from home. I think this is great! Many tasks can be done just as well from home, some even better. On the other hand, spending time with each other in person and being seen are part of our corporate culture. This only works if we're physically in the office. I guess that, in the future,



"We're looking closely at the so-called customer experience: i.e., what do we have to offer to make sure customers choose us?"

"For me, HELUKABEL has a very healthy and uncomplicated corporate culture. People are open to new ideas and prepared to simply try out new things without much bureaucracy."

a hybrid model of working from home and in the office will become the norm.

Another new approach being pursued in collaboration with selected customers is the evaluation of what customers want from our employees. What is particularly important to them and what can they expect from HELUKABEL in the future?

This approach is based on the fact that the company's end customers are also our customers in the personnel department. That's why we're looking closely at the so-called customer experience: i.e., what do we have to offer to make sure customers choose us? This question concerns our products as well as our employees. Our customers have specific expectations of each HELUKABEL employee, particularly those in sales. But these people can only do their jobs well if every upstream and downstream process is running smoothly – from logistics all the way through to accounting. In the personnel department, we are in the process of asking our customers exactly what they expect from our employees. We want to use these findings to trigger internal changes to meet and even surpass their expectations in the future. For example, customers like working with a dedicated contact person at HELUKABEL and having fre-

quent contact. Speed and good reachability are key criteria for many customers – they also value the sales staff's knowledge of the HELUKABEL product range as well as of the requirements and special characteristics of each respective industry. By reflecting, learning from each other and talking with one another, we can actively help improve the customer experience.

Working with employees, customers and business partners in the right way – this is all part of the so-called corporate culture and defines a company's values, vision, strategy and procedures. What distinguishes HELUKABEL's corporate culture?

For me, HELUKABEL has a very healthy and uncomplicated corporate culture. People are open to new ideas and prepared to simply try out new things without much bureaucracy. As a family-owned and managed business, stability is central to our corporate culture, and the management team is the living proof of this. We're continuously developing ourselves, not through one big revolution but through steady evolution. Healthy common sense is at the forefront of all decision making, and employees have a lot of freedom to develop themselves. These are important things that we should maintain well into the future! ◀

KATJA LÄGELER MUST DECIDE!

Classical music or rock?

→ My husband is a pianist and preferably plays classical music. So, classical.

Convertible or SUV?

→ Neither – I would prefer a compact electric car.

Beer or wine?

→ Wine, and preferably white wine.

Do you prefer a savoury or sweet snack?

→ A sweet one. You can always lure me in with gummy bears!

Football or tennis?

→ Once again, a very definite "neither". I'm more of a cross-country runner, I like running all over the place.

Camping or an all-inclusive hotel?

→ Definitely an all-inclusive hotel. Camping is no fun for me with two children.

Mountains or sea?

→ I'm not a keen swimmer at all, so I don't need the sea. I much prefer the mountains!

Cat or dog?

→ I was bitten by a dog as a child and have kept a safe distance from them ever since. But I like cats a lot!

City or village?

→ Definitely village – it's far too loud for me in the city.

Cinema or book?

→ I prefer a good book to the cinema.

Measuring Made Easy

How Aufmaster is revolutionising the work of electrical companies on building sites



The measuring device is connected to the back end of the reeled cable using two clips.

**Do it yourself:
the first Aufmaster
prototypes were
made by hand.**



Recording cable measurements on building sites is a tiresome task: electricians must cut the cables exactly to the required length and document every cut without exception – traditionally using pen and paper. “There must be an easier way,” thought three young entrepreneurs – and so they developed a digital solution called Aufmaster, which saves time and money in equal measure.

“It all began in 2015 in South Tyrol while mountaineering,” recalls Claudius Jehle. The engineer from Ravensburg in Upper Swabia, Germany, is one of the three brains behind Aufmaster. “While there, I was discussing with my father, Paul, who runs an electrical installation business, and my brother Constantin, a qualified electrician, about how tiresome cable measurements are. In our experience, having to write everything down on paper means that things are often not documented correctly, which makes billing very difficult.”

The three mountaineers’ approach to the solution: to invent a device that constantly measures the remaining length of cable on a drum, so that the length that is cut can automatically be calculated and documented. If this data could then be transferred to a smartphone via an app, this would make life a lot easier for electrical companies. The idea for Aufmaster was born. As soon as they got home, the Jehles soldered a prototype and, in the following year, they produced the first measuring devices.

SOFTWARE EXPERTS FOR DIGITALISATION

In 2019, Jan Müller and André Wagner joined the team. The two software experts who have known each other since their school days, had already acquired their first experience as entrepreneurs through

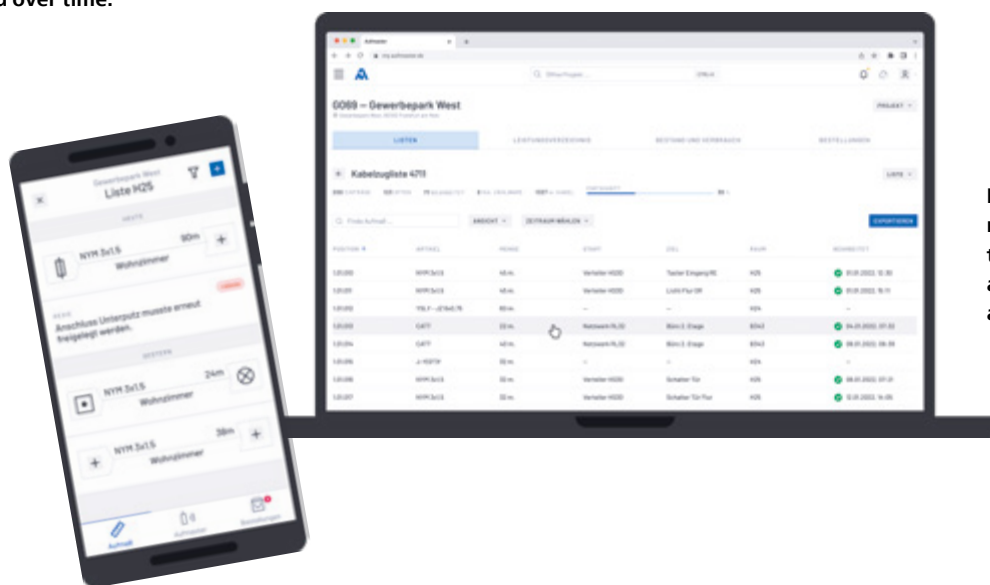


**“Our big vision
is namely: an
Aufmaster in
every toolbox”.**

André Wagner



The design of Aufmaster evolved over time.



In addition to the measuring device, the three founders also created an app and a web portal.

their own firm. “Together we developed websites for various companies and later logistics software for customers in the car and precision optics industries,” reports Jan. “One day a mutual friend told me about Claudius and his idea for Aufmaster.” With the aim of pushing ahead the digitalisation of the project, Jan decided to become part of the Aufmaster story and got his friend and business partner André on board immediately.

Together, the three inventors began to develop an app as well as a web portal for Aufmaster. At the same time, they received their first real-life reports from various customers who had been given the measuring device to try out. “The response from companies was amazing,” André explains. “We worked out that with Aufmaster, we could reduce the cost of measuring and administration by around 30



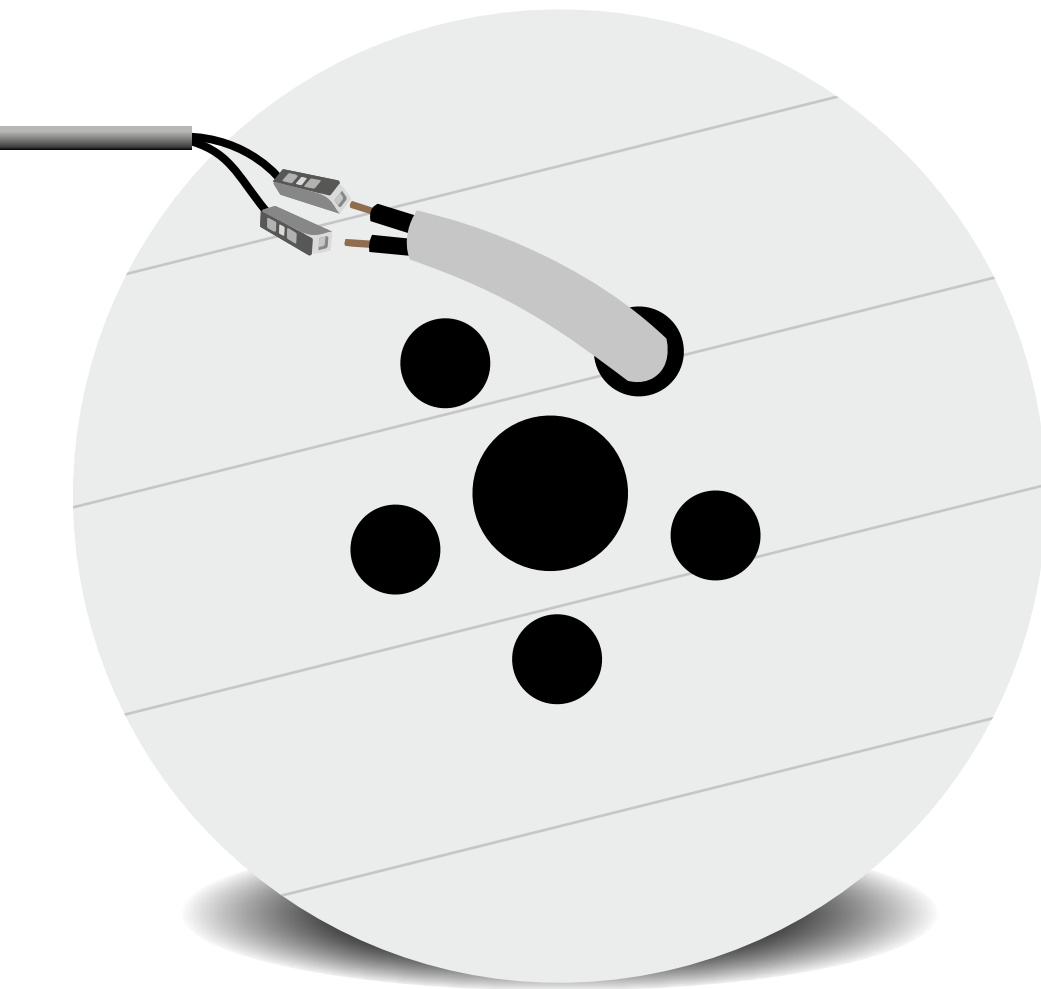
“With cable measurements, things are often not correctly documented, which makes billing very difficult.”

Claudius Jehle

per cent. Electricians on building sites must no longer fill in forms by hand which then have to be laboriously decoded in the office. This saves work and avoids the embarrassment of incorrect billing.”

A STRONG SALES PARTNER

However, it soon became apparent to the creative brains that such a device – particularly in connection with an app and smartphone or tablet – represented something very new to the average craftsman. “We were aware that, on our own, we’d only have limited success,” explains Jan. “We needed a strong partner at our side to help us access the right customers.” The Aufmaster team found such a partner in HELUKABEL, who were also enthusiastic about the idea. Since then, the company has been providing valuable support with sales and marketing. There are also plans to create a joint product database



**"Our partnership
with HELUKABEL
gives us access to the
right customers for
Aufmaster."**

Jan Müller

and attach Aufmaster QR codes to HELUKABEL drums so that the app automatically recognises the respective cable type.

By autumn 2022 everything was in place: the first professionally manufactured batch of Aufmaster devices was shipped to customers and the web portal was ready for use! The project reached its first major milestone. But this certainly won't be its last one, André points out: "Our big vision is namely: an Aufmaster in every toolbox". The three young entrepreneurs are fully aware that there's still a long way to go. "We're convinced that our idea has the potential to spread across the whole industry – the benefits speak for themselves," argues André. "And the cooperation with HELUKABEL provides us with the right prerequisites for sustained success in the market."

WHAT IS AUFMASTER?

Aufmaster is a system comprising of software and a digital measuring device that automatically records and documents the length of cables cut on building sites. It involves connecting the device to the back end of the reeled cable using two clips. Whenever an electrician cuts off a piece of cable, the exact length of the cut is automatically transmitted to an app on their tablet or smartphone. From there the data is transmitted over the Internet to the respective customer account at the electrical company. Using the software allows diverse projects with multiple measuring devices attached to various cable drums to be controlled and managed, and the calculation of the cut lengths to be tracked and documented in real-time. The most significant benefit is the reduced time and energy spent on recording measurements and invoicing – and hence the lower costs. In addition, it reduces the risk for errors, which results in fewer complaints. Find out more at www.aufmaster.de



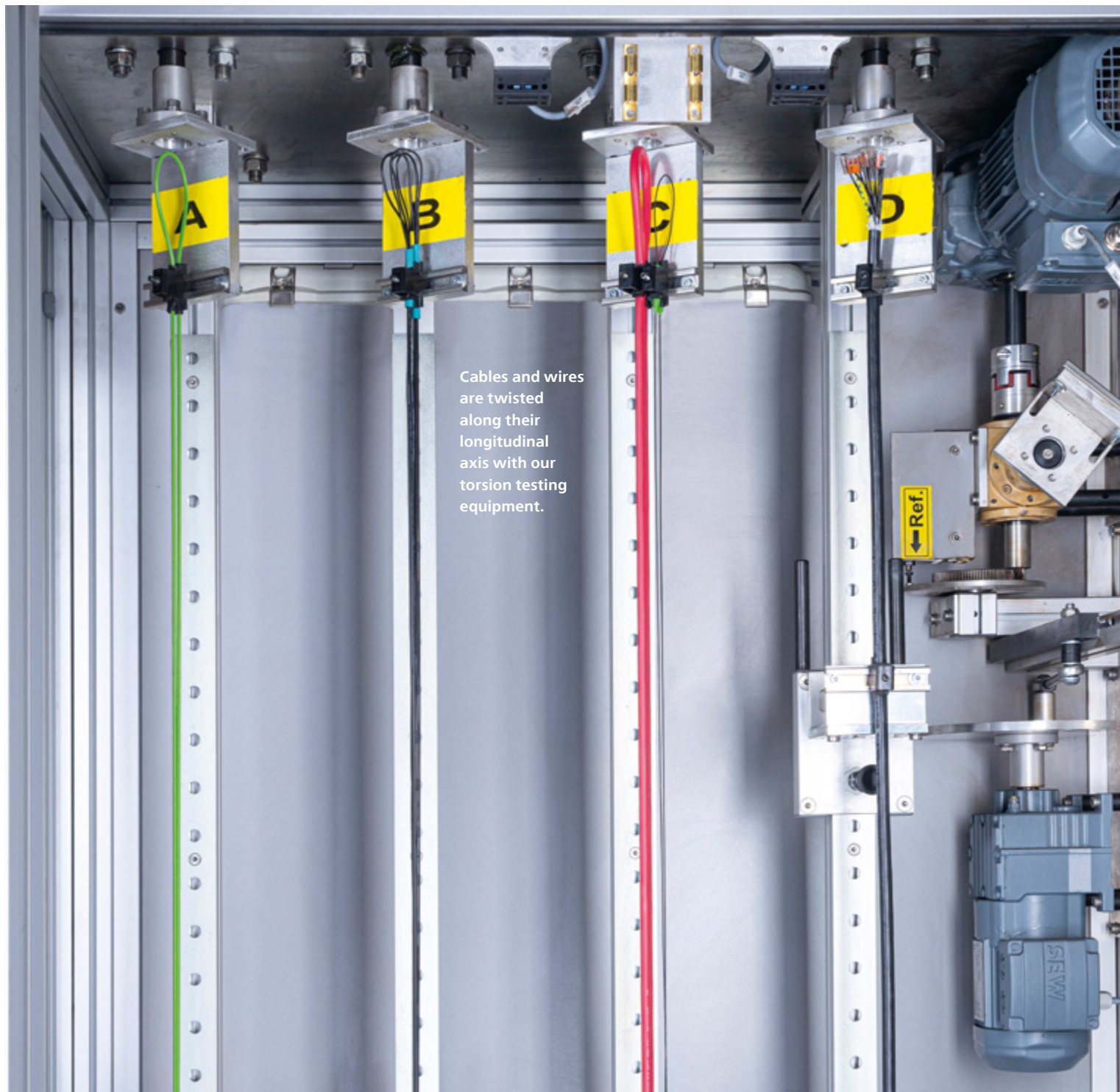


THE SERIES AT A GLANCE:

TORSION TESTS // DRAG CHAIN TESTS // BENDING TESTS // KINK AND ABRASION TESTS //
FIRE TESTS // AGEING TESTS // EMC TESTS

Torsion Tests

During the development of our cables and wires, we vigorously test each product in our testing laboratories. In the first part of our series “Put to the Ultimate Test”, we’ll introduce you to torsion tests.





© Andreas Riedel

Cables and wires in industrial robots and other moving machine parts are often required to withstand extreme stresses caused by torsion. Constant repetitive movements put materials under considerable strain. At the same time, operators expect components to function perfectly and reliably throughout their entire service life to avoid disruptions, outages and safety hazards.

For this reason, at HELUKABEL, we simulate intensive and continuous torsion stresses under realistic conditions with our high-tech testing equipment in Windsbach, Franconia. We have several types of apparatus for doing this because some of our customers, for example those in the automotive industry, have very precise specifications for how a torsion test is carried out. The tests show that our cables and wires withstand speeds up to 1,000°/s, accelerations up to 2,000°/s² and torsion angles up to 720°. Hence, we make sure that each product always meets our customers' high standards, and that they receive the impeccable quality they rightly expect from us as a leading supplier of cables, wires and accessories for more than 40 years.

WHAT IS TORSION?

Torsion occurs when a cable is twisted along its longitudinal axis. This is often the case in robotic applications and in machinery and plant engineering, as well as in wind power plants. The resulting torque causes cable deformation. The phenomenon can be compared with wringing a wet towel. The wire is stretched at places and crushed at others, and these applied forces are constantly changing. The torsional strain increases linearly from the centre of the cable to the surface of the jacket where deformation and stress are at their greatest. To ensure that cables and wires are resistant to torsion, they require a special construction with the use of suitable materials. ◀

Ask the expert

Mr Meyer, how do the impacts of torsion manifest themselves over time?

Continuous torsion significantly accelerates the ageing of cables and wires. For example, the outer sleeve deteriorates more quickly, and this is more pronounced when cheap rubber sleeves are used as opposed to sleeves made from high quality materials such as modified PVC or PUR. There are also diverse forces acting on the copper wires within the cable, which might cause them to break over time. The cable fixing points are also important: simple clips, for example, can't easily allow torsional forces to pass through and are therefore subject to high shear forces. These are forces that are parallel to each other but in opposite directions, and that can cause a cable to break.

If shielded robotic cables are required for better electromagnetic compatibility (EMC), product developers choose a special shielding called the D-screen. What's the difference between a C-screen and a D-screen?

A C-screen is a braid made of multiple copper wires laid alongside each other. It's the most popular type of shielding in cable construction and is used, among other things, for drag chain cables. The C-screen is suitable for applications with bending stresses but not for ones with torsion. This is because it's very difficult for the braid to return to its original state after being twisted along its longitudinal axis. Consequently, we use the so-called wrapped screen or D-screen for torsion-resistant cables. This type of copper wrapping is particularly flexible because there are no wires crossing over each other. The ability of the cable to allow torsional forces to pass through is improved and the cable can be twisted along its longitudinal axis without being damaged.

ABOUT THE AUTHOR

Günter Meyer is Head of Dynamic Testing at the HELUKABEL factory in Windsbach



Welcome to the United Kingdom!

Interesting facts about our HELUKABEL subsidiary and its location



- ▶ HELUKABEL UK was founded in 2013. The company relocated in 2018 to its current premises, Cable House in Ellesmere Port, Cheshire.
- ▶ It receives a shipment from Germany twice a week and stores its cables and wires in its distribution centre, which has more than 2,000 pallet spaces.
- ▶ HELUKABEL UK delivers to customers in England, Scotland, Wales and Northern Ireland. These are primarily construction companies, wholesalers, cable manufacturers and machine builders.
- ▶ In the UK, the JZ-500 and JB-750 control cables, the Ho7RN-F flexible rubber cable and the NHXMH halogen-free flame retardant installation cable are particularly in high demand.
- ▶ Since the foundation of the company, Managing Director Adam Parry and his team have been able to consistently grow the subsidiary's net sales. In 2021, they exceeded 8 million euros.
- ▶ HELUKABEL UK is planning to significantly expand its capacity by 2025: among other things, they plan to operate a larger packaging and shipping area and increase the space in the warehouse by approximately 50 per cent.

FUNFACTS



ELLESMERE PORT is just a few miles away from Liverpool. Once known as the **"THE GATEWAY TO THE WORLD"**, this port city in the North West of England is, among other things, famous for its successful football team and home to the legendary band The Beatles.



The terms "Great Britain" and "the United Kingdom" are often used interchangeably - but in fact this is incorrect: **GREAT BRITAIN** is the island that consists of England, Wales and Scotland. The **UNITED KINGDOM** also includes Northern Ireland.



The standard electrical plug in the United Kingdom is a **TYPE G PLUG**, and is also known as the **COMMONWEALTH-PLUG**. It has three oblong contact pins and is not only used in the United Kingdom but also in many Arabian and African countries, for example. So, a tip for travellers: don't forget to take an adapter with you!

Britons love their **TEA**: on average, they drink **165 MILLION CUPS A DAY** – that's more than 20 times the amount that Americans drink, for example.

FAQ

What is Single Pair Ethernet and how does this technology benefit industrial communication?

Single Pair Ethernet (SPE) is a technology for transmitting data through wired networks. Experts are assuming that SPE has the potential to replace existing industrial communication standards such as Profinet, CAT 5e and 6a, Industrial Ethernet and Ethercat in a variety of applications. The reason being that while all these technologies require two or even four copper wire pairs, SPE makes do with just a single twisted pair – and that with transmission speeds up to gigabit levels. It is also able to simultaneously supply terminal equipment with up to 50 watts over the same twisted pair. This is known as “Power over Data Line” (PoDL).

SPE technology originally comes from the vehicle manufacturing sector where space and weight savings are pivotal issues. Meanwhile, other industrial sectors – particularly those that require fast data transmission – also want to profit from the benefits of Single Pair Ethernet. Thanks to its easy installation and low space requirement, for the first time, Single Pair Ethernet is paving the way for universal automation down to field level – i.e., the integration of sensors, actuators and other devices. These are traditionally connected to the higher-level control plane via Fieldbus systems which are not part of the Ethernet network. Single Pair Ethernet closes this gap and is considered to be a key technology in the Industrial Internet of Things (IIoT) and Industry 4.0, thanks to real time communication down to field level.

Compared to the existing two or four pair solutions, Single Pair Ethernet reduces the cable diameter by approximately 25 per cent and weight by up to 50 per cent. Two wires are also easier and quicker to splice than four or eight wires which in turn leads to lower assembly costs. In addition, smaller bending radii allow for more flexible installation. By using fewer raw materials, SPE is more advantageous for environmental reasons. The technology dramatically boosts process automation speeds from the previous 31.25 kilobits for Profibus PA and

Foundation Fieldbus to 10 megabits with the SPE 10BASE-T1L standard. Other SPE variants even pave the way for speeds of several gigabits per second, thus allowing them to compete with faster communication standards such as USB.

However, because increased transmission rates come at the cost of a reduced range, several Single Pair Ethernet variants are concurrently being developed for a variety of applications. HELUKABEL already has three different SPE cables in its portfolio for the 10BASE-T1 and 1000BASE-T1 standards and is continually expanding its offering. ◀

About the author:

Horst Messerer is Data, Network and Bus Technology Product Manager at HELUKABEL



A STRONG NETWORK FOR TECHNOLOGICAL PROGRESS

HELUKABEL has been a member of the SPE Industrial Partner Network since 2019. This association, based in Rahden, Westphalia, Germany, is an association of companies that specifically aims to promote Single Pair Ethernet technology and advocate uniform standards. The information and exchange platform now has 52 members.

As a premium member of the SPE Industrial Partner Network and a member of the Technical Working Group, HELUKABEL plays a key role in driving technological development forward. The focus is on the development of a consistently standardised infrastructure in order to make the migration to Single Pair Ethernet as easy as possible for manufacturers and users.

To learn more, visit www.single-pair-ethernet.com



PREMIUM
MEMBER

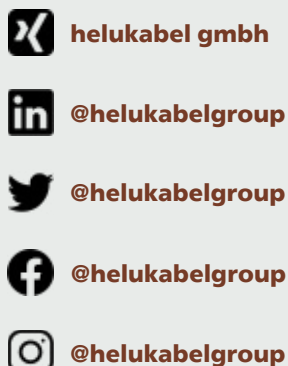
OUR TRADE FAIR DATES

HELUKABEL will be exhibiting at various trade fairs around the world over the next few months. Please check our website helukabel.com/trade-fairs for an up-to-date overview of the dates and locations. We look forward to your visit!



HELUKABEL ON SOCIAL MEDIA

We use our social media accounts to share all the latest news from the HELUKABEL world with you: from product innovations and successful customer projects to delving deep and sharing knowledge on technical topics concerning electrical connection technology. Would you also like to stay up to date? Then follow us! We can be found on the platforms listed below:



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info@helukabel.de
www.helukabel.com

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Dr. Petra Luksch

CHIEF EDITOR:

Dr. Petra Luksch

EDITING:

Matthias Reiser

DESIGN:

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CONTACT THE EDITOR:

HELUKABEL GmbH
Corporate Communications
Schloßhaldenstraße 10
71282 Hemmingen

Mail: presse@helukabel.de
Telephone: +49 7150 9209-0

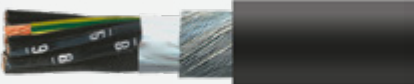
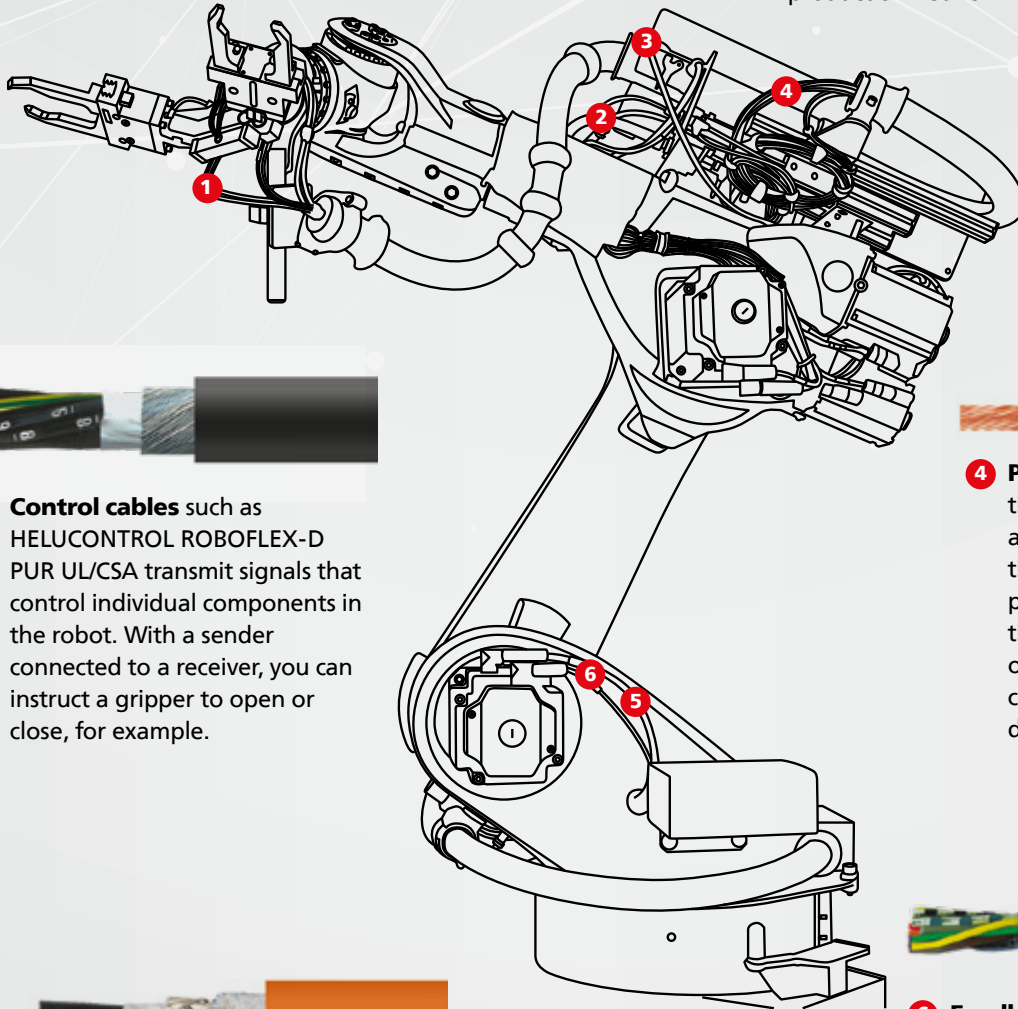
Cables and wires from HELUKABEL have many different purposes in robotics. They can transmit power, data and control signals – in some cases, all three at once. For robots to reliably perform every movement, the cables applied must have an appropriate design and be made of special materials.



- 1 Sensor cables** such as HELUDATA ROBOFLEX RECYCLE PUR UL/CSA transmit signals from the sensors fitted on the robot to the respective receiver. This is used, for example, for position detection as well as for displacement and force measurement.



- 2 Data cables** such as PROFINet type R transmit a wide variety of information from the robot to the external systems – from sensor data to camera images and videos. A functional data flow is, among other things, a prerequisite for production and condition monitoring as well as for a smart production network.



- 3 Control cables** such as HELUCONTROL ROBOFLEX-D PUR UL/CSA transmit signals that control individual components in the robot. With a sender connected to a receiver, you can instruct a gripper to open or close, for example.



- 4 PE conductors** such as the single core H07V-K are used for connecting the robot to the ground potential. They protect the equipment and the operator against leakage currents and electric discharges.

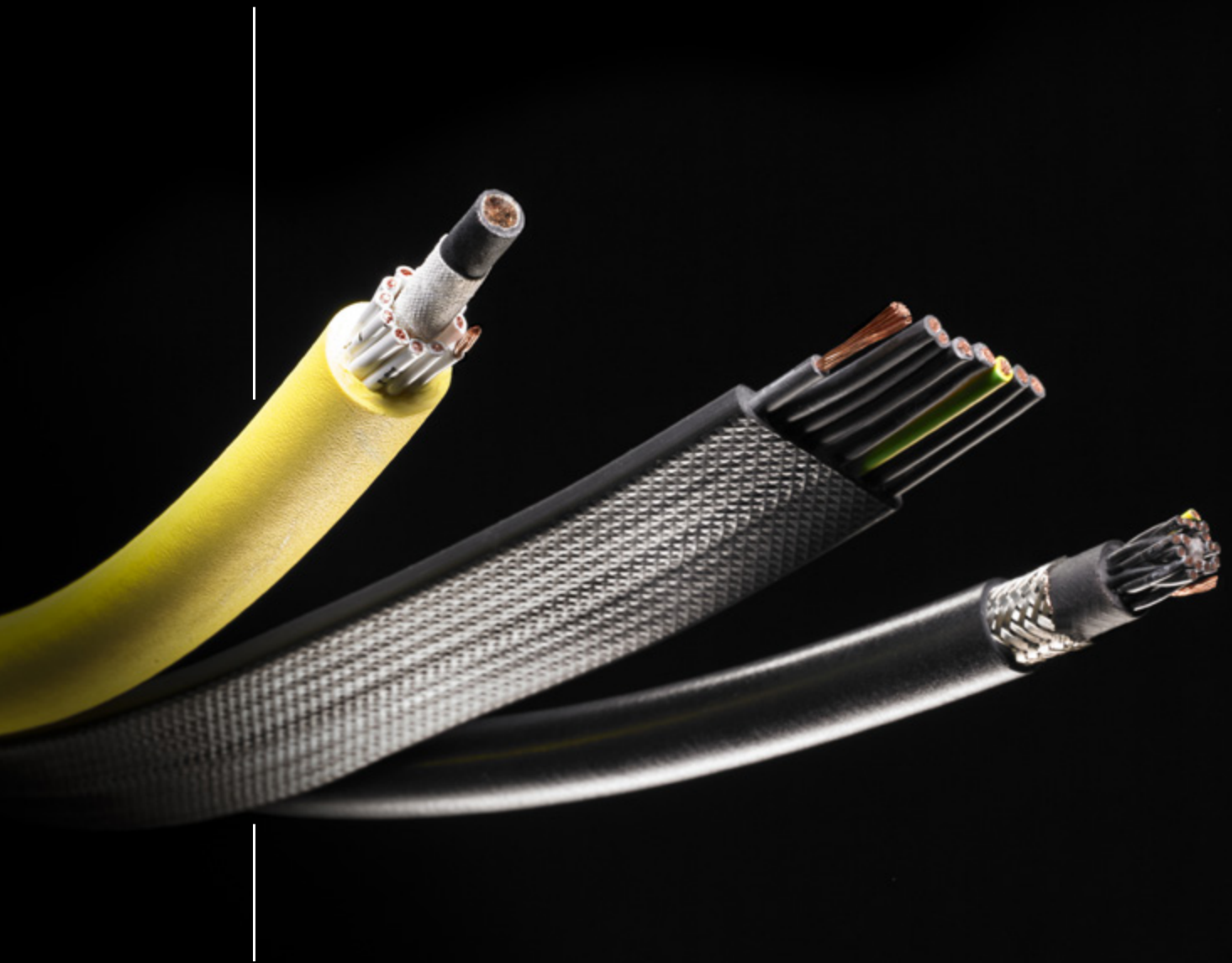


- 5 Servo cables** such as TOPSERV 109 PUR supply energy to the numerous servomotors in the robot. The various axes of the robot as well as the tools fitted on it are set in motion by these motors.



- 6 Feedback cables** such as TOPGEBER 512 PUR are used to control the servomotors. Via an electrical signal, they specify how far, at what speed and in what direction a robot axis moves, for example.

Your One-Stop Source for Electrical Connection Technology



All over the world, cables, wires and accessories from HELUKABEL ensure that energy and data reach their destinations safely and reliably at all times. Experience, know-how and competence in the development of customised solutions are the hallmarks of our business, which has been serving customers for over 40 years. www.helukabel.com