The industry magazine of Carl Cloos Schweisstechnik GmbH

01/2016

weld

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Content

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Dear readers,

Growing demands on productivity and quality as well as increasing labour expense and a lack of well-trained, skilled personnel are new requirements to be met by the welding technology. This increases the global demand for automated production solutions. In total there is a clear trend to change from manual welding to complex automation solutions.

The automation solutions tend to apply systems with automated workpiece identification and loading and unloading processes. Thus the enterprises are on the way to connected production and Industry 4.0. Therefore, we want to make you faster, more economic and more competitive with our products and solutions.

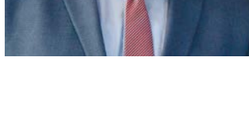
Our special strength is the widely spread competence because everything comes from a single source - from the idea over development and production to training and service. Our process competence is at the forefront in welding and cutting of various materials and components. Because the multitude of product requirements needs a multitude of welding processes. No matter if thick or thin, steel, aluminium, chrome-nickel or high-strength steel: With a large range of proven and innovative processes for manual and automated welding and cutting, we at CLOOS can offer solutions for the future providing maximum efficiency and productivity with regard to automated welding.

Find out numerous solutions to optimise efficiency, productivity and quality in future welding technology in the new edition of our customer magazine "weld".

We hope you enjoy reading this issue!

Your Management

Gerald Mies



Sieghard Thomas

QinTron now with Pulse function

Now the QinTron is also available with the Rapid Weld high-capacity welding process and the Vari Weld process for MIG/MAG welding with a pulsed arc. The DuoPulse option completes the welding process package. The new welding processes open up new fields for different applications.
A robust design, excellent ignition and welding characteristics, comfortable operating elements and a perfect price-performance ratio are the main features of the QinTron. The welding machines with infinitely adjustable voltage preselection are available in the capacity classes of 400 A, 500 A and 600 A. The modern inverter technology offers a great energy-saving potential at an optimum degree of efficiency. The modular design of the QinTron and the subsequent upgrade capability allow maximum flexibility: individual extensions and retrofits are possible without too much effort.

Expansion of the CLOOS Management

Sieghard Thomas is the new managing director of Carl Cloos Schweisstechnik GmbH. The experienced authorised signatory has managed the activities of the welding specialists in Haiger together with Managing Direction Gerald Mies since the middle of March 2016.
Sieghard Thomas has significant experience in the field of robotics and welding technology. At last he was the head of the materials management at CLOOS in Haiger and CEO of the CLOOS subsidiary Cloos Electronic GmbH in Switzerland. In total, he has been working for CLOOS in different positions and business units for more than 40 years.
"Together with the employees in our headquarters in Haiger and our global subsidiaries and affiliated companies we wish to further expand the CLOOS technology leadership in welding technology nationally and internationally," the new managing director explains.

Exhibitions 2016

In 2016, we are present at numerous international trade fairs

MECANICA 2016
17-21 May 2016
Sao Paulo/Brazil

International Engineering Fair
24-27 May 2016
Nitra/Slovakia

ITM Polska
07-10 June 2016
Posen/Poland

Beijing Essen Welding & Cutting
14-17 June 2016
Beijing/China

MSV Brno
03-07 October 2016
Brno/Czech Republic

Weldex 2016
06-09 October 2016
Moscow, Russia

Expo Welding
18-20 October 2016
Sosnowiec/Poland

EuroBlech
25-29 October 2016
Hanover/Germany

You find more information regarding the exhibitions on:

The transition to automation

The MAP Maschinen- & Apparatebau Produktions GmbH increases their investments in automated production technology. Last year, the Rathenow company commissioned three new CLOOS robot systems. Thus MAP accelerates the production processes and increases the quality at the same time.

MAP's 90,000-square-metre premises could just as easily have housed a giant theme park. Instead, it is a place of welding, drilling and milling. MAP is traditionally strong in the field of electrical engineering and the construction of heavy-duty installations, appliances and containers. Beyond this, MAP can also look back on many years of experience in the areas of renewable energy and mining. In addition, series production of welded assemblies with subsequent machining is becoming increasingly important for the company. Since 2007, MAP has been part of the Neuenhauser Group, whose members include around 30 companies throughout Germany. With innovations in automated manufacturing technologies, MAP is responding to the increasing competition in Asia and Eastern Europe. "We want to achieve higher productivity with maximum quality, more predictable costs with reliable lead times and ultimately sustainable jobs with reduced burden on our staff here," explains Lutz Abram, head of sheet production at MAP.

In the compact system a QIROX robot welds different components.

Three new robot systems with cutting edge technology

MAP has thus begun operating three new CLOOS robot systems in the last year. All three systems are characterised by maximum flexibility — an important prerequisite for the variety of different components that are manufactured by the company. On the largest system, a QIROX QRC-350 robot welds generator housings for wind turbines, among other things. Mounted in overhead position, the robot can flexibly switch between the two stations. Usually, the employees prepare the components at station 2 while the robot welds at station 1. The welding robot is fitted with two welding torches: Whilst the bent single wire torch is used for welding small, segmented and difficult-to-reach welds, the straight tandem torch can perform long straight welds at high speed. The torch change is performed automatically via a command from the respective program, enabling the system to be used flexibly for different component types.

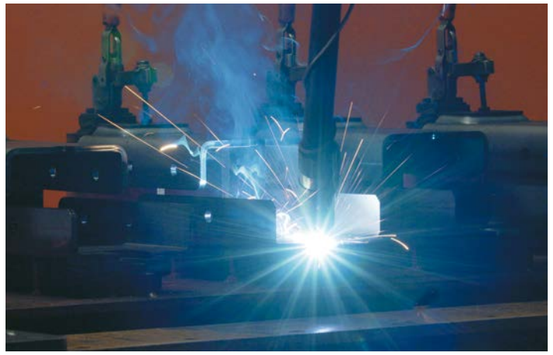
In the mid-sized compact system, a QIROX QRC-350-E welding robot welds different components. The large range of the seven-axis robot both simplifies and speeds up the welding of the partly complex workpieces. The robot is mounted in overhead position on a C-frame at a floor-mounted linear track. A carriage moves the robot in horizontal direction. Mainly small and medium-sized components are currently welded on this system, however larger parts are planned in the future. The system also has two stations, which speeds up the entire process enormously. While the robot welds the workpiece at one station, the employee can remove the welded parts and reload the fixtures again at the other side.

The third CLOOS robot system is an "All in one" system, in which the workpiece positioners, robot and robot positioners are combined in a single unit.

Rising orders through optimised delivery performance

Through comprehensive investment in automated welding systems, MAP has managed to achieve higher productivity at a lower total cost. "For many components, we were able to strongly reduce the welding time by switching from manual to automated welding," says Marvin Triebwasser, robot programmer at MAP.

In addition, MAP now achieves exactly reproducible welding results and can therefore guarantee customers consistent quality. Whereas with manual welding there were sometimes large variations, the robots now weld even demanding seams uniformly and with a consistently high quality. "Although we are still at the beginning of automation, we have already managed to improve our delivery performance to our end customers, and have thus far received only positive feedback with regard to part quality," says Abram.



Picture above: Previously, one MAP employee used to weld 150 of these small parts per shift. Today, the welding robot in the compact system manages 350 parts per shift.

Picture below: The large range of the 7-axis robot simplifies and accelerates the welding of the often complex workpieces.

Improved working conditions for employees

The staff also benefit from the introduction of automated welding. As the welding robots carry out the physically heavy work, the general danger from arc radiation and welding fumes is much lower. Intensive training — both on-site at MAP and at the CLOOS training centre in Haiger — ensures that employees are familiar with the new equipment. "Through innovative production technology we want to continuously improve the quality and skills of the MAP staff and provide attractive jobs within our region," says Abram.

"We have managed to improve our delivery performance to our end customers, and have thus far received only positive feedback with regard to part quality."

Lutz Abram,
Head of sheet production MAP

Cooperative partnership

The partial move away from traditional welding tasks with manual production towards semi-automated manufacturing represents a major challenge for a medium-sized company like MAP. "The conversion takes place in many small sub-steps," explains Abram. "During this time, we depend on good, reliable partners like CLOOS." Through its use of the new CLOOS systems, the company intends to initiate a new chapter in its history. Its sister company, Glüpker Blechtechnologie GmbH from the Neuenhauser group of companies, has already depended on CLOOS welding technology for decades. In addition, MAP and Glüpker are actively supported by the company Engelking, a long-time sales and service partner of CLOOS.

Watch the system video on CLOOS TV:

Quick, flexible, economic

The industrial vehicle specialist Meiller has trusted in the CLOOS technology for decades. At the Czech site of Slaný Meiller operates a total of six robot systems with eight welding robots and more than 300 welding power sources by CLOOS.

The new CLOOS robot systems welds side walls for tipper bodies. The high-capacity welding process achieves the highest speeds for welding the thin, light components and increases the production quality at the same time.

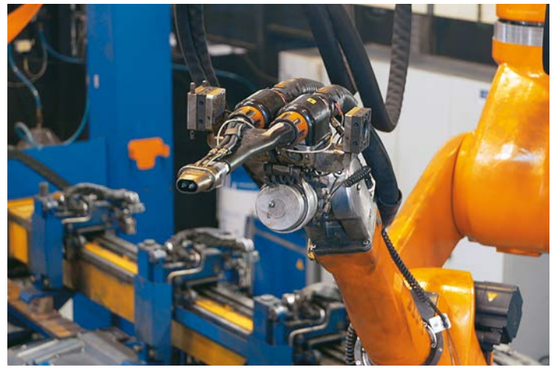
The family company Meiller, with headquarters in Munich, was founded in 1850 and can look back over a long tradition. Meiller has made its name as a worldwide market leader in the production and sale of tipper bodies and tipper trailers and high-quality lift doors. Through close cooperation with HGV manufacturers, chasses and bodies are optimally matched.

Lightweight construction is on the focus

Lightweight construction is becoming ever more important for commercial vehicles. In the past, lightweight design played a special role in the automotive industry, but now weight-reducing measurements are also in demand of the industrial vehicle industry. Payload optimised lorries can transport more freight, save fuel and relieve the load on the traffic network – thus the lightweight design results in enormous increases of efficiency here, too.. "At Meiller, we increasingly use lightweight components," explains Andrej Stary, programmer and designer at Meiller in Slaný. The side panels of the tipper bodies are manufactured from 2.5-mm fine-grained steel. Previously, this component consisted of three individual elements; today the side panels are bent out of one piece, so that only one seam needs to be welded on each side. "Due to the reduced number of welds, the component is much lighter than before, which brings huge benefits for our tippers," says Stary. "The new robot system perfectly meets the exacting requirements of these demanding components."

7-axis robot increases workpiece accessibility

The heart of the system are two 7-axis QIROX QRC-350-E welding robots. The range of the robot simplifies and accelerates the welding of the complex workpieces. The workpiece positioner with movable counter bearing has two vertically arranged faceplates. The workpiece fixture is mounted between the two faceplates enabling the large side panels to be optimally positioned and welded. A special feature is that the parts are inserted bent to prevent component distortion from the outset. The counter bearing can be flexibly moved on the base frame which allows the distance between the two faceplates to be adjusted to match the different sizes of the side panels. "We don't produce in high volumes, as we offer our customers a wide variety of products," says Stary. "Therefore, the system has to weld a wide range of components with different dimensions."



Automated torch changing system ensures flexibility

Each robot is fitted with two welding torches. Whilst the bent single wire torch is used for welding small, segmented and difficult-to-reach welds, the straight tandem torch can perform long straight welds at high speed. The torch change is performed automatically via a command from the respective program, enabling the system to be used flexibly for different component types.

Tandem Weld provides maximum speed with maximum quality

In the CLOOS Tandem Weld process, two electrically independent arcs burn in a common molten pool. The process is based on two electrically separated processes which match each other perfectly. The front wire ensures a safe penetration, the back wire quickly fills big joints with filler material. The parameters for the two processes can be set differently, allowing a variety of combinations for special seam requirements. The high deposition rate of Tandem Weld enables extremely high welding speeds. The tandem torch reaches speeds of up to 4.6 metres per minute during welding the side panels. In addition, the process is characterised by low heat input and a good gap-bridging capability. This reduces component distortion, compensates for material tolerances and reduces expensive rework. Tandem Weld is thus ideally suited to the comparatively sensitive fine-grained steel components produced by Meiller.

4.6

metres per minute - that's the speed of the CLOOS robot system with Tandem Weld when welding the side walls for tipper bodies.

Watch the video of the system on CLOOS TV:

Sensor technology guarantees optimum weld quality

In addition, the robots are equipped with two CLOOS sensors to compensate for tolerances. During the welding, the arc sensor measures whether the burner position actually agrees with the programmed track. In the case of deviations, for example by heat distortion, the robot recognises the real contour. The online laser sensor measures the processing line online during welding. Both the position of the welding torch and various process parameters are continuously adjusted to produce an optimum welding result.

Offline-programming saves time

The robot system is programmed offline with the RoboPlan software by CLOOS. While the system is in production, a new program can be simultaneously produced in RoboPlan. The welding, search and travel paths and tools can be determined using 3D models, and the welding parameters and other functions required for running the program can then be defined. The program is developed in this way before being transferred to the robot controller for optimisation in the workplace. This process is less time-consuming than producing a whole new programme in the system.

Expanding the cooperation further

In the future, Meiller wants to invest in innovative automation solutions in order to ensure its long-term competitiveness. For its welding technology, Meiller continues to rely on the welding specialists from Haiger in Germany. "As long-term partner, CLOOS knows our expectations and requirements very precisely," says Stary. "We want to further expand our trust-based cooperation."

1960

It is an essential part of everyday life: The laser technology. Whether in medicine, industry or in consumer electronics – the "focused light" brought significant progress in many fields. Already in 1917, Albert Einstein discovered the so-called stimulated emission thus laying the foundations for the further development. In the 1950s the physician Charles Townes succeeded in building a light source by means of this stimulated emission; later he was awarded the Nobel Prize. Theodore H. Maiman generated the first laser beam in 1960. Since then the technology developed constantly and is now also used for spectacular performances, for example at the Royal Observatory Greenwich where a green laser beam characterises the prime meridian every evening.

The laser unleashes its full welding power

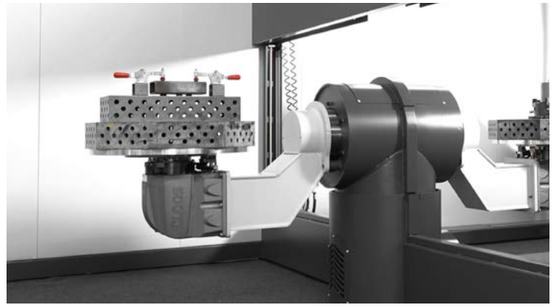
Three- or four-fold welding speed, minimum distortion and only one layer – these are the typical advantages of laser welding. CLOOS can offer practical examples of this technology and intends to make it widely available. At its heart lies the new “QIROX Laser Cell”.

Until now, the potential of laser welding has primarily been realised via bespoke systems — now CLOOS is adopting a new approach. With the new “QIROX Laser Cell” the company has developed a highly flexible laser cell incorporating perfectly tuned components. . The turnkey package requires little space and can be easily integrated into any production line. It consists of a laser welding head, safety equipment, operating terminal, positioner, QIROX robot, flat screen with HD camera for visualisation and a pre-assembled media room.

To provide further flexibility, the QIROX Laser Cell can also be equipped with conventional welding technology — for example, components can also be produced using the gas-shielded metal-arc welding (MIG/MAG) process. The combination of both technologies ensures maximum utilisation of the laser welding cell, thereby ensuring high productivity.

In order to fully assess the potential of laser welding, it is necessary to examine both the technology itself as well as some practical examples. Fundamentally, users can choose between the two process variants thermal conduction and deep welding.

Maximum welding speeds at top quality are the advantages of laser welding.



The 2-station systems are available with different types of positioners for different workpieces and can be loaded from outside.

Ultimately the choice usually depends on the material thickness, base material and welding capacity.

Thermal conduction welding is comparable to Tungsten Inert Gas (TIG) welding and is suitable for similar applications. The laser melts the material locally and the edges are combined in the melt to form a clean, virtually spatter-free weld. The advantages: Compared to a TIG weld, the heat-affected zone is considerably narrower. Much higher welding speeds are also possible which means that the heat introduced, i.e. the heat input, can be significantly reduced. This is of particular benefit for sensitive materials or when thermal deformation becomes a problem. Thermal conduction welding can be used either with or without filler material.

For larger material thicknesses, deep welding is an efficient alternative. In this variant, the laser beam strikes the workpiece surface with a high energy density, melting the material locally and partially vaporising it. A vapour capillary, the so-called keyhole, forms in the molten liquid and is maintained by the resultant metal plasma. Inside the keyhole, laser light is repeatedly reflected and partially absorbed, enabling the keyhole to penetrate deeper into the material. With its high feed rate, the laser drives the keyhole in front of it while the two edges merge behind it to form a narrow weld. As a rule of thumb, a laser power of around 1 kW is required for each millimetre of weld penetration in standard structural steel. In practice, this process can be ideally combined with a standard MIG/MAG process allowing plate thicknesses of up to 20 mm to be welded in a single layer. The weld preparation in a V-shaped joint that is required for conventional welding processes is no longer necessary.

Example 1. The “laser-only” technology has proven itself to be particularly effective when working with low material thicknesses. In this case, only the component edges are fused together and cold wire is added as required. The result is a relatively low-energy welding process with minimum distortion and high welding speeds. As a real-world example, this system is currently in use with the Luxembourg-based steel construction company TMS which produces high-quality plate metal assemblies made of steel, stainless steel and aluminium and is dependent on a highly flexible production process. The centrepiece of the company's 2-station welding system supplied by CLOOS is a 6-axis articulated-arm robot which stands on an 8-metre-long, floor-mounted linear track and carries a specially developed laser-welding head. The robot positions the focus of the 6-kW fibre laser beam precisely to within a few tenths of a millimetre of the required welding point. With the aid of an online sensor, the welding head is then guided into the weld to ensure optimum positional accuracy.

Example 2. A very demanding laser system for welding, cutting and marking telescopic mobile crane booms. Until now, welding mobile crane booms made of high-strength steel using the submerged arc process represented the state of the art in welding technology. Provided that the correct parameters are determined, the submerged arc process leads to both high quality and, thanks to its high depositing capacity, economic welding results.

Particularly with high-strength steels, the low heat input plays an essential role in achieving the required metallurgical properties for the weld. The concept of a hybrid technology combining laser and MIG/MAG welding was designed to improve on the good performance of conventional submerged arc welding. There are also several options to select the laser type which matches the application.

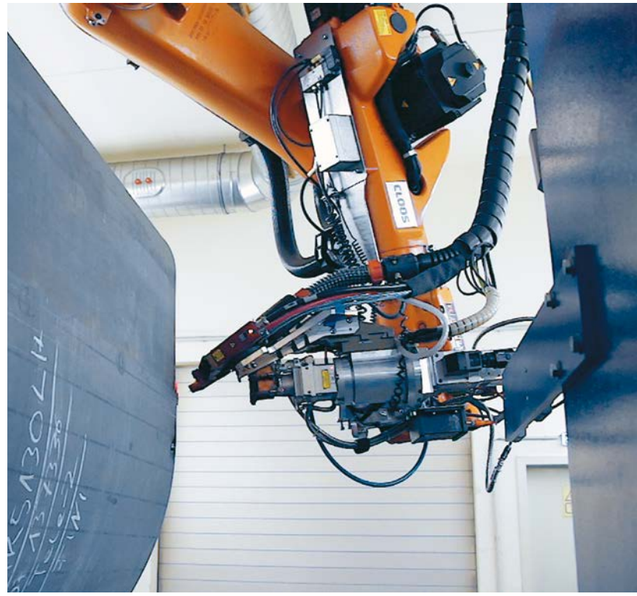
Furthermore, practical examples show the excellent welding results achieved with lasers — in this case they were produced by bespoke systems. However, from now on similar results can be achieved using pre-assembled QIROX Laser Cells — only much faster and easier. At the Manitowoc Crane Company, Wilhelmshaven, the CLOOS system's robot is suspended from a gantry which can process components with a length of up to 19 metres. Each component is manually stapled, secured on the transport vehicle and moved into the cell. The hybrid welding head then uses an online laser sensor to find the joint, which is stabilised horizontally in the “PC position”. Both welding processes, laser and MIG/MAG, complement each other — the laser beam provides deep penetration and the MIG/MAG process fills the joint with a suitable filler material. In addition, the interaction of the two systems serves to stabilise the entire process. Using this laser-MIG/MAG hybrid technology, telescopic boom parts with a length of up to 19 metres and a thickness of between 6 and 12 mm can be welded on both sides in the PC position.

Costly high-alloy additives are not required for the filler material, and unlike with the submerged arc process, no backing in the form of a copper bar is needed for laser hybrid welding in the PC position. Beyond this, the laser system can offer even more added value. It is equipped with an automatic tool change system. After the welding program, the robot places the laser hybrid head in the exchange station and grabs a separate cutting head. Without requiring the boom to be repositioned, the cutting head can then burn millimetre-precise openings into the steel. With reduced power the same cutting head can be used to apply markings for different operations.

Turnkey cell solution

The “QIROX Laser Cell” is equipped with a diode laser, however it can also be combined with any other type of laser. The 2-station systems are available with various positioner types for different components and can be loaded from the outside. The operator can therefore remove the welded components and reload the devices at one station while welding takes place at the other. This results in an enormous saving on time for the process.

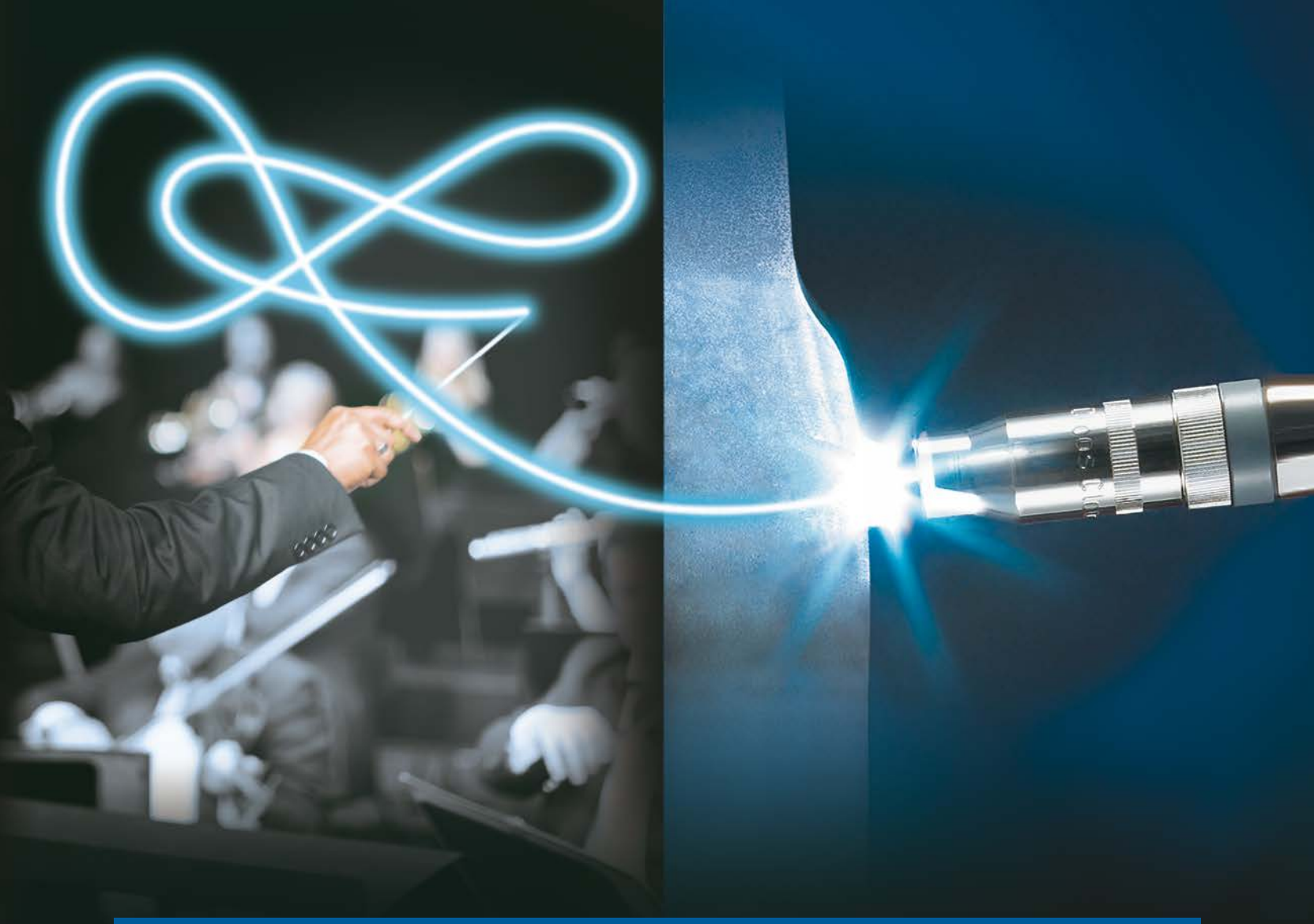
The decision to use laser technology is a step into a completely new production method that requires a lot of experience and know-how. Investment in a laser system usually entails comparatively high acquisition costs — roughly EUR 30,000 per kW of laser power, with an average requirement of 12 kW. However, the acquisition costs represent only one aspect of the total investment. Ultimately, the potential arising from this technology opens up entirely new possibilities for increasing both productivity and quality in order to ensure competitiveness in the global marketplace



Picture above: The telescopic mobile crane booms are welded using laser-MIG/MAG hybrid technology: Manitowoc has stopped all submerged arc welding and thereby saved EUR 20,0000 annually on additional material and powder only.

Picture below: At crane manufacturer Manitowoc, the robot and hybrid welding head are suspended from a gantry and can process up to 19-metre-long parts.

Watch the video of the QIROX Laser Cell at:



Humans are individual. Just like welding.

Every production challenge requires individual technologies to achieve optimal results. To ensure that you manufacture and handle the best possible products and component parts, CLOOS supports you with excellent arc welding expertise and a broad product portfolio. No matter if automated or manual – with CLOOS you always weld and cut accurately, at the highest economic and technological level. **www.cloos.de**

CLOOS

Weld your way.