MITSUBISHI ELECTRIC

The Art of Economy

Issue 02/22

myonic GmbH

News from Mars.

How EDM aids exploration. *P.6*

The magazine for smart users.

Profile

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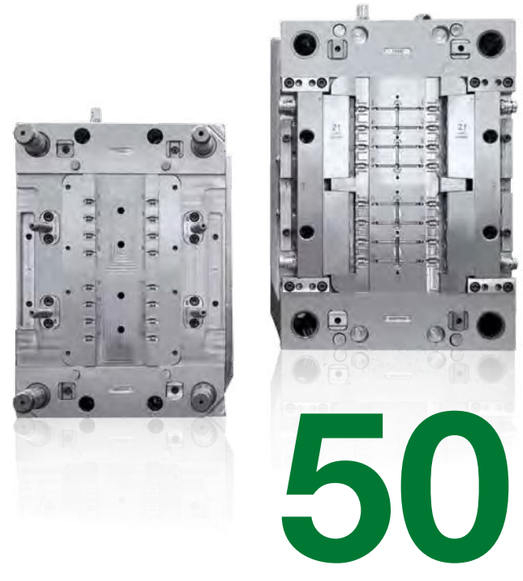
User reports



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Published by
Mitsubishi Electric Europe B.V.
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Editorial

Leaving the earth

often starts with down-to-earth parts production and ultra-precise EDM machines.

Aerospace regularly puts the technologies employed to the ultimate test. The exciting solutions from myonic contributing to the exploration of Mars can be found from page 6 onwards.

Mitsubishi Electric Space Systems has been working in the satellite sector since the 1960s and is Japan's only manufacturer to deliver everything from development to production. It is no wonder that the EDM machines used in the process enjoy great popularity. A highly innovative project is the 3D printing in space of huge antennas that far exceed the capacity of current launch vehicles. Just look at the right-hand magazine page.

For the still lofty heights of aerospace, SACS has been offering solutions tailor-made to the industry for 20 years. More as of page 76.

Far worldlier is the 50% state subsidy for the investment in a new EDM machine. You can find out how this contributes to company success by reading about esm Erodier-Service-Müller starting on page 86.

Best regards from the Ratingen Technology Centre and best wishes for 2023

Hans-Jürgen Pelzers

Hans-Jürgen Pelzers
Sales Department Manager

> Curiosity is the essence of our existence.
>
> *Gene Cernan, astronaut & moon walker*

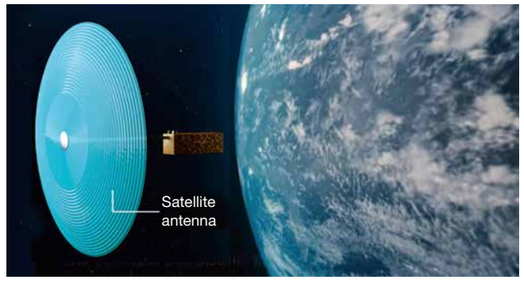
News

The antenna factory in space.

Mitsubishi Electric develops solar-powered 3D printing technology for satellite antennas.

Mitsubishi Electric Corporation announced that the company has developed an on-orbit additive-manufacturing technology that uses photosensitive resin and solar ultraviolet light for the 3D printing of satellite antennas in the vacuum of outer space. The technology specifically addresses the challenge of equipping small, inexpensive spacecraft buses with large structures, such as high-gain antenna reflectors, and enables on-orbit fabrication of structures that greatly exceed the dimensions of launch vehicle fairings.

Resin-based on-orbit manufacturing is expected to enable spacecraft structures to be made thinner and lighter than conventional designs, which must survive the stresses of launch and orbital insertion, thereby reducing both total satellite weight and launch costs.



On-orbit manufacturing and deployment of a satellite antenna in space. The extended capabilities are expected to enable more timely provision of satellite imagery and observation data that meet the varied needs of individuals and organisations.

Mitsubishi Electric's new compact robot for beginners – cost-efficient and user-friendly

Mitsubishi has developed the RH-CRH series to make robots and the efficiency improvements they bring more accessible. The new SCARA robots are not only particularly easy to operate and use, but also around 20% cheaper than comparable models.

Thanks to their four axes and a reach of up to 700 mm, the RH-CRH robots are ideally suited for pick & place, assembly, handling as well as sorting and palletising tasks. Applications to date range from plant handling in the agricultural industry to game console production in the electronics industry. Depending on the model, the robots' payload is 3 or 6 kilograms.

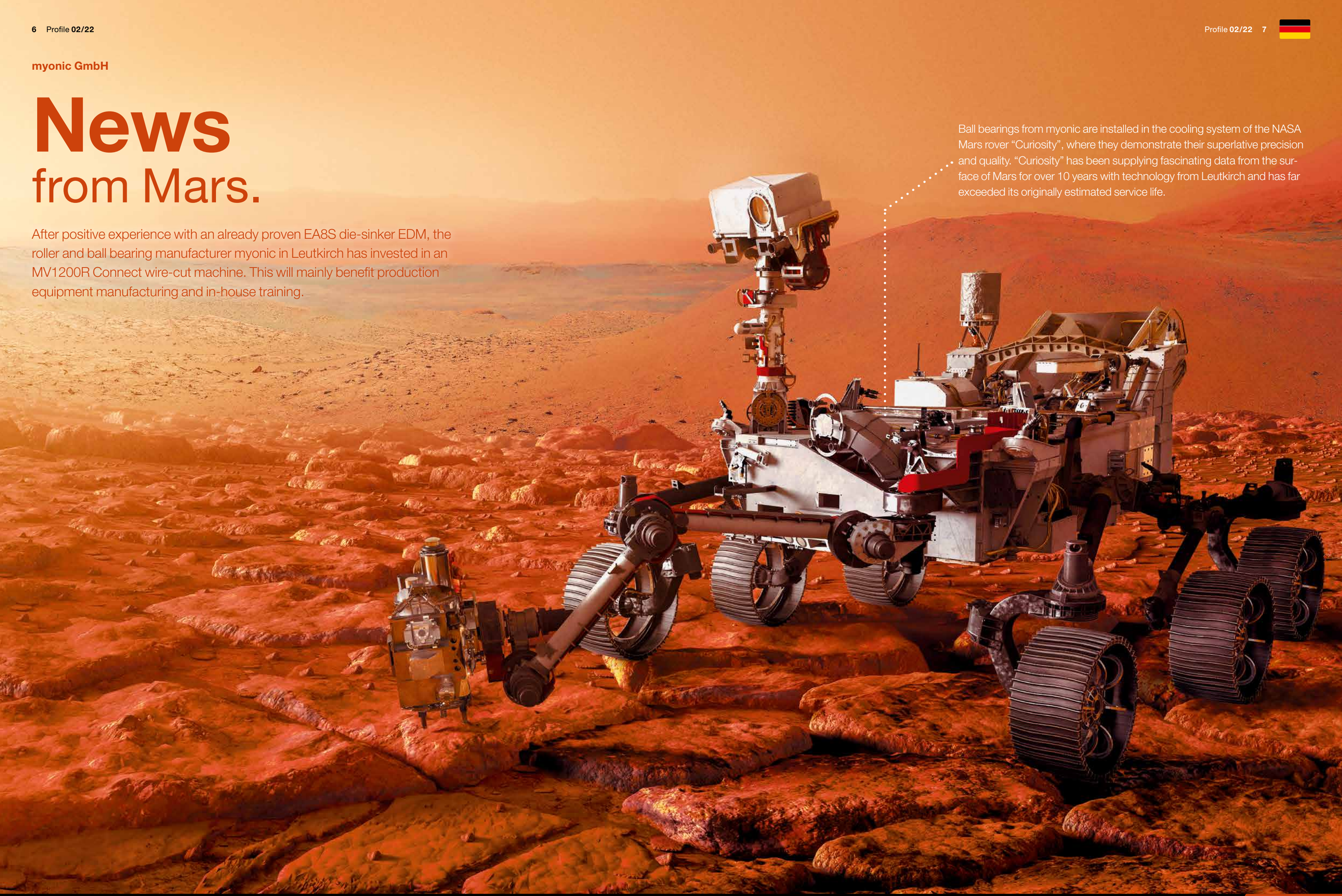
In addition, they offer cycle times of up to 0.41 seconds and an accuracy of ± 10 µm – an outstanding performance for their compact design. Another impressive feature is their small footprint, as they only take up about 65% of the floor space of conventional robots. And thanks to the MELFA SafePlus function, there is also no need for bulky fencing when working cooperatively with humans.

myonic GmbH

News
from Mars.

After positive experience with an already proven EA8S die-sinker EDM, the roller and ball bearing manufacturer myonic in Leutkirch has invested in an MV1200R Connect wire-cut machine. This will mainly benefit production equipment manufacturing and in-house training.

Ball bearings from myonic are installed in the cooling system of the NASA Mars rover “Curiosity”, where they demonstrate their superlative precision and quality. “Curiosity” has been supplying fascinating data from the surface of Mars for over 10 years with technology from Leutkirch and has far exceeded its originally estimated service life.



myonic ball bearings on Mars.

High-grade technology for maximum precision: production at myonic in Leutkirch

When Johannes Beckers talks about wire erosion, his eyes light up. As head of Service Mechanic Maintenance / Training at the roller and ball bearing manufacturer myonic in Leutkirch, he is responsible for operating equipment and is also in charge of training. “With wire erosion, we have invested in a sophisticated technology. However, for me it’s absolutely essential if we are to remain competitive in the long term,” he says.

The company in Allgäu produces high-quality miniature roller bearings and complete bearing units for special applications. These include, for example, spindle heads for dental drills in which roller bearings with a diameter of just a few millimeter operate without lubrication at speeds of over 200,000 rpm. For this, a variety of production equipment, such as collets for mounted points, has to be manufactured with high precision. These components, Beckers explains, often have intricate geometries that can only be produced with wire erosion. “In addition to the collets produced in-house, we used to outsource various wire erosion jobs for other workpieces. However, despite the good and reliable cooperation with regional businesses, this repeatedly caused unnecessary delays and longer waiting times. That was one of the main reasons for integrating wire erosion technology into our own production set-up,” Beckers adds.

The precision roller bearings are tested and assembled in the cleanroom.

Tiny miniature ball bearings from myonic

As their experience to date with the machine manufacturer Mitsubishi Electric had been excellent, those responsible at myonic decided on an MV1200R Connect wire-cut EDM machine on Beckers’ recommendation. Markus Hepp, who works in equipment manufacturing, confirms the MV1200R Connect’s ease of operation and programming. Only a few days of instruction and training at Mitsubishi Electric in Ratingen were quite sufficient for him to be able to work productively with the MV1200R Connect. “Thanks to the innovative human-machine interface with a large-format touchscreen, the control of the machine goes a long way towards meeting the wishes and expectations of young professionals in particular. It can be operated intuitively,” he adds. “Many programming and operating steps are self-explanatory or very easily grasped via graphics and in dialogue. The control also shows details of the function and diagnostics on the touchscreen, which simplifies everyday work with the wire EDM machine significantly.” His positive verdict on Mitsubishi Electric’s ground-breaking programming and user interface is based on a comparison with a rival wire-cut EDM machine that myonic has been using for production for several years.

Success with niche products

At a – by international comparison – high-cost location in Germany, myonic’s development and production activities are competitive because it specialises in high-quality roller bearings for difficult ambient conditions.

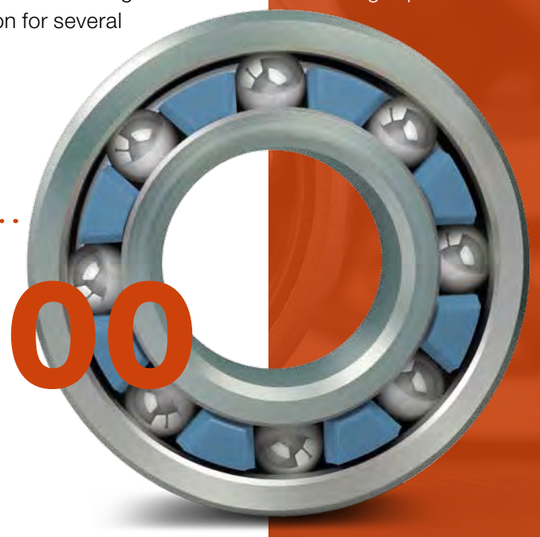
Its product range includes roller bearings for computer tomographs, for surgical instruments and medical prostheses, for dental drills, and also for robot arms for use on satellites in space, for machine spindles for high-speed cutting (HSC) and for navigation systems in aviation and shipping, e.g. the gyro compass.

These mostly very small or slim radial and axial roller bearings each have to meet specific requirements. These can be operation without lubrication to avoid contamination of the environment, use in a vacuum close to the absolute temperature minimum, or long-lasting, reliable operation at very high speeds of over 300,000 rpm.

Speeds reaching up to over

300,000

rpm



myonic Group in figures

Around
€60 million
2021/2022

1971
€3.43 million

1959
4 employees

2021/2022
524 employees

1960
13,000 ball bearings

2021/2022
5,000,000 ball bearings

Industrial mechanic Michael Frick setting up the MV1200R Connect. The wire can be used to machine components for devices with an accuracy of a few µm.

The MV1200R wire-cut EDM machine is now indispensable for the manufacture of our operating equipment.

Johannes Beckers, Head of Service Mechanic Maintenance/Training at myonic

Extending capacity

myonic is also using the MV1200R Connect temporarily in production. If, for example, miniaturised collets for dental and medical technology have to be machined, wire erosion proves to be particularly useful. “In the cylindrical workpieces, there are deep grooves only a few tenths of a millimetre wide that replace a complex grinding process”, says Hepp. “This can only be achieved with a sophisticated wire erosion process. We now also put the MV1200R Connect to intensive use for this type of machining.”

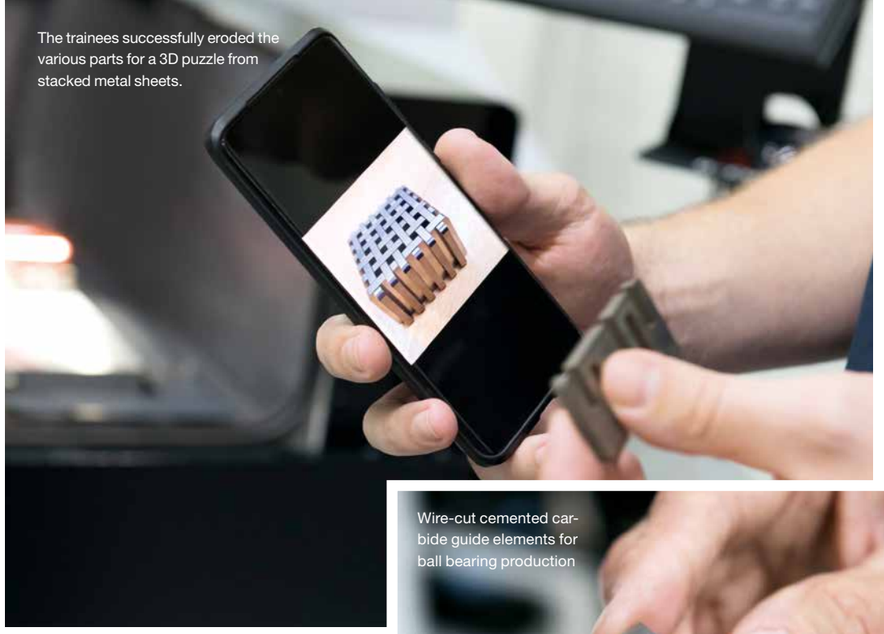
Thanks to the second wire EDM, the production technicians now have greater capacity and,

Wire-cut EDM is the only practical way to machine narrow grooves with sharp corners in hardened steels.

Machining miniaturised collets with wire erosion.

Young professionals in particular find programming and operation via touchscreen particularly easy and convenient.

Markus Hepp, industrial mechanic



The trainees successfully eroded the various parts for a 3D puzzle from stacked metal sheets.

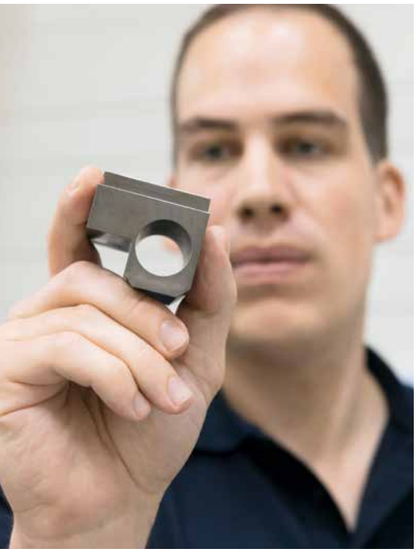
Wire-cut cemented carbide guide elements for ball bearing production

above all, an alternative should the machine already in use in production for many years break down. The specialists in Leutkirch attach great importance to the wire EDM's ability to run reliably and also unsupervised. "This allows us to cost-effectively machine workpieces in small series – during night shifts, for example," says Hepp. The automatic wire threading system of the MV1200R Connect makes a significant contribution to process security, reliably threading thin wires measuring 0.1 to 0.3 mm in diameter.

Opening up further fields of application

Encouraged by the excellent experience with the MV1200R Connect in the first few weeks, the experts at myonic are now using the wire EDM technology beyond its initial applications. With the aid of the MV1200R Connect, employees in the company can develop and deepen their extensive know-how of wire EDM machining, says Beckers. "This not only makes us a little more independent of external suppliers, but also gives us a competitive edge. We can now develop economic, forward-looking machining processes ourselves," he adds. Until now, many workpieces have been machined in several steps, such as milling, drilling, grinding and – for

Learning through play, the trainees designed and cut the various parts for a 3D puzzle.



Industrial mechanic Markus Hepp checking a finished part. Wire-eroding it completely instead of drilling, milling and grinding it boosts accuracy and accelerates throughput.

for different machining processes are omitted, this significantly accelerates throughput and reduces in-house effort. Furthermore, the single clamping on the wire-cut EDM machine ensures much higher accuracy. We can reliably machine all function-defining contours with an accuracy of less than 0.01 mm. This proves to be particularly beneficial for components for complex devices that we produce for our grinding machines in the production equipment department." In this way, the apparent drawback of wire-cut EDM can be turned into a quality-defining asset.

difficult geometries – wire eroding. Of course, this entails considerable internal organisational and logistical effort. In addition, there is prolonged downtime, and throughput thus takes longer. But in Beckers' opinion, it may prove to be much better and faster to design the components in such a way that all contours and geometries can all be wire-eroded. This may seem like a lengthy process at first glance, Hepp admits.

"But," says Beckers, "you have to look at the process as a whole. If the multiple clampings on machines

myonic GmbH

Founding year
Original company established in 1936 as RMB (Roulements Miniatures de Bienne) S.A. in Biel, Switzerland, and in 1968 as MKL Miniatur Kugellager Leutkirch at today's main location in Leutkirch, Germany

Managing Director
Christoph von Appen

Employees
345 the parent plant in Leutkirch

Core business
Development and production of special miniature precision roller bearings and bearing units individually optimised for their applications in selected, sophisticated drive systems in medical technology, aerospace, the automotive industry, mechanical and plant engineering, and micromechanics.

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Development and production of miniature precision roller bearings are based at the parent site in Leutkirch in the Allgäu region of Germany.

Interview in brief

Getting young professionals excited about technology

As head of industrial training, Johannes Beckers sees his task essentially in attracting young people to jobs in the industry.

Mr Beckers, how important is training at myonic?
We see the young generation as a forward-looking task and as a special challenge. Young people no longer automatically come to industry for employment as they did a few years ago. But in order to stay competitive in Germany in the long term, we need a large number of highly skilled employees. That's why in-house training is at the top of myonic's agenda. We plan to double the number of our industrial trainees in the next few years.

How do you succeed in attracting more young people back to industrial professions?
We want to win over young people with appealing and sophisticated technology. I still see that young people are enthusiastic about technology, such as smartphones, tablets and the apps associated with them. So if we want to attract these people to our companies as junior staff, we have to take these interests seriously and, say, offer all trainees their own tablets to support their learning, in addition to modern production technology. We have also created a bonus system for good grades during the apprenticeship, which creates an additional incentive.

What do you mean by this specifically?
Mitsubishi Electric's wire EDM technology is a good example. The MV1200R Connect is equipped with a forward-looking control system and is programmed and operated via a large touchscreen. This is very much in line with the environment young people are used to from smartphones. This environment is familiar to them, and they can immediately apply the know-how and skills they have taught themselves in their free time. With appropriate support from experienced hands, they can immediately enjoy a sense of achievement.

What other ideas do you have to make training in the industry more attractive?
We need to integrate challenging technologies into training as early as possible. Today, young people are put off by the training that was customary just a few years ago. This might involve, for example, spending weeks manually shaping a piece of steel profile with a file. Young people today are much more advanced in their intellectual abilities than one assumes. They want to be challenged. So it is only right to familiarise them as early as possible with sophisticated technologies such as CNC programming, multi-axis machining on turning and milling centres and the somewhat exotic process of wire erosion.

How should companies present themselves if they want to attract the attention of young professionals?
Besides the technologically attractive environment, a modern social structure is of course part and parcel of this. Demanded and preferred today is behaviour that is more collegial but still defines the direction and content. All employees in a company want to and should contribute their skills and efforts and be appreciated for this. Companies must present themselves as desirable employers overall. myonic is one of the 100 most attractive employers in Germany.

Johannes Beckers wants to get young people excited about sophisticated technology.

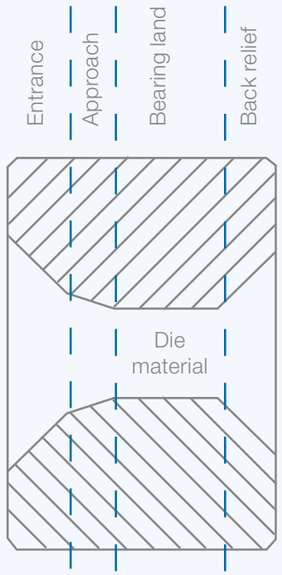
Isis SAS

The production of wire is an extremely demanding process. The starting material is usually rod or rolled wire. The sharpened end of this is guided through the entrance of a drawing die, which is slightly narrower than the diameter of the wire, and then drawn by machine. This makes the wire thinner and at the same time longer. This is repeated with decreasing diameters until the final size is reached. The equipment used is highly complex and can have up to more than 30 drawing stages. The drawing dies are made of extremely hard materials and must be manufactured with extreme precision.

Extremely exacting and precise.

Towards the end of the 19th century, the Rhone-Alps region of France saw the establishment of companies specialising in the manufacture of drawing dies for the production of gold wire. The buyers were the silk weaving industry operating in Lyon and the surrounding area, which used such gold threads in high-quality fabrics. Some of these companies still practise the trade today, as there is still a market for such products worldwide. Their customers include the stewards of former royal residences such as Versailles Palace. “My great-grandparents started making tungsten carbide drawing dies for local steel producers after the end of the Second World War,” recalls Philippe Greusset, President of Isis SAS in Neyron, France. “My great-grandparents were pioneering innovators even in those days by using the considerably cheaper carbide for the drawing dies instead of the gemstones customary at that time.” Unlike gemstones, the blanks made of this material did not have to be laboriously drilled. The pressed, but not yet hard-sintered material was obtained from Sweden. In this state, it was possible to machine it with steel tools. After hard sintering by specialised contractors, it was polished with diamond powder and machined to its final size. Today, Isis still supplies the diamond paste formulated in-house at that time.

Section of a drawing die for wire production. The wire is sharpened at the front, inserted through the entrance and then continuously drawn. As it passes through graded drawing dies, it becomes progressively thinner and longer.



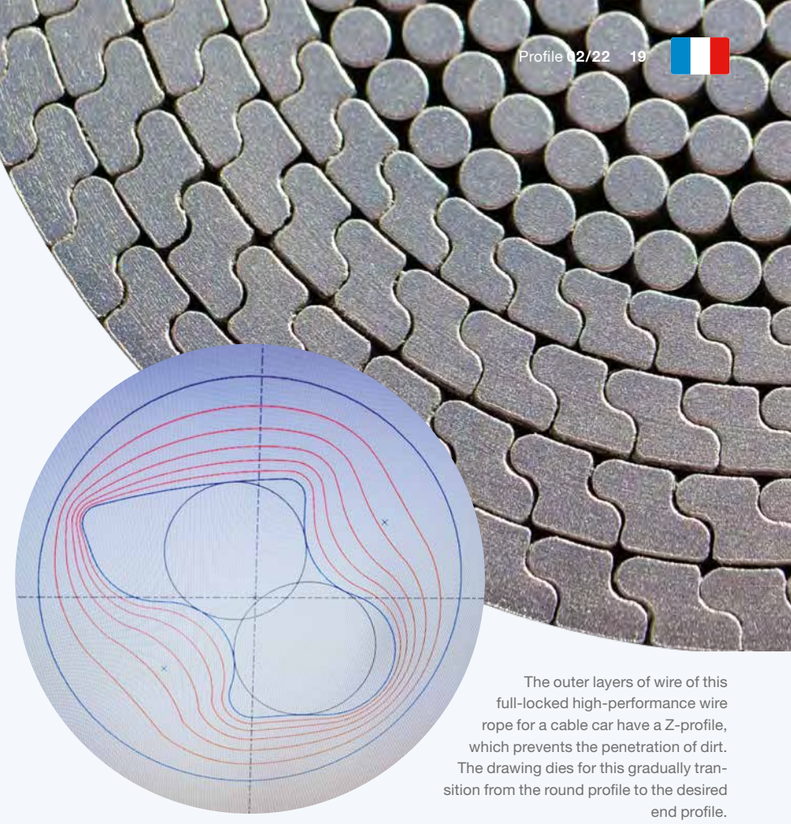
Innovation as company philosophy

“Since then, the technology of wire drawing has been constantly evolving and we have adapted to this by contributing many new ideas,” adds Bruno Sapina, Technical Manager at Isis. Precious metals and the classic commonly used metals such as copper and carbon steels have been increasingly joined by such materials as stainless steels, aluminium, magnesium and titanium. At the same time, the expectations of the quality and durability of the drawing dies have also grown.

Isis has steadily kept pace with these market demands. Nowadays, the carbide blanks produced by carbide manufacturers for drawing dies are sintered with a preform. For cost reasons, however, the available bore diameters are graded in tenths of a millimetre, for example, while end customers require dimensions in hundredths-of-a-millimetre gradations. Isis therefore grinds and polishes these pre-products to achieve the desired final dimensions.

Sophisticated drawing dies with non-circular profiles …

“While we at first mainly produced drawing dies with circular profiles, our focus is now on those with more elaborate geometries,” Greusset explains. These are required for the advanced high-performance wire ropes used in high-rise lifts, in mining, for



The outer layers of wire of this full-locked high-performance wire rope for a cable car have a Z-profile, which prevents the penetration of dirt. The drawing dies for this gradually transition from the round profile to the desired end profile.
(Photo: Fatzer AG, diagram: Isis)

Load-bearing capacity up to

1,400 tons

130 mm diameter

anchoring offshore platforms and for cable cars. Such ropes can achieve diameters of up to 130 mm and load-bearing capacities of over 1,400 tons. They have an extremely complex structure of stranded wires with a wide variety of diameters and geometries ranging from round to square or polygonal to Z-shaped geometries for so-called “locked ropes”. These Z-profile wires interlock in a way similar to a zip fastener, so the rope has a smooth surface and is largely protected from penetrating moisture and dirt.

The production of such wires starts with a round profile, whereby successive drawing dies gradually dictate increasingly extreme changes in shape until the desired final geometry is achieved. For this, Isis has extensive know-how gained from decades of experience.

My great-grandparents started out making drawing dies for steel wire. Today, our focus is on intricate tools for modern high-performance wire ropes.

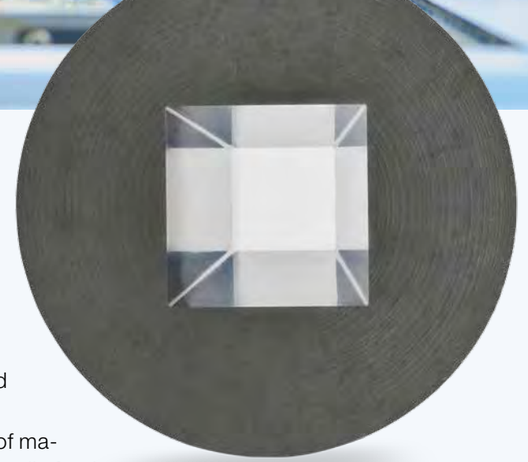
Philippe Greusset, President of Isis SAS

Carbide shear blade

This succession of changes in geometry is optimised in the computer, taking account of the existing machine configuration. The result is drawing die configurations enabling the customer to optimise his production technically and economically.

… and a wide range of high-precision carbide and diamond products

“Thanks to our expertise in the machining of ultra-hard materials, a growing number of customers have also come to us with requests for the production of a wide variety of special components,” says Sapina. These included solutions as diverse as carbide shear blades for the cutting of wire ropes and highly wear-resistant, low-diameter nozzle tubes. An ingenious solution for the robotic sandblasting of gas turbine interiors consists of long carbide nozzles with angled baffles that deflect the abrasive sand sideways to the inner surfaces of narrow cavities. Other products include diamond nozzles for the high-pressure machining of materials and grinding media for the shredding of sugar beet. For such projects, the first step is to listen to the customer’s wishes and ideas. Then, in partnership, we investigate how to find a practicable solution using the company’s capabilities and resources.



The test sample decisive for the purchase decision after final polishing

Wire eroding since 1980

“We commissioned our first wire erosion system back in 1980,” says Greusset. With this technology, we were able to cut hard-to-machine

The MP1200 Connect supplied in March 2022 is already in 24/7 production operation.

So far there haven't been any real problems. We are now convinced that we've taken the right choice with this purchase.

Philippe Greusset, President of Isis SAS

tungsten carbide, even in its hard-sintered state. We were also able to cut much more complex contours than with rotating processes such as turning or cylindrical grinding. Another advantage of wire EDM is that it can also be used to machine polycrystalline diamond (PCD), so we were able to offer customers diamond tools. However, the state of the art available at the beginning was pretty primitive compared to today. For example, the material for wire EDM with diameters of 0.25 mm was much coarser than today, and there was no automatic threading. Whereas today the operator can simply feed his CNC files from a CAM programme into the machine control at the touch of a button, back then a punched tape had to be produced. This was then read into the control system. Despite these initial shortcomings, however, EDM was so obviously superior to the then state of the art that wire EDM quickly became the standard process at Isis.

Mitsubishi Electric best of three

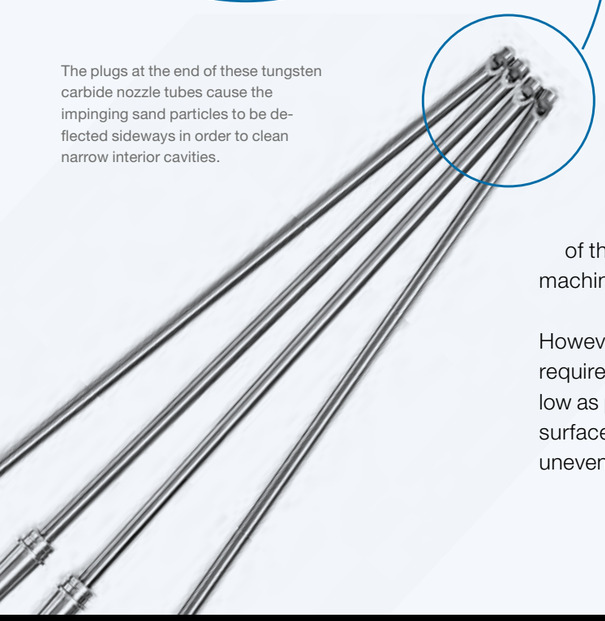
"In 2019, it became clear to us that we would need another wire-cutting machine," Sapina reports. At that time, the company had machines entirely from other suppliers. In order to determine the best-suited machine, a specification was defined and sent to the three machine manufacturers in question.

Special emphasis was placed on suitability for bevel cutting, as this, in view of the most frequently machined tools, is one of the most important work processes in this department. The suppliers were asked to produce the required trial pieces and to supply them for evaluation. Due to the pandemic, this evaluation phase took until November 2021.

Mitsubishi Electric clearly came out on top in the evaluation of the test parts, which is why the company was then awarded the contract. In addition to precision and performance, the surface quality achieved also played an important role, as the workpieces' functional surfaces usually have to be polished to

This succession of drawing dies gradually progresses from an almost round initial profile to a biconcave rectangular one.

Fine adjustment of the MP1200 Connect with the ergonomic manual control box.



The plugs at the end of these tungsten carbide nozzle tubes cause the impinging sand particles to be deflected sideways in order to clean narrow interior cavities.

a high gloss. This time-consuming and consequently expensive process is all the easier to accomplish, the lower the roughness of the surfaces supplied for machining.

However, the polishing effort required is also to be kept as low as possible because the surface is inevitably abraded unevenly during this manual process. Therefore, the more the surface is polished, the more the final geometry deviates from the target specifications. With the accuracies of ± 2 µm that Isis often has to uphold, this point also spoke in favour of Mitsubishi Electric. The company also considers the advice provided by the manufacturer to be comprehensive and professional.

The new MP1200 Connect wire EDM system was supplied in March 2022. After the successfully completed training, production is now running 24/7 on the new machine. “So far there haven’t been any real problems. We are now convinced that we’ve taken the right choice with this purchase”, says Greusset summing up.

These remnants from wire erosion illustrate the importance of bevel cutting for Isis’ production activities.

Isis SAS Carbide Tools

Employees
Roughly 22

Founding year
1945

CEO
Philippe Greusset, President

Core business
Drawing dies made of carbide, ruby and diamond for the production of wire material as well as hard-wearing special components made of carbide or gemstones for numerous industrial applications in the aerospace, automotive, chemical and petroleum industries

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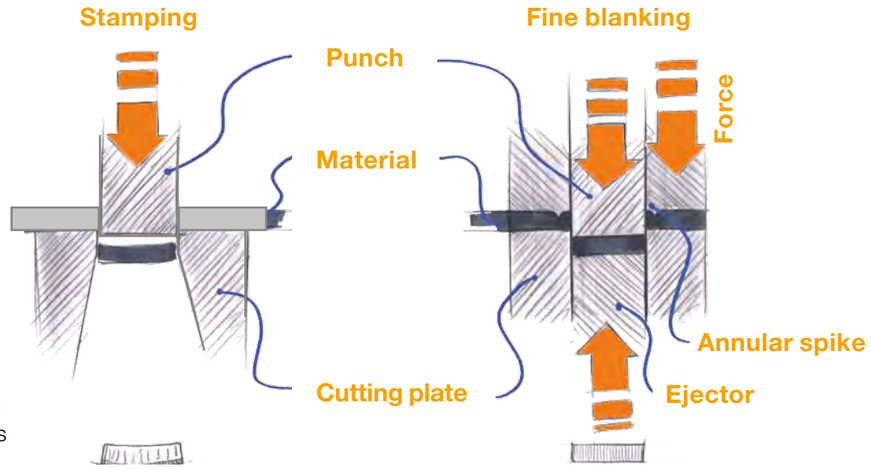
Feinstanz AG

Machining high-precision parts ready for use.

Wire-eroded punches and dies for fine blanking.

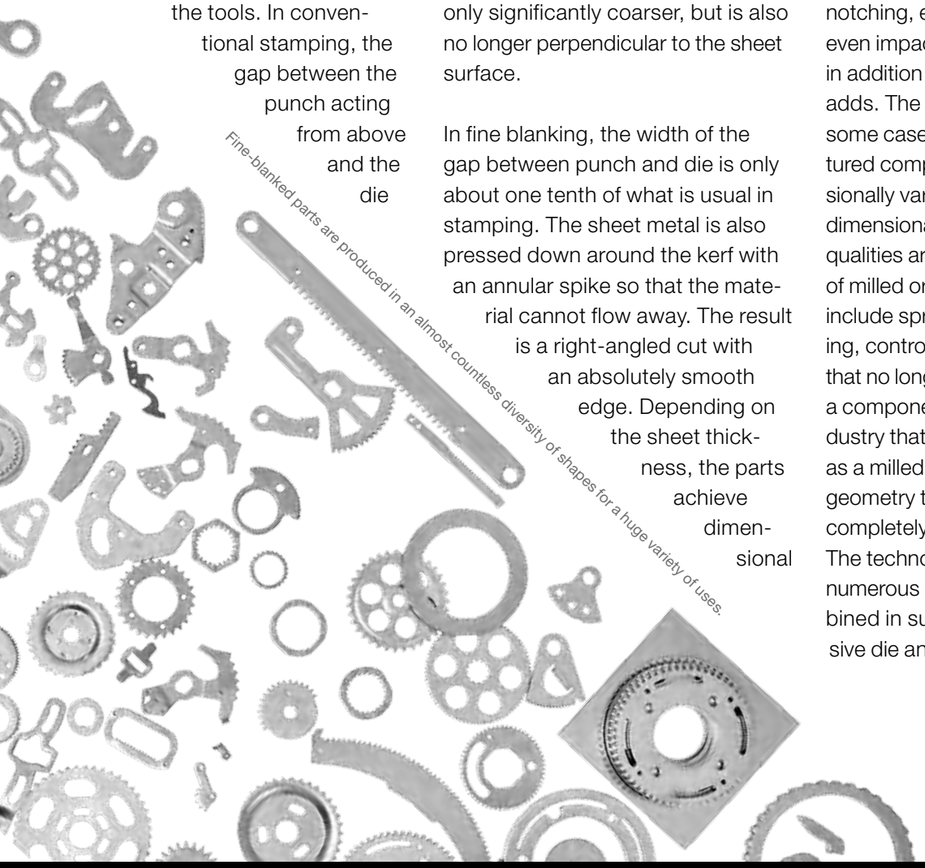
There is hardly an object in everyday life that does not contain sheet metal parts. Whether it's a car, computer, music system or kitchen appliance, numerous sheet metal components can be found literally everywhere. Most of these are created by stamping, a powerful and cost-effective technique. For some applications, however, the quality of the parts produced with this method is not sufficient. This is where fine blanking comes into its own, a technology similar to stamping but which delivers much better precision in terms of both contours and cut edges.



"We are manufacturers of high-precision components, many of which are ready for assembly almost straight from the tool," explains Reto Bamert, Head of Sales/Marketing at Feinstanz AG in Rapperswil-Jona, Switzerland. Its main customers are the automotive industry, kitchen and furniture makers, machine manufacturers and makers of equipment for building services and ventilation.

Production in the company revolves around stamping and similar processes, but the fine blanking technology used is considerably more complex and delivers much more precise components than classical sheet metal stamping. The difference lies primarily in the tools. In conventional stamping, the gap between the punch acting from above and the die positioned beneath it is comparatively large. This means that the sheet is only cut smoothly at the beginning of the stamping process. The remaining removal of material, on the other hand, is not done by cutting, but more or less by tearing. This part of the cut edge is then not only significantly coarser, but is also no longer perpendicular to the sheet surface.

In fine blanking, the width of the gap between punch and die is only about one tenth of what is usual in stamping. The sheet metal is also pressed down around the kerf with an annular spike so that the material cannot flow away. The result is a right-angled cut with an absolutely smooth edge. Depending on the sheet thickness, the parts achieve dimensional accuracies of less than 5 µm in some cases.



Fine-blanked parts are produced in an almost countless diversity of shapes for a huge variety of uses.

Combination with cold forming processes

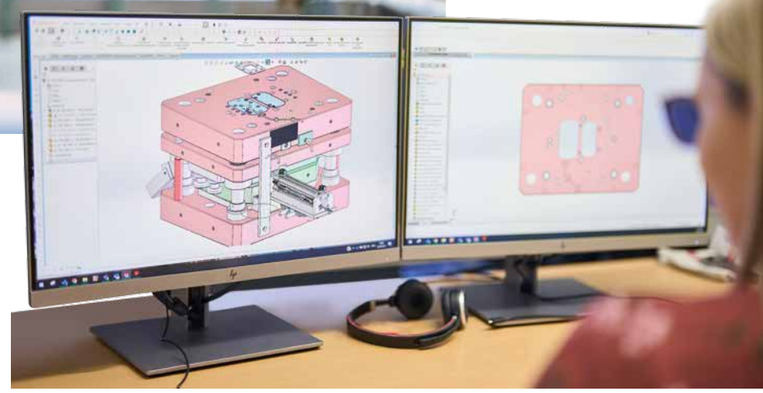
"For fine blanking, progressive dies are often used that can carry out various forming processes such as notching, embossing, piercing and even impact extrusion in timed steps in addition to fine blanking," Bamert adds. The result is high-quality, in some cases highly complex, structured components with three-dimensionally variable geometries. The dimensional tolerances and surface qualities are often the same as those of milled or turned parts. Examples include sprockets with intricate gearing, control cams on furniture fittings that no longer need reworking, and a component for the automotive industry that was originally designed as a milled part with complex 3D geometry that comes out of the tool completely ready for installation. The technology is efficient because numerous individual steps are combined in succession in the progressive die and no further mechanical

In fine blanking in particular, the earlier in the development phase we can work together with the customer, the more they usually benefit.

Reto Bamert, head of Sales/Marketing at Feinstanz AG

View inside a fully automated, robotic production cell for subassemblies

Tool assembly calls for the utmost care. Only in the hands of genuine experts do the best production tools become a true factor for success.

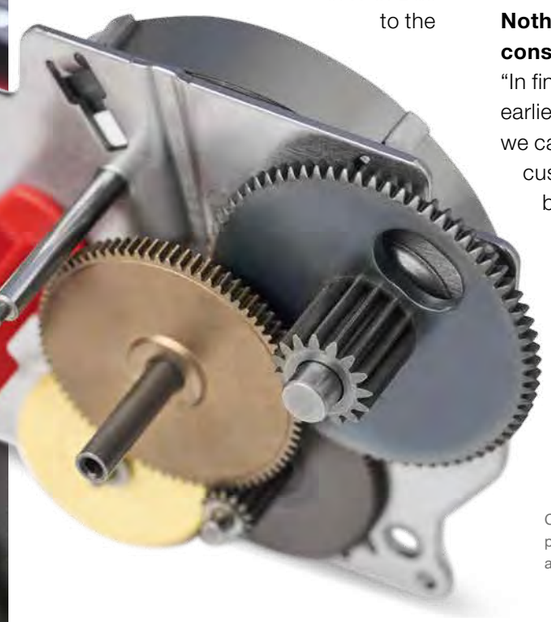


Customer advisors have the latest programs for design and simulation at their disposal.

working is usually required on the part afterwards. For example, with the aid of piercing it is possible to produce the axes of a planet carrier with a basic ISO tolerance of IT 8. Due to the combination of numerous operations in a single pass, so many additional operations can often be saved that the process proves on balance to be the most cost-effective option.

Nothing beats expertise in consulting and development

"In fine blanking in particular, the earlier in the development phase we can work together with the customer, the more they usually benefit," says Bamert. An important consideration here is the possibility of integrating additional functions in the same part thanks to the numerous possible tweaks on its passage through a progressive die. This can save the production and attachment of additional parts and/or further machining processes. The advantages when considering the process chain as a whole are often substantial. However, this requires the customer's developers to discuss their ideas with the design engineers at Feinstanz as early as possible at the design stage. The latter can then contribute their knowledge of the fine blanking process to the discussion so that the parts are designed from the outset to maximise the benefits possible in the process. An example of this is the swash plate of an axial piston pump, which only needs flat grinding on both sides after fine blanking. For such collaboration, the long-standing fine

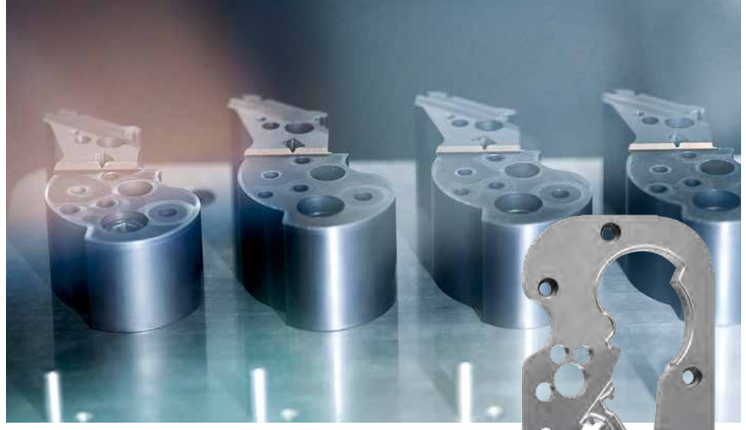


Composite part supplemented with bought-in parts and assembled ready for installation: actuator for ventilation flaps

blanking employees in the design office have the latest design and simulation software at their disposal, as well as the option of producing prototypes for trials.

Machining, assembly, packaging, delivery logistics …

“Another key service we can offer our customers is an extension of our own value chain tailored precisely to their needs,” Bamert reveals. In principle, this includes everything required to deliver a product or an entire assembly to the customer in exactly the condition they need for immediate use in production. This comprises all conceivable additional machining such as surface grinding, turning, cylindrical grinding and laser marking, and also, for example, the silver-plating of aluminium bus bars. Further steps included the addition of bought-in parts such as threaded bolts, springs or gear wheels and assembly, quality control and blister packaging. The customer thus receives fully functional assemblies such as actuators for ventilation flaps for building air conditioning. Such work is carried out manually or with partial or full automation in robotic production cells, depending on the requirements. Bought-in parts and services such as silver-plating are procured externally from a network of proven providers.



The punch and die for a sheet metal part are cut by wire erosion from hardened tool steel several centimetres thick.

Feinstanz assumes sole responsibility for the overall service delivered to the customer.

Tools are a core competence

“While we source our machines and peripheral components for our tools externally, we always make the crucial tool components such as punches and dies ourselves,” Bamert discloses. This is the

The seven-year-old MV1200R (front) and the 20-year-old FA20 in the wire EDM department.

> *The two Mitsubishi Electric systems prove to be reliable and patient workhorses in daily use that can always be relied on.*
>
> *Marco Rauchenstein, skilled mechanic at Feinstanz AG*

company's decisive expertise, and it is not only the design engineers' skills that count, but also the workshop employees' experience and attention to detail. After all, the tools in production have to run in some cases at high stroke rates despite large sheet thicknesses of up to 14 mm. In view of the enormous loads they have to withstand, wear is inevitable, and this can also affect the quality of the cut edges of the parts. The greater the care in making and maintaining the tool, the longer it can produce flawless parts.

Mitsubishi Electric wire EDM machines: durable and reliable workhorses

"We create the contours of the punches and dies for our tools by wire erosion on two Mitsubishi Electric machines," says Marco Rauchenstein. The skilled mechanic has been responsible for this department and thus for the quality of the fine blanking tools in the company since 2014. The latter is to be taken literally, because the tool contours decisive for the accuracy of the fine-blanked parts are made from plates of hardened tool steel several centimetres thick. After wire cutting, their contours do not undergo any further machining. A 20-year-old FA20 wire EDM and an MV1200R commissioned in 2015 are used. Both machines operate with deionised water. The

Marco Rauchenstein at the control of "his" MV1200R

path data supplied by the design department in DXF format are supplemented with material parameters and then converted into specific machining programs via CAD/CAM. Both machines – including the "veteran" FA20 – achieve the required accuracy without any problems, but the newer MV1200R is about 30% faster. He services the systems himself once a month and they have been running without any major malfunctions over the many years. Should any issues arise, these are quickly and competently resolved by Binkert, Mitsubishi Electric's Swiss agent. "The two Mitsubishi Electric systems prove to be reliable and patient workhorses in daily use that can always be relied on," says Rauchenstein summing up his experience.

Feinstanz AG
A member of the Federtechnik Group

Managing Director
Florian Thoma

Employees
Roughly 70

Founding year
1958

Core business
Precision components in the fields of fine blanking and component assembly for the automotive industry, kitchen and furniture making, machine manufacture, and building services and ventilation

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The combination of fine blanking and forming offers Feinstanz's customers a wide range of design options for complex and precise multifunctional parts.

A particularly high degree of rationalisation is achieved in the fine blanking of gearing. Feinstanz AG's expertise permits the fine blanking of high sheet thicknesses with small tooth modules.

LOTTE Co.

Ice cream makes chewy encounter with digital manufacturing.

Since its launch in 1981, Lotte's "Yukimi Daifuku" is loved by people of all ages as a popular Japanese household favorite. Many have tried the unforgettable flavor and texture of the vanilla ice cream balls wrapped in soft, chewy mochi rice cake. "Delicious whenever eaten, regardless of the season." However, to achieve that deceptively simple goal of consistent texture, quality and taste is actually more difficult than most people would think. To solve this challenge Lotte has introduced Mitsubishi Electric's e-F@ctory to the production of Yukimi Daifuku.

Pitfalls of production.

"Before introducing e-F@ctory, there was an issue of inconsistency in the rice cake quality," says Hiroshi Sugimoto, Manager of the Facilities Department, Urawa Plant, LOTTE Co., Ltd. "When wrapping the ice cream, the hardness of the rice cake used to vary depending on the temperature and water content. Some operations were dependent on people, and losses arose out of the need to finely adjust the machine parameters."

"The e-F@ctory system allows us to conduct improvement activities such as enhancing the operating rate, stabilizing quality, and optimizing staffing for production activities. The extendibility of the system, depending on what we want to do, was also appealing," Sugimoto adds.

At each of the Yukimi Daifuku production lines the state of the product and the operating status of the machines is collected by PLCs installed in each process. Vast amounts of data, such as vibration data from the rice cake hopper to data from the conveying inverters is collected. All of the data can be gathered in real-time not only through the overall SCADA monitoring system, which is installed in the control room, but also through on-site computer displays.

"By introducing this system, data have become centralized, making it possible to view and investigate conditions whenever we want," remarks Hiroshi Akimoto, Section Manager of Facilities Department, Urawa Plant, LOTTE Co., Ltd. "Because the data volume is extremely high, having all the data centralized in one place has a

Yukimi Daifuku is loved by people of all ages.

positive effect. One big benefit is that we can now gather and analyze data and conduct data diagnostics using a real-time data analyzer. This system not only helps us stabilize the state of the rice cakes used for the Yukimi Daifuku, but also promotes improvement activities within the plant."

"Another benefit is the adjustment of the blending ratio of rice cake and ice cream," Akimoto continues. "This used to be done by experienced operators, who monitored the state of the rice cakes as they come out of the wrapping machine by kneading them with their fingers. We thought it would be great if we could automate this process. By automating such processes, which were conventionally performed based on human senses, and by capturing signs of any poor quality in the wrapped rice cakes beforehand, we can eliminate problems. That was our ultimate goal."

"Ice cream is of course cold. And it is combined with rice cake, which is warm when it is made," says Takayuki Manako, Executive Director & Plant Manager of Urawa Plant, LOTTE Co., Ltd. "This technical aspect of combining a cold item with a warm one in a good balance is what makes Yukimi Daifuku a complex product. But I think this challenge is something that inspires us to find new ways to overcome it. The temperature in the manufacturing room varies all year round. We strive to maintain consistent conditions, but at the same time, we try to reliably create even better conditions. We introduced the e-F@ctory manufacturing concept with the expectation of realizing this in the future."

"In the course of daily production, machines do not operate in the same condition every day. Previously, experienced staff members checked and adjusted the settings of the machines," Manako continues, "but with e-F@ctory we can visualize the condition of machines and the machines themselves can issue instructions to make adjustments. Another thing is that maintenance and failures are unavoidable with machines. We expect that these can also be better managed by using e-F@ctory's symptom management features."

"The use of IoT has only just been introduced to the production of Yukimi Daifuku. However, the Urawa Plant has many other lines making chocolates and ice creams, so Yukimi Daifuku is not our only challenge," Manako adds. "We aim to horizontally deploy this system and construct a smart plant in which 'symptom management' and 'operating rate improvement' are implemented on numerous lines. Stable plant operation and manpower savings will eventually make a major contribution in terms of costs and so on. If we consider LOTTE as a whole, our goal is to further evolve this technology and extend it to other plants."

"MELIPC", the Mitsubishi Electric industrial PC on which data collection and analysis and diagnostics are carried out.

"With e-F@ctory we can visualize the condition of machines and the machines themselves can issue instructions to make adjustments.

Takayuki Manako, Executive Director & Plant Manager of Urawa Plant, LOTTE Co., Ltd.

What is mochi ice cream?

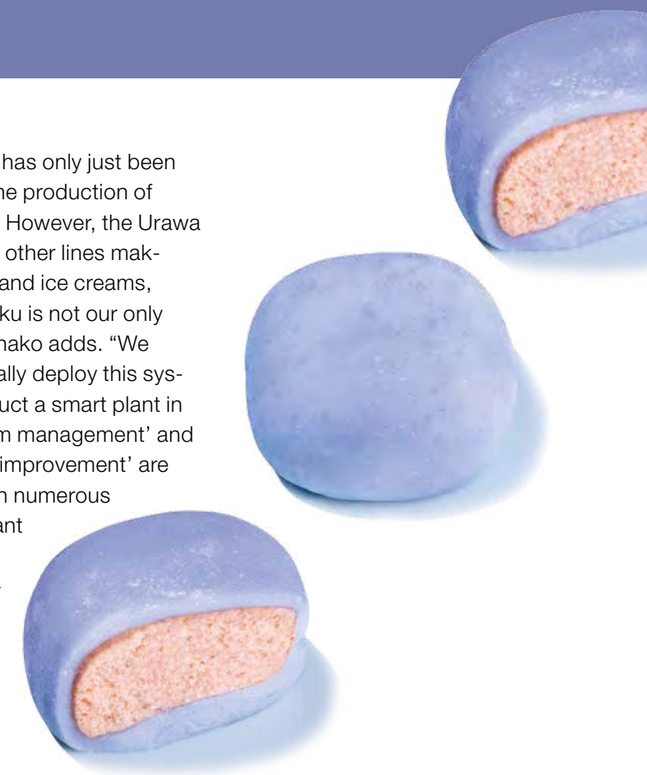
Mochi ice cream is a Japanese rice cake. There are countless variations of mochi: filled, coloured, round and square.

Ice cream filling

An ice cream filling inside that goes well with soft mochi. Vanilla, chocolate and strawberry are the traditional flavours. But such flavours as coconut, mango, matcha and green tea are also widely available.

Mochi

A crushed sticky rice that is moulded around the ice cream filling.



Prototyp Werke GmbH

Wire-cutting a higher profile.

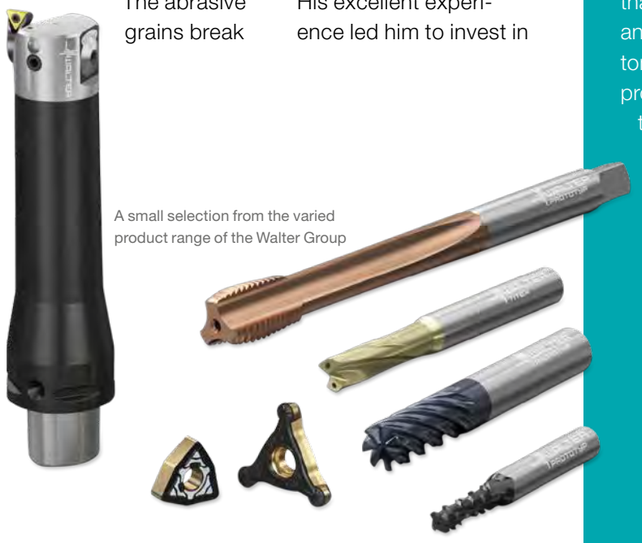
Prototyp in Zell am Harmersbach in Baden produces threading, forming and milling tools for its parent company, the tool manufacturer Walter AG in Tübingen. The grinding wheels required for this are profiled by the specialists on wire erosion systems from Mitsubishi Electric.

Profiling grinding wheels with wire EDM.

Prototyp Werke in Zell, a company of tool manufacturer Walter AG since 2007, develops and produces standard and custom carbide tools for drilling, forming and milling threads. In production, the tool grinders have to meet challenging specifications for high precision. Different profiles have to be ground with high precision into round-ground carbide rods for a variety of tools. It is very difficult to achieve the accuracies required today by adopting the methods previously used for preparing the grinding wheels. According to Fabian Lehmann, the tool grinders at Prototyp therefore replaced the former "crushing" of the grinding wheels with wire eroding in 2019. "During crushing, profiled form rollers are pressed against the grinding wheels. The abrasive grains break out of the grinding wheel and the desired profile is created. This process is highly elaborate when high precision is required. The profiles are extremely difficult to produce and, due to the manual aspect, almost unrepeatable. In addition, the process is very labour-intensive, requiring long set-up and preparation," Lehmann explains.

Reliable and accurate

In order to profile the grinding wheels with much greater process security and, above all, repeatability, the tool grinders have been using an EDM-Dress 2400R wire eroding machine from Mitsubishi Electric since 2019. Initially, says Lehmann, only diamond grinding wheels with complex profiles were processed on this machine to replace manual crushing. His excellent experience led him to invest in



A small selection from the varied product range of the Walter Group

Tools from Baden – Prototyp Werke GmbH

The foundation stone for the company was laid by Alfred Zimmermann, an engineer in Zell, in 1919. He started out with the production of micrometers. From 1920, he added the production of dies, primarily for sewing machine threads for sewing machine manufacturer Dürrkopp in Bielefeld. In the ensuing years, the firm gradually started cutting all other common types of thread as well. The company has been called "Prototyp" since 1927.

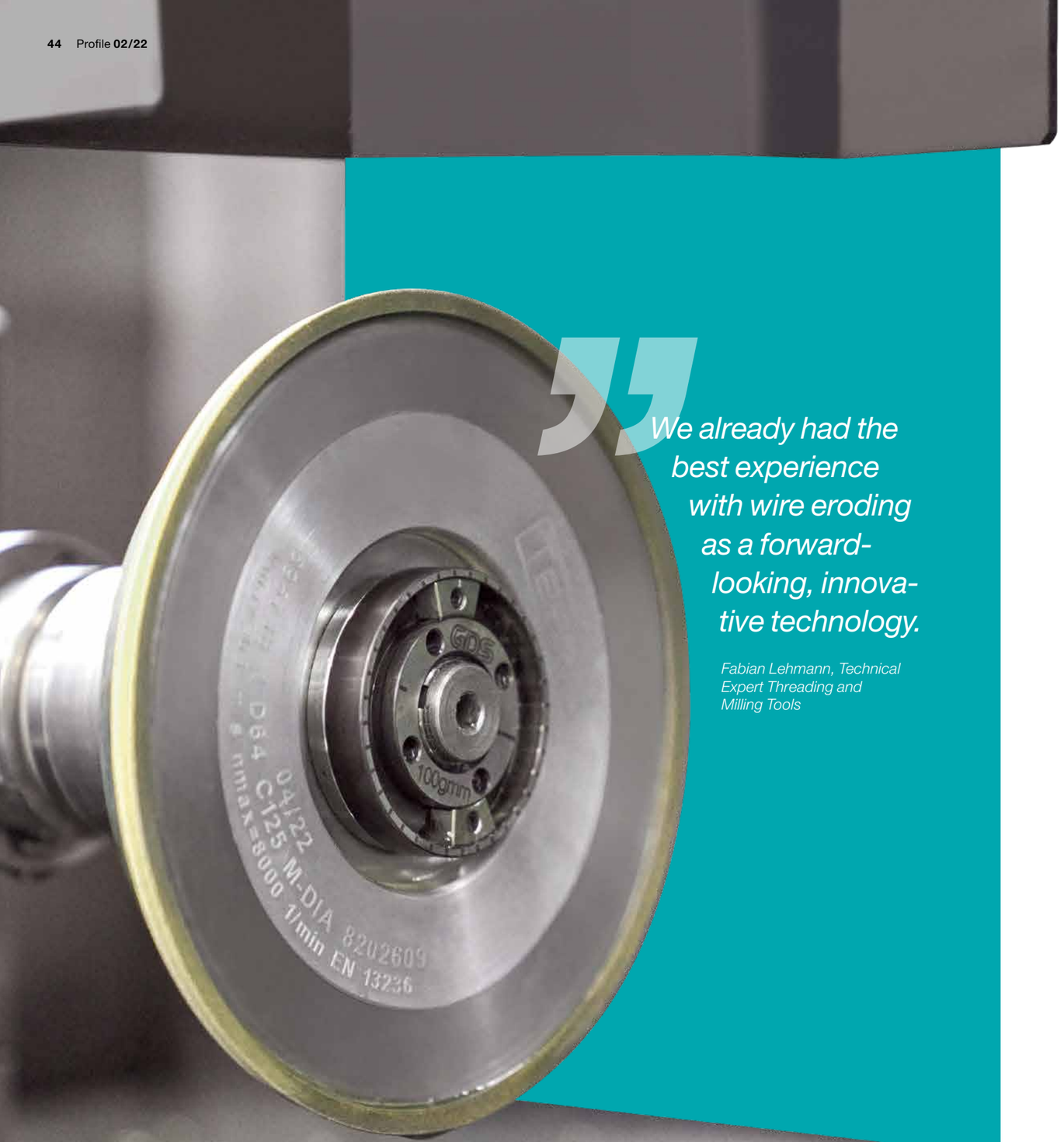
Today, the specialists in Zell am Harmersbach develop and produce high-tech milling and threading tools of HSS and solid carbide. The production activities include not only the grinding of the various geometries, but also the surface treatment and coating of tools. It produces about 1.8 million threading tools and 1.1 million milling tools annually.

The Prototyp plants in Zell have been a state-of-the-art production site belonging to Walter AG since 2007. As a globally operating toolmaker, the Walter Group is active in all of the world's major markets. This means that the company can supply standard and special tools directly to the customer worldwide and, together with production specialists, implement the in each case optimum machining process.

Annual output

1,800,000
threading tools

1,100,000
milling tools



We already had the best experience with wire eroding as a forward-looking, innovative technology.

Fabian Lehmann, Technical Expert Threading and Milling Tools

an automatically loaded wire-cut EDM machine for profiling other grinding wheels. He had several sound reasons for doing so. “We no longer wanted to invest in a technology with many years of proven use, but which is no longer up to the mark – such as dressing with rollers. We already had the best experience with wire eroding as a forward-looking, innovative technology. Moreover, with wire EDM we can programme the profiles with precision, and the outcome does not depend on the skill of our technicians,” Lehmann continues. A lively exchange of information and further discussions with the specialists at the Kompetenzzentrum für spanende Fertigung (Centre of Excellence for Machining) in Tuttlingen under Professor Dr.-Ing. Bahman Azarhoushang confirmed our decision to purchase another wire-cut EDM machine. Beyond the advantages of higher accuracy, the wire-profiled grinding wheels show significantly higher productivity and economic efficiency. “In addition, the grinding wheels profiled with wire erosion permit higher feed rates in certain applications,” Lehmann adds. Abrasive grains are not broken out during wire erosion, but cut apart, thus creating a much more efficient microstructure. The grinding wheels prove to be stronger and more aggressive. The grinding wheels profiled by wire erosion can therefore reliably grind high-precision profiles for a longer period of time.

Designed for mass production

The tool grinders in Zell produce, firstly, standard tools in medium series and, secondly, custom tools in small batches flexibly and at short notice. For this, they need a large number of different grinding wheels and grinding wheel sets. For the latter, up to four individual grinding wheels are set-up in advance on a shaft with a standard tool holder – an HSK50, for example. In this way, the grinding wheel sets for machining the tools can be changed in the tool grinding machines quickly and with high repeat accuracy. “So that we can profile our numerous different grinding wheels with wire EDM, we not only invested in a second wire EDM machine MV1200R from Mitsubishi Electric in 2021, but also installed a highly automated, flexible

Grinding wheels profiled with wire have a highly efficient microstructure.

Higher productivity and efficiency with wire profiling.

DiamondCell 1200R robotic cell," says Lehmann. Sets of grinding wheels are now profiled in a fully automated process in rapid succession. The skilled personnel place the grinding wheels in a kind of tray in the DiamondCell. From there, a robot transfers the various programmed grinding wheel sets to a shelf, from where they are successively fed into the rotating spindle in the workspace of the MV1200R Connect wire erosion system and processed. After wire eroding, the robot dips the grinding wheel sets in an oil bath to protect them from corrosion and then places them on the rack from where they can be removed.

Flexible programming

The robotic cell is equipped with a master computer. Here the grinding wheels for profiling are entered as jobs. The storage positions of the grinding wheel sets for eroding are also programmed. The sequence and thus priorities can also be adjusted to account for already entered data. This ensures maximum flexibility with complete automation of the profiling process. Lehmann explains working with the flexible robotic cell: "To wire-cut the profiles, we read in DXF files on the master computer. From this, we create the NC programs from the control system, in dialogue and with user guidance. The wire EDM machine is integrated into the robotic cell's master computer and receives production orders from there. We can create further NC programs for profiling grinding wheels in parallel. We benefit enormously from the fact that the robotic cell can profile more than 20 different grinding wheel sets in chaotic succession, unattended. This way we achieve high productivity und exceptional cost-effectiveness with our work."

Integrated into the robotic cell, the MV1200R profiles grinding wheels and complete grinding wheel sets unattended in dependable processes.

The DiamondCell 1200R does its profiling work absolutely reliably and autonomously over a long period of time. We mainly use wire with a diameter of 0.2 mm. Even in the event of a pretty unlikely wire breakage, the machine reliably rethreads and resumes machining.

Fabian Lehmann, Technical Expert Threading and Milling Tools

The robot loads and unloads the wire EDM machine in the cell.

Highly automated robotic cell.

The investment in the DiamondCell 1200R robotic cell with integrated MV1200R wire-cut EDM machine from Mitsubishi Electric has now proved to be absolutely right and worthwhile for us in several ways.

Fabian Lehmann, Technical Expert Threading and Milling Tools

Dependable and rugged

"The DiamondCell 1200R does its profiling work absolutely reliably and autonomously over a long period of time. We mainly use wire with a diameter of 0.2 mm. Even in the event of a pretty unlikely wire breakage, the machine reliably rethreads and resumes machining," says Lehmann, highlighting the strengths of the wire EDM machine from Mitsubishi Electric.

Because the process of wire-eroding the grinding wheels thus runs so dependably, the tool grinders in Zell soon intend to profile grinding wheels in three shifts as well for the mass production of their threading tools. The grinding wheel sets are dipped after wire-cutting in an oil bath to prevent corrosion of the grinding wheel carriers and tool holders. Lehmann expects the volume of production orders for the automated robotic cell to grow in the near future. Unfortunately, not all the grinding wheels in use can be eroded trouble-free – these must be replaced with suitable wheels so that whole wheel packs can be transferred from manual dressing to wire EDM dressing.

Prototyp Werke GmbH

Founding year
1919, and a member of Walter AG in Tübingen since 2007

Number of employees
350

Core business
Development and production of innovative threading and milling tools of high-speed steel (HSS) and solid carbide

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www.walter-tools.com

Fabian Lehmann (l.) and Christian Huck, Business Unit Manager / Director Prototyp plant, have been completely won over by the forward-looking technology of the automated wire EDM system for profiling grinding wheels.

Spimeca SAS

Where high-tech mould making comes naturally.

The Vosges Mountains – France's geological twin of Germany's Black Forest – are popular with tourists, but sparsely populated due to the harsh weather conditions. The area's most important asset is its skilled and industrious people. This is what an enterprising group of friends built on in 1989 when they started making die-casting and injection moulds here. With ingenuity and quality, the company soon established itself.

Not what you would expect: a flourishing high-tech mould making business in idyllic countryside.

Success in a rural location.

“We owe our success to our quality, know-how and excellent service,” says Philippe Pierrel, managing director and co-owner of Spimeca SAS in La Bresse. Founded in 1989, the company specialises in the making, maintenance, modification and repair of metal moulds for the production of plastic injection mouldings and zinc die castings. The moulds they make weigh up to 2.5 tonnes.

Its customers are suppliers to various industrial sectors such as vehicle manufacture, packaging, building accessories, medical technology, and household and electrical appliances. In addition to numerous clients in eastern France, the customers also include companies in Germany, Belgium, Switzerland, Romania and Algeria. Many of the customers have been loyal to the company for over 20 years and regularly place new orders. In 2018, several senior employees took over the company in a management buyout.

Focus on challenging moulds

“Our customers know that we also take on orders for particularly fiddly moulds – especially two-material ones,” Pierrel adds. These include highly nested moulds, moulds for multi-component injection moulding and moulds for thermosets and elastomers. That’s also why a full third of the workforce is engaged in design engineering and job preparation. This is where modern hardware and CAD/CAM software packages are used.

Mr Pierrel and co-owner Ludovic Claudel (head of the Technical Office) examining a customer drawing

Moulds up to

2,5 tonnes

One of their strengths is elaborate moulds for plastics injection moulding.

A largely closed digital transfer of machining data to advanced, CNC-controlled machine tools ensures fast and efficient production of the required components with the desired precision. In addition, the company teams up with customers to advise them on particularly demanding tasks as part of development projects. For supplementary engineering services such as the simulation of the injection moulding process, the company resorts to its network of proven external specialists.

Modern equipment

“If you want to deliver high quality and precision, you have to invest in high-grade machinery,” says Pierrel. Currently, this includes four advanced CNC machining centres and a further four spark erosion systems, also CNC-controlled. The machining centres are a turning machine, three 3-axis milling machining centres and a 5-axis milling machining centre. These are supplemented by a cylindrical grinding machine and three surface grinding machines. In the EDM sector, Spimeca has two die-sinking EDM machines, two wire EDM machines and a start-hole drilling machine. One of the die-sinking EDM machines is automated with an EROWA robot system.

High level of service

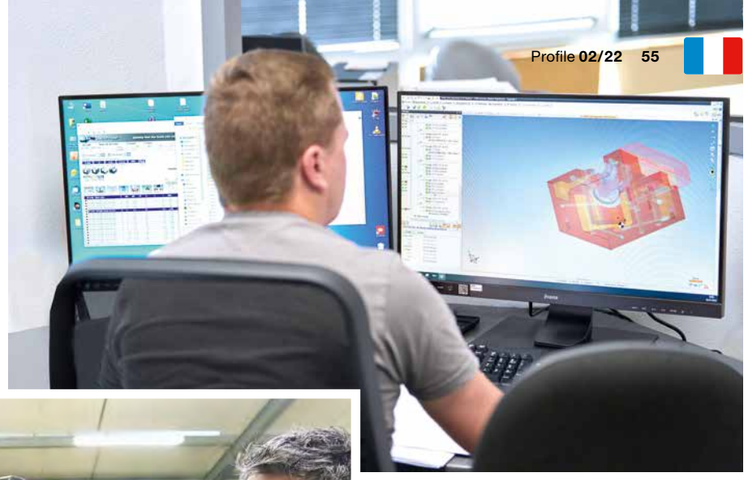
“An important advantage of our company philosophy from the customer’s point of view is our high level of service,” Pierrel explains. If necessary, they can react within two days. The fact that Spimeca also handles third-party products is

highly appreciated. The service covers all aspects of maintenance and modification to repair after damage due to wear-and-tear or impact. Speed is of the essence in such cases, because the customer usually has to complete his orders to tight deadlines. In the event that material has to be rebuilt on components, e.g. after wear, the company has also invested in a special system for laser build-up welding. Such jobs now account for about 50% of total revenue. This service not only strengthens the loyalty of existing customers, but also attracts new ones.

Choosing Mitsubishi Electric

"The decision to purchase a new wire EDM machine was taken in January 2021," Pierrel reveals. It was to replace an older machine from another manufacturer that no longer met the tougher demands in terms of performance and precision. At that time, Spimeca already had long-standing contacts with Delta Machines, Mitsubishi Electric's French agent, so they also sought information there during their search. The discussions revealed that a MV1200R Connect water bath machine met Spimeca's requirements best. Instead of arranging trial machining, Delta organised a whole series of visits to users who were already using the equipment.

Moving mould components with complex geometries machined by wire erosion



Computer-aided design and job preparation in the engineering department

The new Mitsubishi Electric MV1200R Connect has been in continuous use since September 2021.

The discussions with fellow users proved very helpful and ultimately led to the decision in favour of the Mitsubishi Electric MV1200R Connect. The order was placed in May 2021 and delivery took place in September. After delivery, Delta first provided three days of internal training, which was attended by three employees. Two further days of training then followed in November. This two-stage approach was deliberate to enable the second training session to build on the practical experience already gained. Since then, Delta has also proved to be competent and quick to respond to questions from staff.

Satisfied with quality and service

"The new wire-cut EDM machine has been in continuous use since then and proven to be efficient, reliable and highly precise," Pierrel reports. Spimeca can now use wire diameters of only 0.1–0.3 mm instead of the 0.2–0.3 mm previously used on the old machine. In combination with the significantly better surface quality, this opens up additional market opportunities in the machining of

cutting and punching tools, for example. Machining in discontinuous cuts benefits particularly from this.

Since commissioning, there have been no machine failures whatsoever. The unit works reliably, staff have no problems with it and the quality achieved is satisfactory. “At the end of the day, I can say that all our expectations have been met,” says Pierrel summing up.

Wire-cut copper electrodes for die sinking

***The new wire-cut EDM machine** has been in continuous use since then and proven to be **efficient, reliable and highly precise**.*

Philippe Pierrel, managing director and co-owner of Spimeca SAS

Société De Production Industrielle Et Mécanique – Spimeca SAS

Employees
18

Founding year
1989, management buyout 2018

Owners
Philippe Pierrel, Laurent Poirot, Ludovic and Aurélie Claudel

Core business
Making, modification, maintenance and repair of injection moulds

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Tel. +33 (0)3 29 25 56 57

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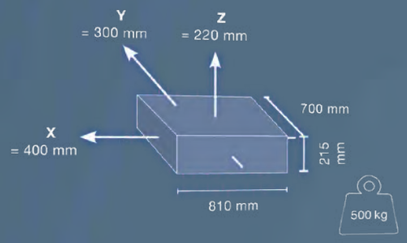

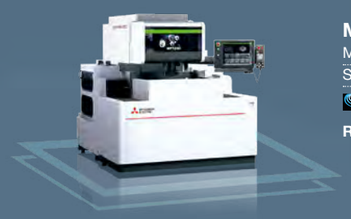

MP1200 Connect

Machine height	2015 mm
Surface finish in the standard version	Ra < 0.10 µm

Maisart

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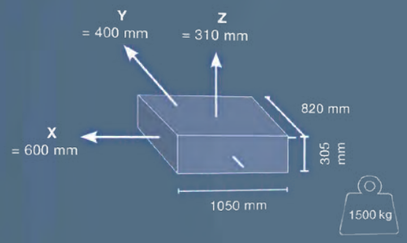
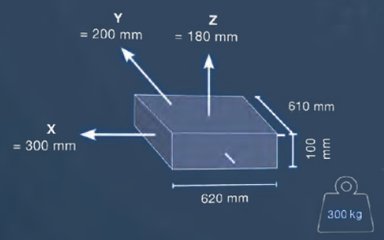


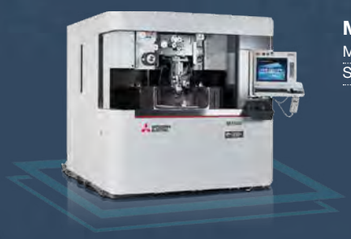
MP2400 Connect

Machine height	2150 mm
Surface finish in the standard version	Ra < 0.10 µm

Maisart

MX600 – Precision in Oil

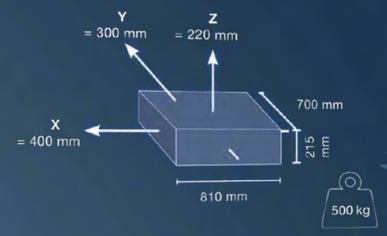


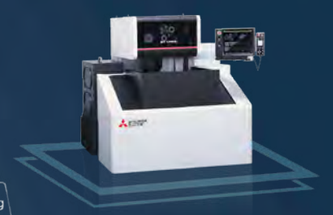


MX600 Advance Tubular

Machine height	2100 mm
Surface finish in the standard version	Ra 0.05 µm

MV-R Series – Power for Precision



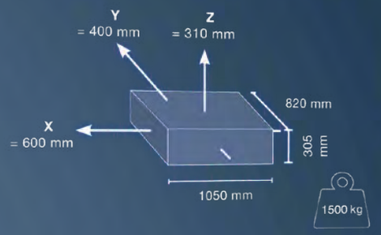


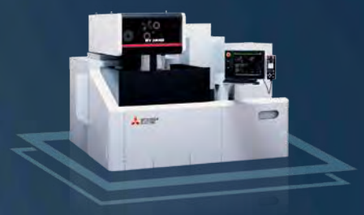
MV1200R Connect

Machine height	2015 mm
Surface finish in the standard version	Ra 0.25 µm

Maisart

Reports on pages 6, 26, 40 and 50





MV2400R Connect

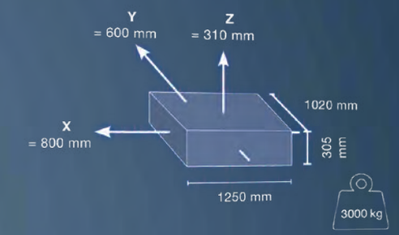
Machine height	2150 mm
Surface finish in the standard version	Ra 0.25 µm

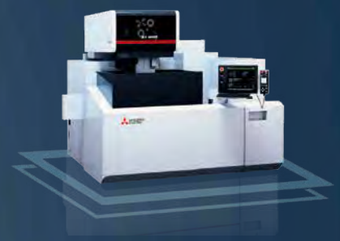
MV2400R Z+ Connect available:

Machine height	2380 mm
Travel	X: 600 mm, Y: 400 mm, Z: 425 mm
Max. workpiece dimens. (WxDxH)	1050 x 820 x 420 mm

Maisart

Report on page 86



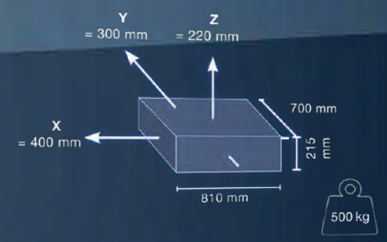


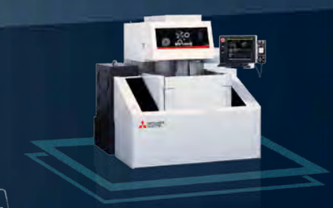
MV4800R Connect

Machine height	2415 mm
Surface finish in the standard version	Ra 0.25 µm

Maisart

MV-S Series – Ready for Production

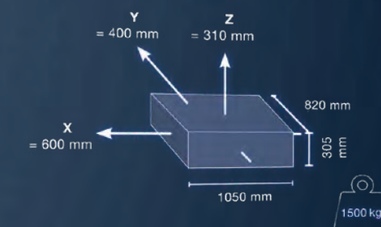


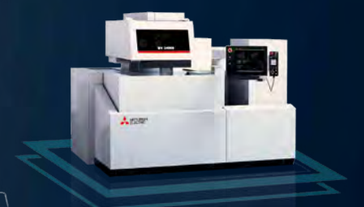


MV1200S New Gen

Machine height	2015 mm
Surface finish in the standard version	Ra 0.35 µm

Report on page 76



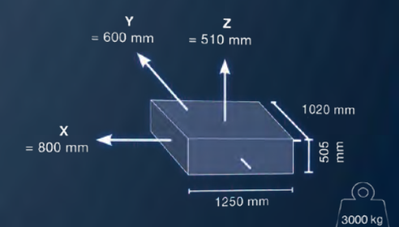


MV2400S New Gen

Machine height	2150 mm
Surface finish in the standard version	Ra 0.35 µm

MV2400S Z+ New Gen available:

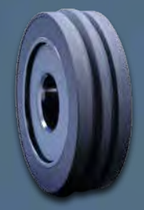
Machine height	2380 mm
Travel	X: 600 mm, Y: 400 mm, Z: 425 mm
Max. workpiece dimens. (WxDxH)	50 x 820 x 420 mm



MV4800S New Gen

Machine height	2815 mm
Surface finish in the standard version	Ra 0.35 µm

EDM-Dress – wire EDM dressing of CBN and diamond grinding wheels



DIAMONDCELL

- 100% reproducible results
- Unmanned machining
- Increased grinding productivity
- Extended grinding wheel life
- Fully automated

Report on page 40

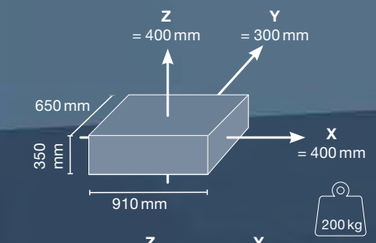
EDM-DRESS

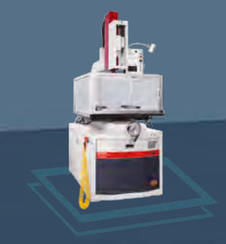
- 100% reproducible results
- Unmanned machining
- Increased grinding productivity
- Extended grinding wheel life

Maisart

EDM Drilling

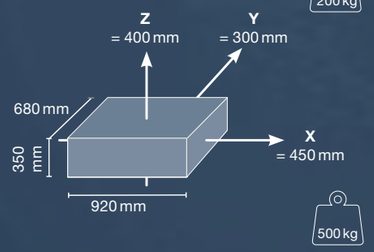
start Series – Drilling Power





start 43Zi

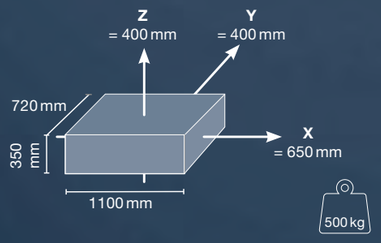
Machine height	2200 mm
Possible electrode diameter	0.3–2.5 mm

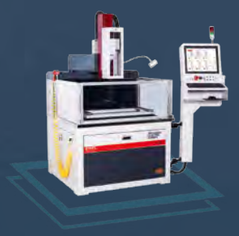


start 43Ci

Machine height	2130 mm
Possible electrode diameter	0.3–2.5 mm

Report on page 60



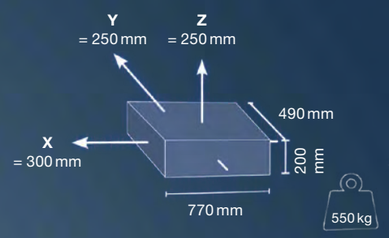


start 64Ci

Machine height	2100 mm
Possible electrode diameter	0.3–2.5 mm

Die Sinking

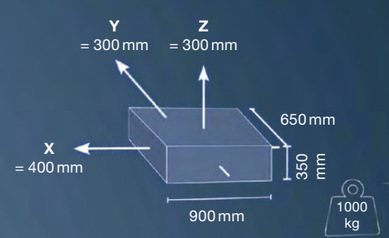
SG-R Series – Power for Precision

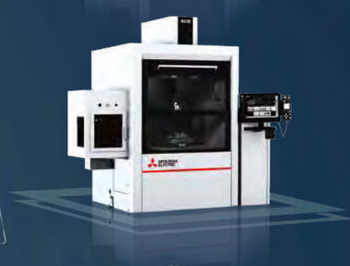


SG8R

Machine height	2140 mm
Table dimensions (W x D)	500 x 350 mm
Daylight	150–400 mm

Maisart

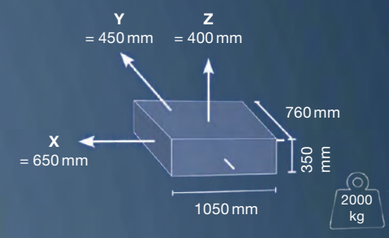


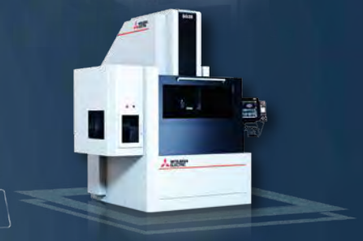


SG12R

Machine height	2420 mm
Table dimensions (W x D)	700 x 500 mm
Daylight	200–500 mm

Maisart





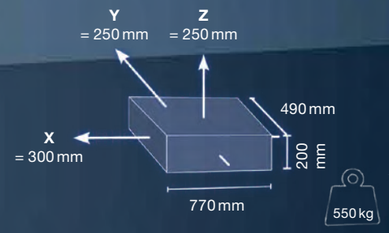
SG28R

Machine height	2745 mm

- User-friendly D-CUBES control system
- Wide range of technologies
- Heavy-duty machine construction

Maisart

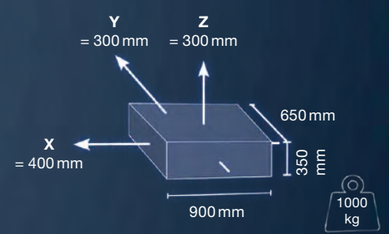
SG-S Series – Power for Precision



SG8S

Machine height	2140 mm
Table dimensions (W x D)	500 x 350 mm
Daylight	150–400 mm

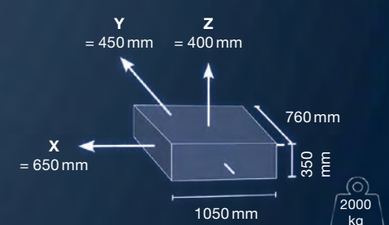
Maisart



SG12S

Machine height	2420 mm
Table dimensions (W x D)	700 x 500 mm
Daylight	200–500 mm

Maisart



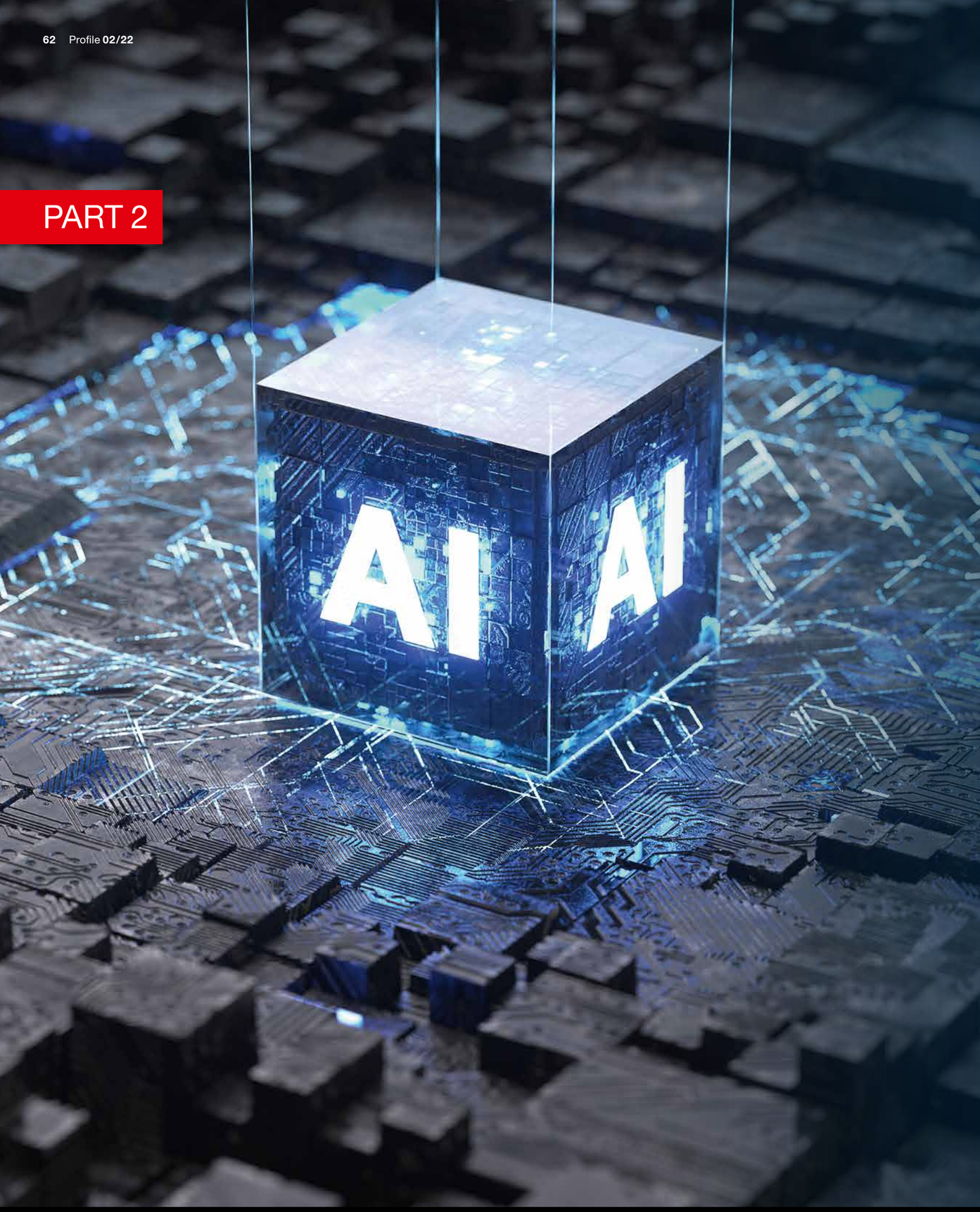
SG28S

Machine height	2745 mm

- User-friendly D-CUBES control system
- Wide range of technologies
- Heavy-duty machine construction

Maisart

PART 2



Mitsubishi Electric

You don’t get AI off the peg.

Artificial Intelligence for automation.

The potential of Artificial Intelligence (AI) in production is becoming more and more apparent. At the same time, the range of AI functionality in automation is also increasing. Mitsubishi Electric unites a diverse range of such features under its Maisart brand. SPS-MAGAZIN asked its European headquarters in Ratingen about the areas of application they are targeting and whether these features are truly already operational.

By using Artificial Intelligence, Mitsubishi Electric is making its products not only smarter, but also safer and more user-friendly. As a consequence, the company aims to position its Maisart AI platform not just in the business sector of automation technology, but holistically across a broad spectrum of industries. For example, the intelligent algorithms from the AI range are already being used for the control of air conditioning systems, the navigation of mobile units and the predictive maintenance of robots. Technologically, the platform combines such diverse approaches as Deep Learning, Reinforcement Learning and Big Data Analytics. But how are such users as machine manufacturers and production companies benefiting from this technology? Division Manager Stefan Knauf and Marketing Manager Jan-Philipp Liersch provide the answers.

Mitsubishi Electric launched its Maisart platform back in 2017. How far have they come with it in the meantime?
Stefan Knauf: Currently, more and more AI features developed in-house are being translated into concrete

Maisart® is Mitsubishi Electric’s brand of AI technology. The name stands for “Mitsubishi Electric’s AI creates the State-of-the-ART in technology.” This means that we are using our proprietary AI technology to make everything smarter.

products. We are already providing such Smart Plus options in automation systems for controllers, servo drives and robots.

Jan-Philipp Liersch: In doing so, we are pursuing a special approach, because Maisart doesn't force the user to generate added value solely via the cloud and with a troop of data scientists. On the contrary, our philosophy is to apply AI right where the data is generated. Only then is it possible to draw conclusions directly and feed measures straight back into the process, i.e. the machine. Data traffic, server capacity and the necessary security efforts are reduced at the same time.

Knauf: In some cases, not only are the structures simplified, but also the business processes. Because not all data records necessarily have to be forwarded to higher levels – Smart Data takes precedence over Big Data: data recording, sorting and evaluation. As a result, the user can quickly and easily integrate AI functions into the process via Mitsubishi Electric hardware. If required, however, comprehensive and tailored data analysis is also of course possible, e.g. at the edge level. Maisart is already being used by some customers here as well.

With its MELIPC controllers, Mitsubishi Electric brings Artificial Intelligence in manufacturing to the control level.

How do customers find out whether Maisart has the right AI features for their needs?

Knauf: Supplying the complete battery of algorithms doesn't get us very far. Instead, we start the other way round and ask the customer what goal he has or what problem he wants to solve. In terms of a manufacturing process, it is mostly about ways of preventing errors. And about the factors that have any effect at all on the product's quality. That's why our approach deliberately involves the people at the machine. After all, they usually have the most experience and know the sticking points in the process best.

Liersch: Until a data analyst finds weak points in the cloud, you may in some cases waste a lot of time. The use of a Big Data solution is therefore much more elaborate than using locally collected data. Especially if you talk directly to the people responsible for the various process steps about the data relevant to them. You don't get AI off the peg.

So you have to treat each customer individually?

Liersch: Correct. Also because machine makers and end users have different degrees of experience with AI. We have customers who have already gathered a lot of experience of data analysis. We can engage with them on a highly advanced level. Other companies are still having difficulties getting their minds round the issue. That's when you have to start at the beginning, with the AI basics.

Knauf: But whether it's an SME, a corporation, machine operator or technical manager, it always takes someone with an idea to create future added value with AI. The big visions tend to come from the upper echelons. The hands-on ideas usually come from the shop floor. Ultimately, however, Artificial Intelligence must be adopted across the board at all levels. In this respect, it is currently easy to see growth in both the range of applications for AI and the willingness to use it.

The user can start with individual AI functions and later extend them to the entire factory.

Jan-Philipp Liersch, Marketing Manager Industrial Automation at Mitsubishi Electric

Using Maisart, Mitsubishi Electric has managed to dimension neural networks to fit into firmware.

Stefan Knauf, Division Manager Industrial Automation at Mitsubishi Electric

Melfa Assista

Mitsubishi Electric's Melfa Assista robot delivers the same precision and positioning accuracy as a conventional industrial robot, but is easy to operate and switches between cooperative and collaborative use at the touch of a button. It reliably carries out complex assembly tasks while reacting flexibly to changing conditions. Set-up is simplified by a direct teaching function. The position is stored on the keypad built into the robot arm. For more complex travel paths, there is also visual programming software that allows motion functions and individual adjustments to be programmed on a tablet computer by drag & drop – without any special knowledge of robots. The Melfa Assista has a repeat accuracy of ±0.03 mm at a nominal load of 5 kg and a reach radius of 910 mm. The range of possible applications includes laboratory automation, precision assembly, high-grade packaging and component handling.

Liersch: One area where this is very clearly visible is robotics.

In what way?

Liersch: Robotic systems are becoming increasingly complex. Smart algorithms and sufficient computing capabilities are needed to keep the applications manageable. The best example is the trend towards direct cooperation between humans and robots. Artificial intelligence is needed to make this safe and sensible. Without it, a robot like Mitsubishi's Melfa Assista, which converts from a classic industrial robot into a cobot at the touch of a button, would be unthinkable. The kinematics are even so intelligent that additional sensors can be dispensed with in many places. The intelligent control alone gives it collaborative abilities.

Knauf: Another area where we can easily observe the development of AI features is industrial image processing. AI has been in use here for many years – in distinguishing between good and bad parts, for example. Thanks to growing computing power and improved algorithms, robot vision continues to advance. So much so that robots today have mastered the variety of parameters necessary, for example, to perform the quality control of produce in the food industry, i.e. fruit and vegetables.

And the user is expected to keep up with these advances without specialist knowledge of AI?

Liersch: This is one of the main keys to success. That is why we attach top priority to the straightforward applicability of AI functions. Whether it's options like temperature compensation, force/torque control or autonomous path planning, our AI solutions of course use complex models. But we prepare them for easy use so the user doesn't have to have a lot of AI know-how.

What's more, he can also start small, with individual functions on a machine. Step by step, he can then extend the use of Artificial Intelligence to the entire factory via the edge level or the cloud. The Maisart concept is also designed for this from the outset.

Is your current generation of automation hardware already fully AI-capable?

Knauf: Using Maisart, Mitsubishi Electric has managed to dimension neural networks to fit into firmware. This is now being applied to more and more products from the Mitsubishi Electric portfolio and – because Maisart is implemented across all divisions – is also finding its way into a growing number of applications and industries. From automation and building services to automotive.

On this journey, I think it is easy to appreciate that the time really is ripe for the application of AI in production. More and more users have grasped the potential inherent in it. The generation change among engineers and technicians is also contributing to growing awareness. Last but not least, people are coming into increasing contact with Artificial Intelligence in everyday life.

Do you also see this trend among your own employees?

Knauf: Definitely. Ultimately, a prerequisite for Maisart's success is getting our own team ready for Artificial Intelligence. Only then we can bring AI functions to the market on a large scale. To be honest, this is a lengthy process that we are still in the middle of.

Liersch: Our e-Factory network is a huge help here. Because it offers incredibly versatile extension options wherever Mitsubishi Electric's portfolio has its limitations. And so there are many companies among our partners that already have special tools for the implementation of AI – and provide valuable support for such applications.

Mitsubishi Electric's big goal with Maisart is to implement a real industry standard for AI in the market – the abbreviation stands for "Mitsubishi Electric's AI creates the State-of-the-Art in Technology". And, as we all know, this is best done hand-in-glove with partners and the customer.

SPS-Magazin 2/2022

AI for the next generation: the firmware of the new MR-J5 servo family is already equipped with intelligent Maisart algorithms.

Mitsubishi Electric Europe B.V.'s AI solution wins prize in Renault and Google CO_2 competition

An intelligent data tracking and monitoring solution developed for automotive factories by Mitsubishi Electric has been awarded a coveted 2nd place at the Hackathon CO_2 Industry event organized by Renault and Google.

The competition entry was put forward by Global Key Account Manager Stephen Methogo and Senior Application Engineer Houari Derraz, Mitsubishi Electric Europe, France. It uses data-tracking to visualize, aggregate and report energy usage in real time. Based on the collected data, it leverages actionable insights from AI to reduce process emissions at shop-floor, factory and global level.

The event was held from 23 – 25th November 2021 at the innovative Renault Refactory based in Flins, France which is dedicated to achieving a circular automotive economy. The factory relies on developing collaborative partnerships and technology to address four main areas of sustainability.

Hackathon CO_2 Industry focusses on the decarbonization of their factories. The event is organized by Renault Group and Google and accompanied by Startup Inside, it is aimed at energy players, industrial equipment manufacturers and digital companies with 'an appetite for innovations related to the environment'. Stephen Methogo commented: "We are delighted to have won recognition by this event, especially as our work on achieving CO_2 reduction targets within the automotive sector is also at the core of Mitsubishi Electric's global Environmental Sustainability Vision 2050."

And it does it with even more “feel” and force reduced by 50% from 20 to 10 newtons ...

In the assembly of PCBs and insertion of mechanical parts, cycle time has been slashed from 5.5 seconds to 1.9 seconds. What is it that Maisart does differently?

Automation is becoming increasingly important in modern industrialised countries. This stems from a combination of labour availability and economic factors. The conventional route was time-consuming and resulted in significantly higher cycle times.

Until now, automated systems for precision assembly and placement operations have required programming and parameter setting by skilled personnel to achieve the flexibility of assembly processes performed by humans. These requirements increase assembly costs and time, which manufacturers want to reduce.

Thanks to Mitsubishi Electric’s Maisart AI technology, the new, rapid force-feedback control algorithm cuts assembly time and prevents the assembly robots from moving too vigorously. The technology allows task parameters such as speed to be set quickly and precisely. High-precision force sensor data in particular can be accessed without the need to pause the robots. Conventionally, robots are halted before force-feedback control is introduced – but Mitsubishi Electric’s new algorithm now eliminates this step.

The new AI technology facilitates rapid and incremental learning using Maisart’s enhanced learning capability, which represents a vast improvement over traditional methods that take an enormous amount of learning time to examine various data inputs and their combinations.

Mitsubishi Electric has harnessed its expertise in industrial automation, machine tools and autonomous working technology to refine the learning capabilities of AI and facilitate the progressive learning of work processes. Instead of learning all the technology at once, the company has simplified the content and added easy, automatic step-by-step learning to accelerate and streamline the learning progress. Internal tests have shown that the time taken to write the program is only a tenth of the time taken for manual processes.

To reduce cycle time (average time between the production of one unit and starting work on the next) when using such production equipment as industrial robots, skilled workers usually have to make numerous settings on the production equipment. With Mitsubishi Electric’s new AI, on the other hand, adjustments to route, speed, acceleration, etc. are performed automatically. The procedure is learned beforehand in a simulator so the AI can automatically make

MELFA Smart Plus Card

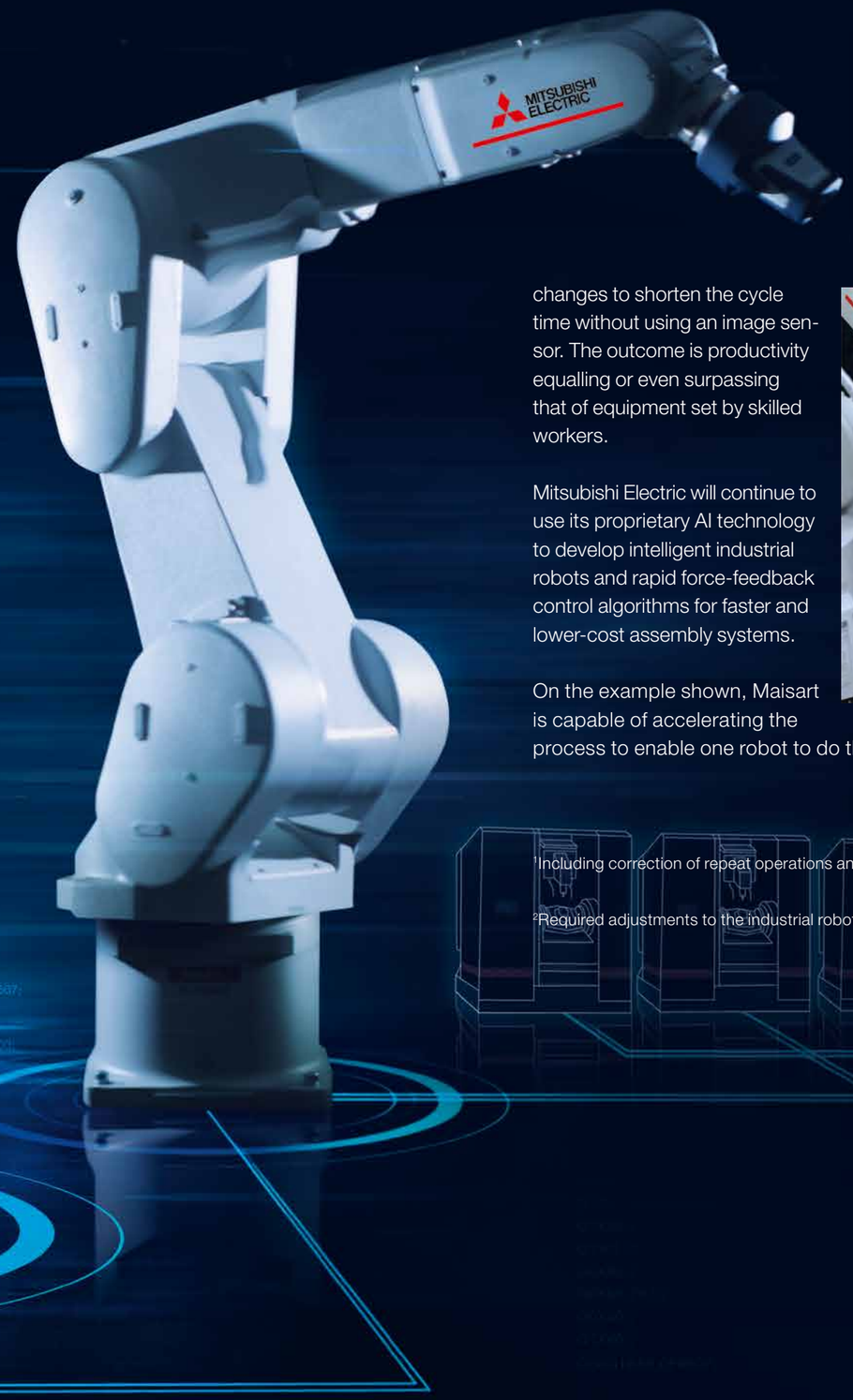
The MELFA Smart Plus Card reduces downtime by detecting anomalies early on (predictive maintenance).

The predictive maintenance function is used by Maisart to detect and report anomalies in robot drive systems* at an early stage in order to reduce downtime.

High-precision predictive maintenance is achieved by simply plugging the card into the robot controller without any other device or sensor having to be added.

* Gearbox, motor encoder and batteries for storing position data

Robot training
up to 90% faster than
manual methods



changes to shorten the cycle time without using an image sensor. The outcome is productivity equalling or even surpassing that of equipment set by skilled workers.

Mitsubishi Electric will continue to use its proprietary AI technology to develop intelligent industrial robots and rapid force-feedback control algorithms for faster and lower-cost assembly systems.

On the example shown, Maisart is capable of accelerating the process to enable one robot to do the work of almost three.

[1] Including correction of repeat operations and acknowledgement of operations.

[2] Required adjustments to the industrial robot.

Rapid progress in AI

1997

KING DEPOSED

Chess computer Deep Blue defeats reigning world champion Garry Kasparov in New York chess match.

2004

211 KM AUTONOMOUSLY THROUGH THE DESERT

Stanford robot "Stanley" takes first place in the DARPA Grand Challenge.

2005

CLEVER GENIE RELEASED FROM THE LAMP

Release of the popular "Akinator" online AI game, which can accurately guess people and objects

2006

AI CONQUERS THE HOME

With autonomous robotic vacuum cleaners, AI makes its debut in the home.

2007

AI COMPOSES NEW BEATLES SONG

"Daddy's Car" is the first song written entirely by AI in the style of The Beatles.

2014

NOVEL PENNED BY ARTIFICIAL INTELLIGENCE

"1 the Road" is the first book written by Artificial Intelligence.

2015

SCHUBERT'S 8TH SYMPHONY

AI finishes the famous Unfinished.

2016

IMAGINATIVE MACHINE

Ian Goodfellow gives AI the gift of imagination. His system creates, among other things, highly realistic-looking photos of imaginary celebrities.

2017

AI AD-LIBS

Two chatbots communicate with each other to learn negotiation techniques. In doing so, however, they deviate from English and invent their own language. Now that's clever!

2018

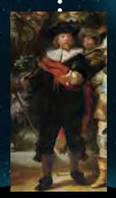
AI GOES ETHICAL

The EU Commission presents ethical guidelines for Artificial Intelligence. Point 1: "Primacy of human agency and human oversight"

2019

"INTELLIGENT LIFE" ON MARS

NASA's Spirit and Opportunity robots navigate the surface of Mars without human assistance.

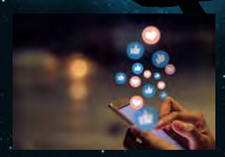


REMBRANDT OF THE FUTURE

AI replicates the style of the Dutch Baroque artist Rembrandt in a remarkable portrait.

BUSINESS REVOLUTION

AI means business. Social media and streaming providers in particular use the technology for their systems.



The thrilling world of Artificial Intelligence.

386 AI-based patents with 37 projects from Mitsubishi Electric

Maintenance support using Augmented Reality (AR) for smart glasses based on three-dimensional models

Fast force-feedback control algorithm with AI technology for industrial robots

Intelligent control technology for industrial robots for rapid object detection and real-time adaptation to changes in conditions

World's first wireless communication technology with automatic AI optimisation for enhanced performance and capacity

Field edge AI: image-based water level measurement with highly responsive sensor, independent of day, night or weather conditions

Multilingual speech recognition technology that automatically recognises the language being spoken

World's first Maisart diagnostic technology for rapid detection of anomalies in the operation of industrial machinery

Cooperative AI for human-machine collaboration to raise productivity in factories

Technology for rapid FA equipment set-up combining AI from AIST and FA technologies from Mitsubishi Electric

Sensor fusion technologies for autonomous parking and driving with millimetre-wave radar, cameras, etc.

World's first automated deep learning algorithm for automated AI system design

Autonomous control of equipment with model-based AI for significant cost and time savings in control program development

AI with rapid incremental learning for the accelerated acquisition of industrial robot motion sequences

Compact AI knowledge representation and reasoning solution for human-machine interfaces such as TV sets

Global remote lift maintenance service with remote monitoring, inspection and data analysis for safety, well-being and comfort

2016

Compact AI for easy integration into automotive equipment, industrial robots and other machines

High-speed training algorithm for deep learning in vehicles, industrial robots and other machines

World's first system for real-time crowd analysis

Self-learning technology for detecting cognitive distraction in drivers

2017

Launch of Maisart brand as AI-based technology (compact AI, deep learning and highly efficient AI for intelligent learning)

World's first technology for distinguishing and reconstructing simultaneously recorded audio of different speakers

2018

Camera technology with object recognition AI for the development of cars without rear-view mirrors

Compact AI hardware for implementation on small field-programmable gate arrays (FPGAs) for application development

2019

Human-machine interface (HMI) for cars with intelligent messages alerting drivers to objects outside the field of view

World's first digitally controlled ultra-wideband gallium nitride (GaN) amplifier destined for 5G mobile communication systems

2020

KOTSUMON® system with AI video technology for analysing assembly line worker hand movements for improved productivity

General-purpose FR-E800 inverter series with AI-based diagnostics for intelligent installations

2021

Technology to represent AI control mechanisms, eliminate AI black boxes and realise comprehensible AI

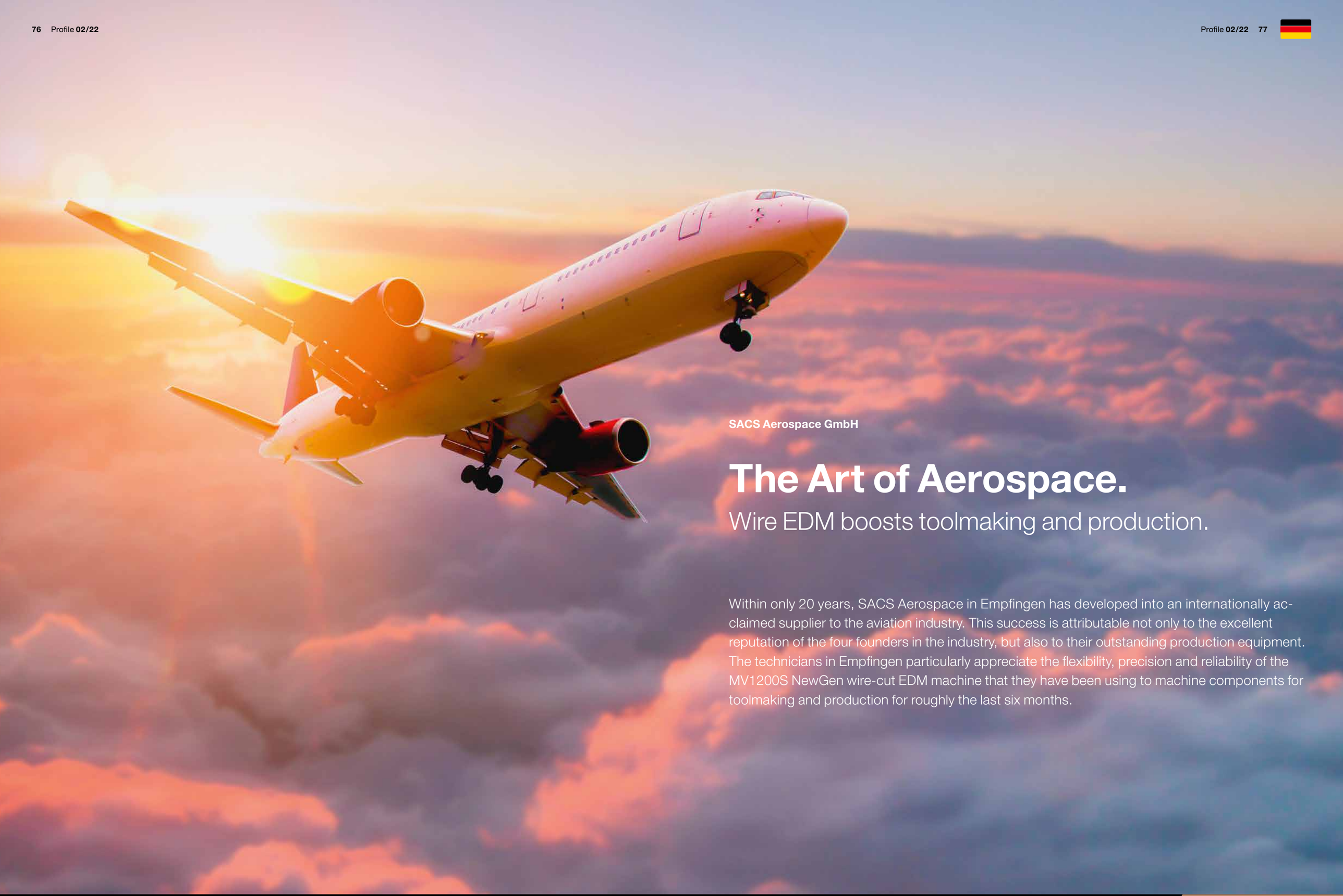
Environment-based navigation aid for intuitive route guidance and increased safety

Today

Further projects online.
Scan code now!
https://www.mitsubishielectric-edm.de/maisart

Compact AI for grand improvements.

Mitsubishi Electric



SACS Aerospace GmbH

The Art of Aerospace.

Wire EDM boosts toolmaking and production.

Within only 20 years, SACS Aerospace in Empfingen has developed into an internationally acclaimed supplier to the aviation industry. This success is attributable not only to the excellent reputation of the four founders in the industry, but also to their outstanding production equipment. The technicians in Empfingen particularly appreciate the flexibility, precision and reliability of the MV1200S NewGen wire-cut EDM machine that they have been using to machine components for toolmaking and production for roughly the last six months.

Success thanks to outstanding production engineering.

The Art of Aerospace.

SACS Aerospace GmbH is an owner-run company with its headquarters in Empfingen. In addition to engineering, quality and manufacturing, the company focuses on high flexibility and closeness to the customer.

Today‘s SACS Aerospace GmbH (Solid Aerospace Connecting Systems) was founded in 2002 as a production and development company and is devoted to innovative solutions for everything from individual components to system assemblies on a daily basis.

The very latest manufacturing technologies and efficient supply chain management facilitate precision at the highest level. Expert teams in the areas of aerostructure, interiors and standard hardware are an assurance of expertise and experience.

... the ready-to-install armrest: SACS has all the necessary production and assembly processes.

From sheet metal for instrument cabinets ...

The specialists at SACS design and produce complete assemblies, such as self-locking closures for flaps.

Rolf Kuhm, one of the four founders of SACS Aerospace GmbH along with Oliver Dratius, Achim Mayenberger and Steffen Grunert and now Vice President Engineering, is hugely enthusiastic about aviation. He and his colleagues, he says, were working for the aviation industry even before they founded the company, but were unable to realise their forward-looking ideas and plans in their previous positions. At the time, they dreamed of optimised production technologies, well thought-out component design and flexible production. Only since they have been running their own company have they been able to put these ideas into practice. Their success has vindicated them. In 2015, they moved into a stylish office and production building in Empfingen near the A81 motorway. The company currently employs 170 people.

High vertical integration

Kuhm also sees the company’s high vertical integration as a key factor in its successful development. “We have all the production and processing methods for machining and forming metals. These include turning, milling, grinding, deep drawing and punching. Our skilled workers have extensive expertise in aerospace component assembly. In this way, we can offer everything from a single source, from design to the supply of ready-to-install parts and components. Since we are certified for aviation and our processes are validated, we can flexibly handle orders from aviation companies all over the world.”

SACS Aerospace’s customers include such aircraft manufacturers as Boeing, Airbus, Bombardier, Embraer and Dassault, as well as such airlines as Lufthansa, SAS Scandinavian Airlines, SWISS and other illustrious names in the international aviation industry. For these, SACS Aerospace produces, firstly, components for the engineering of commercial, cargo and business aircraft. At the same time, the Empfingen-based company also produces spare parts for the ongoing maintenance of a multitude of various aircraft types. The product range produced by the aviation specialists is correspondingly broad and extends from small hinges and easily detachable closures for

SACS’ portfolio includes components for aircraft interiors.

For everything from spacers to door closers, SACS is an expert supplier to the international aviation industry.

A forward-looking technology like the MV1200S NewGen wire EDM machine is ideal for the environment of the challenging aviation industry.

Rolf Kuhm, Vice President Engineering

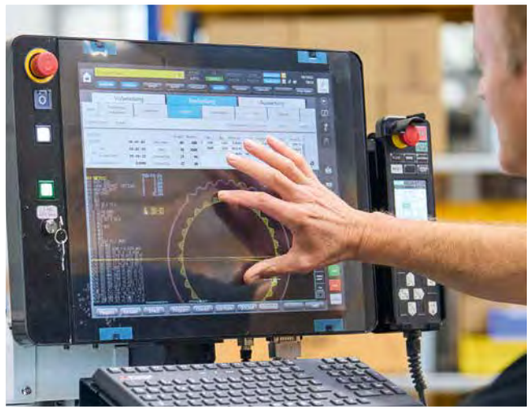
inspection flaps and cowlings (so-called quarter-turns) to components for turbine engines, e.g. valves and screw connectors for fuel pumps, and complete fixtures for the aircraft interior, such as folding tables and brackets with integrated power supplies for laptop computers.

Wire erosion for toolmaking

Since they also produce numerous parts and components for assemblies, the aviation specialists in Empfingen also design and produce stamping and forming tools themselves. “It is our constant aim to create innovative components. For this, we need special sheet metal parts that can only be manufactured with highly intricate tools, and mostly progressive dies. That’s why we have our own shop for tools and moulds. Our in-house specialists are the only ones capable of making the tools required for our innovative sheet metal parts sufficiently swiftly and flexibly,” Kuhm explains. Wire erosion, he continues, is indispensable in the making of tools and moulds. That is why the toolmakers have been using this production technology since the company was founded. However, the machine they originally used soon proved to be short of the mark. In 2022, they therefore invested in an MV1200S NewGen wire-cut EDM machine. “After only a few months, this wire erosion machine has proven to be significantly better and more efficient,” says Kuhm. The MV1200S

For the production of safety-relevant components, SACS is also certified to international standards.

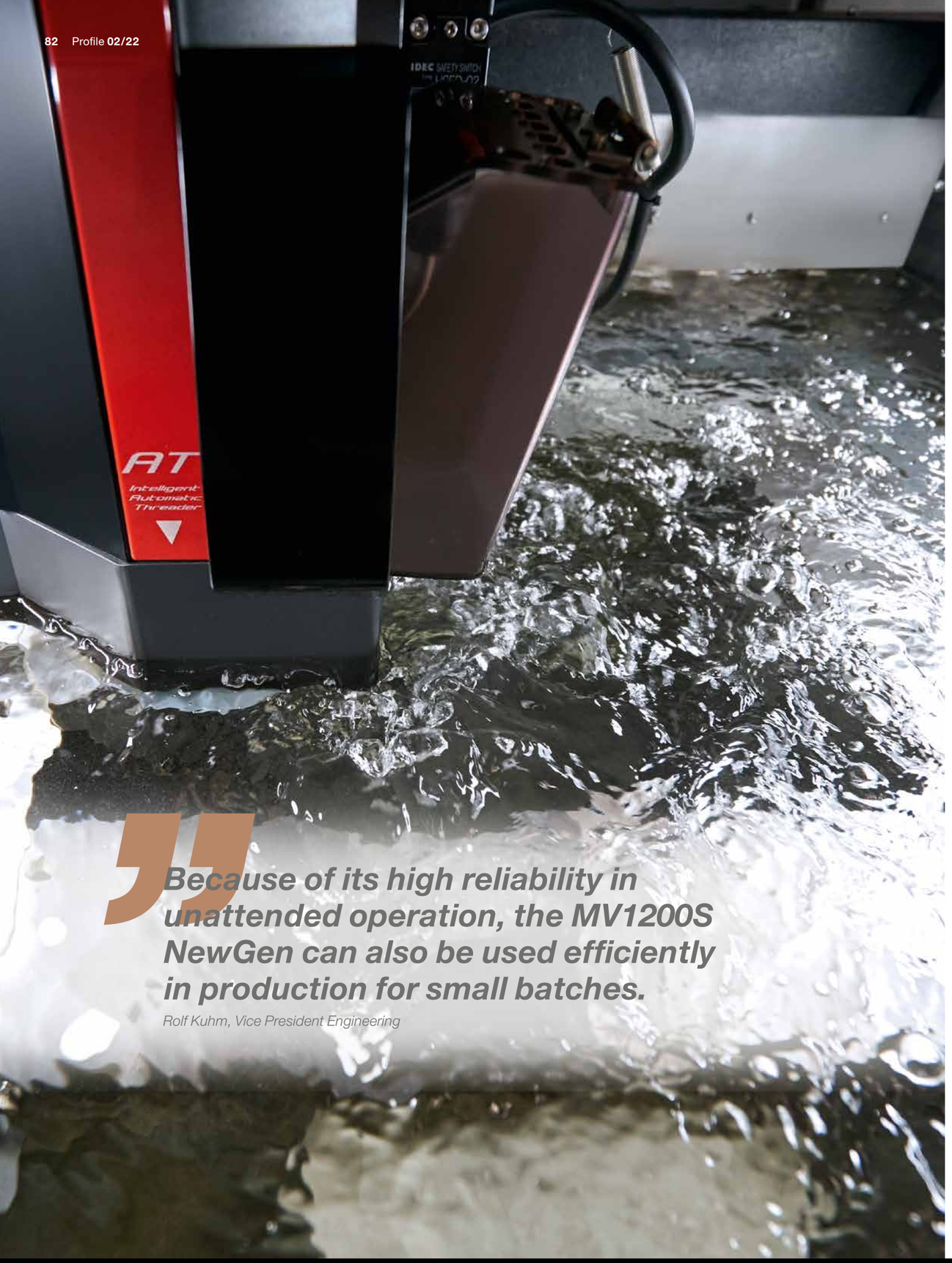
The highly user-friendly and intuitive multi-touch display of the MV1200S NewGen comes with freely configurable menus and can be operated using the gesture control familiar from tablet computers.



NewGen from Mitsubishi Electric is up to three times faster than the old machine from a rival manufacturer. The specialists at SACS program the workpieces on a conventional CAD/CAM system installed at a PC workstation in the workshop near the wire EDM machine. The MV1200S NewGen is particularly easy to parameterise and operate via the touch screen, Holger Pfriender and Matthias Beckmann, the two wire EDM specialists agree. The training in Ratingen associated with the installation and commissioning of the machine was highly detailed and effective, they say. After only three days, they were familiar enough with the functions and the way the machine works, parameter settings and set-up that they were able to use the machine productively on their site without any problems. This means that the toolmakers can now machine dies and punches for punching and forming tools using tool steels 1.2379 and 1.2210. Special steels can of course also be used.

All-round precision: special gears produced with wire erosion

Wire EDM, Kuhm explains, is often preferable to other machining processes – firstly to produce special component geometries, e.g. small apertures with sharp corners. It has organisational and economic advantages as well. The wire-cut EDM machine also operates reliably unattended, Pfriender and Beckmann agree. They can program and set it up during the supervised shift. The MV1200S NewGen runs overnight, and the next day they can install the finished components in their punching and forming tools. Above all, the specialists have been impressed by the highly



> *Because of its high reliability in unattended operation, the MV1200S NewGen can also be used efficiently in production for small batches.*
>
> *Rolf Kuhm, Vice President Engineering*

Holger Pfriender appreciates the smart user interface of the MV1200S NewGen.

In production, SACS uses the option of cutting stacks of sheet metal.

SACS produces spacers on the unmanned MV1200S NewGen.

reliable wire threading. “We can rely one hundred per cent on the programmed components being cut from the clamped panels,” is how they sum up their experience with the MV1200S NewGen.

Expandable production process

In the meantime, the specialists at SACS also exploit the benefits of wire EDM in production. “Thanks to the dependability of the MV1200S NewGen, we also effortlessly process small workpieces for ongoing production on the machine. Although the process is slower, productivity is high. We have a few tricks up our sleeve to achieve this,” the specialists in Empfingen explain. For example, to produce small discs only a few millimetres in diameter from thin, high-strength steel sheet, the specialists clamp stacks of several dozen layers of metal sheet in the workspace of the MV1200S NewGen. A special feature of the discs being cut is that they have alternating polygonal geometries on the inside and outside. On a stack of sheet, the discs being cut are intelligently nested by the NC program. In this way, an externally round and internally polygonal sheet is placed adjacent to another sheet with complementary geometries, i.e. internally round and externally polygonal. The MV1200S NewGen cuts the sheets out of the sheet

SACS also designs and produces complex progressive dies for small series.

stacks reliably and with high precision.

“In production in particular, we benefit from the reliable wire threading,” says Kuhm. “When cutting discs from stacks of sheet metal, for example, we can rely on several hundred or more than a thousand discs being cut overnight from a stack of sheet metal clamped in the evening. Should the wire threading system ever fail to find the kerf at the break position and be unable to thread the wire, the machine simply moves on to the next cutting job, i.e. to the next disc on the sheet.”

The MV1200S NewGen’s record of how much wire is left on the reel and how much has been used also contributes to the machine’s high reliability. This enables the staff programming and setting up the machine to estimate whether the wire left on an installed reel is still sufficient for a programmed cutting job. If not, they change the wire reel in anticipation. This is quick and easy to do, says Pfriender.

In addition, the already partially used wire reels can be used again and again, as the MV1200S NewGen stores the remaining wire lengths on the reels and assesses them for subsequent cutting jobs. The technicians in Empfingen plan to equip their MV1200S NewGen with a larger wire station for wire reels weighing up to 20 kg. “This will allow us to use the MV1200S NewGen in production for entire weekends,” says Beckmann.

Because of these ingenious functions, the MV1200S NewGen is already proving to be highly efficient after just a few months. Kuhm stresses the dual benefits for internal tool and mould making and for production. “In aviation, the batches we produce are usually small, and often only a few hundred components. If the functions of the wire EDM machine are skilfully used for this purpose, this number of components can be produced directly on the MV1200S NewGen highly efficiently and cost-effectively. The machine offers the unbeatable advantage of running unattended, with high process security and precision,” says Kuhm, summing up his positive experience from the first six months with the MV1200S NewGen.

The continuous production of small sheet metal parts in particular calls for superlative toolmaking precision.

SACS Aerospace GmbH

Founding year
2002 in Rottweil
2015 move to its own office and production building in Empfingen

Managers
Achim Mayenberger and Oliver Dratius

Employees
170

Core business
Development and production of equipment components, parts and spare parts for aircraft, and especially commercial and business aircraft

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Intelligently cutting up to 425 mm

with a 50% state subsidy?

Combining precision and technical expertise with excellent service is the daily motivation of Peter Müller, Managing Partner of esm Erodier-Service-Müller GmbH. For him it is important to generate tangible added value for customers with his work. His machinery therefore always has to be regularly optimised in accordance with the customer's wishes. The entrepreneur's wish list recently included an EDM machine that also cuts over 300 millimetre high workpieces perfectly. esm found what it was looking for at Mitsubishi Electric. The Mitsubishi Electric MV2400RZ+ Connect has impressed them with its high quality, user-friendliness and a cutting height of 425 millimetres.

Gefördert durch:
Bundesministerium für Wirtschaft und Klimaschutz
aufgrund eines Beschlusses des Deutschen Bundestages

Funded by the Federal Ministry of Economic Affairs and Energy on the basis of a resolution of the German Bundestag

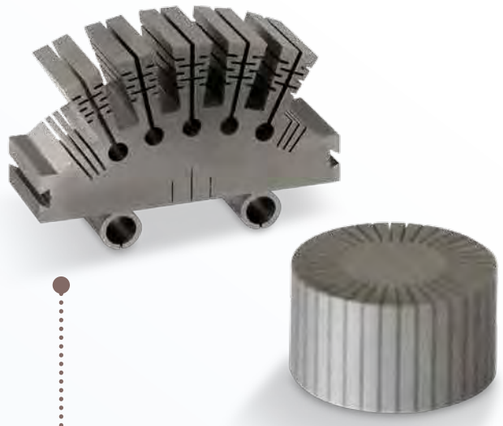
Wolfgang Müller founded the company in 1989. His many years of experience in the field of die-sinking and wire-cutting provided a solid basis for starting up the business and have also ensured the company's success in the long term. Within a few years, the equipment at esm Erodier-Service-Müller GmbH grew from one to ten machines and the production area increased rapidly to 350 square metres. With a constant stream of new customers and larger orders, esm reached its limits at the company base in Kronberg in 2015. There was not enough space for further growth with new staff and new machines. This also marked the moment when management of the company was handed over to the company founder's son Peter.

Comprehensive advice and timely information

"I gave taking over the company a lot of thought and looked very closely at how my father had successfully built up the company over 25 years," Peter explains, "and then put service and customer care at the top of the agenda." The customers are comprehensively advised from the very beginning and informed immediately when the job is finished. It is important to Peter that his customers are fully involved in service provision. "This also includes the fact that we always quote a price within 24 hours," he says. Before getting started, esm lays down the processing steps together with the customer, so that the customer also has the opportunity to point out the special features of his workpieces. "We often receive parts that have already been extensively pre-machined," Müller explains. "Then there are often many thousands of euros in the workpiece that the customer has already invested in machining. We are very focused on appreciating these machining efforts and handle the workpiece with the appropriate care." For esm, an order does not end with delivery or invoicing. For Müller, a good after-sales service making sure the customer is happy is an integral part of every assignment.

3.20 mm-diameter micro gearwheel with 16 teeth, material brass (CuZn40Pb2)

Components made of steel, some machined with 0.1 mm wire



Accurate to +/-0.003 mm

Component manufactured with 0.10 mm wire for high standard of surface quality, material 1.2379, hardened

Aluminium component with complex 3D contour

Constantly building on expertise

Since its founding, esm has concentrated exclusively on erosion. Thanks largely to its decades of experience, the company's services are much sought-after in the sector. As a subcontractor, esm offers the full range of machining options from wire cutting to die sinking, bore and micro-erosion. For example, the company produces fully hard-eroded items and precision mechanical components with high standards of precision for classic tool- and mould-makers. Customers from the medical technology and metrology sectors appreciate the company's comprehensive expertise in the erosive machining of such special materials as silicon carbide, tungsten carbide, titanium, tantalum and platinum iridium.

Müller also attaches importance to working with research institutes, precision engineering and microtechnology companies as well as start-ups. "They are not usually

Small parts are also eroded with precision on the large machine. Here an esm logo machined with 0.10 mm wire, character height 1.5 mm, material 1.4301.

The MV2400RZ+ Connect also excels with delicate contours.

among the high-turnover A-customers. But with their sometimes challenging orders and complex requirements, they enrich our knowledge and broaden our conceptual horizons," says Müller. "What counts for us is the end product and the way to achieve the optimum result as cost-effectively as possible."

Commitment to the environment

"Sustainability is currently on everyone's lips," says a surprised Müller. "At esm we have been practising it for ten years with great success. This included switching at the time to a green electricity supplier – a pretty unusual step in the industry at the time." The company has been proactive with this strategy and has spread the word in the marketplace. "Our customers' response has been astonishingly encouraging. I had not expected so much positive feedback," Müller says enthusiastically. The construction of the new company building offered Müller the chance to push ahead with his ideas on sustainability. The building is built energy-efficiently and equipped with highly advanced LED lighting. Both the heating and the air conditioning for production run very inexpensively and efficiently via several heat pumps. "We pay attention to the little things," Müller reports. "Among other things, we have banned plastic packaging and bottles and give shipment packages a second life."

Advanced machinery

In order to meet its high quality standards, esm regularly invests in its machinery. "In the last four years," says Müller proudly, "we've purchased three new machines and thus upgraded a third of our equipment. We finance all our investments exclusively from our own funds. This is by no means commonplace nowadays and in the present market conditions, and it shows that we are building on a solid foundation."The most recent purchase was a Mitsubishi Electric MV2400RZ+ Connect. For almost 30 years, the only wire-cut EDM systems in the esm shop were all from a different manufacturer.

"We were basically satisfied with these machines," says Müller, "but we were only able to cut workpieces up to 300 millimetres high." So the company needed a machine for greater cutting heights. "We discussed the matter at great length with our staff and weighed up the pros and cons of changing the machine set-up," says Müller. "In the end, we decided on the Mitsubishi MV2400RZ+ Connect."

Decisive for Müller in switching to Mitsubishi Electric were the performance data with a cutting height of 425 millimetres and the quality of the machines. In addition, Müller insisted on working with a competent and efficient manufacturer that provides comprehensive and rapid after-sales service. esm has paid special attention to having a broad market presence. "We know that Mitsubishi has a lot of machines on the market, is vigorously developing

Cutting heights
up to 425 mm

Wire EDM Team Leader Rainer W. with a 350 mm long toothed component

Web widths 1–0.03 mm

its systems and is also investing in research," Müller explains. The machine has been in operation in esm's production shop since May 2022 and initial experience has been very positive. "We haven't needed on-site service yet, but we have used the telephone service for queries," Müller reports. "The hotline is quick and competent. So far we've been able to solve our problems within one to two hours of the call."

0.4 mm template made of 1.4301 with web widths decreasing from 1.0 mm to 0.03 mm

A gift from BAFA

"During the decision-making process, Michael Willwacher from Mitsubishi agent Willwacher pointed out the funding opportunities available from BAFA, the German Federal Office of Economics and Export Control," Müller recalls. Initially sceptical, he decided to apply for funding after all. Together with his tax accountant and his wife, who also works for the company, he gathered all the data and filled out the detailed forms. Around two months after the application, the decision came. "BAFA financed 50 per cent of our investment in the new Mitsubishi MV2400RZ+ Connect," says Peter Müller enthusiastically. "Brilliant! And a win-win for us and our customers!"

Funded by the Federal Ministry of Economic Affairs and Energy on the basis of a resolution of the German Bundestag

Gefördert durch:

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aufgrund eines Beschlusses des Deutschen Bundestages

esm Erodier-Service-Müller GmbH

Managing partner
Peter Müller

Employees
7

Founding year
1989

Skills and core competences
Fully hard-eroding classical tool and mould components, precision mechanical components to high standards of precision, components for medical technology and metrology, high level of expertise in the erosive machining of such special materials as silicon carbide, tungsten carbide, titanium, tantalum and platinum iridium

All EDM methods: wire cutting (6 machines), die sinking (3 machines), hole drilling (2 machines), die-sinking of tungsten carbide

High level of expertise in cooperation with research institutes, universities and start-ups/prototype production

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Horoscope

for hard-wired EDM experts.

Capricorn
22 December – 20 January

Saturn brings about a positive change in your life. Buoyed by this, you are also in the mood for something new at work. A fresh wire EDM machine would be great. Or maybe a start hole drilling machine? Or an articulated arm robot? So many possibilities! But first you have to win over your boss. As a confident Capricorn, you're bound to find a way to do this.

Aquarius
21 January – 19 February

Don't apply too much pressure in the next few weeks – this won't help you when wire-cutting or in your private life. Patience and equanimity should be your constant companions. For all your ambition, it's better to stabilise your current position first. Soon you will find a suitable taper angle to build on and progress.

Pisces
20 February – 20 March

Even as a cautious Pisces, contact is not something to be avoided. Neither with your clamping device nor with your workmates. Instead, swap notes and deepen your working relationships. Privately, too, one or the other conversation might make a difference. With sensitivity and attention, you'll easily succeed.

Cancer
22 June – 22 July

The temperatures are dropping and the nights are getting longer. Clearly, your partner needs more intimacy and attention. Fortunately, your reliable MV-R Connect runs unmanned overnight, so you can concentrate fully on your better half during these hours. On the following days you return to work in a particularly good mood and thus inspire your workmates as well.

Leo
23 July – 23 August

You've got the knack of eroding, there's no question about it. You work as meticulously as your EDM machine. But is your Leo heart as reliable in other areas as it is in machining? Don't let your private life slide, and find time for yourself and your loved ones. They are at least as important as wire-cut and die-sinking EDM.

Virgo
24 August – 23 September

Cultivate your customer relations in December with freshly eroded Christmas cookie cutters – Uranus will thank your stars for it. The coming spring will then bring you profits right across the board. Sit back and enjoy your reduced discharge energy so that you can get back to work with renewed energy density in the New Year.

Aries
20 March – 20 April

Just as you are enthusiastic about the user-friendliness of your EDM system, those around you are delighted with the effortless way you get along with them. You make it easy for others to like you. During the coming phases of the New Moon, you are therefore even more relaxed and sociable than usual. Your workmates appreciate you not only as an experienced EDM exponent, but also as a person.

Taurus
21 April – 21 May

At the moment you're making high demands not only of yourself but also of others. However, not everyone lives up to them. Be a magnanimous Taurus and remember: everyone has their strengths. While one may be an excellent EDM operator, another is good at organising. Help to boost energy efficiency as well by exploiting synergies: cooperation is better than going it alone.

Gemini
22 May – 21 June

If your EDM machine does play up, take care of it immediately. Intelligent production data analysis will help. After all, maintenance has to be maintained and not put off to tomorrow. By the way, the same applies to interpersonal relationships: relationships and friendships also need looking after. Tackle challenges as they arise rather than letting things slide.

Libra
24 September – 23 October

Tension is brewing in your private life in the next few weeks. As a Libra who needs harmony, you can't stand that at all. Do something about it and try to resolve conflicts. When it comes to rough surfaces, such things are no problem for you. So with the right finishing touches, you'll soon smooth out any unevenness.

Scorpio
24 October – 22 November

Your performance curve is dropping alarmingly. Enjoy the upcoming holidays, because these are the last opportunity to relax this year. From January onwards, the influence of Saturn's moon Mimas will fire you up, so that you can quickly work off your Christmas flab. The time of feasting and revelry over mulled wine will be over in no time.

Sagittarius
23 November – 21 December

Put your Z-axis slide through its paces this winter, and your path-measuring system will show you the optimum travel paths. But watch out for obstacles! With a good surface quality, you won't feel the slightest resistance. Everything will also go smoothly for you in your love life as well: more than relaxed, you'll coast into the New Year.

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