

Getting diamonds into shape.
Wire EDM for PCD cutting edges.

Lehmann GmbH Präzisionswerkzeuge p. 64

Microseconds, micrometres
and millions.

Hublot SA

06

Speed
and accuracy.

Ing. Lang & Menke GmbH

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Well on the way
to the top.

Jehle AG

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Ets. Boutroué



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Legal notice

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Editorial



Hans-Jürgen Pelzers

“A very little key
will open a very
heavy door.”

Charles Dickens

The genuine patent cure for the crisis

No company in machine manufacture worldwide applies for more international patents than Mitsubishi Electric. Occupying second place for the most patent applications in 2019, Mitsubishi Electric is ahead of almost all other companies with a reputation for innovation. Major inventions often start out very small – such as sensors. If they provide more accurate information, machines can operate with greater precision and speed. The sensors developed by Mitsubishi Electric are so revolutionary that they can be used to explore the moons of Mars far away from Earth. In addition, they protect our home planet from natural disasters – the third satellite, for example, is currently being built to keep a close eye on our global water cycle and Earth's atmosphere.

Somewhat closer to Earth but no less innovative is the application of sensors in laser cutting machines. Here, AI-supported sensors “hear” and “see” exactly whether the cut quality is up to international standard, preventing costly rejects. It is precisely this technological lead that you will find in the new die-sinking EDM systems of the Mitsubishi Electric SG series. But listing here all the other advantages of this new generation of machines would go beyond the scope of this article. So take a look at page 72 of this issue.

Many Mitsubishi Electric customers use the EDM systems for their own innovations and patents – such as the first scratch-resistant gold developed by the Swiss luxury watch manufacturer Hublot (from p. 6). Let us inspire you. Perhaps you can use the current situation to finally realise your own ideas and emerge from the crisis as a winner. Stay safe – and stay hungry for the best solution!

Hans-Jürgen Pelzers

from the Technology Centre in Ratingen

News



Three-dimensional images for safe autonomous driving

Mitsubishi Electric Corporation announced that it has developed a compact light-detection and ranging (LiDAR) solution incorporating a micro-electromechanical system (MEMS) that achieves an extra-wide horizontal scanning angle to accurately detect the shapes and distances of objects ahead in autonomous driving systems. The new LiDAR solution irradiates objects by laser and uses a dual-axis (horizontal and vertical) MEMS mirror to scan for the reflected light, generating three-dimensional images of vehicles and pedestrians. Mitsubishi Electric expects this compact, low-cost solution to contribute to the realization of safe, secure autonomous driving.

Enjoy your read of this issue!

MITSUBISHI ELECTRIC – THE WORLD’S MOST INNOVATIVE MACHINE MANUFACTURER

Mitsubishi Electric ranked 2nd globally and 1st among Japanese firms in international patent applications

Mitsubishi Electric Corporation announced that it has been ranked second globally and first among Japanese firms in terms of international patent applications filed in 2019, according to an announcement released by the Switzerland-based World Intellectual Property Organization (WIPO) on April 8th 2020.

Novel satellite for the prevention of global disasters

Mitsubishi Electric Corporation announced that it has been designated by the Japan Aerospace Exploration Agency (JAXA) as the contractor of the Global Observing SATellite for Greenhouse gases and Water cycle (GOSAT-GW), the third in the GOSAT series, and has already initiated development activities. GOSAT-GW will have two missions: greenhouse gases observation for Japan’s Ministry of the Environment and the National Institute for Environmental Studies (NIES), and water-cycle observation for JAXA. By developing the GOSAT-GW satellite, Mitsubishi Electric will contribute to measures for preventing disasters attributed to global warming and climate change, and to advance scientific and technological methods that enable more accurate prediction of climate change.

Exploring the moons of Mars with Mitsubishi Electric sensors

Mitsubishi Electric Corporation announced that it has been designated by the Japan Aerospace Exploration Agency (JAXA) as the contractor of the Martian Moons eXploration (MMX) space probe. Mitsubishi Electric, which has already initiated development activities for the project, will be responsible for the MMX’s system design, manufacturing and operation, leveraging technologies that it first developed for the Smart Lander for Investigating Moon (SLIM) and the „Kounotori“ H-II Transfer Vehicle (HTV). The MMX’s mission is to determine the origins of Mars and its two moons, Phobos and Deimos, as well as discover how water and organic substances became part of the primordial solar system.



Rendition of MMX space probe (© JAXA)



Machining unusual materials with wire EDM.



Hublot SA

Microseconds, micrometres and millions. Hublot. The watch.

First. Unique. Different. This is the slogan of Hublot. The fact that Hublot belongs to a special world is already evident from its picturesque location. Nyon lies on the shores of Lake Geneva, in which in calm weather the snow-capped peaks of the Alps are reflected. The site is home to assets worth millions in a handy format: Hublot wristwatches are top-of-the-range products of Swiss watchmaking, whose price range starts at CHF 7,000 and is in principle unlimited. This is also where the most expensive Swiss watch to date, worth CHF 5 million, was manufactured. Mitsubishi Electric's electrical discharge machines in the production shops with a total area of more than 8000 m² have also contributed in the production of some of these iconic timepieces.

The Big Bang Ferrari Magic Gold with its tiny Ferrari logo, the cavallino rampante, was developed in close partnership with Ferrari.

On entering the reception area, the eye is immediately caught by large-format pictures underlining the bond between Hublot and its ambassadors. These include celebrities from the worlds of sport, art and music, as well as personalities from charities and environmental protection. Working closely with them, Hublot is constantly creating new watch models using high-tech materials and with unique designs. Thanks to its creative designers and innovative materials specialists, these timepieces in the typical Hublot style are available in an almost overwhelming variety of versions, often in limited editions and, thanks to the masters of the watchmaking craft, equipped with various ingenious technical features such as tourbillons or power reserves of up to 50 days. The ambassadors include such illustrious

names as Pelé, Usain Bolt, Kylian Mbappé, José Mourinho, Bar Refaeli and Chelsea FC. But one well-known company name also stands out in the list: Ferrari, the legendary sports car from Maranello.

Hublot and Ferrari as natural partners


Hublot and Ferrari have much in common: you don't buy a Hublot watch because it tells the time more accurately than a mobile phone, and you don't drive a Ferrari on the in most cases speed-limited European motorways to be faster than other drivers. Instead, buyers choose these products for lifestyle reasons and also in order to enter the «family» of these brands (Hublotistas and Ferraristas). Manufactured with tradition and a great deal of craftsmanship, they are elevated to a standard

that mass products cannot match. Buyers make their choice with greater deliberation on the strength of the products' beauty, aesthetics, progressiveness and crafted perfection. It therefore comes as no surprise that Hublot and Ferrari have been working in close partnership since 2011 to create watches that combine innovation, excellence and performance at the highest level. The first of these models, called Big Bang Ferrari Magic Gold, was launched in 2012, and one of the special features of its development was the use of a new, patented composite material made of ultra-hard sintered boron carbide ceramic and 18-carat gold. Unlike gold as a metal, which is soft in any alloy and therefore easily scratched, this matt-gold dark material is extremely hard thanks to the boron carbide



The watchmaker is constantly on the lookout for new materials for his timepieces.

New watch models made of exotic materials.



Hublot's strength is based on its distinct identity – the art of fusion – this unique ability to create time-pieces that combine tradition and innovation.

Ricardo Guadalupe, company CEO

HUBLOT is a Swiss luxury watchmaker headquartered in Nyon. Founded in 1980, the company is known for its innovative approach resulting from the unique marriage of gold and rubber in the „Art of Fusion“. The birth of the legendary „Big Bang“ model in 2005 has been restaged several times, opening the way to new flagship collections (Classic Fusion, Spirit of Big Bang) with complications ranging from simple to extremely challenging. This spirit of innovation typifies the exceptional DNA of this rapidly growing Swiss watchmaker.

Keen to preserve its traditional high standard of expertise, the Swiss watchmaker is guided by its philosophy of „Be the First, Different and Unique“ and proves with its innovation in materials (Magic Gold = scratch-resistant gold, bright and colourful ceramics, sapphire) as well as its manufacture of movements (Unico, Meca-10, Tourbillon) that it is continuously at the forefront in its field. On the knife-edge between past and present, luxury watch manufacturer HUBLOT has its sights set on a visionary future: its symbiosis with the great events of our time (FIFA World Cup, UEFA Champions League, UEFA EURO and Ferrari) and their most outstanding ambassadors (Kylian Mbappé, Usain Bolt, Pelé).

and scratch-resistant. The drawback, however, is that it is also extremely difficult to machine. All the same, Hublot chanced its hand with this project and successfully mastered the challenge. This success in turn marked the beginning of a story culminating in what are now four Mitsubishi Electric EDM systems in Hublot's production facilities: one MV1200R, two MX600 and one Start 43Ci EDM drilling machine. But first things first.

Constant innovation – in the materials sector as well

„Hublot's strength is based on its

distinct identity – the art of fusion – this unique ability to create time-pieces that combine tradition and innovation,“ is how Ricardo Guadalupe, the company CEO, sums up the manufacturer's philosophy. This applies not only to the multitude of different models and versions constantly being created by its designers, but also to the wide range of materials used. These include not only such familiar materials as stainless steel, aluminium and titanium, but also such precious metals as gold, platinum and palladium as well as exotic metals like tantalum, tungsten, zirconium and

osmium. As an alternative to metals, ceramic, carbon fibre and rubber are also used. Incidentally, the term „fusion“ also has to do with the fact that Hublot, as part of its research and development activities, operates its own metallurgy department with a foundry enabling the watch manufacturer to develop and produce the desired materials itself.

Production of individual parts in advanced industrial processes

„My department has to supply the watchmakers with individual parts that meet the highest quality standards,“ is how Production Manager

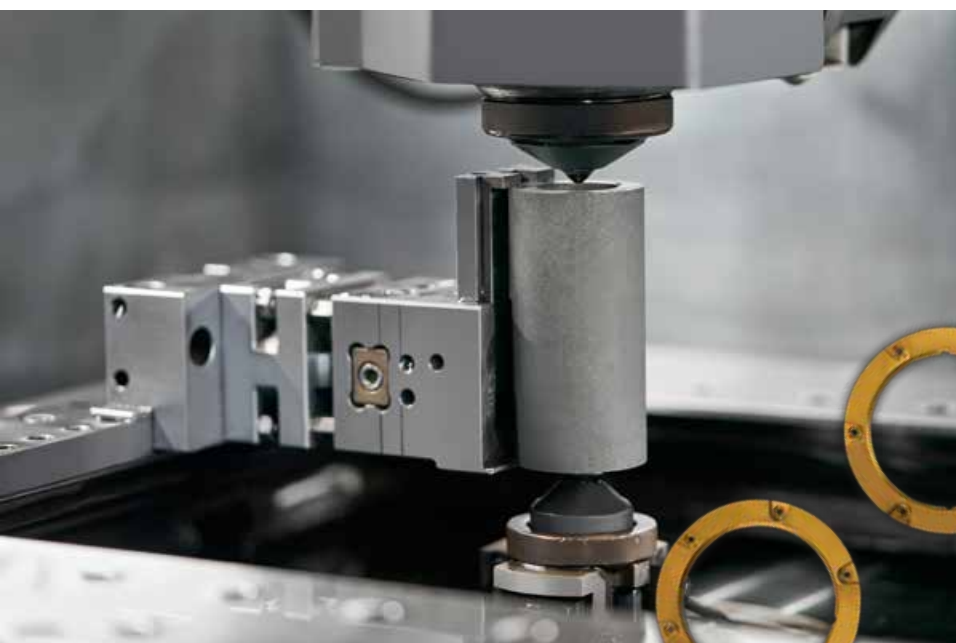


Machining of brass watch components in the oil bath of a Mitsubishi Electric MX600

Major benefits in terms of quality and productivity.

Au B₄C**Magic Gold**

Developed and crafted by Hublot in the company's own metallurgical department. The world's first and only scratch-resistant 18-carat gold alloy.



1.5 to 2 kg of 18-carat gold goes into such a Magic Gold blank, depending on the version.

With its Mitsubishi Electric MV1200R, Hublot succeeded in making considerable progress in the machining of its globally unique material "Magic Gold".



The machined case parts of Magic Gold shimmering in a warm golden brown.

José Almeida describes his area of responsibility. State-of-the-art technology is used for this purpose, because the watchmakers who later assemble the movements by hand from hundreds of individual parts with meticulous care must be able to rely totally on the quality of these components. Dozens of high-precision automated milling, drilling, turning and electrical

discharge machines are lined up in production, producing small to tiny components, often with very complicated shapes, for the assembly of watch movements and cases. This combination of modern industrial production methods for the manufacture of individual parts with the traditional, entirely manual watch-making craft is also an expression of

Hublot's specific „fusion“ philosophy, the creative blending of tradition and innovation. Another machining process is wire-cut EDM, which is used especially for components that cannot be milled owing to their extreme hardness or clamping problems. EDM is also frequently used for the production of small series or prototype components, as no complex



Mitsubishi gave us excellent advice, made a test system available for several months and sent its engineers round for the tests.

*José Almeida,
Production Manager*

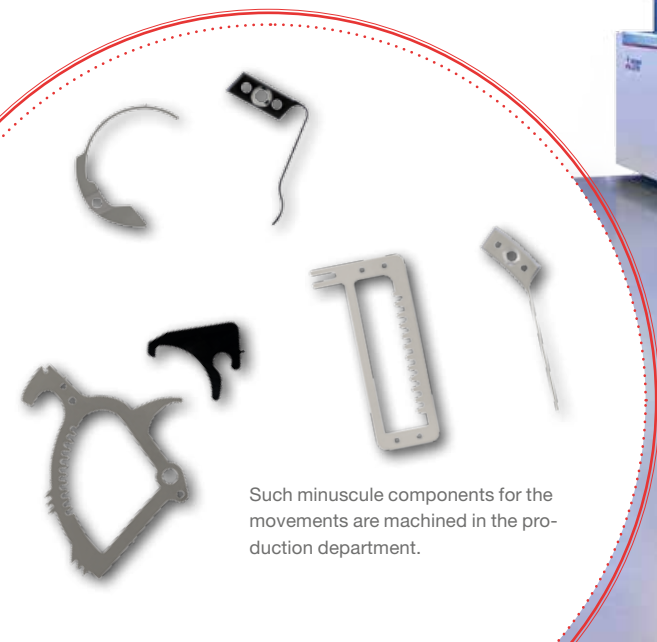
clamping devices or special tools are required for this. In view of Hublot's commitment to innovation, this is of considerable importance.

Mitsubishi Electric steps into the breach

„Because of its extreme hardness of 1200 HV, Magic Gold can only be cut or drilled by electrical discharge,“ Almeida adds. The company contacted Mitsubishi Electric. The initial advice given proved to be excellent,

and, in addition, Mitsubishi Electric generously provided Hublot with an MV1200R water bath machine as a test system for several months. And not only that: engineers were also sent to Hublot for several days to assist with the tests. In the course of three months of joint development work, all problems were satisfactorily solved and the procedure for the task was validated. For Hublot,

quality and productivity improved significantly over the previous state of affairs, and Mitsubishi Electric succeeded in acquiring an attractive customer. All in all, a fine example of benefits all round.



Such minuscule components for the movements are machined in the production department.



Four Mitsubishi Electric EDM systems can be found in Hublot's production shop.

Success also with oil bath machines

„After this achievement, it was only natural for us to also talk to Mitsubishi Electric when the two outdated oil bath machines were taken out of service,” Almeida recalls. These machines are mainly used for materials that are used in watch movements. These include steels that would be at risk of rusting in a water bath. Other materials used in this area are brass, copper-beryllium and carbides. In addition to watch movement parts, the oil bath machines are also partly used to machine jigs and fixtures.

In a comparison with different suppliers, the machines' ability to take changing material thicknesses into account during the cutting process proved to be the decisive criterion. In coping with sudden changes in material thickness – such as those that occur with pre-milled components – the Mitsubishi Electric systems proved superior. In the Hublot workshop, two MX600 oil bath machines are now also gently humming alongside the MV1200R.



Hublot SA

Founding year

1980

Managing director

Ricardo Guadalupe

Employees

Approx. 700

Core business

Hublot with its headquarters in Nyon is a Swiss maker of luxury watches. Today, its watches are among the most expensive and exclusive in the world – with its USD 5 million watch, for example, Hublot holds the record for the world's most expensive watch. Like the luxury watchmaker Tag Heuer, the company belongs to the French group Moët Hennessy Louis Vuitton S.A. (LVMH).

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Hublot: Swiss watches in a class of their own

When it comes to Swiss timepieces, one usually thinks of wristwatches – but this is a fairly modern development, as the first watch was not produced until 1810. The Swiss clockmaking tradition, on the other hand, is already around 500 years old. The reformer Calvin, obsessed with punctuality, attracted numerous Huguenots, masters of the art of timekeeping, from France to Geneva. The zealous reformer gave the industry another major boost by banning the wearing of jewellery. The local goldsmiths had to adapt and switched to the production of decorative timepieces. From Geneva, this art quickly spread throughout the entire Jura mountain range. Initially, the product range extended from church clocks to pocket watches. According to entries in the Breguet company archives, the first wristwatch mentioned above was not made until 1810 by Abraham-Louis Breguet for the Queen of Naples. The first waterproof wristwatch was then crafted by Rolex in the 1920s. This was followed in 1926 by the first automatic watch from a manufacturer based in Grenchen in the canton of Solothurn. Probably the most complex watch artwork ever produced is the Calibre 89 by Patek Philippe, which consists of a total of 1728 parts.

The industry made an almost fatal mistake when it invented the quartz watch. Although the first quartz watch was developed in 1967 at the Centre Electronique Horloger (CEH) in Neuchâtel, the market was left mainly to Japan and the USA, bringing the Swiss watch industry almost to the brink of collapse in the mid-1970s. Today, it has regained its footing, achieving export revenue of almost CHF 20 billion in 2017.



This top-of-the-range Hublot watch, Big Bang Meca-10 "Nicky Jam" high jewellery 45 mm, costs CHF 350,000.

From the church tower clock to the pocket watch.

Hublot

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as long as stocks last.



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From practitioners for practitioners.



Working flexibly and at short notice for regional customers.

Raditek CNC-Technik

Easily grasped.

Component suppliers benefit from simple programming and operation.

The subcontractor Raditek in Markdorf on Lake Constance has expanded its range of machining processes to include wire-cut EDM. For the company this opens up additional opportunities to supply even complex components from a single source.

Single items based on customer drawings

Founded in 1998, Raditek CNC-Technik in Markdorf, Germany, now has nine employees and works flexibly and at short notice, mainly for regional customers. Its product range includes customer-specific components for jigs and fixtures, for assembly and packaging systems and for automation technology. Most of its orders come from industrial companies working in the aerospace, food and beverage, and pharmaceutical industries in the surrounding Lake Constance region. Most jobs, second-generation owner and Managing Director Jasmir Dzidic explains, are for single items or at best tiny series up to about five

identical components. To produce workpiece grippers and carriers, drive levers, guide rails and similar parts from sketches, customer drawings or data, for example, the subcontractor in Markdorf has at its disposal all the usual machining technologies, such as drilling, turning, milling and now also grinding.

Growing spectrum of components

Thanks to the high quality of the components produced and to the company's flexible processing of orders to tight deadlines, there have recently been an increasing number of enquiries, even extending to complex workpieces, Dzidic continues. This also includes

components with special geometries, such as gearing, and workpieces made of extremely hard materials and hardened steels. “A few months ago, we received orders to machine components with internal gearings. Customers also asked whether we could produce nozzles with conical inlet funnels. The latter are made of a pre-pressed sintered ceramic, so-called green bodies. Such components cannot be milled or turned, or only with extreme effort and very long machining times. That was the reason for me to take a closer look at wire EDM machining,” says Dzidic.

The subcontractor machines complex structures in hard materials faster and more economically with wire EDM – more easily than by turning and milling.



Comprehensively informed

Together with his father Razim, who still works for the company, Dzidic first gathered information at a trade fair in December 2019 and then interviewed employees of other manufacturing companies, including those of his customers. The latter use wire EDM technology mainly for the machining of their product range. “It soon became evident that wire EDM is just the right machining technology for our extended range of components. Hard materials, difficult contours with very small radii, and even very narrow grooves – anything that cannot be milled or only with great difficulty can be accomplished effortlessly by using wire EDM,” says Dzidic, summing up his conversations. Now it was a matter of finding the machine that was best suited to the needs of a small, inexperienced jobshop. “Here, too, the information from neighbouring businesses soon gave us the necessary clarity. Nearly all of those we talked to recommended the machines from Mitsubishi Electric. These, they claimed, are equipped with the latest technology and can be programmed and operated easily and unproblematically, which makes them particularly suitable for ‘beginners’. The advice, training for programmers and operators, and the after-sales service at Mitsubishi Electric were also considered outstanding and highly rated,” says Dzidic recalling his conversations. All the



Nearly all of those we talked to recommended the machines from Mitsubishi Electric. These, they claimed, are equipped with the latest technology ...

*Jasmir Dzidic,
Managing director*

The choice is yours: the MV2400S NewGen can be operated either like a smartphone with an app structure and graphic support or with classic G-code programming.

The best-suited machine.

interviewed users of these wire EDM machines also spoke approvingly of the cost-benefit ratio.

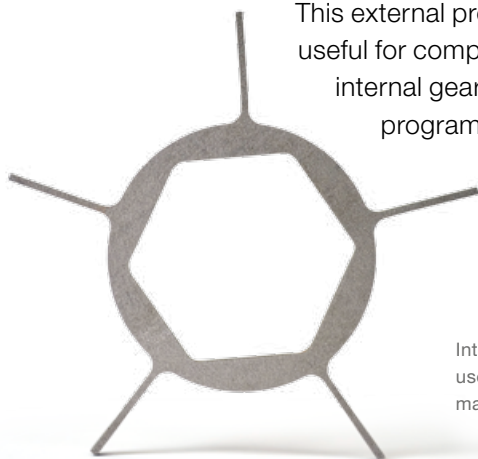
Investment pays off

On the basis of these recommendations, Raditek invested in an MV2400S NewGen wire EDM machine. After only a few months of practical experience, Dzidic says that all the claimed features and advantages of this machine described by his fellow professionals have been vindicated. The advice and service supporting the commissioning process were excellent, he adds. Within a few days, the skilled applications technicians in Ratingen explained to him the functions and working methods in such detail and with such proficiency that he took only little time to produce the first workpieces from drawings.

Dzidic considers the workspace to be large and very accessible. He can easily insert and clamp even bulky workpieces, he confirms. He finds special praise for the current D-CUBES control generation. "The touch panel with its control panels and functions – comparable to today's smartphone apps – is naturally fully in line with the way younger employees work," says Dzidic, and by this he also means himself. The functions selected on the large screen are self-explanatory and guide the user systematically and intuitively through the various dialogues for parameter input. Nevertheless, experienced specialists can also draw on their technical knowledge from other, proven NC manufacturing technologies. As an alternative to the graphically supported functions, they can also select a programming function with classic G and M codes. Dzidic is convinced this would be very helpful to his father, for example.

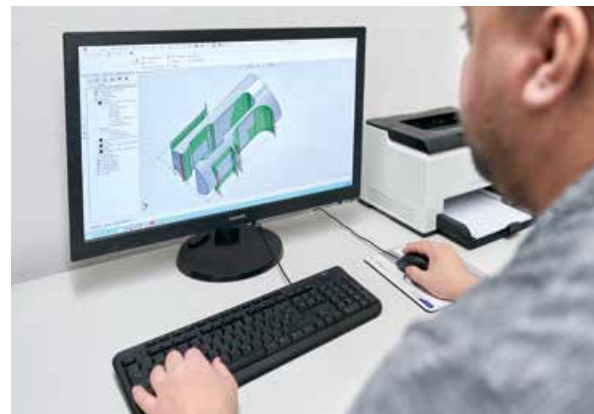
At Raditek, most of the components destined for wire-cutting are first transferred in data form to an external CAD/CAM system from DCAM. This is where the NC programs for wire EDM are generated.

This external programming is particularly useful for complicated contours such as internal gears, Dzidic reports. After programming, the machining process can be simulated on the screen. In this way,



Internally and externally, wire EDM can be used for finishing intricate components made of hard materials in a single pass.

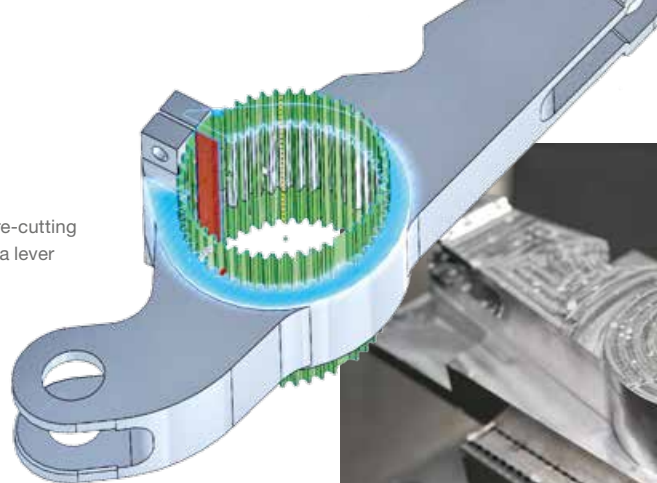
The datasets of NC programs for wire EDM are generated at the programming station from 3D models.



Razim Dzidic flexibly produces customised clamping fixtures for a wide variety of components.

possible collisions or geometric errors are revealed in advance, thus subsequently accelerating throughput, since this approach eliminates aborted machining processes, expensive scrap and the protracted reworking of workpieces. A special advantage is that the MV2400S NewGen controller stores proven parameters for commonly used materials. This means that inexperienced

Optimal machining: wire-cutting the internal gearing on a lever



users can simply adopt the data and machine efficiently with them.

Realising ideas with more flexible and faster machining

Wire EDM technology has now enabled Dzidic to machine difficult contours and geometries in-house. This has increased his flexibility in the handling of changing production orders at short notice. He has also come up with his own ideas for innovatively, quickly and accurately machining workpieces by adopting unusual processes. He explains an example: "We had to manufacture housing components using structural steel plate up to 170 mm thick. The usual production steps – first flame-cutting the rough geometry, cleaning the edges with an angle grinder and then milling them to the exact dimensions – were in my view laborious and complicated. So we simply put the plate directly onto the EDM system and wire-cut the final geometry in a single pass." EDMing with wire initially requires longer processing. But with a 10 kg wire spool, the machine can machine

such workpieces unsupervised for up to 30 hours. Thanks to the reliable wire threader, it runs smoothly and productively over the entire period. This machining process, Dzidic confirms, is more cost-effective overall, since lengthy and elaborate transfers between processes, idle times, multiple clamping and reclamping, expensive tools and special clamping devices for the milling machine are no longer required. "With the MV2400S NewGen wire EDM machine we have gathered excellent experience in just a few months. We were able to familiarise ourselves quickly, Mitsubishi Electric's service department provided us with excellent advice and support, we have managed to expand our range of services considerably, and we have achieved greater flexibility because we can now machine a wider range of components entirely in-house," says Dzidic summing up.

Raditek CNC-Technik

Founding year

1998

Managing director

Jasmir Dzidic

Employees

9

Core business

Flexible and fast machining of customer-specific components for jigs and fixtures, automation and assembly systems and for operating equipment in general as one-offs and multiples from hard and hardened materials on the basis of drawings, samples and graphic data

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Enhanced flexibility thanks to wire EDM.

Short interview Jasmir Dzidic



*[...] the **MV2400S NewGen** wire eroding machine, so we see ourselves **well equipped** to master difficult situations even for several months.*

*Jasmir Dzidic,
Managing director*

How are you affected by the current difficult situation caused by the coronavirus?

Dzidic: We are currently experiencing an approximately 20 per cent decline in incoming orders. We produce special and replacement parts for plant construction and for plant operators. As long as these plants continue to operate – in the food and beverage and pharmaceutical industries, for example – wear and replacement parts will certainly be needed. For this reason, the situation is likely to stabilise for us at the current level.

How are you preparing for medium- and longer-term developments?

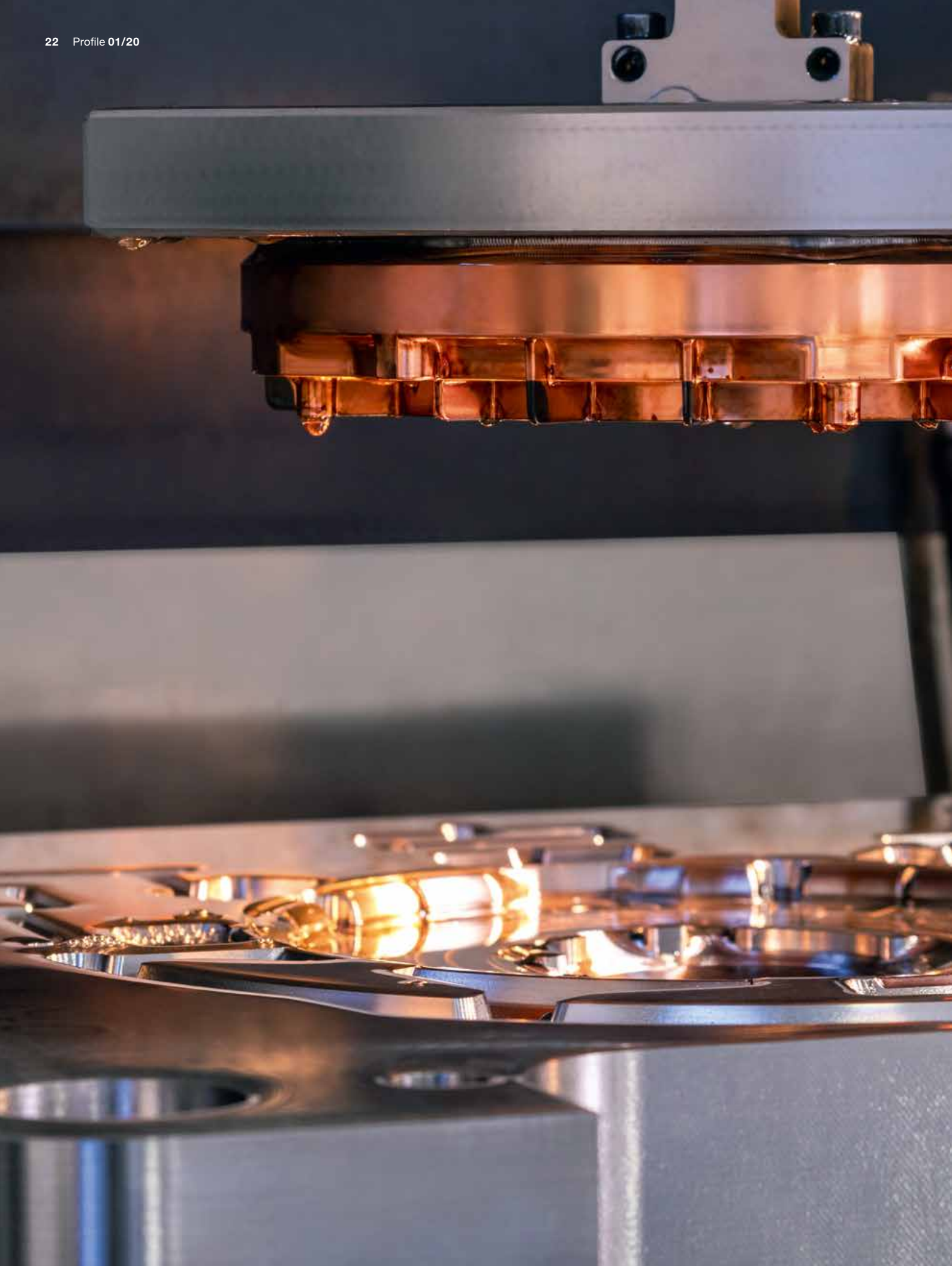
Dzidic: Obviously, we hope that the restrictions will soon come to an end and that the economy in general will then pick up again. As a result of the financial crisis ten years ago and my joining our company's operational business, we are already well set-up for the long term. We have streamlined our internal processes. Likewise, in recent years, which have been marked by growth and sound financial management, we have

invested repeatedly in new machines and also in forward-looking technologies. The most recent example is our investment in the MV2400S NewGen wire eroding machine, so we see ourselves well equipped to master difficult situations even for several months.

What's your assessment of your financial situation despite declining business?

Dzidic: Following the financial crisis in 2009/2010, we gradually drew up contingency plans, which we can now use as a guide. This gives us the certainty

that, in conversation with customers and also with the banks, we will be able to cope well with the current adversities. We have also certified our company to ISO 9001. As a result, we are perceived as a competent and capable supplier, even in times of economic crisis, by our considerably larger customers. This will continue to safeguard sufficient orders so that we can survive financially.



High precision to within a few hundredths of a millimetre.

Naton Kft.

Guaranteed quality.

EDMs in full-time operation at Naton Kft.

The production of die-casting, plastic mold injection tools and sheet metal working tools used mostly in automotive industry requires extremely high precision up to hundredths of a millimeter. The success of a part or a whole project can depend on these strict tolerances so using the appropriate technology is key. Although they are not complete solutions in themselves, the proper EDM machine tools are best suited to perform these tasks. This is exactly how they see it at Naton Kft., a hungarian company that designs and manufactures precision tools almost exclusively for the die casting industry.

A bold dream became a proud reality

The history of the company dates back to 1988, when Géza Marton and his colleague at the time, István Nagy decided to create their own enterprise as craftsmen, using a garage as their workshop. Five years later they had already worked in a limited partnership in another workshop with 300 m² space. In 2011 the floorspace has doubled, the company has converted into an Ltd. form and one of the owners (István Nagy) was replaced by Csaba Szabó, who had previously worked as a technical and development chief at a big foundry company. His expertise has given a renewed impetus to the company, so it continued to develop and strengthen over time.

Thanks to the persistent work and various tenders, Naton Kft. was able to invest in new machines and expand their workforce almost every year while their customer base also stabilized. Today, they have orders from big firms, such as Csaba Metál Zrt., FESTO, FÉMALK Zrt., SMR Automotive or V-Casting Ltd. Finally, in 2018 the company moved to a new site, where they've been working in a beautiful, modern building giving place to a



Productive "guest": the loaned EA12-S has now been superseded by the second EA28-V Advance.

well-equipped workshop and sunny offices ever since. The key of their competitive edge lies in their corporate philosophy focusing on a long-term, stable customer base, supplier partnerships that offer high quality, certified raw materials and the use of advanced, professional technologies and equipment.

Trust can only be achieved through positive experiences

The machines at Naton Kft. consist of the latest milling machines, lathes, cylindrical and surface grinders, but – based on their orders – sinker and wire EDM machines are at the heart of the fleet. "We often have to machine



Csaba Szabó (on the left) and Géza Marton (on the right)

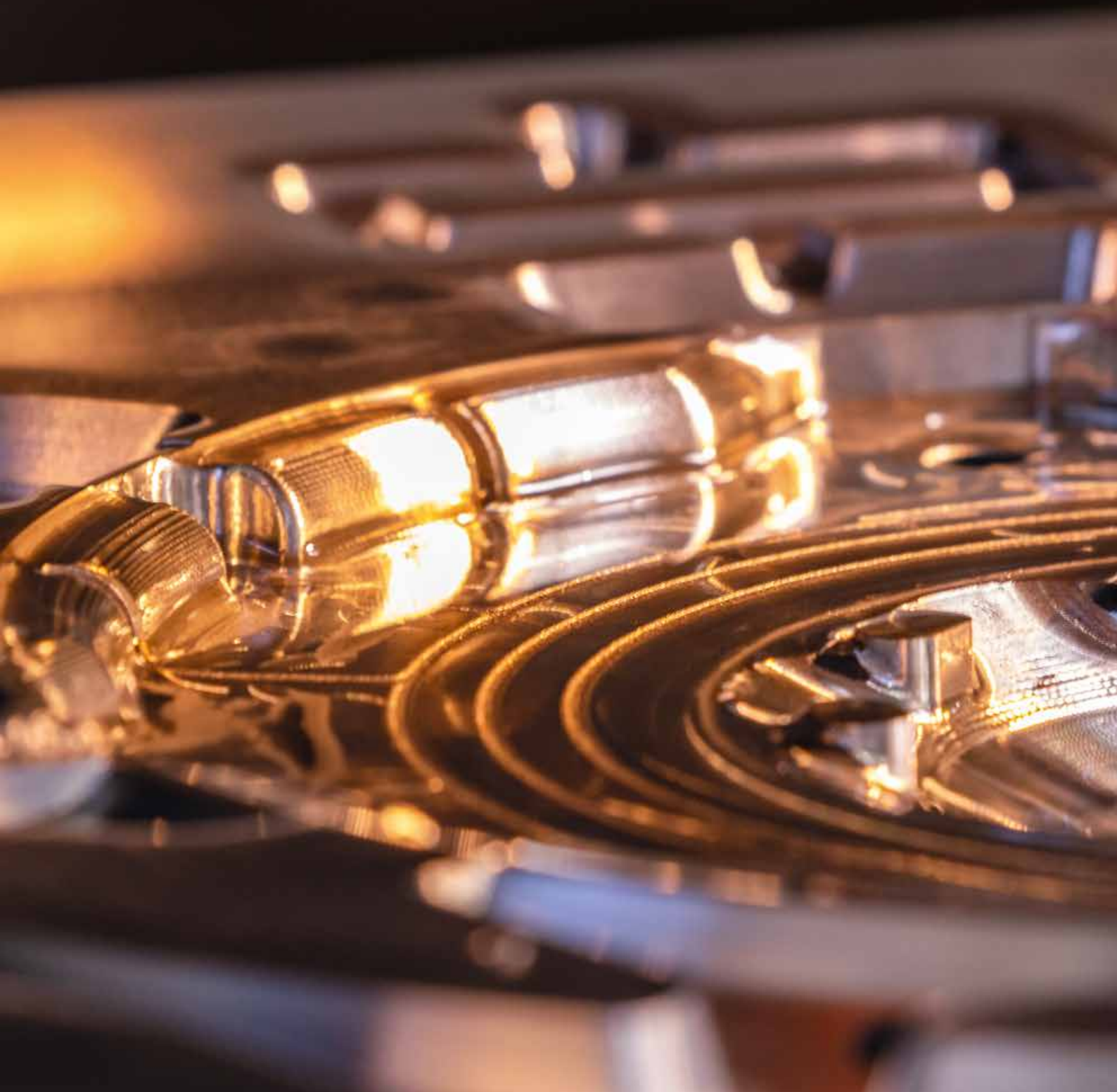
thin ribs and parts that are hard to reach or resize holes when manufacturing custom tools. These tasks are impossible to perform with milling machines. They can only be manufactured within hundredth of millimeter precision on wire EDMs." says Géza Marton.

Their first wire EDM – a Mitsubishi Electric DWC90, no longer in use – was purchased when they were still operating in a limited partnership. "We made punching tools for a German company that manufactured tinker

tools. They ordered in high volumes, and the DWC90 proved to be a really capable machine” – adds one of the owners. Thanks to the excessively positive experiences, Naton Kft. has made an early commitment to the Japanese brand and has been working with Mitsubishi Electric EDMs exclusively ever since.

Sole agent in the brand’s domestic distribution – M+E Szerszámgép Kereskedelmi Kft. – also took a significant role in the decision. They not only provide help for Naton

Kft. by quick installation and comprehensive services, they also support the production with flexible rental options. An unforeseen capacity shortage led to Naton Kft. wanting to expand their machine fleet with another Mitsubishi Electric EA28-V Advance sinker EDM. But the machine with the required custom parameters wasn’t available on stock at the time. So, the distributor offered a rental option for a smaller machine as a temporary solution. “It was delivered quite quickly and smoothly” tells Géza Marton.



**Strict requirements demand impeccable operation**

Today they use three Mitsubishi Electric EDMs: the oldest one is an almost 10-year-old EA28-V Advance sinker EDM, that lately operates 24/7. It required one small repair job but apart from that, it has been working seamlessly since its installation. “The machine also works at night with previously measured electrodes mounted into the tool magazine” – says one of the owners. The next machine acquired was an FA10-VS wire EDM that has also been working for a long time now. This one wasn’t yet purchased from M+E but they’ve

been providing the required services for it for a while now. Obtaining spare parts is not always easy for older machines, but is not a problem for Mitsubishi Electric and its domestic sales partner M+E.

Their latest machine – an MV2400S NewGen wire EDM – was installed in early 2019 and it operates without any problems since. It’s characterized by high cutting speed and accuracy and has a low power consumption, so it guarantees economic production. Machines from the MV series feature the contact-free – so also wear-free – Tubular

High cutting speed with low power consumption.

The machine also works at night with previously measured electrodes mounted into the tool magazine.



The new MV2400S NewGen wire EDM was installed at the beginning of 2019 and has since been running without a hitch.

direct drive, and the patented wire threading that ensures operator-free production. This fleet will be expanded with the EA28-V Advance, that at the same time replaces the small rental machine.

Naton Kft. complements its business with design services, which fortunately also proves to be very popular – all but one of their customers require it. “Moreover, we also create part models to ensure that the model can be molded in case the customer has a new idea” adds Géza Marton. They use Siemens NX and PTC Creo (formerly Pro/ENGINEER) software for the design process, and – depending on machining requirements – it usually

takes 12–20 weeks in general to finish a tool from design to production. Naton Kft.’s example perfectly demonstrates how much an efficient and reliable, well-equipped and well-supported machine fleet can ease production. Although success requires many other factors, without good equipment quality cannot be guaranteed.

Naton Kft.

Founding year

1993

Managing director

Géza Marton, Csaba Szabó

Employees

21

Core business

Production of die-casting moulds, plastic injection moulds and sheet metal forming tools

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Mitsubishi Electric

Dressing for a competitive edge.

How is it done?

Grinding with higher abrasion rates and at the same time having tools that last longer enables you to save money and deliver faster. This is how you win new customers and outperform competitors – but to do so, everything has to run smoothly.



DiamondCell – it's the right balance of all the components that counts.

Dressing grinding wheels in a contactless process.

The dressing (= profiling and sharpening) of grinding wheels by EDM is not a fundamentally new technology. However, with the current wire-cutting systems from Mitsubishi Electric, the scope for machining has been extended considerably. Unlike conventional dressing with fixed or moving dressing tools, the process with

wire-cutting is contactless. Although this also applies in principle to die-sinker dressing with shape-imparting electrodes, the wire erosion process is much kinder to the grinding wheel.

Child's play with the wire erosion systems from Mitsubishi Electric

The wire erosion systems from

Mitsubishi Electric make this process child's play. The basis is the grinding wheel's geometry – defined either in a drawing or, better still, in a geometry file, e.g. in DXF format. The profile is programmed as a cutting path. If a DXF file is available, it can be read straight into the control and processed into an NC program.



The grinding wheel is dressed by EDM with high abrasion rates and precision and long tool life.

The machining technology is selected from the machine's database, and then the grinding wheel is clamped and work can start. The process takes place fully automatically, and the only thing left to do is remove the ready-profiled grinding wheel from the chuck. It couldn't be simpler or more flexible. In cooperation with ITS-Technologies in Oberndorf am Neckar, various rotary spindles have already been developed with the most widely used chuck seats so that grinding wheels of many

different sizes and with conventional chuck interfaces can be efficiently processed. Mitsubishi Electric and ITS-Technologies have wide-ranging expertise and plenty of experience in this sector.

Even unmanned and fully automated operation if desired

The process as such is defined and takes place dependably on the unmanned wire EDM machine. This means that a basic precondition for

the further automation of this machining technology has been satisfied. Here, again, Mitsubishi Electric has the associated expertise and also the requisite products of its own, e.g. the robots of the MELFA series. Many fully automated machining cells that also dress grinding wheels in self-controlled operation are already in operation.

Unmanned operation with robots



Advantages

Technical advantages

- Reproducible dressing result
- Complex geometries can be produced, hence fewer grinding wheels needed in some cases
- Intricate structures are easily produced – extension of the scope for grinding

Economic advantages

- Up to 280 % increase in grinding productivity
- Up to 390 % increase in grinding tool life
- Reduction in the number of required grinding wheels
- Reduction in the number of required grinding machines
- Significant competitive edge due to lower costs

Fully automatic process.

DiamondCell with its components

DiamondCell as a single machine, automated with a handling robot and magazine in different configurations – the solution for total autonomy. Autonomous running time depends on the size of the magazine.

Featuring inbuilt flexibility, the production cell can be used in further configurations for a variety of components in need of erosion.



Ing. Lang & Menke GmbH

Speed and accuracy.

MV2400R Connect in the company's own toolshop safeguard deliveries at short notice.

Working mainly for the automotive industry, Ing. Lang & Menke GmbH in Hemer produces small stamped and formed parts in large series. For samples and prototypes as well as for the flexible making of progressive and bending tools at short notice, the company has its in-house toolshop. The company thus also preserves and safeguards its own know-how for the required production technologies.

The product range of the stamping shop in Hemer includes form springs, spring washers, locking elements for screw connections, bearing plates, housings for small electric motors, holders and springs for carbon brushes as well as contact and assembly elements. These components are manufactured from standard and stainless steels and non-ferrous metals with a sheet thickness of up to 2.5 mm. The company handles large series of several million components per year, produced from the strip on high-output automatic stamping and

forming presses. "As a relatively small supplier with currently 240 employees, we are called upon to act flexibly. For our customers – almost all European automotive component suppliers – we have to ensure that we can deliver even changing batch sizes on schedule straight to the assembly lines on the just-in-time principle," says Toolshop Manager Michael Schmitten in Hemer. Stamping and forming operations, he continues, therefore have a high degree of vertical integration. Included in this are the company's own hardening shop and



Changing batch sizes just-in-time.



Lang & Menke produces small sheet metal parts in large series.



Up to several million components are produced at Lang & Menke each year.



heat treatment as well as its own toolmaking and design activities. Components are optimised in close cooperation with customers and the production specialists within the company. This relates to both technical and economic issues, says Schmitten. Based on the experience gained over many years in stamping and forming, the specialists in Hemer design functional components that can be produced at minimum cost as simply and reliably as possible in large series on automatic stamping and forming presses with high process security.

Wide-ranging expertise

"From design engineering and the production of samples, prototypes and tools up through to large-scale series production, our specialists master all production steps. Our wide-ranging expertise enables us to work with customers in

developing high-grade components and cost-effectively producing up to several million components a year in series," Schmitten reports. To minimise the time from development and design through to the production-ready component and thus to be able to react flexibly to enquiries, the stamping and forming operations in Hemer have their own sample production and toolmaking activities. This is where prototypes for stamping and forming tools are produced and refined for series production. Thanks to the new EDM systems, it is possible to erode complete tools and thus



Unassuming stamped parts perform important electrical, electronic and braking functions in cars.

reduce the amount of EDM work farmed out.

Internal repairs

"So that we can produce just-in-time, our automatic stamping and forming presses must achieve maximum availability. This naturally applies particularly to the tools," Schmitten explains. That's why the in-house toolshop handles the maintenance and repair of the numerous stamping and forming tools. This keeps distances as short as possible and ensures that faulty and worn tools are repaired and made available again for production at short notice. The main tasks involve reworking the cutting and forming parts – tool inserts – or producing new ones as replacements. They often have to have narrow grooves, geometries with minimal radii and sharp-edged penetrations with cutting contours. The technicians in the toolshop,

Schmitt reports, not only machine with turning, milling and grinding operations, but often also with wire EDM. Some years ago, the company purchased for this purpose two wire EDM machine from a different manufacturer. However, due to the increas-

ingly good to very good order situation in production in 2018 and 2019, its capacity was no longer sufficient to cope with all the pending repairs at short notice.

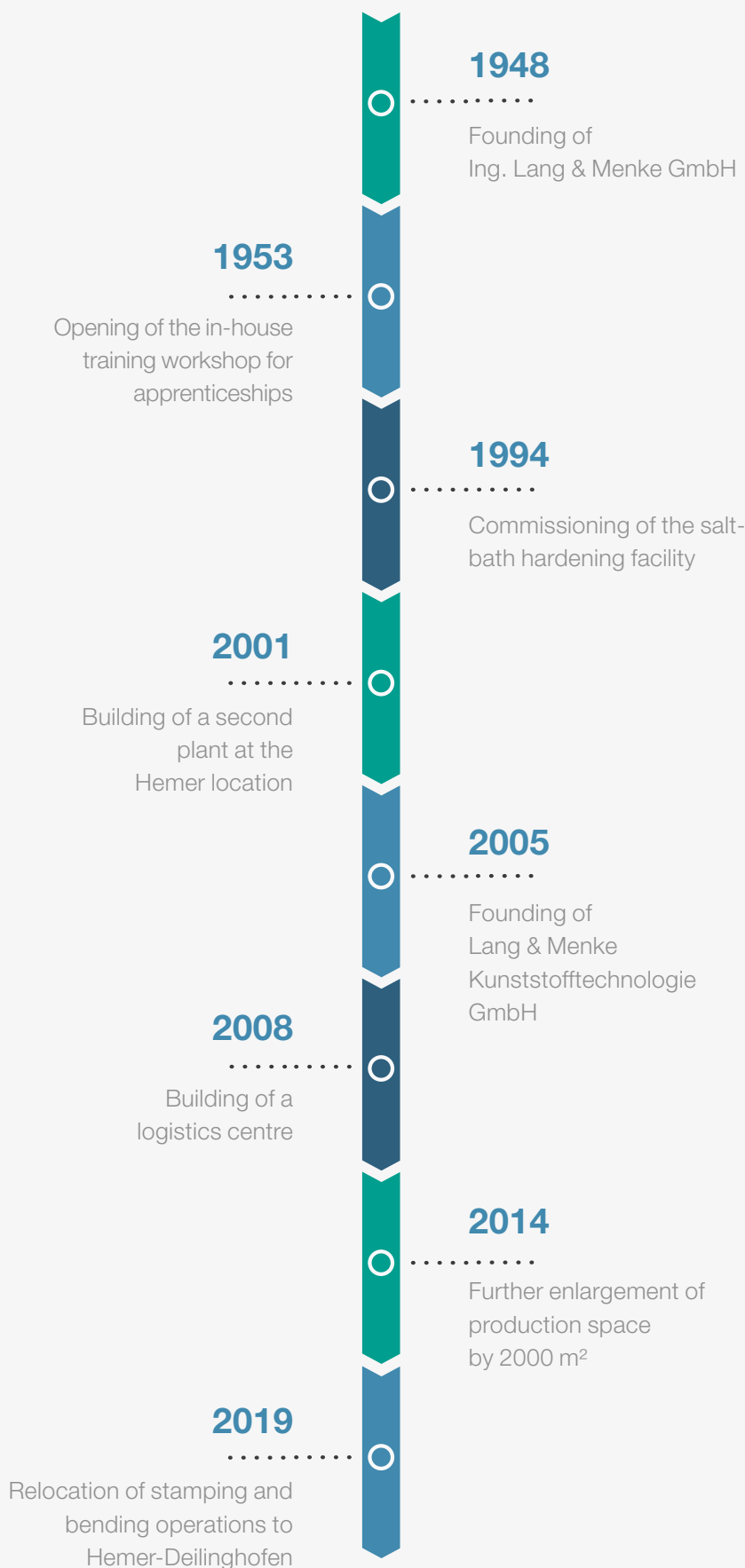


Outsourcing the machining of stamping and forming tools to subcontractors was not considered an alternative. "Awarding contracts specifically for repair work is problematic. On the one hand, it requires a great deal of logistical planning. At the same time, it is almost impossible to achieve short throughput times even with great effort. However, to maintain production for punctual deliveries, things always have to be done quickly," says Schmitt, adding: "We also want to keep our wire EDM expertise in-house." This is why, he continues, the company decided to invest in additional wire EDM machines in 2019. The toolmaking facilities were extended.

The right choice

Before taking their investment decision, the specialists gathered information on the currently available technologies and machines for wire EDM. On the basis of recommendations, they concentrated on machines from Mitsubishi Electric. The Japanese manufacturer's experts provided detailed information and advice in Ratingen. "Above all, the

Over 70 years of success





Maximum precision counts in the production of replacement parts for stamping tools.

practical demonstrations in the Technology Center in Ratingen, which our toolmaking specialists attended, were highly impressive in all respects," Schmitten points out. Detailed analyses revealed that the wire EDM machines from Mitsubishi Electric displayed the optimum cost-benefit ratio. The programmers at Lang & Menke were soon persuaded by the extremely user-friendly and straightforward programming and operating principle of the new control generation. "The choice of the MV2400R Connect wire EDM machines from Mitsubishi Electric has proven to be the best decision in recent years," Schmitten stresses.

Quickly up and running

This decision was subsequently vindicated by the rapid pace of installation and commissioning through to the first produced spare parts for stamping tools. This took only four days, Schmitten adds. This was a particularly positive surprise for him, as his past experience of other machine manufacturers has been anything near as good. The specialists in the toolshop in Hemer had already undergone initial training during commissioning and learned about the machines' functions. They found Mitsubishi Electric's service technicians to be highly competent, skilled and helpful. In face-to-face meetings they impart the necessary specialist knowledge as well as tips and tricks for daily practice. Further, five-day training courses in Ratingen then provided the toolmaking staff with the necessary skills to work reliably and productively with the wire EDM machines.

Greater speed ...

In Schmitten's view, a particular

advantage of the MV2400R Connect machines over the wire EDM previously used is the significantly faster throughput, making it possible to respond very flexibly and quickly to demands for the repair of tools at short notice. Programming simplicity, Schmitten believes, is one contributory factor. At Lang & Menke, the NC programs for the wire EDM machines are generated externally on the PEPS programming system from Camtek. The database for material and geometry parameters integrated there is easily connected to the control of the wire EDM machines. The NC data are transmitted directly via data line. At the machines, the current control system shows the entered parameters and operating elements clearly and comprehensibly on the large touch screen. The machine operators have found that the MV2400R Connect wire EDM machines can also be mechanically tooled and set up quickly and conveniently. This is

ensured by the readily accessible workspace. During cutting, they operate up to 15 per cent faster than the previously used wire EDM machine. The extremely reliable automatic wire threader also contributes to high productivity and prevents unnecessary stoppages. At Lang & Menke, the two MV2400R Connects mainly run in two shifts, as the machine operators often have to retool to produce changing spare parts. Thanks to the reliable wire threader, they can operate several machines at once. In the case of complex tool

inserts with long cutting paths, they allow the machines to work uninterrupted into a third shift. Even then, the dependable wire threader keeps the wire EDM machines running productively without interruption, contributing significantly to rapid throughput and maximum flexibility.

... and accuracy

For the toolmakers in Hemer, the accuracy of the wire cutting machines is also a decisive factor. "Especially when producing spare parts, the focus is on accuracy. This has a large



Thanks to the readily accessible workspace and neatly arranged touch screen, toolmakers always have everything under control.

On Mitsubishi Electric's wire EDM machines, we effortlessly achieve accuracies of less than a hundredth of a millimetre. That's what makes these machines so valuable to us.

*Michael Schmitten,
Toolshop Manager*



Producing high-quality sheet metal parts in large series requires complex progressive dies.



The freely movable control panel and parameter setting on the touch screen ensure rapid set-up.

bearing on the function of the repaired tools and the quality of the components produced,” Schmitt explains. Multiple stamping and forming tools have to be machined to absolutely identical tolerances. Even components of large series produced in individual batches on different stamping machines and tools must not differ from each other and must exhibit the same component tolerances and properties. In addition, replacement parts for worn tool components must fit exactly into the surrounding components of the existing tools. “To ensure this, repeatability in the production of spare parts is crucial. On Mitsubishi Electric’s wire EDM machines, we effortlessly achieve accuracies of less than a hundredth of a millimetre. That’s what makes these machines so valuable to us,” Schmitt emphasises. Thanks to the high precision and quality of the wire-cut components, the toolmakers in

Hemer minimise the amount of reworking required. “In this way, the MV2400R Connect wire EDM machines contribute significantly to productive and flexible operations in the repair of stamping and forming tools,” says Schmitt summing up the benefits. At Lang & Menke in Hemer, all the specialists are so impressed by Mitsubishi Electric’s future-oriented and mature technology that they invested in a third MV2400R Connect at the beginning of 2020.

Ing. Lang & Menke GmbH

Founding year

1948

Managing director

Dr. Martin Radtke

Employees

240

Core business

Production of high-quality stamped and formed parts from up to 2.5 mm thick sheet metal in large series (mainly for the automotive industry), development and design of components, and stamping and forming tools as well as in-house toolmaking for prototypes, samples and repairs, plus, since 2005, the injection moulding of composite metal-plastic parts at Lang & Menke Kunststofftechnologie GmbH

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Rapid throughput and maximum flexibility.



The choice of the **MV2400R Connect wire EDM** machines from **Mitsubishi Electric** has proven to be **the best decision** in recent years.

Michael Schmitten, Toolshop Manager



The hallowed tradition of the female entertainer.



The mysterious world of the Geisha.

Fine artist or sex worker?

Japan's traditional culture is represented above all by kabuki theatre with its rich costumes, the samurai and the geisha. Anyone who travels to the Land of the Rising Sun shouldn't therefore pass up the opportunity to visit smaller towns, far removed from the modern world of anime and cosplay in Tokyo. In Kyoto, for example, the hallowed tradition of the female entertainer is still appreciated and alive. This is where you can also test Western conceptions of the geisha as a lady of pleasure – a definition that does not do justice to such women, particularly today.



So what is the geisha really?

According to the superficial interpretation in the West, the geisha is usually regarded as the Japanese equivalent of the prostitute. Such a conception, however, is far removed from the reality of these women. Literally translated, “geisha” means “person of the arts”. This term clearly indicates that the female entertainer possesses skills that have little to do with sexual services. Geisha culture has its origins in the 17th and 18th centuries when it was in vogue to hire convivial women for an amusing evening. What are probably the best-known geishas come from the Meiji period, the period in which Japan underwent renewal under the imperial dynasty of the same name.


A geisha has to master a number of arts. One of her most important tasks is to serve tea, for which she should, among other things, be aware of the distinctive features of and subtle differences between the various matcha teas. She also places other beverages and foods on the table. This is how she ensures the bodily well-being of the customer, while also keeping the conversation going, making intelligent comments and displaying discussion skills. She should also be able to sing and play traditional Japanese instruments like the shamisen. This lute-like instrument is a classic feature of a private evening with a geisha, although it is also used increasingly in connection

with larger shows, e.g. in Kyoto’s traditional Gion quarter. Most female entertainers are also capable of playing the 13-string koto zither and thus charm their customers.

Accessories and appearance

In addition to musical instruments, there are a number of accessories typical of the geisha. The most obvious is of course her clothing, by which she is immediately identified. Each geisha wears a richly ornamented kimono with an “obi”, a heavy, wide belt that holds the silken robe together. The types and forms of the belt can be very different and also differ according to region and occasion. Most geishas choose for themselves the formal version. With its very festive appearance and a huge width of 68 cm, the “maru obi”, for example, is a typical item of the geisha’s clothing. This obi also symbolises the historic fashion of the Meiji period and, with its enormous weight, is a real challenge for the wearer. These days, the Nagoya obi is very popular with geishas – this belt is only half as wide as the maru and is very widespread particularly in modern Tokyo.

On their feet, the geisha wears the narrow “geta” sandals made of wood, slipping her toes into a thong much like that of a flip-flop. Very conspicuous are the wooden



blocks on the soles that, in their modern version, can be up to 10 cm high. The more experienced the geisha, the higher the shoes she usually wears. Female entertainers still in training, for example, usually choose the “pokkuri geta”. In Kyoto, these shoes made of chestnut or fir are also known as “okobo”.

Her hair is either artistically pinned up or replaced with a wig. The hair is usually held together with elegant sticks. Brooches, pearl necklaces and blossoms are also attached. From the hair ornamentation known as “kanzashi” one can tell how advanced the geisha is in her training. Each year the material changes from lacquered wood to tortoiseshell, silk, silver and gold. Special kanzashi is used on certain festive occasions like the cherry blossom season or the New Year.

The face of the geisha is creamed with a thick, white paste known as “oshiroi”. This tradition goes back to the time when there was no electric lighting and women wanted to be clearly visible in candlelight. In addition, the cream looks like a kind of mask that completes the overall transformation. As soon as the geisha has made up her



Then as now.



face, she identifies fully with her role. The bright red lipstick contrasts sharply with the white paste.

Japan's geisha culture today

It was the geisha of the past that also served more as a prostitute. In the Edo period from circa 1603 to 1868, there was no clear division between entertainment and sexual services. Although by decree geishas could not advertise as prostitutes or show too much femininity, conversation and song often culminated in sexual acts. Eroticism has since been largely banished from the geisha's profession. Anyone who hires a geisha today is looking for conversation, dance and song. In many tea houses women are employed to enchant holidaymakers.

The geisha culture is still very active today in Kyoto, the old imperial capital. If you stroll through the Gion district, you'll see many of the women walking the narrow streets in the evening hours. The Hanamikoji Boulevard is a hotspot for geishas. The women here are often referred to as "geiko" in the local dialect. The best place to gain an impression of this unique tradition is one of the tea houses, e.g. "machiya" or "ochaya". After a public performance, it is possible to withdraw into a separate room to have oneself entertained by the geisha.

The Gion district in Kyoto at night





Flexible and cost-effective production.

Jehle AG

Well on the way to the top.

Toolmaking benefits from precision wire erosion for a superlative surface finish.

Jehle AG in Etzgen, Switzerland, produces stamped and formed parts as well as fully assembled components in medium to large series for the automotive, electrical and construction industries all over the world. The company's own, recently extensively modernised toolmaking department has made a significant contribution to its success. Here, MP2400 Connect wire EDM systems ensure faster throughput and flexible, cost-effective production.

The new technology centre
in Etzgen



From coil to component: Jehle manufactures sheet metal parts in large series.

The specialists in Etzgen develop, design and make stamping and forming tools, not only for their own production facilities, but also as subcontractors for external customers. The spectrum ranges from simple stamping, deep-drawing and bending tools to highly complex progressive dies, transfer tools and injection moulds. In addition, the tool- and mouldmakers in Etzgen produce tools with special functions, such as integrated tapping or devices for feeding and riveting bolts. They also make individual fixtures and gauges.

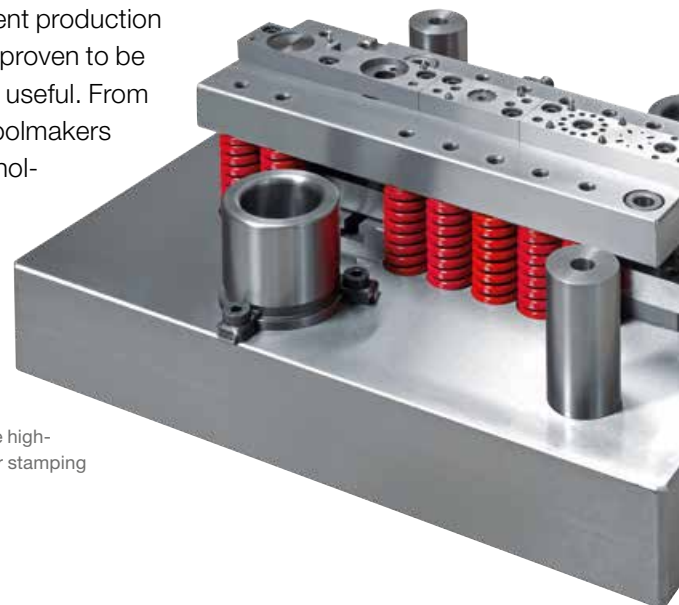
With their ultra-modern technology centre for tool- and mouldmaking, which was enlarged a few months ago, they want to move a step closer to their goal of becoming one of the top toolmakers in Europe. Helmut Sautermeister, head of tool- and mouldmaking, explains: "We are one of the few companies to offer comprehensive services, from the idea through to the tested and adjusted tool." For example, the Swiss experts advise the customer on the possible production of a component right from the concept stage. Together with their clients, they optimise not only the geometry of the components but also the production steps and the forming tools designed for them. In doing so, they benefit from the extensive experience gained from their own series production, part of which is located directly adjacent to the technology centre in Etzgen. This enables them to find the best possible strategies for the highly cost-effective and reliable production of components in large series.

With high vertical integration to top quality

Using modern CAD systems and CAE software, the specialists design and dimension the forming tools and injection moulds and are able to simulate production

processes and virtually check and optimise tool function. They then design the required parts and program the production processes. When making and building complex forming tools, the experts in Etzgen benefit from their very high vertical integration. This ranges from sawing the blanks and all machining technologies to heat and surface treatment. In addition, the tools are assembled, adjusted and tested at Jehle to ensure their reliable function. "It is this high level of vertical integration in particular that ensures our international recognition as a leading toolmaker. With our high-quality and dependable forming tools, we contribute significantly to ensuring that production companies – like our own series production – operate efficiently and profitably," says Sautermeister.

Its close cooperation with its own adjacent production facility has proven to be particularly useful. From there the toolmakers in the technology centre



High-speed presses require high-quality tools for stamping and forming.

Success due to high vertical integration.

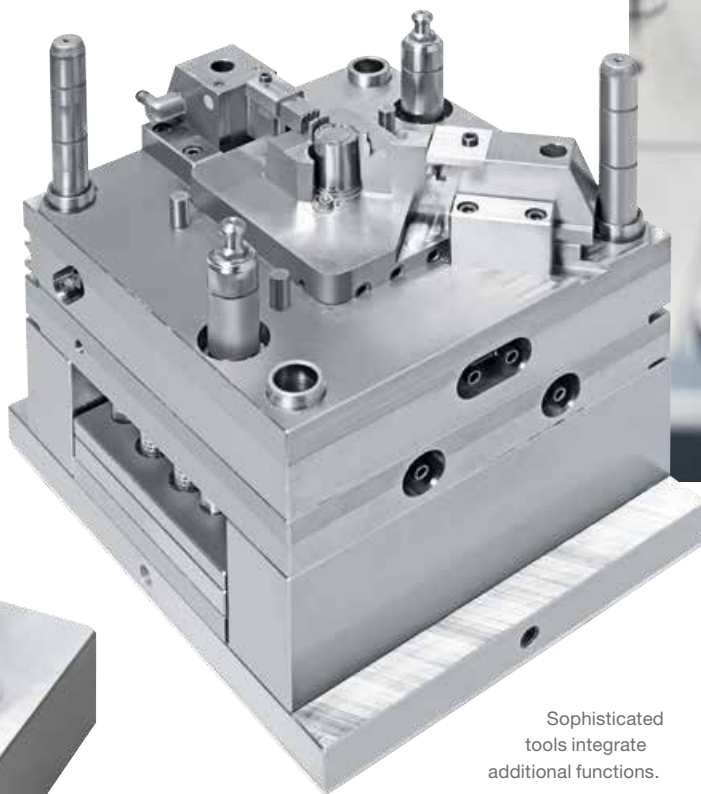
receive direct feedback on the function, reliability and service life of the stamping and forming tools. Other services provided by the tool-making department at Jehle AG naturally include repairing tools and rehabilitating them for series production as quickly as possible.

Optimised organisation, structures and production processes

At the recently built and opened technology centre in Etzgen, the experts have largely optimised their entire production sequences and processes. This includes the digitisation of numerous internal processes from design and order planning, through component machining and post-treatment to the assembly, adjustment and acceptance of complete tools, Sautermeister explains. The toolmakers have also significantly improved internal materials



Complex workpieces are produced on multi-stage forming tools in a single sequence.



Sophisticated tools integrate additional functions.

flow. The components undergoing production now pass almost linearly through all the necessary process stations from the blank and the ready-to-install component through to the assembly of the complete tool. "On moving into the new building, we invested in additional advanced

machines and also replaced some of the tried-and-tested ones," Sautermeister explains. In this connection, Jehle AG also purchased two MP2400 Connect wire EDM systems from Mitsubishi Electric, choosing this manufacturer because of their excellent experience gained to date. The Swiss toolmakers appreciate the reliable operation of the machines and the professional service of the Japanese manufacturer and its European subsidiaries, which is always available at short notice.

From a garage business to a globally recognised industrial partner

1947



Josef Jehle founded his company in 1947 as a one-man business, already producing stamping tools and metal goods.

1962

In 1962 and 1963 the company became an AG, or Swiss public limited company, and moved with its then 20 employees for the first time into a specially built industrial building with over 900 m² of floor space. A few years later, the second generation in the shape of Ulrich Jehle joined the family business and 20 years later considerably enlarged the production and storage areas.

1990



In the course of the 1990s, the company obtained numerous certifications, including ISO 9001, and, post-millennium, Jehle AG took over a metal hardware producer and a stamping facility with its own toolshop. By taking over a specialised trading company, the company bolstered its position particularly as a supplier to the automotive industry.

2012



Michael and Raphael Jehle joined the company in 2012 to continue the family business in the third generation.

Aargau Enterprise Award 2012 – winner in the category “industrial and production companies with up to 250 employees”

200
employees



2018



In 2018, Jehle AG expanded its tool- and mouldmaking activities at its current headquarters in Etzgen near the German border by opening its innovative technology centre.

The company, with its two divisions of tool- and mouldmaking and series production, is today an internationally respected development and production partner in the automotive and electrical industries, in the construction sector and in machine manufacture.

On more than 50 mechanical, hydraulic and servo-electric presses with a pressing force of up to 6300 kN, the Swiss suppliers produce components in large series from 0.2 to 12 mm thick and up to 800 mm wide sheet and plate. They can also produce ready-to-install components using a variety of welding processes, riveting, all machining processes, heat and surface treatments and assembly. With the aid of its comprehensive logistical services, these are supplied to customers all over the world.

From Etzgen to all corners of the world.

Innovative technology accelerates throughput

The two MP2400 Connect wire EDM systems were chosen for several reasons. Fatih Cakir, production manager for tool- and mouldmaking in Etzgen, points out that the large workspace of 600 x 400 x 310 mm enables the company to handle the complete range of components with great flexibility. In addition, the tool-makers can cut smaller components in multiple clampings or several components from a larger plate. The latter is mainly performed during unattended night shifts. "For this, the MP2400 Connect has unbeatable advantages. It runs extremely reliably and automatically and reliably threads



When it comes to stamping tools for automatic high-output forming machines, superlative precision is what counts.

*Of all the machines we assessed, the wire-cutting machines of the MP series offer the **best combination of high accuracy and surface quality.***

*Helmut Sautermeister,
head of tool- and mouldmaking*

the wire, even in difficult situations, such as plate of different thicknesses. This enables the wire EDM units to operate productively around the clock," Cakir reports.

In addition, he explains another extremely important feature: "On the MP2400 Connect wire EDM systems, in conjunction with the fine finishing generator, we can program the cutting speeds so that we can cut highly precise geometries to an outstanding surface finish with roughnesses of Ra 0.1 µm. Although this slightly prolongs the

wire-cutting process, it significantly reduces the time required to polish the surfaces to about a third. This means that we can now work much more efficiently overall with the MP2400 Connect wire EDMs. In addition, we achieve greater flexibility thanks to faster throughput."

Sautermeister adds: "Of all the machines we assessed, the wire-cutting machines of the MP series offer the best combination of high accuracy and surface quality."

To enable the two MP2400 Connect in Etzgen to operate



The intuitive control system with its large touch screen and user interface is comparable to current smartphones.

For this, the MP2400 Connect has unbeatable advantages. It runs extremely reliably and automatically and reliably threads the wire, even in difficult situations, such as plate of different thicknesses.

*Fatih Cakir,
production manager for tool- and mouldmaking*

unattended, they have additional wire stations for 20 kg wire spools. The tool- and mouldmakers in Etzgen usually use 0.15 to 0.25 mm wire and cut components from 30 to 70 mm thick plate of conventional tool steels for cold and hot work and, more rarely, of carbide. A function extension facilitates cuts at angles of up to 45° – for tapered edges for example. To minimise downtime, the machines are equipped with the additional ‘connect’ function enabling the mcAnywhere Contact app to send the operator a

mobile phone text message to report malfunctions during unsupervised shifts.

Staff prefer advanced operating and programming interface

Skilled operatives were able to set up and operate the new MP2400 Connect wire EDM machines in a very short time, Cakir confirms. This is made possible by operation at the large-format touch screen, the handling of which is

Lower production costs due to pioneering innovation.



comparable to that of conventional smartphones. It proves to be particularly straightforward and user-friendly for skilled workers undergoing training and especially for apprentices. The features of the wire EDM system are self-explanatory. Usually the toolmakers in Etzgen use the external CAD/CAM system VISI to design and program the components being cut. The machine operator receives the data via a data line, supplements it with a number of cutting and machine parameters, sets up the wire EDM and starts the production process. Single items calling for frequent set-up and retooling are machined by the Swiss toolmakers in supervised shifts. Smaller series and components that have already been reliably cut multiple times as repeat parts can be machined by the wire erosion systems in unattended shifts overnight and at weekends.

Automation minimises non-productive time

Another advantage of Mitsubishi Electric's machines, says Sautermeister, is that they are amenable to partial or even complete future automation. The toolmakers in Etzgen, Switzerland, have already significantly reduced non-productive periods and downtime. Plate from which several components are to be cut is loaded on change pallets outside the wire EDM machines. During retooling, the machine operator merely changes the entire pallet. This is done quickly and reliably. Elaborate, time-consuming and labour-intensive set-up and adjustment at the machine are no longer necessary. Sautermeister can even imagine robots changing the pallets for his wire EDM machines in the future. "What we really appreciate about the Japanese manufacturer is that it is open to such ideas and approaches that enable us to machine more cost-effectively," he adds.

Jehle AG

Founding year

1947

Managing director

Raphael Jehle

Employees

200

Core business

Efficient, largely automated production of sheet metal components in large series for the automotive and electrical industries, the construction sector and machine manufacture

Development, production, assembly, provision and maintenance of forming tools and injection moulds for internal needs and for external customers

Contact

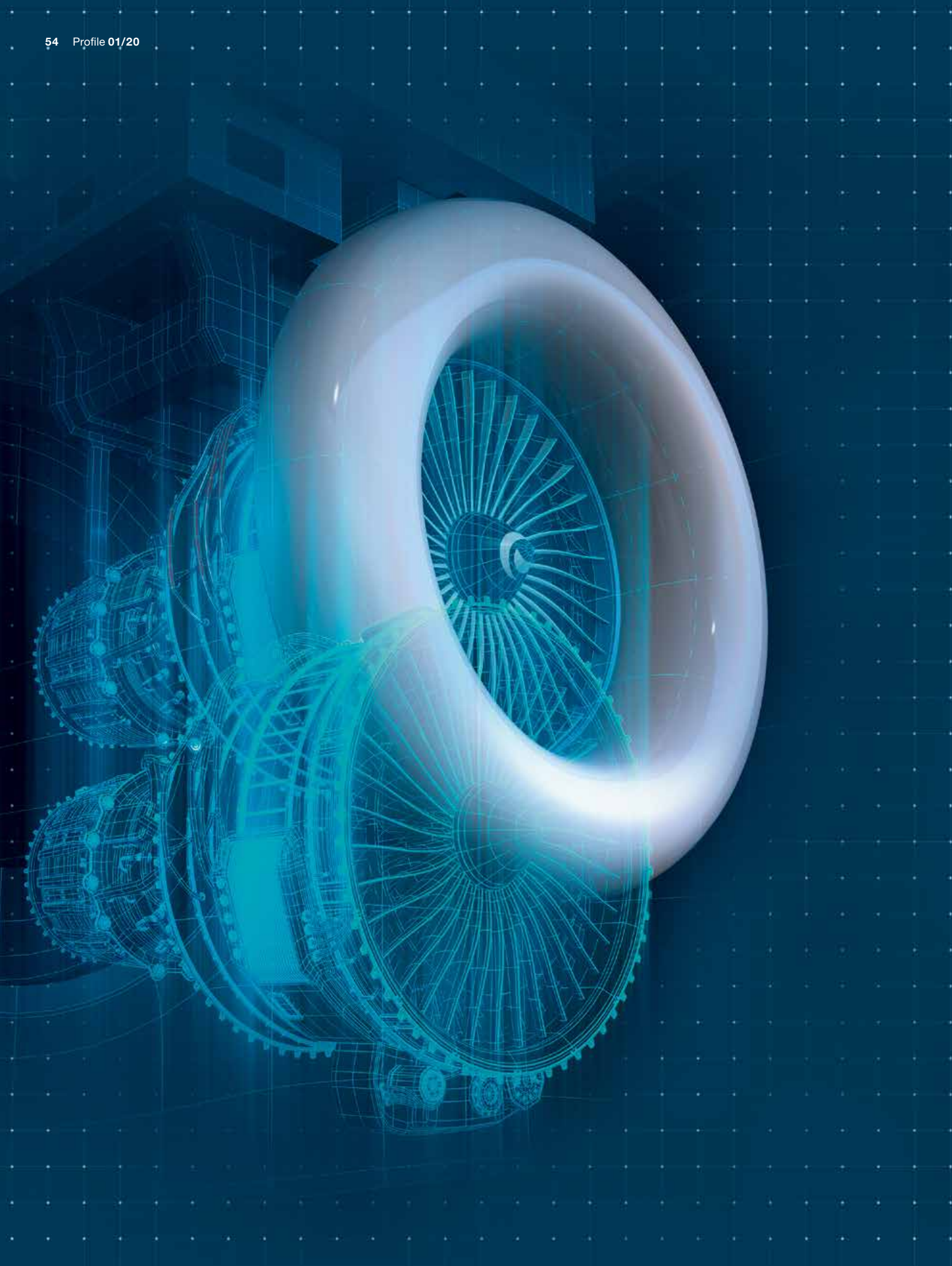
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A tailor-made, virtual one-off.

Top topic

There's no such thing as a digital twin off the peg.

The use of virtual technologies ensures rapid commissioning, high transparency and process reliability. This enhances production flexibility and boosts competitiveness. In the course of the digital transformation borne by 'Industry 4.0', the digital twin is initiating a paradigm shift in production and delivering significant added value. The digital twin is a custom-made, virtual one-off and constitutes the counterpart to a real object. A multitude of digital data and their interrelationships as well as specific algorithms are used for the precise functional representation of a potential or already existing object. This can be a product, production process, installation – such as a machine tool – or a combination of production islands through to a complete production plant. The digital twin is thus the methodological approach to optimising a real object across all phases of the life-cycle, starting with 'time-to-market' and extending to efficient product recycling and system retrofits.

It would be too restrictive to confine the term 'digital twin' to an unambiguous definition. The varying requirements and individual viewpoints along with the multitude of possible applications would be too limiting for this relatively young technology trend. This lack of clarity therefore leaves room for discussion, expansion and application-oriented evolution.

Nevertheless, there is a common understanding of the digital twin in that it always represents a digital replica extending to a 3D model capable of simulating a real object. It contains data, details such as performance characteristics and properties and their interactions with each other. In addition, there are algorithms, behavioural and

simulation models for the most appropriate representation of the real object in its specific context. For example, certain behavioural patterns can be derived for a planned or already existing object from the machining cycles of a CNC machining centre. 3D visualisations make it easier for users to gain an understanding of a machine's 'inner

workings' – of a drive spindle, for example. The model thus allows the designer to be extremely flexible in sounding out the scope for adaptation to individual requirements:

Digital image permits specific viewpoints

A digital twin is reserved not only for developers, but is also available on dashboards for plant and works managers and on mobile devices for service personnel. In terms of their needs, these users can make use of a specific set of tools from the shared digital modular system, the digital twin in question. For example, a design engineer tests the performance of a newly developed machine not on the realised prototype, but in the digital development environment. Collisions of a tool with the machine body, for example, can be ruled out from the outset. Similarly, commissioning already takes place in virtual space. On the basis of prior simulations and behavioural analyses, those responsible receive early notifications of possible malfunctions on their control panels or machine displays in the later, real operating situation. This can be an anticipated material bottleneck, foreseeable wear of a tool, or declining product quality. On the basis of the available behavioural analyses, preventive maintenance with servicing and maintenance plans is advisable.

Neuralgic areas or critical points have to be tracked down and improved. On an already existing real object, these can be clearly revealed in the post-modelling or even at the design stage through simulation. Starting from the product, a clear focus is placed on what is usually a multi-stage production process. All

relevant process parameters have to be recorded exactly. To complete the process, the data now available via sensors also have to be included. These are made available by such smart devices as digital servo amplifiers, PLC controllers and robots. The aggregation of process data helps to consolidate and condense the resultant large volume of data. This is done by accounting for their mutual interactions, e.g. in terms of performance characteristics, and enables the process to be depicted in IT models capable of simulation. But beyond this, it is worthwhile analysing the entire value chain in order to identify potential for improvement and thus maximise optimisation. To make a comparative assessment possible, the definition of the relevant key performance data is advisable. This information is available in real time throughout the entire value creation process. If deviations occur, a targeted response can be initiated immediately.

Standardised open platform forms the basis

The achievement of such objectives requires the active processing of what are always current and high-quality data. Against this background, an enormously large volume of data is generated. Established IT systems such as data pools like big data and clouds, product life-cycle management (PLM), ERP for the provision of product master data, the MES system for process data, the CAD system for 3D visualisation, and the CAD/CAM system for determining NC runtimes can be used for recording, processing, administration and transfer. A major development step in the context of Industry

4.0 and the IIoT efforts (Industrial Internet of Things) aims to create a standardised, open platform. On this basis, it is possible to define uniform interfaces for interaction between digital twins. The product, tool and machine can be brought into interaction and analysed. Cross-manufacturer, uniform digital descriptions facilitate this, enabling a single user to use several digital twins from different manufacturers that communicate bidirectionally with each other. In addition, the aim is to achieve continuity so that individual digital twins along the respective value chains can be combined to form a so-called digital thread. Such a common thread is used for real-time evaluations, and corrections are made in interaction between digital twins and real twins with the aim of achieving the possible optimum.

The digital twin creates new prospects

On no account does the digital twin have to be the 'first-born'. It can also be transferred from the real world to the digital world. The scale of the digital image being developed depends on the demarcation of functionalities, properties and the degree of complexity. This step only makes sense, of course, if there is an appropriate economic interest. Such considerations may arise, for example, if an investment in machinery fails to yield the expected payback. Here, the digital twin is suitable for effective analysis or causal research and for testing alternative solutions via simulation in the virtual world. It can also be used to deal with repeated faulty production or unforeseen machine downtimes, so that appropriate targeted measures

can be taken in real operations.

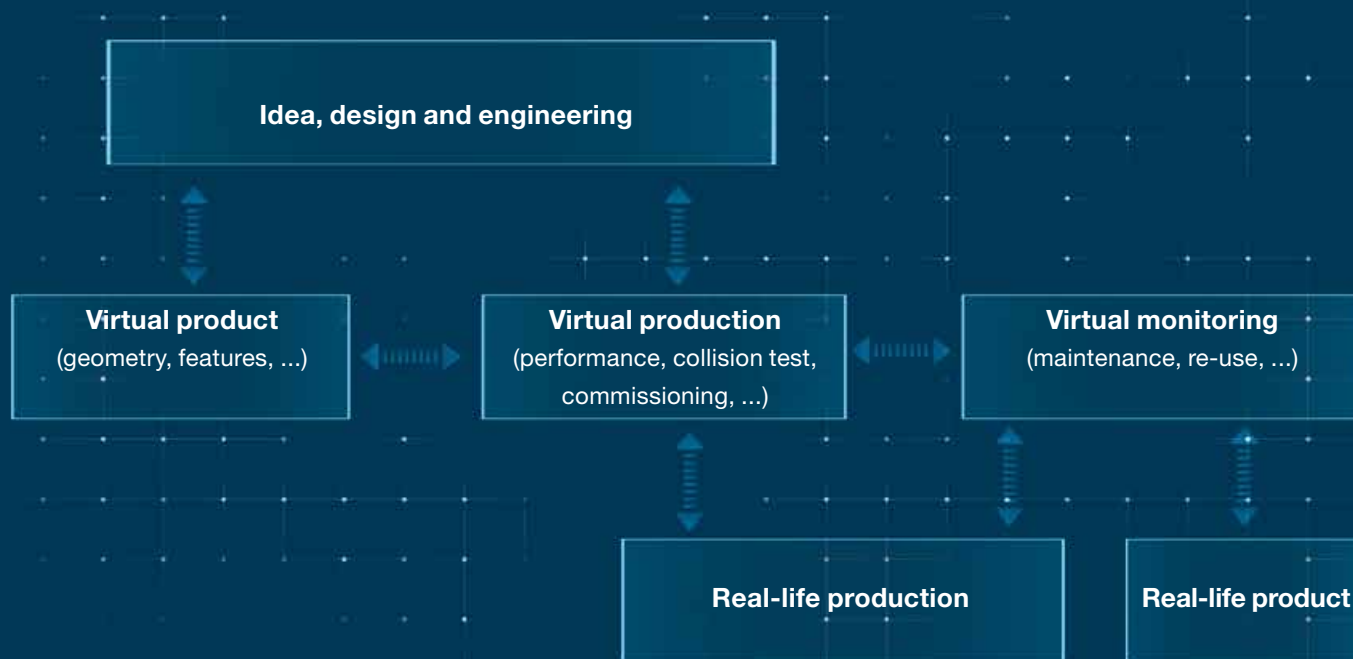
Other promising application scenarios arise, for example, when a machine tool manufacturer launches a new machine generation and has a corresponding digital twin. This can act as a digital master and take up the machines on the market as a

digital fleet – provided the users of these installed machines agree to interact with the manufacturer's digital master. This approach can result in a powerful economic impact with great efficiency for all parties involved. In individual cases, the manufacturer's service technicians can, for example, obtain an overview of a malfunction

and propose suitable measures. In addition, it is possible for the manufacturer to evaluate certain patterns of machine behaviour from overall customer evaluations and contribute to improvements.

The technology of the digital twin represents a major milestone in the

The digital twin designed, tested, monitored, corrected and optimised



production world. The constant evaluation of processes yields continuous learning processes and ever better models, hypotheses and forecasts. But despite all the euphoria and possible self-regulating mechanisms, it is, in terms of automatic correction, first of all a highly efficient, intelligent IT tool in

networked applications. It is up to the decision-makers to draw the right conclusions from this and to implement their findings. In general, the use of the digital twin must not be limited to the design, commissioning and production stages, but can also include other areas such as the control of business management

processes, spare parts procurement, materials management and service, as well as staff training.

Ets. Boutroué



Traditional engraving with advanced technology.



Symbiosis

of high tech and outstanding workmanship.

Excellence can be found not only in the field of modern industrial production, but also in many traditional crafts and trades. But technological change is also making itself felt here. The example of Boutroué, which has succeeded in melding traditional engraving with advanced technology, shows how this can be achieved. In the field of wire erosion, it has been consistently using Mitsubishi Electric systems since 2006.

"Our services are called for, for example, when it comes to marking top products for the luxury goods, jewellery and watchmaking industries, for instrument making or fashion accessories," says Laurent Savonneau, owner of Établissements Boutroué in Paris. The tradition-steeped firm, which probably dates back to the time of the French Revolution, is the last remaining master engraver in Paris. Some of its customers are world-famous companies from such sectors as fashion and

fashion accessories, goldsmiths, instrument makers, perfumers, and makers of wines



In 2014, Boutroué was named a Company of Living Heritage by Emmanuel Macron, then Minister of Economic Affairs, with 200 other companies.

and spirits. Boutroué also makes dies for medals and coins, sports trophies, metal labels for high-quality products as well as emblems, stamps, punches for jewellers, embossing stamps for sketch pads, branding irons, prototypes and parts for the luxury goods industry – from machining through to finishing. In addition to meeting the highest standards of durability and quality, what all these applications have in common is that they also have to satisfy exceptionally exacting aesthetic requirements.

Our services are called for, for example, when it comes to marking top-quality products in arts & crafts, fashion and instrument making.

Laurent Savonneau, owner of Établissements Boutroué

Modern technology combats manpower shortages and tight deadlines

"As with many traditional crafts, the art of engraving is gradually dying out, so that we're barely able to find suitable staff," says Savonneau with regret.

Moreover, in the fashion sector, for example, the deadlines are incredibly tight, he adds. When accessories are shown at fashion shows, the first orders come in within hours and then have to be completed as quickly as possible. This is why the company today consistently draws on state-of-the-art technology. The machine shop is therefore chock-a-block with highly advanced CNC-controlled machines such as milling machines, lathes, laser-cutting and engraving systems, EDM systems and other equipment for the fast and efficient machining of metal components. Thanks to this transformation, the firm has succeeded not only in consolidating its traditional customer base, but also in attracting new customers in

The company with a long tradition.



Laurent Savonneau is visibly proud of his modern wire EDM systems.

It didn't take us very long to choose Mitsubishi Electric systems, as we were impressed by both the quality of the technology and the supplier's service readiness.

*Laurent Savonneau,
owner of Établissements Boutroué*

all branches of industry – from small businesses to large corporations. These require such items as precision-manufactured prototypes, die-casting and injection moulds and electrodes for die-sinking EDM. Boutroué's production is designed for small to medium-size quantities from single items to several hundred components.

Flexibility and service readiness

"Almost every customer who comes to us needs detailed advice and assistance," Savonneau adds. The issues concerned are almost always unique and often also involve aesthetics and design, calling for close attention to the customer's various ideas. Even old technology often has to be given a new lease of life with modern means, e.g. in the case of a manufacturer of elaborately embossed cutlery who needed new embossing dies. Here Boutroué was able to help by scanning old designs and using modern reverse engineering methods to create new embossing dies for production. Other tasks involve high-quality jewellery components for goldsmiths, an area in which Boutroué has meanwhile made a name for itself as a specialist in the electrical discharge machining of precious metals. The firm therefore attaches great importance to wire EDM.

Choosing Mitsubishi Electric wire-cutting technology

"We had our first contact with Boutroué in 2006," recalls Mathieu Ogier, sales engineer at Mitsubishi Electric's sales partner Delta Machines in Morangis, France. Boutroué had been operating two wire EDM systems from other manufacturers for seven years but wasn't satisfied with them. The decisive factor was essentially

Some of the firm's customers are world-famous companies from such sectors as fashion and fashion accessories, handicrafts, instrument makers and makers of wines and spirits



that the old systems could no longer sufficiently satisfy the market's increased precision requirements, causing some jobs to be outsourced at high cost. The search for alternatives then led to talks with Delta Machines.

Quality and service readiness all-important

"It didn't then take us very long to choose Mitsubishi Electric systems, as we were impressed by both the quality of the technology and the supplier's service readiness," Savonneau reveals. An invitation to a nearby trade fair demonstration provided the opportunity to experience the systems in action, obtain comprehensive information on all features and also see parts produced with them. This live demonstration proved highly persuasive, he adds. Further questions were then clarified in several rounds of talks, including visits to users.

Two further factors played a special role in the choice. Firstly, the geographical proximity of the Morangis branch was essential as a prerequisite for rapid support in the event of a need for advice or service. Even more significant, however, was Delta Machines' willingness to take the decommissioned machines in payment and handle their marketing as part of the deal for the two systems, an FA10 and an FA20. Boutroué would not otherwise have been able to keep the disused systems in the very cramped workshop while waiting for a buyer.

Arrival of the second generation

"In 2016, because of the advances in technology, we bought new wire EDM machines and once again opted for Mitsubishi Electric," says Savonneau. With accuracies in the 1/100 mm range, the new-generation MV1200R and MV2400R systems are not only more precise than the old systems, but also feature other striking improvements such as automatic wire threading even in narrow kerfs so that production can immediately resume. This was an important factor, he claims. Although the old FA



The Mitsubishi Electric MV1200R wire EDM machine in operation at Boutroué since 2016 permits automatic re-threading even in narrow kerfs

systems already had automatic threading, the device had to return to the beginning of the kerf for this purpose. After threading, the entire cut portion of the kerf had to be traversed again, which, depending on the complexity of the cutting geometry, sometimes resulted in a considerable loss of time.



Barbs machined with wire erosion



High concentration while Savonneau operates the MV1200R

The firm's decision in favour of Mitsubishi Electric was taken not least because of the quality of the systems. It has rarely had to resort to the after-sales service, which is due to the fact that the interior of the machines largely originated from Mitsubishi itself. "And what they've installed in it is of Rolls-Royce quality," Savonneau confirms.



Ets. Boutroué

Founding year

1885 (earliest records)

Managing Director

Laurent Savonneau

Core business

Industrial engraving, fashion accessories

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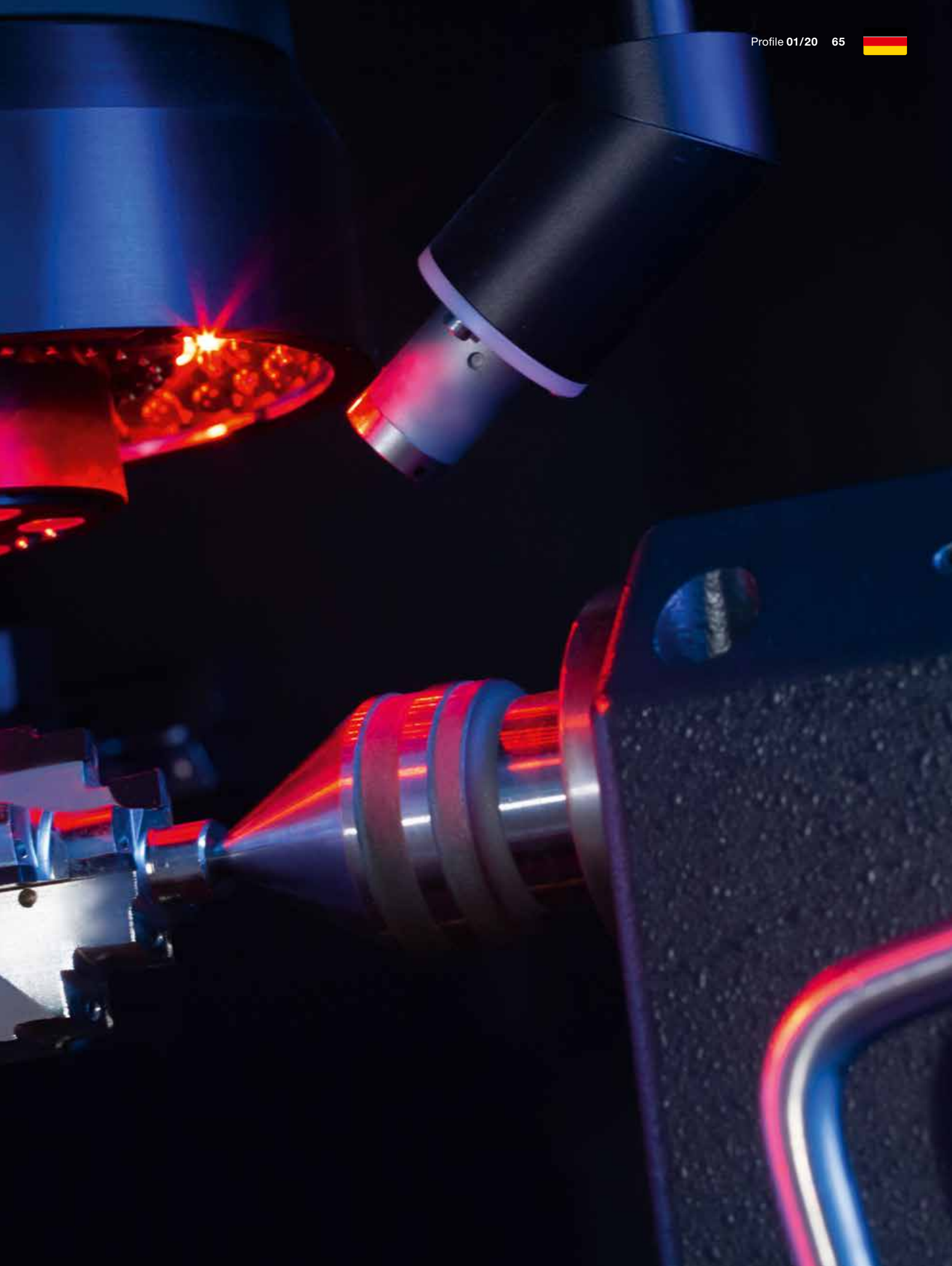
Lehmann GmbH Präzisionswerkzeuge

Getting diamonds into shape.

Wire EDM for PCD cutting edges.

Lehmann in Göda produces drilling and milling tools with PCD cutting edges specifically for the finishing of light metals and plastics. The specialists machine the tiniest special geometries with high precision and outstanding surface quality on an MX600 wire cutting machine from Mitsubishi Electric.

Highly precise special geometries.



The recently built production hall is air-conditioned for maximum precision.



So that it will have sufficient skilled workers in the future, Lehmann trains its own apprentices.

With its over 100 employees today, Lehmann Präzisionswerkzeuge in Göda has established itself beyond the region as a versatile supplier of high-quality cutting tools. The company fabricates standard tools made of high-speed steel and solid carbide and with PCD cutting edges for a wide range of industries, including aircraft construction, medical technology, manufacturers of equipment in pharmaceutical and food production, and the automotive industry. In addition, it also

produces wear parts made of ultra-hard materials for packaging and assembly machines. In the almost 30 years since its foundation, the company has specialised primarily in drilling and milling tools with special geometries, managing partner Roland Lehmann reports. These are machined on the basis of data and drawings, but are often also developed in cooperation with customers to improve the accuracy of the workpiece or raise productivity. The advantage of these special tools is that they combine several production steps in a single tool. They thus not only improve accuracy, for example, with several aligned and concentric bores and chamfers, but also boost productivity by eliminating the need for tool changes. The Göda-based toolmaker produces the special tools at short notice as single items, and in small and large series.


PCD tools in demand for lightweight engineering

Tools with cutting edges made of polycrystalline diamond (PCD) are ideal for the machining of magnesium, aluminium alloys and especially fibre-reinforced plastics. They are particularly wear-resistant and are conducive to high productivity. "Due to the trend towards electromobility, automotive suppliers and vehicle manufacturers are having to machine more and more components made of lightweight but high-strength materials such as aluminium and magnesium. We develop and produce the necessary PCD tools flexibly and at short notice, even with special geometries," says Lehmann.

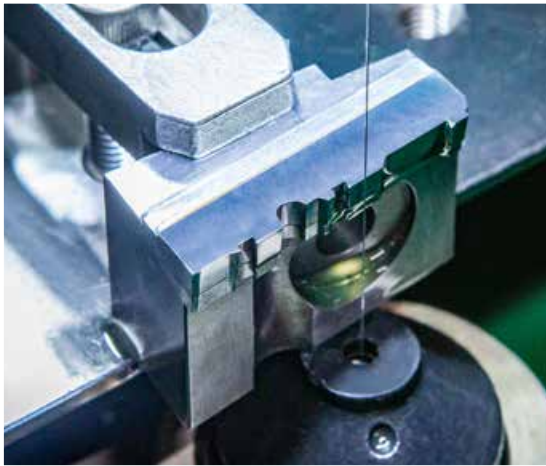
Drilling and milling tools with PCD cutting edges consist of a tool body of steel or solid carbide and PCD inserts brazed onto it. Conventional



Lehmann in Göda produces a broad portfolio of PCD tools.



Top quality assured with
advanced measuring equip-
ment with tactile and optical
measuring systems.



In the production of precision tools with PCD cutting edges, Lehmann Präzisionswerkzeuge benefits from the outstanding functions and features of the Mitsubishi Electric MX600 oil-bath wire EDM.



standard blanks are used as the bodies. These are first turned and milled or ground so that PCD inserts as the basis for the cutting edges can be brazed on. In order to achieve high-precision cutting edges to within a few μm , the PCD cutting edges are then finished. This can be effectively accomplished with wire erosion. Intricate cutting edge geometries can be produced with wire EDM, Lehmann explains. Even the angular areas of the PCD cutting edges are readily accessed by the wire. This is why he and his toolmaking specialists in Göda have been producing the cutting edges of special PCD tools on wire EDM machines for several years now. About a year ago, they invested in an MX600 wire eroding machine from Mitsubishi Electric. Lehmann elucidates: "We already had extensive

experience with wire EDM machines from other manufacturers. We had also used oil as the dielectric before. What impressed us about the wire EDM machine from Mitsubishi Electric was that it runs with high precision and reliability. Above all, wire eroding in oil has proven to be particularly useful for the machining of cutting tools with PCD cutting edges and makes the reworking of the eroded geometries unnecessary. The wire EDM not only machines with high precision to 2 to 3 μm , but also generates surfaces of the highest quality in the oil dielectric. Polishing and lapping are therefore unnecessary, as are special measures to prevent the corrosion of bare tool parts. This goes a long way towards accelerating throughput and thus enables us to produce special tools with PCD cutting

edges for our customers with high flexibility and within the shortest possible time."

Easy to program

At Lehmann in Göda, the toolmakers design tools on an external 3D CAD system on the basis of customer data and specifications. They contribute their extensive experience and knowledge of efficient machining processes. The production of PCD cutting edges is programmed on a DECAM CAM system. This system is precisely geared to data exchange with Mitsubishi Electric wire EDM machines and to their parameters, Lehmann confirms. "We have also found parameter input at the machine and operation to be particularly straightforward. Our specialists took only a few hours after commissioning to

*What impressed us about the wire EDM machine from Mitsubishi Electric was that it runs with **high precision and reliability**. Above all, wire eroding in oil has proven to be **particularly useful for the machining of cutting tools with PCD cutting edges** and makes the reworking of the eroded geometries unnecessary.*

*Roland Lehmann,
Managing director*

learn how to machine the first tools productively on the MX600 wire EDM system,” Lehmann reports, adding: “In daily practice, the employees entrusted with EDM are capable of programming and machining all cutting tool geometries quickly and reliably.” The wire EDM machine from Mitsubishi Electric comes with an exceptionally wide range of functions. Even after a year in operation, Lehmann notes, his employees have not really identified or been able to use yet all the functions provided by the wire EDM machine. “It will therefore probably be possible

to further optimise processes in the future,” Lehmann adds.

So as to produce as many geometries of a PCD cutting edge as possible in a single process, the MX600 at tool manufacturer Lehmann has a rotary axis as additional equipment. For maximum precision, the wire eroding machine is located – along with other machines – in an air-conditioned area of the workshop.

Maximum availability

Above all, Lehmann appreciates the extensive support provided by

highly skilled Mitsubishi Electric service staff during commissioning and daily use of the MX600. Sound information on the functions of the wire EDM machine can also be obtained over the phone at any time, he confirms. This ensures availability and his specialists can consistently use the machine productively. They also receive ongoing advice from Mitsubishi Electric’s competent service staff to familiarise them with the numerous functions of the MX600 so they can further optimise the machining of PCD cutting edges. The toolmakers usually use the wire EDM machine in two full shifts

Special tools with PCD cutting edges, machined on Mitsubishi Electric wire EDM systems





Thanks to high-quality training and expert support from Mitsubishi Electric's specialists, Lehmann's skilled workers are able to use the MX600 wire EDM system flexibly and productively.

every day. In the third shift, depending on the machining time for cutting edge geometries, they allow the machine to run unmanned.

Success founded on flexibility

For Lehmann the machining speed of wire EDM is of only secondary importance. Much more critical for him are the speed of set-up, tooling and programming, enabling the company to react flexibly and at short notice to changing production orders. He is convinced that the success of his company is largely attributable to its high flexibility. "We regularly see ourselves as a vital service when helping customers to produce prototypes or pilot series, for example, within the shortest possible time and when they need the optimum cutting tool for this," Lehmann explains. His company therefore also has a very high

vertical integration. The in-house design department provides the necessary know-how to develop the best tool solutions in cooperation with customers. Starting with the blank, the developed tools can be turned, milled, ground, eroded and coated in house. Only for heat treatments, which are required for hardened wear parts, for example, are outside companies enlisted.

Lehmann GmbH Präzisionswerkzeuge

Founding year

1991 as a one-man business

Management

Roland Lehmann,
Jens Mammitzsch

Employees

100

Core business

Developing, making and regrinding cutting tools with standard and special geometries as well as wear parts made of hard materials flexibly and at short notice

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www.lehmann-praezisionswerkzeuge.de



Scan now and watch the company film!

Short interview Roland Lehmann

What do you see as your company's particular success?

Lehmann: In 1991, as a one-man business, I literally started repairing and regrinding tools in my garage. I undoubtedly benefited from the fact that I reacted very flexibly to the wishes and needs of my customers right from the start. To this day – we are now a medium-sized company with 100 employees – flexibility is our top priority. We always aim to make the tool that suits our customers best as quickly and flexibly as possible.

How is the current crisis affecting your business due to the rapidly spreading COVID-19 and the associated restrictions in social and economic life?

Lehmann: It's a big help that we work for a very broad range of industries, so we've only recorded a roughly 10 per cent drop in new orders and sales. In our 30-year company history we have deliberately not concentrated on a narrow circle of customers, but have always sought and found orders from many different manufacturing companies. This has also enabled us to acquire a very broad range of expertise in the machining of different materials and the production of different workpieces. Consequently, we have developed and realised a wide range of tools made of HSS, carbide and PCD with a multitude of standard and special geometries for the machining of steel, light metals, graphite and plastics. We are benefiting from this broad know-how base in the current situation.

How do you see your company developing in the medium and long term?

Lehmann: With our expertise, skilled employees and high-performance machines, such as the MX600 wire eroding machine from Mitsubishi Electric, we believe ourselves to be ideally equipped for the coming years. We are confident that we will soon overcome the current difficult situation. Our confidence in the future is also reflected in our training of junior staff. Each year we take on four apprentices, for whom we run a specially equipped training workshop.

Mitsubishi Electric

Precision sinking with artificial thinking.

But that's not the only thing that's new ...

Behind every dependable, precision EDM machine is sound engineering. In addition, the technological nerve centre of every EDM is its electronics. Whether CNC control, axis drives or erosion generator – here everything comes from a single source: Mitsubishi Electric.



SG-SERIES – THE EDM MOVIE

Scan code now
and watch the film:

www.mitsubishi-edm.de/sgr-en

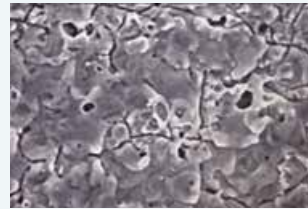
Ideally equipped for all tasks.

The SG series banks on steel – a great deal of steel – as an assurance of precision and longevity. The use of the best components, such as glass scales from Mitutoyo, also guarantees the reliability of the machine system over a long machine life. Its straightforward operation and programming – a hallmark of Mitsubishi Electric's die-sinking EDM systems – leaves the operator time for the essential, i.e. the proper planning of the various EDM tasks. And here, too, this is aided by the intelligent control strategy with integrated job planning. This way the user benefits from the evaluation of a wide range of operating data, including actual job costing.

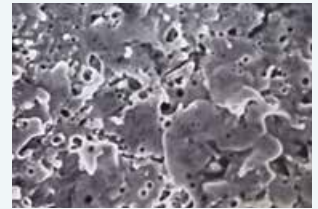
Integrated artificial intelligence

The D-CUBES control generation excels with the Artificial Intelligence developed by Mitsubishi Electric. Forward-looking machining strategies are applied in a self-learning process. The automatic adaptation of the lift-off paths and immersion strategy ensures a continuously optimised

Micro-cracking in carbide? No thanks!



Too aggressively eroded:
identifiable microcracks



Eroded with the SG-R: full material
removal with minimal
microcracking

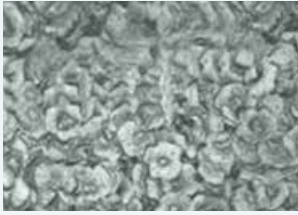
Despite its high power density, the technology of the SG series is designed for gentle material machining. Even when machining carbide with high currents in roughing operations, there is scarcely any microcracking. The service life of the machined components is thus significantly extended.

erosion process – resulting in a real leap forward in productivity. To suit the actual conditions in the process, the generator parameters are also continuously adapted – for an optimum, low-wear erosion process. At the same

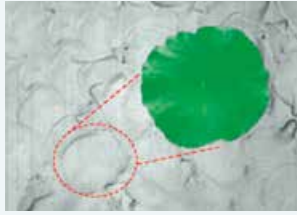


I'm very satisfied with the Mitsubishi SG12S. I was able to erode several top-quality workpieces within a week. The decision to buy it was absolutely right. Even the modern touch screen control is no problem for me as a 67-year-old user and greatly simplifies my work.

Willi Reichert, Managing Director Willi Reichert GmbH

LLTX lotus effect technology

Conventionally machined surface



LLTX lotus effect

Thanks to this technology*, mould surfaces are given a texture similar to that of a lotus leaf, which significantly improves the demoulding of plastic components.

* Optionally available



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The formation of deep ribs with a uniform surface structure is a feature of the IDPM Power Master.

time, there is plenty of performance in reserve thanks to the 80 A or optionally 120 A generator. The GV Generator is designed for a wide range of applications and is supported by the digital Power Master IDPM. The outcome is superlative performance with extremely low electrode wear by using graphite electrodes as well as the creation of intricate details and high surface qualities with copper electrodes. Special adaptations for carbide, titanium and PCD are available for a wide

range of applications, so that the user is optimally equipped for virtually all challenges.

1.6 G dynamism

The newly developed drive unit of the Z axis operates soundly and precisely with an acceleration of up to 1.6 G and travel speeds of up to 20 m/min. By using the in-house AI technology, these lift-off movements are neatly controlled – for an efficient and stable erosion process in every situation.

Programming at the PC

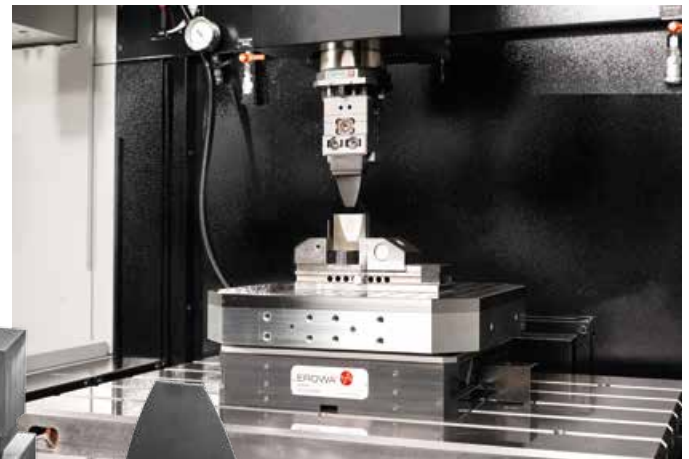
Sometimes programming at the machine itself is the



Very best value for money.



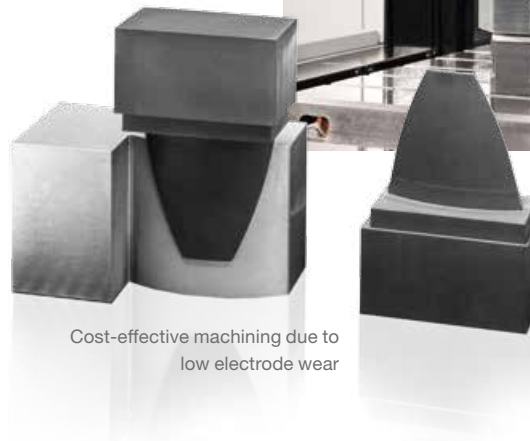
The advanced D-CUBES M800 control supports the operator in every situation. It handles routine tasks and takes the effort out of programming.



The newly developed drive unit of the Z axis

fastest and most efficient way to achieve your goal. More often, however, external programming at the PC is the more convenient and effective choice. Ergonomically optimised, without distraction and with all the convenience of programming while the machines do their job. The external programming software is included in the SG-R's standard package.

The standard full range of equipment on the SG-R completes the package. A fire extinguishing system, C axis with a zero point clamping system, external programming software, integrated job planning and operating



Cost-effective machining due to low electrode wear

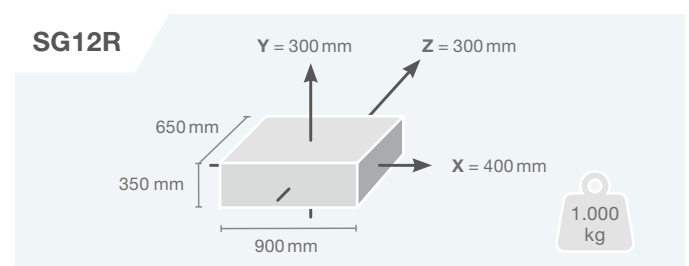
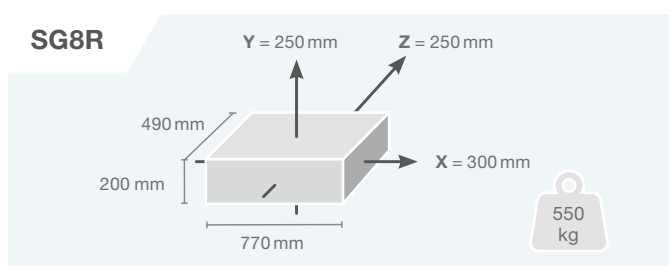
data output with many status details (also via MTConnect) – all this is included in the machine's

standard equipment. The overall scope of delivery can be customised with a few, useful extra features – tailored to the respective requirements.

Conclusion

The extensive equipment, pioneering technology and familiar sound engineering come at a price that makes buyers' hearts beat faster. The SG-R series will find many discerning followers.

Travel paths and workpiece specification



Horoscope

for hard-wired EDM experts.

Capricorn



22 December – 20 January

For the first time in history, you have the chance to save humanity – by just sitting at home in front of the TV and doing absolutely nothing. Or you can get creative. Shakespeare wrote his masterpiece “King Lear” when he was in quarantine. At any rate, after the lockdown you will return to your workplace as a celebrated wire EDM specialist.

Aquarius



21 January – 19 February

Soak up some sunshine on the balcony and recharge your energy reserves – you need them for your private life. Your partner will be delighted with the increased magnetic pull of your relationship. You can sit back and relax – your trusty EDM systems can fortunately whirl away on their own and get along without you for a few more days.

Pisces



20 February – 20 March

Jupiter’s moon Ganymede is in control of your life for the next few weeks. Not quite as accurately as a CNC, but you will be surprised to find that some of the dishes you try out taste totally different. A good opportunity also presents itself in your private life – prove your mettle and approach the person of your dreams even if you’re wearing a breathing mask!

Aries



20 March – 20 April

With its influence, Neptune makes your workpiece surfaces feel much more velvety, as the vibrations penetrate to the subatomic level. Your boss and workmates will be over the moon. In conflicts at home, however, you should keep a low profile to prevent unnecessary peripheral damage.

Taurus



21 April – 21 May

In the constellation of Taurus, the moon ensures a high level of output. Your workpieces are therefore unrivalled. In addition, a mysterious message reaches you on your EDM interface. If you follow the instructions it contains, you will experience a surprise that has nothing to do with your work – on the contrary!

Gemini



22 May – 21 June

Even in these times, the German adage still holds true: if you rest, you rust! Take decisive action to counter this and secretly adjust the dimensions of all the axes of your workmates’ projects. But don’t overdo it – your colleagues will be devastated if their workpieces suddenly come out of the dielectric a factor of 10 too small.

It's written in the stars. And you can read it here ...



Cancer

22 June – 22 July

Don't just work blindly, do some thinking as well – best of all, about what really makes you happy. Actively seek a challenge and resonate with the buzz of the alternating current. But also pay enough attention to your private life. A healthy work-life balance whets your appetite for more.



Leo

23 July – 23 August

Saturn's moon Telesto is dancing out of its usual orbit. You will now appreciate beguiling curves not only when eroding, but also at the end of the day. To speed things up, take a deep breath! Even if it gets really warm, you know as an experienced EDM specialist that cooling off in the dielectric is never an option.



Virgo

24 August – 23 September

Others may worry about the tense economic situation and the rising price of gold, but you know what you're capable of and have more confidence in yourself than ever before. Your steady hand not only helps you to thread the wire, but also makes you a tower of strength in adversity. When eroding, you will be delighted by the extra-fine, colourful sparks.



Libra

24 September – 23 October

Your otherwise commendable organisational talent is being severely tested. This imaginary whirlwind achieves taper angles of well over 30°, so you will have to improvise and demonstrate unprecedented spontaneity. This also has advantages, of course, as your newly gained flexibility raises your appeal to new heights.



Scorpio

24 October – 22 November

Venus is finally in trine with Mars, so now is the time to fall in love again. Cupid has a full quiver to shoot from and the object of your attentions is also inflamed with passion for you. But beware: many a person has burned their fingers on hot wires! At work, your accomplished job set-up skills will keep your evenings free.



Sagittarius

23 November – 21 December

This fall, you'll have to make bold choices. Approach things with common sense and don't rely solely on your lucky electrode. You have to wire-cut everything you can to stay on track. In your private life, however, things are looking rosier. The sparks fly between you and your partner like on the day you met.

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