LAPP ROBOTICS

We combine the future and the present

LAPP GROUP

DESIGNING THE FUTURE TOGETHER

ROBOTICS IS AN EXCITING FIELD. UNLIKE VIRTUALLY ANY OTHER INDUSTRY, IT ENABLES US TO DESIGN THE FUTURE AND ENJOY IMMENSE PROGRESS IN AN INCREDIBLY SHORT AMOUNT OF TIME. THE ROBOTS OF THE LAST FEW YEARS HAVE NOT ONLY BECOME SMALLER, BUT ALSO BOAST FAR MORE MOVABILITY AND THUS VERSATILITY. THESE DYNAMICS ALSO MOTIVATE US AS SUPPLIERS TO KEEP DEVELOPING NEW SOLUTIONS IN ORDER TO SUPPORT THE INNOVATIVE ABILITIES OF OUR CUSTOMERS.

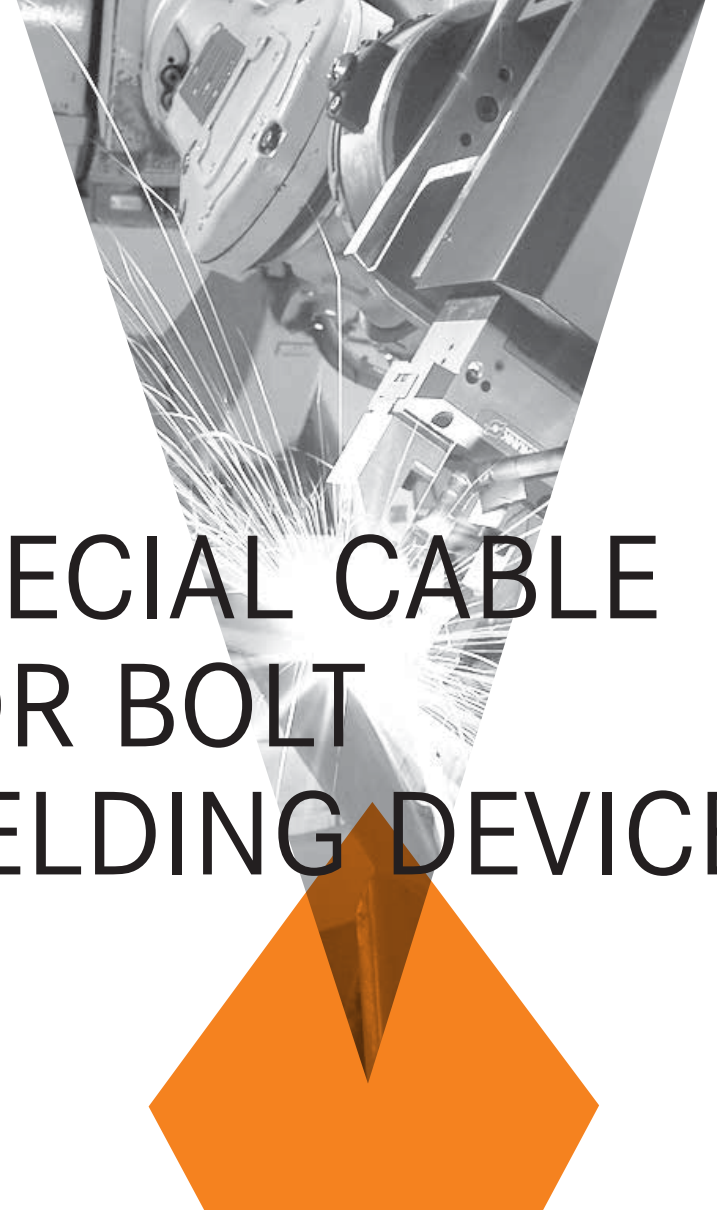
As space within a robot grows ever limited and the mechanical loads grow ever higher, a new approach is also required for energy supply and data provision. That's why we develop the appropriate cables for each customer with optimal bending radii and a material that is suited to the respective chemical and mechanical influences.

Over the pages that follow, we will show you which of our special connections are already featured in robots from various productions; we will open up the doors to our laboratory and test centre and introduce you to a customer that puts faith in our expertise. We hope that you enjoy looking through this information and look forward to being able to design the future with you soon.

CONTENT

SPECIAL REQUIREMENTS DEMAND SPECIAL CABLES

THERE ARE SITUATIONS IN WHICH STANDARD CABLES SIMPLY AREN'T UP TO THE JOB. THIS IS ALWAYS THE CASE IN ANY PARTICULARLY NARROW AREAS, OR WHEN EXTERNAL FORCES ARE CONSTANTLY APPLIED TO A CABLE. SITUATIONS SUCH AS THESE CALL FOR A SPECIAL SOLUTION FROM LAPP.

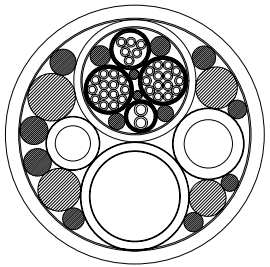


SPECIAL CABLE FOR BOLT WELDING DEVICES

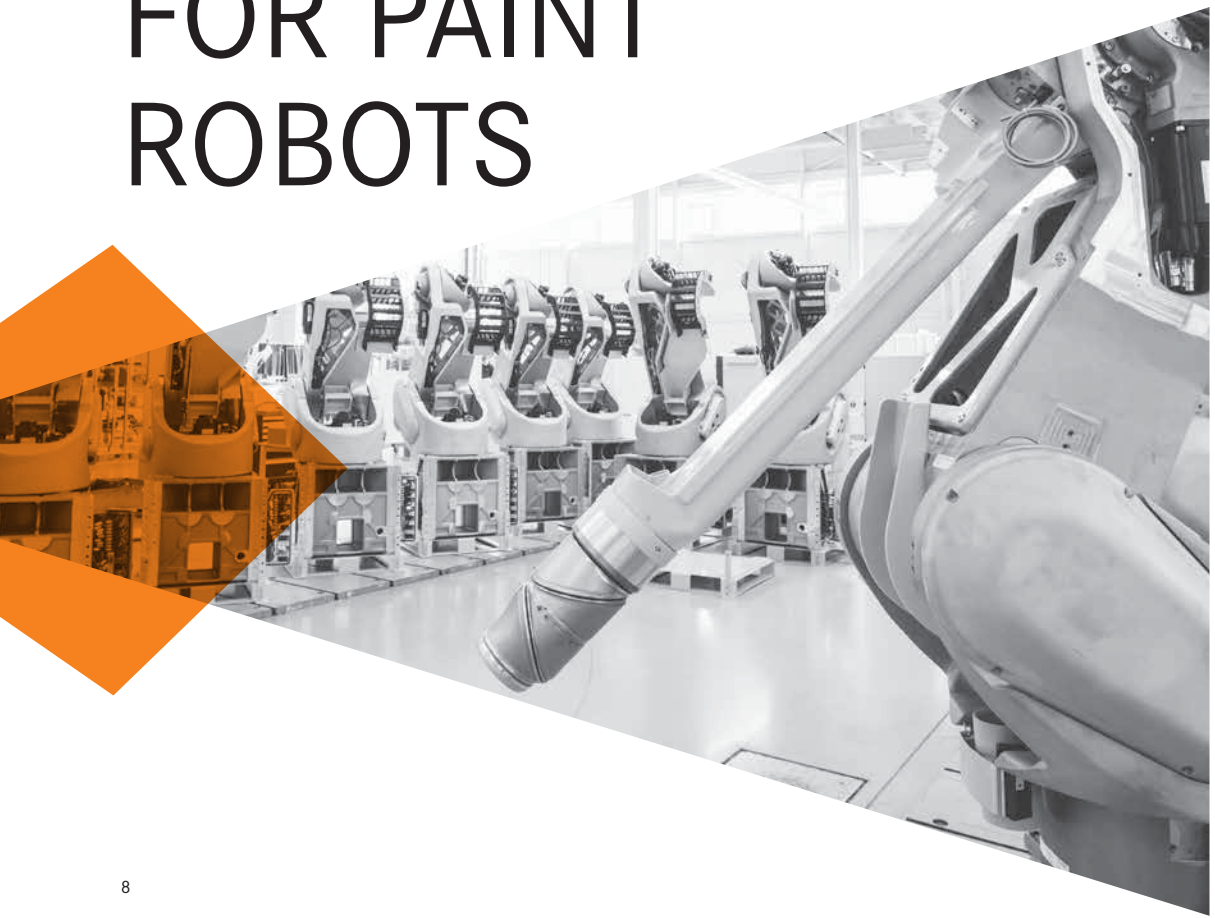
Anyone looking to weld bolts in a body is always faced with demands posed by the lack of space. The robot must therefore be designed so as to occupy as little space as possible. The cabling plays an essential role in this regard. Our solution is a hybrid cable in which the energy transfer cable and the signal and data cables are routed alongside the air hoses and the protective conduits. The signal and data cables are protected by the electromagnetic field of the ground cable in order to consistently eliminate interference signals. The hybrid cable must also be suitable for use with robots, meaning that it must be flexible. Bending radii and torsion angles are therefore adapted to vehicle manufacturing applications. The service life of two to three million cycles is also oriented towards the highest demands. This is the only way to safely avoid downtime.

Cable design:

- 50 mm^2 welding cable
- 1 PA Nylon Air Hose
- 1 PA protective conduit
- 14 x 0.34 mm^2 data and signal cable with special shielding
- 14 x 0.34 mm^2 data and signal cable with special shielding
- 6 x 0.34 mm^2 data and signal cable with special shielding
- 2 x 0.75 mm^2 signal pair with special shielding
- Sliding fleece
- Polyurethane outer sheath



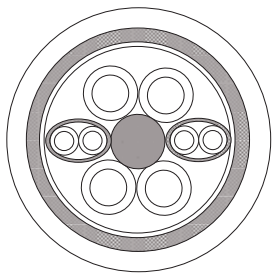
SPECIAL CABLE FOR PAINT ROBOTS



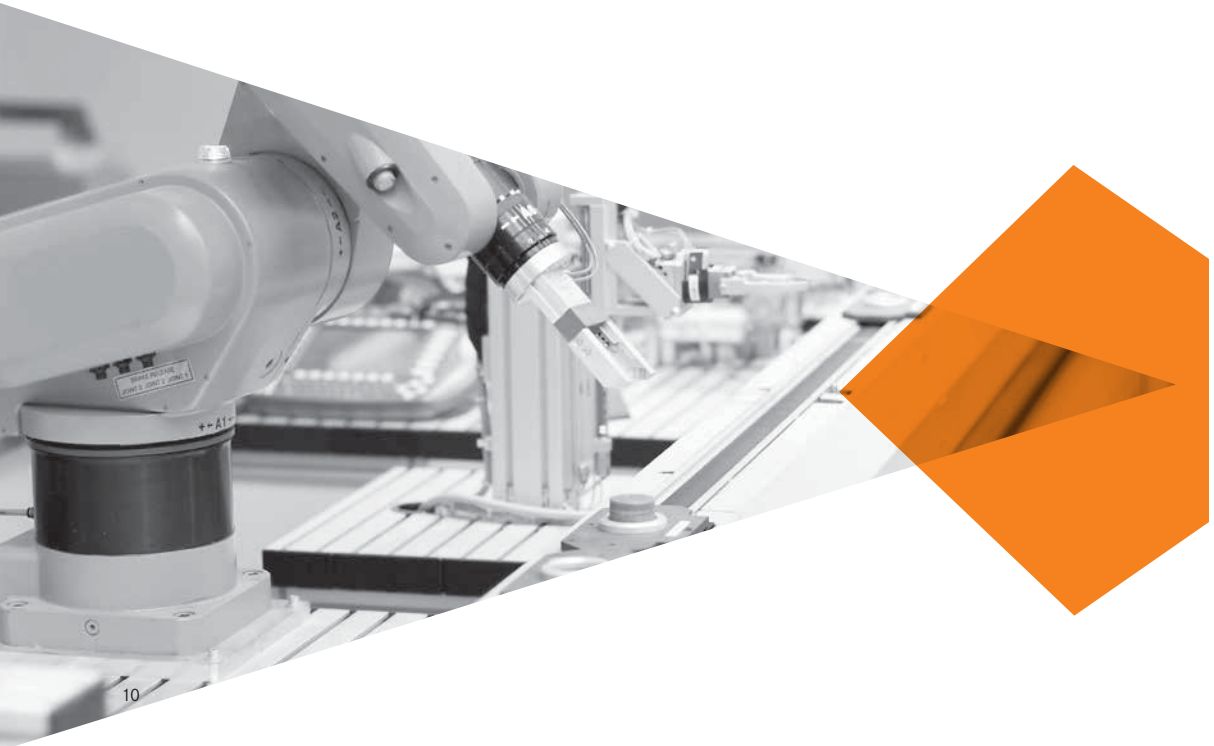
Narrow, dusty and hazy due to paint vapours – there is nothing comfortable about the workplace of a paint robot, and it poses particular challenges for developers of robot cables. This is because the cables not only need to withstand very narrow bending radii, they must also accompany the extremely high torsional movements of over 360° per metre. The paint must also be applied evenly in flowing movements. But this is no problem for our special cable. The servo cable also goes to extremes with its durability, lasting for four to five million cycles at minimum. It consists of three energy transfer cables and a shielded data pair. Since no two applications are alike in the field of paint robots, we will shortly be providing our customers with plug and play solutions. Turn to page 18 to see exactly what this means.

Cable design:

- 4 x 2.5 mm^2 power cable with special insulation
- 4 x 0.5 mm^2 data cables twisted in pairs and specially shielded
- Sliding fleece
- Special shielding for torsion
- Sliding fleece
- Polyurethane outer sheath



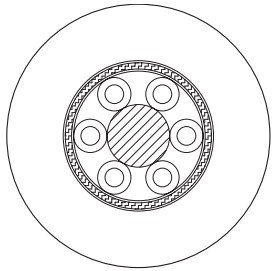
SPECIAL CABLE FOR HANDLING ROBOTS



Our special cables for extreme situations. The so-called coder cables are used to transmit sensor signals from a robot using all six axes. Plainly speaking, this means that the cables must withstand torsional movements of around 1000° per metre in both directions of rotation. This is not an easy task for the designers from the Lapp Group. The cable design must be completely redeveloped, with the cable being produced from a special material that reliably handles the strong torsional movement. What does this mean for you? An immediate end to what were once extreme situations.

Cable design

- 6 x 0.14 mm² data network cable
- Special sliding fleece
- Special shielding made from special coating
- Special sliding fleece
- Polyurethane outer sheath



THE EFFICIENCY QUOTIENT

DÜRR

is a global system partner to the automotive and supply industry and the global market leader for painting technology, balancing technology and cleaning technology. The company has 8,200 employees in 52 locations across 23 countries. In the last three years alone, the number of Dürr robots installed worldwide rose from 4,400 to 7,300.

INDIANA RED, MISANO RED, TORNADO RED – EVERY AUTOMOTIVE MANUFACTURER HAS ITS OWN RANGE OF COLOURS. AND YET MANY OF THEM HAVE SOMETHING IN COMMON: THE VEHICLE PAINT IS APPLIED BY ROBOTS PROVIDED BY DÜRR BASED IN SOUTHERN GERMANY. WE VISIT THE PREMISES IN BIETIGHEIM-BISSINGEN – AND ASK HOW ARTIFICIAL INTELLIGENCE CAN BOOST EFFICIENCY.

Long, bright corridors, floodlit production halls and lots of noticeably young employees. The laboratory of the future certainly has a futuristic look about it. System provider Dürr supplies cleaning systems for use in the production of engine and gearbox components, and also balancing systems and products for final assembly. First and foremost though, Dürr plans and builds paint shops for the automotive industry. In other words: workplaces for robots.
An entire football team's worth of 6-axled robots are all lined up. They're ready for function testing, and almost ready for use. Melfi, Dingolfing, Shanghai – the destinations of the robots have been determined. Many of them are going global. After all, Dürr operates on an international stage. The label reads RPL: Robot Paint Low. Its taller counterpart bears the acronym RPE, the E standing for elevated.

HI-TECH HELPER

It's not just the driver that has extremely fixed ideas about the paintwork of a vehicle, but also the manufacturer. With frequent model changes, innovative vehicle designs and new paint systems, Dürr also needs to be extremely flexible and innovative. Painting has been a hi-tech industry for a long time now.
Painting robots are tasked with keeping the sprayer at a constant perpendicular distance from the bodywork during the painting process to ensure even coverage. As such, Dürr not only designs and programs moving and fixed painting robots for interior and exterior painting applications, but also "handling robots": intelligent little helpers that can open, hold and close car doors and bonnets.

THE ART OF REDUCTION

“Leading in production efficiency”. That is the motto that appears under the Dürr logo – and the company also offers a simple formula: less is more. Less time, less routing, less material and less energy. Wherever Dürr minimises paint changeover times or losses of paint and solvent, the global market leader increases the production efficiency of its customers. That’s why Dürr continues to grow. And that’s also why systems and products continue to undergo constant development – including the internal components.

“Our robots use cables that are exposed to enormous loads, namely torsional movements that the cables simply have to be able to cope with. Not just a couple of times, but millions of times over. This is where we can count on Lapp”, says Heiko Kamp from product development for control engineering at Dürr.

THE THINK TANK NEVER STANDS STILL

However, it’s not just the major mechanical and chemical loads and the high technical requirements for bending radius and torsion that pose a challenge: because robot applications are virtually always unique, each cable is effectively a customised solution.

“We rely on Lapp expertise to develop and produce our special cables for this area”, says Heiko Kamp. Even if this means treading new ground, because the Dürr think tank never stands still. “The new ideas keep on coming. Customised solutions are often required in order to implement these ideas: cables and connectors that you cannot simply buy ‘off the peg’. That’s where we feel it’s best to put our faith in Lapp.”

FROM MOONSHINE BLUE TO GLACIER WHITE IN LESS THAN 10 ML
A painting robot can switch from one shade of paint to another in 10 seconds, with minimal material waste. Dürr has managed to reduce the unavoidable loss of paint to 10 ml per colour change – that amounts to 2 teaspoons or half a glass of schnapps.

ESTABLISHED BRANDED PRODUCTS

TRIED AND TESTED. IN STOCK.

- 1 + 4 EPIC® circular and rectangular connectors
- 2 + 9 ÖLFLEX® robot and servo cables
- 3 UNITRONIC® field bus and transmission systems
- 5 SKINTOP® cable entry systems
- 6 + 7 SILVYN® cable protection and guiding systems
- 8 HITRONIC® optical data communication systems
- 10 FLEXIMARK® marking systems
- 11 ETHERLINE® Ethernet technology systems

PLUG AND PLAY: PERFECT CABLE INTERACTION

IT TAKES AT LEAST ONE CABLE TO BRING A ROBOT TO LIFE. GENERALLY, IT REQUIRES MANY MORE. CABLES SUPPLY ROBOTS WITH ENERGY AND DATA, AND ALSO SET THEM IN MOTION. BUT ROBOT CABLING IS A COMPLEX MATTER AND VARIES FROM ONE APPLICATION TO ANOTHER. THIS IS NOT A PROBLEM FOR LAPP SYSTEMS. WE'VE BEEN COMING UP WITH TAILORED SOLUTIONS FOR DECADES.

There are cables running through every limb of a robot. They are used for the camera or the tool used by the robot to perform its task, be it gripping, welding or painting, or for transmitting energy and data. The individual cable harnesses must never interfere with each other and – of course – must never be damaged by the conduit that encases them. Naturally, developers of conduit packages are constantly faced with challenges. How are the parts connected? Where is the holder? How much play is required in the conduit? And what will be placed where? These questions are posed on a daily basis at Lapp Systems – and have been for decades.

LAPP: THE SOLUTION PROVIDER

Preassembled cables of all types are the pursuit of developers. This is where Lapp can serve as a solution provider for its customers. “Our aim is always to provide the customer with a Plug and Play solution”, says Klaus Joachim, Head of Automation at Lapp Systems. “The customer shouldn’t have to take care of anything. He comes to us and says: “Dear Lapp team. How can I arrange the cables I need safely and durably?”. And that’s where we begin the design process.” Not only do we consider the parameters of the robot; the spatial requirements are also crucial in producing a sophisticated system with a long, reliable service life.

FULLY ASSEMBLED ON REQUEST

“One of our biggest advantages is that all Lapp components are in-house”, continues Frank Rothermund. “This means we know precisely what each product can do and how the products interact.” Such expertise are just as essential when compiling customised conduit packages as when designing drag chains for the 7th axle of a robot or systems for servo motors. In all these areas, Lapp offers fully assembled Plug and Play solutions so you can rest assured that your systems are designed with the application in mind and planned right down to the smallest connector. Ensuring a robot with a long, reliable service life.

A CABLE UNDER PERMANENT STRESS

720° ROTATION, 50 TIMES A MINUTE, FOR A WHOLE MONTH. THOSE ARE TOUGH CONDITIONS FOR ANY CABLE. BUT ESPECIALLY FOR THOSE USED IN ROBOTS, AS THE DEMANDS HERE ARE ESPECIALLY HIGH. THAT IS WHY LAPP PUTS ITS PRODUCTS TO THE TEST IN ITS OWN LABORATORY AND TEST CENTRE BEFORE THEY ARE EVEN USED. THIS IS WHERE CUSTOMISED AND IN-HOUSE DEVELOPMENTS ARE PUT THROUGH THEIR PACES.

PHASE 1: THE DRAWING BOARD

Every new Lapp product starts life here on the developers' drawing board. They consider the stresses that the cable must bear and start experimenting with traversing rates, bending radii and chemical parameters. No challenge is too great here. Does the cable need to withstand quick changes of position with acceleration of up to 50 m/s^2? Does it also need to resist chemical substances like diluted acids, aqueous solutions or oil-based lubricants? No problem.

Lapp has a solution for every requirement. Robotics is viewed as the supreme discipline of development. For one, the copper in robot cable is very fine. The wires cannot be allowed to be disturbed or rub on the outer sheath of the cable. In addition, robots operate at extremely high cycle frequencies, which presents a challenge for the durability of the cable. The developers therefore have a lot to bear in mind as they attempt to create the perfect product for this diverse range of requirements. And it needs to be perfect, as Lapp Group demands nothing less from its premium products.

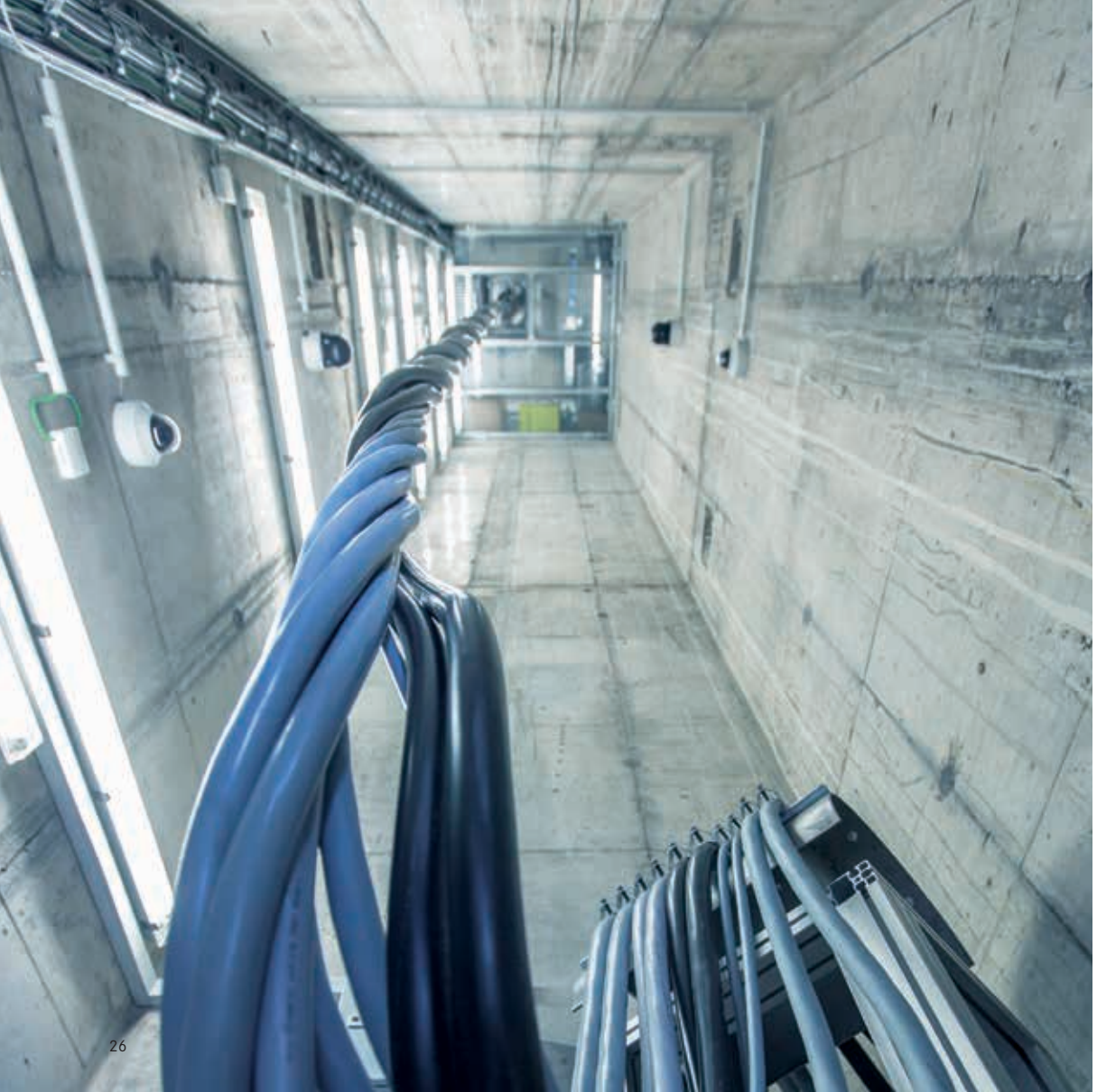
PHASE 2: CREATING A PROTOTYPE

Currently the cable still only exists on paper. Intangible and only perfect in theory. Producing a prototype changes this. This can be used to determine whether the theoretical considerations also hold true in practice.

PHASE 3: TESTING

Only the toughest tests guarantee the highest quality. There is a range of high-tech devices available in our laboratory and test centre to really put the products under the microscope. One special piece of equipment is our highly dynamic power chain test system.

This is used to test varying lengths of cable at speeds of up to 5.0 m/s and acceleration of 7G. Only Lapp can offer this kind of testing technology, which can achieve up to 30,000 cycles per day. That leads to either quick results, or maximum safety. Months of testing can total up to 10 million cycles.



Equally indispensable for our developers is our self-constructed torsion bending testing facility. It simulates the movements of a robot and puts the cable under strain again and again. If however, the focus is more on torsion, our torsion testing facility is the perfect solution. Here, metre-long cables are twisted left and right up to 720°. There is also a test robot available for highly specialised and practically oriented tests. It is freely programmable and can therefore simulate a range of applications, such as a welding process. The advantage of this live testing is that it occurs under conditions that are virtually identical to real use.

PHASE 4: REVIEW?

Thanks to our experience, Lapp usually has no need for this phase. But in the rare event that the test results do not meet requirements, the design is reviewed. The developers take a look at what is to blame for the problem and think about how it can be solved. Then the testing process starts again.

PHASE 5: PRODUCTION

Once the product has passed all the tests successfully, it is either put into series production or delivered to the customer as an individual order.

WHY LAPP? THE BENEFITS AT A GLANCE

OVER THE LAST FEW PAGES, YOU'VE LEARNED A LOT ABOUT WHAT LAPP HAS TO OFFER IN THE FIELD OF ROBOTICS TECHNOLOGY. WE WOULD NOW LIKE TO SUMMARISE THIS ONCE MORE – AND ANSWER A VITAL QUESTION: WHAT CAN YOU EXPECT WHEN YOU WORK WITH LAPP? THE ANSWER: A GREAT DEAL.

AN ENTIRE SYSTEM FROM A SINGLE SOURCE

Control cables and cable protection, data communication systems and cable glands, industrial connectors and cable labelling... When you choose Lapp, you receive all your connection technology products from a single source. You can therefore rest safe in the knowledge that all your cables and connectors will function perfectly together.

INNOVATION DRIVER RATHER THAN INNOVATION DRIVEN

Lapp constantly keeps one eye on the market. At least one. Industry 4.0 needs to be actively shaped, so our developers are constantly thinking about how they can make the Lapp product range even more innovative. They feed market trends as well as practical experience into their developments.

HI-TECH CABLE PRODUCTION WITH SAMPLE SIZES

Lapp develops products – and then manufactures them in-house. This makes it possible to produce sample sizes as well. This is extremely useful when it comes to customised systems; it means that you can try out your new product before placing bulk orders.

TESTED QUALITY

Quality and Lapp go together like copper and cable. That's why we meticulously test every single product in our own laboratory and test centre. The stress placed on cables in the robotics industry is immense, so quality is absolutely essential in ensuring a long service life.

A LOCAL SERVICE ALL OVER THE WORLD

Anyone with production facilities all over the world also wants to be sure that there are technical contacts on site. With 100 representative offices, 41 sales companies and 17 production sites around the world, you can rest assured that we are here for you.

EXPERTISE FROM EXPERIENCE

Founded in 1957, the Lapp Group has been developing premium-quality connection technology from the very beginning. Then came our work within robotics – over 25 years ago. We have been able to incorporate the expertise we have gathered over the years into all the latest technologies. And, together with you, we are continuing to reap the rewards of our vast experience.

CONCLUSION

As in connection technology, our benefits allow all components to interact perfectly with each other. Together they assure you safe, reliable production – without a single worry about downtime costs.

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U.I. Lapp GmbH
Schulze-Delitzsch-Str. 25 · D-70565 Stuttgart
Tel.: +49 711 7838 01 · Fax: +49 711 7838 3080

LAPP GROUP