MITSUBISHI ELECTRIC

The Art of Economy

Issue 01/22

Carlow Toolmaking Services

EDM is cheaper than milling.

Findings from 22 years of EDM practice. P.14

The magazine for smart users.

Profile

Contents

User reports

Regular items

Legal notice

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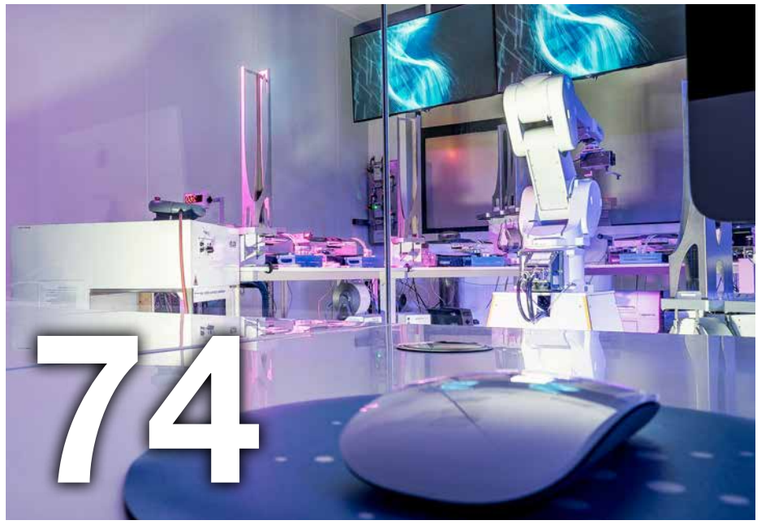


Inflation and high energy prices as a competitive advantage …

Prices are rising not only in the supermarket and at the petrol station, but also in production. Practically every metalworker is affected by this. But how can this be turned to our advantage?

Machines of the latest design from Mitsubishi Electric operate much faster and consume much, much less electricity and wire. If you also bear in mind that interest rates are currently still low, but that the cost of machines is set to rise in the foreseeable future, anyone can immediately see that the ideal time to invest and reduce unit costs long-term is now. This way you at least partially escape inflation. The old rule that “real value beats monetary value” has rarely been truer than it is today.

Mold-tecnic has defied inflation, significantly increased its output and cut costs (p. 40).

Robots and AI are changing all our lives. The new AGAMEDE robotic system accelerates diagnostics considerably – but that’s not all. Read the full story starting on page 74.

There is also exciting news from materials research at Montanuniversität Leoben and how EDM machines are helping (p. 6).

Best regards

Hans-Jürgen Pelzers
from the Technology Centre in Ratingen

Hans-Jürgen Pelzers
Sales Department Manager

> In a gold rush, don’t invest in gold diggers but in shovels.
>
> *André Kostolany, journalist and finance expert*

Locate positions with centimetre precision from a distance of 32,000 km

with the aid of the QZS-1R Michibiki Quasi-Zenith Satellite from Mitsubishi Electric.

Mitsubishi Electric Corporation announced that it has completed initial verification of the functions and performance of equipment aboard the QZS-1R satellite, which the company built and delivered to the Cabinet Office of Japan and is now in quasi-zenith orbit as the successor to the original Michibiki Quasi-Zenith Satellite (QZS-1).

Mitsubishi Electric is pursuing related opportunities in various fields, including the development and sale of receiver terminals and antennas for the Centimetre-Level Augmentation Service (CLAS) and high-precision three-dimensional maps, ultimately to help popularize the wider use of high-precision positioning in society.

The QZS-1R was launched on 26 October 2021 from Tanegashima Island in Kagoshima Prefecture. Compared to the first Michibiki satellite, the QZS-1R has improved the durability that is expected to extend the satellite’s design life by about five years compared to its predecessor.

Mitsubishi Electric develops teaching-less robot system technology

Mitsubishi Electric Corporation announced it has developed a teaching-less robot system technology to enable robots to perform tasks, such as sorting and arrangement as fast as humans without having to be taught by specialists. The system incorporates Mitsubishi Electric’s Maisart AI technologies including high-precision speech recognition, which allows operators to issue voice instructions to initiate work tasks and then fine-tune robot movements as required. The technology is expected to be applied in facilities such as food-processing factories where items change frequently, which has made it difficult until now to introduce robots. Mitsubishi Electric aims to commercialize the technology in or after 2023 following further performance enhancements and extensive verifications.

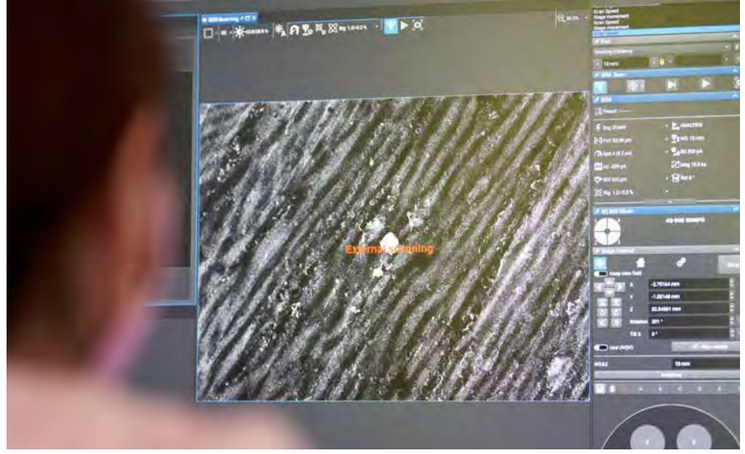
Erich Schmid Institute

Researching unusual materials.

EDM in the service of materials science.

Compared to the media stars of research such as medical technology, microprocessors and genetic engineering, the materials sciences are a rather unspectacular field of research. Their successes and breakthroughs attract far less attention in the media and among the general public than the cloned sheep Dolly or the latest mutations of the coronavirus. Nevertheless, science is conducted just as intensively and successfully here as in other research fields. The developments in materials science best-known to the general public include the lightweight and ultra-strong carbon fibres.

With the help of wire erosion, components produced by additive manufacturing are precisely detached from the building platform.



Electron microscopy allows researchers to study the internal structure of materials.

"Here at the Erich Schmid Institute for Materials Science, we conduct research into the high-tech materials of the future," says Robin Neubauer, mechanical engineer and workshop manager at the Erich Schmid Institute for Materials Science in Leoben. The institute is one of a total of 25 of the Austrian Academy of Sciences. The latter institution, founded by scholars 175 years ago, today has over 760 members and around 1,800 employees. Its goal is to promote progress in science and in society as a whole.

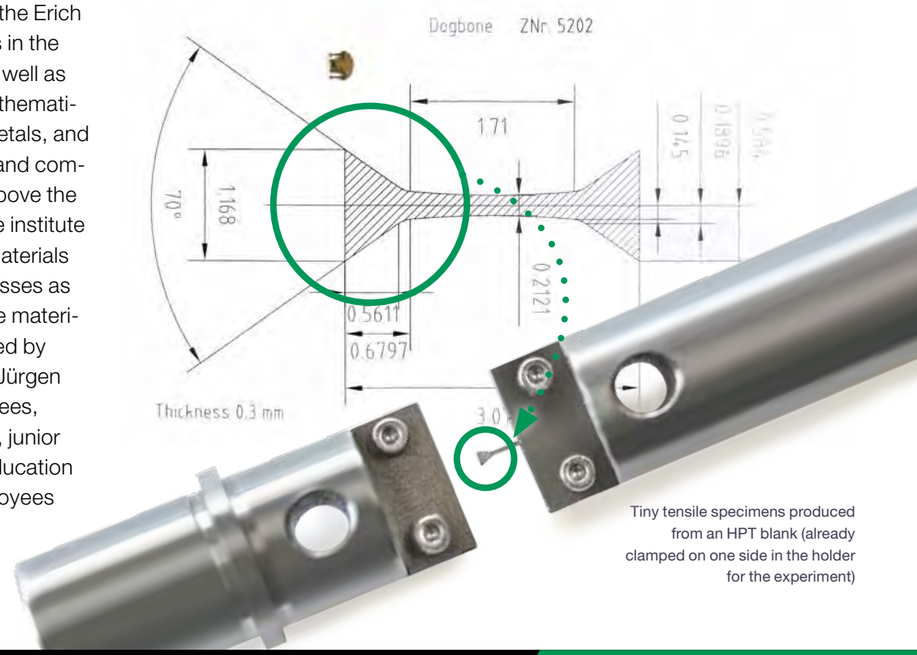
In close cooperation with the Chair of Materials Physics at Montanuniversität Leoben, the Erich Schmid Institute specialises in the study of microstructures as well as experiments on and the mathematical-physical modelling of metals, and also of biological materials and complex structures. Over and above the classic industrial metals, the institute often investigates special materials produced by unusual processes as well as novel nanocrystalline materials. Involved in the project led by Prof. Dr.-Ing. habil. Dr. h.c. Jürgen Eckert are some 95 employees, including senior academics, junior academics at all levels of education and numerous skilled employees from technical and administrative professions. The research partners include such numerous high-tech industries as aerospace, medical technology, machine manufacture and laboratory technology.

In-house development takes priority at the test facilities

"We work with in some cases highly unusual materials produced in processes developed here, such as the High Pressure Torsion (HPT) forming process," adds toolmaking technician Marco Reiter. His tasks include the design and realisation of the numerous special tools and devices needed for the production and testing of material specimens. Since there is practically nowhere where they can be purchased, they are fabricated in the institute's own workshop.

This also includes the tools for synthesising the HPT material specimens produced at the institute. HPT specimens are made from in some cases quite exotic powder mixtures with the aid of solid round tools, between which the powder is compacted under extreme pressure by multiple rotational movements. Here, the powder particles, as a result of friction and pressure, fuse together into a solid body.

The specimens produced range from very tiny – much smaller than a 1 cent coin and only 0.3 mm thick – to the size of a men's watch. To determine their mechanical properties, tiny tensile specimens must be obtained from them. This used to be done by milling, but this was extremely time-consuming and costly due to the specimens' minuscule



Tiny tensile specimens produced from an HPT blank (already clamped on one side in the holder for the experiment)

A clamped specimen in the installation space of the MV1200S shortly before the start of the process

75%

continuous utilisation of the wire-cut EDM machine

An unusually high value for a university workshop

dimensions and the sensitivity of the extremely thin tools.

Progress from the introduction of wire EDM

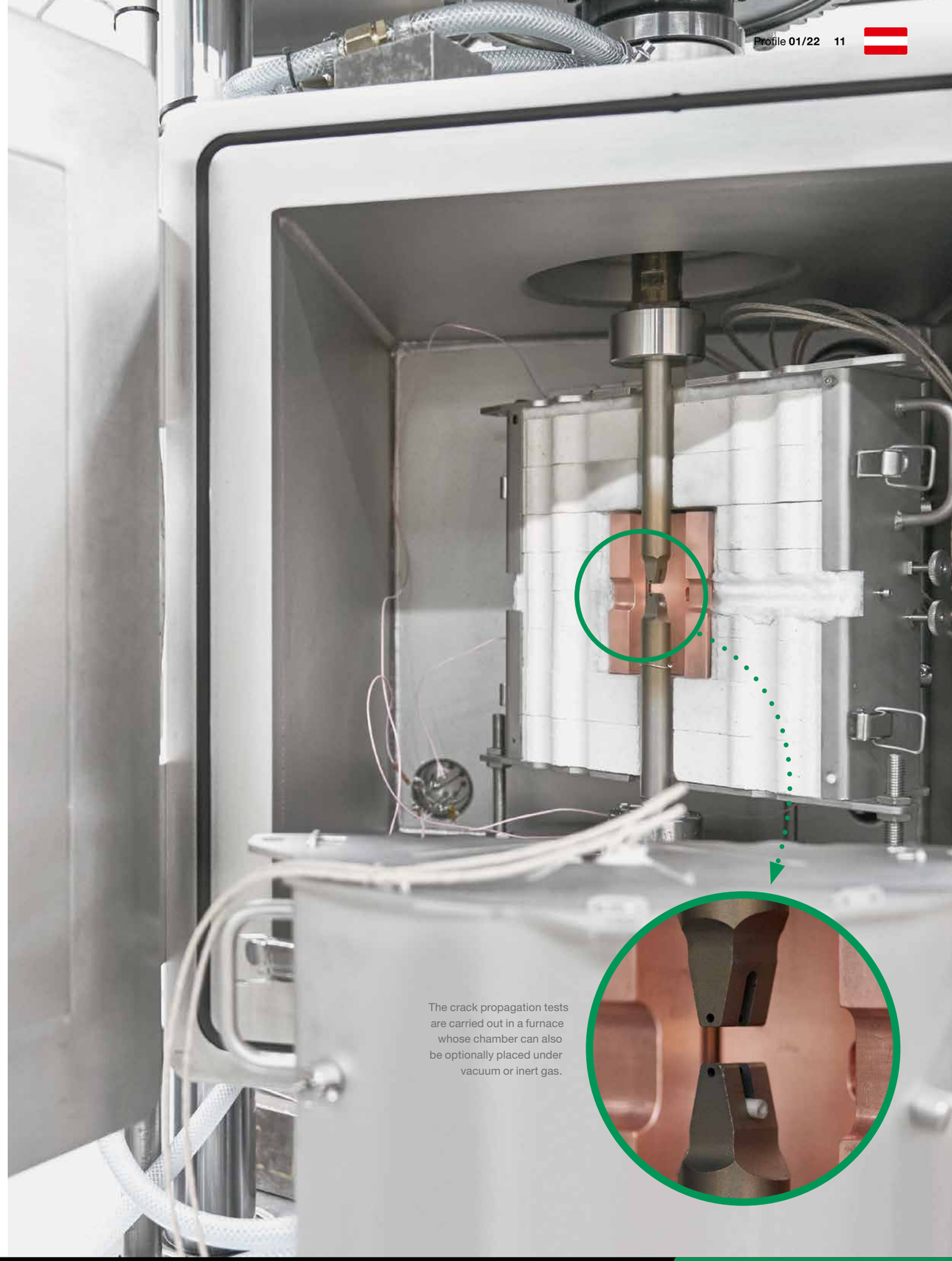
“In 2017, we were then given a used wire-cut EDM machine, on which we were able to test the technology for the first time,” Neubauer recalls. Having appreciated the benefits of the technology, their appetite for more grew. As the existing system proved to be too antiquated and unreliable, the search for a modern alternative began in 2019. After reviewing several offers, they were impressed by the Mitsubishi Electric MV1200S wire EDM system, and not only because of its performance, but also because of its price-performance ratio and the good support provided by the Austrian technician Sebastian Ziegler. Deionised water is used as the electrolyte.

Installation took place in the second half of the year, but the agreed one-week training course was cancelled because of the COVID 19 restrictions. Thanks to a two-day brief introduction, the excellent documentation and the tireless efforts of the Mitsubishi Electric agent, who helped out repeatedly with brief visits and telephone support to answer queries or solve problems, familiarisation nevertheless went smoothly. In addition to specimens, the company now also builds in some cases highly sophisticated devices in-house, such as special test rigs for the performance of dynamic crack propagation.

Excellent experience

“The MV1200S has meanwhile become an indispensable core item of our workshop equipment,” says Reiter. Some materials that are difficult to machine, such as tungsten- or nickel-based alloys and exotic materials like amorphous metal, can only be machined with wire erosion, as they are beyond the scope of

Specially fabricated fixtures for crack propagation testing. The fir tree structure is free to move laterally so that the specimen is not exposed to unwanted lateral force components.

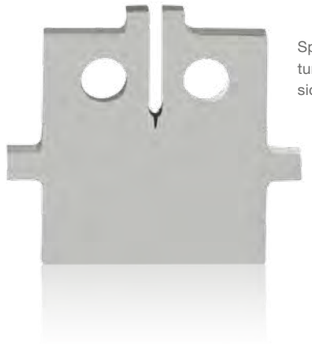


The crack propagation tests are carried out in a furnace whose chamber can also be optionally placed under vacuum or inert gas.

The MV1200S has meanwhile become an indispensable core item of our workshop equipment.

Marco Reiter, toolmaking technician

Certain exotic materials can only be machined by wire erosion.



Specimen for dynamic crack propagation tests machined by EDM from tungsten produced by powder metallurgy and subsequently rolled, side length ~7 mm.

conventional methods. In the meantime, the software link has been upgraded and CAD-CAM programs are used to feed the CNC data required for machining straight from the CAD designs into the machine control system. The importance of the wire EDM machine for the institute is demonstrated by the fact that its capacity utilisation is now at a roughly constant 75%. For a universal workshop like the one at the Erich Schmid Institute with its wide range of equipment and technologies, this value is exceptionally high.

Since commissioning, there have been no failures or malfunctions that can be directly attributed to the machine. However, new materials and tasks are constantly having to be processed. For many of these materials, some of them very exotic, there are no ready-made parameter sets in the control system database. In such cases, of course, one has to experiment more often in order to arrive at the ideal settings. In this context, the support provided by the Mitsubishi Electric agent should be highlighted, as he always helps out with advice and practical assistance when things get stuck.

Erich Schmid Institute of Materials Science of the Austrian Academy of Sciences

Employees
Approx. 95

Founding year
1971

Director
Univ.-Prof. Dr.-Ing. habil. Dr. h.c. Jürgen Eckert

Core business
Investigation of microstructures and experiments on and the mathematical-physical modelling of metals, and also of biological materials

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Punch for the HPT process for the production of novel materials

EDM is cheaper than milling.

Findings from 22 years with Mitsubishi Electric.

Since its inception in 1994, Carlow Toolmaking Services Ltd has specialised in manufacturing components, jigs and fixtures for the medical device, oral health care, pharmaceutical and automotive industries. To support its growth trajectory, the Carlow-based company in the Irish Republic has continually invested in Mitsubishi Electric EDM technology from the Engineering Technology Group (ETG).

Continuous growth for Carlow

John Whelan, Design Engineer at Carlow Toolmaking Services says: “We make jigs and fixtures for the medical industry and we have a contract toolroom, so we do a little bit of everything. At present, we have parts here from an old steam engine that we are producing right through to high-end medical device equipment. 22 years ago we bought a Mitsubishi FX10 wire EDM machine – and it is still running every day.”

With the Carlow based company enjoying continued growth, it added a second Mitsubishi Electric EDM machine, an MV1200S five years ago. This has since been followed by a Mitsubishi Electric MV2400R that was installed before the Covid pandemic. However, the global hiatus on much of the manufacturing industry hasn’t halted progress at Carlow Toolmaking and the start of 2021, it added a second Mitsubishi Electric MV1200S wire EDM.

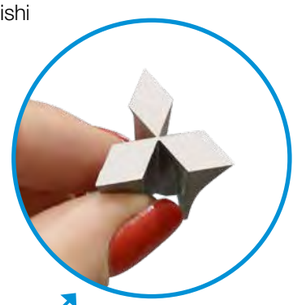
The new machines assure the user of the highest precision and efficiency. This means jobs can be executed easier and faster.

The first machine has proven its longevity

John explains why the company keeps investing in Mitsubishi Electric machine tools from ETG: “Obviously, the longevity has been proven with our first machine, plus the fact that we use the same software – the training curve was a lot easier by sticking with a Mitsubishi machine rather than switching to another machine.” Pat Amond, Director at Carlow Toolmaking Services adds: “What it has helped us change at Carlow Toolmaking Services over the last couple of years is the efficiency on the machines. We are dealing with ETG and Mitsubishi, and this has enabled us to be more efficient and helped us to produce jobs easier and quicker, which is a major benefit to Carlow Toolmaking. With an awful lot of the higher-quantity parts we are making at the moment, we are using the Mitsubishi wire eroder rather than our milling machines. Over the years we have discovered that we can stack parts and prepare them on the EDM and it is more efficient. Additionally, the machines can run overnight unmanned and this has given us an edge over our competitors; and our customers have benefited from that.”

The new machines are faster and better

Looking at the evolution of the Mitsubishi Electric machines since the company bought its first wire EDM 22 years ago, John Whelan says: “The interface has changed and it is a lot slicker and the speed has improved. The stainless steel tanks on the newer machines are much easier to clean – and they do the same job as they always did.” The two MV1200S wire EDM machines and the MV2400R incorporate Mitsubishi Electric’s Tubular Shaft Motor technology that delivers extra-smooth axis movements with drives positioned right in the centre of the moving weight. In addition to smooth axis movement and high precision, the machines have



22 years ago we bought a Mitsubishi FX10 wire EDM machine – and it is still running every day.

John Whelan, Design Engineer at Carlow Toolmaking Services

CARLOW TOOLMAKING – THE FILM

Scan code now and watch film:
www.youtube.com/watch?v=XepaZVTh46U

The machines have glass linear scales right next to the workspace. This enables maximum accuracy.

linear scales right next to the workspace to give the user maximum accuracy right from the start. In fact, Mitsubishi Electric provides a 12-year positional warranty on all drives. Regarding the upgrade to the control interface, the new 19-inch touchscreen control interface provides onboard CAD/CAM programming with complete import function for 2D, IGES and DXF files to streamline workflow. Added to this is an integrated maintenance monitoring function that monitors wear on all consumables such as rollers and bearings, and an EDM wire spool monitoring function that allows the operator to determine how much wire is left on each spool.

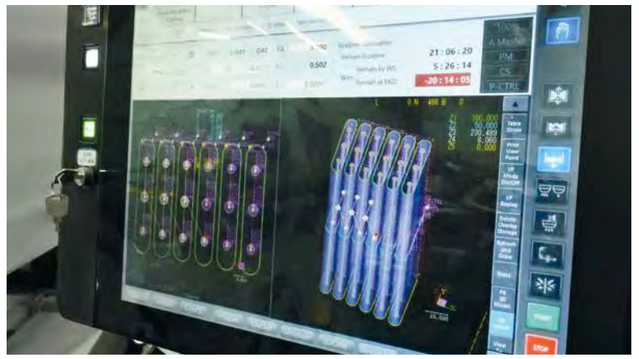
The machines also run unmanned at night

When asked if the Irish company is running the machines at their limits, John says: “We tend to run overnight when we have the right type of work to go on the machines. We also cut a wide range of materials here, and anything conductive can be wire-eroded. So, we can cut anything from graphite right through to PCD. At the moment, we are cutting a bronze component that conventionally may have been milled, but it is much better to do this job on the wire EDM. We tend to do jobs slightly differently. We think around wire eroding rather than milling. As we design many jobs in-house, we design to suit our abilities. So, we very often design around wire erosion as it is more efficient.”

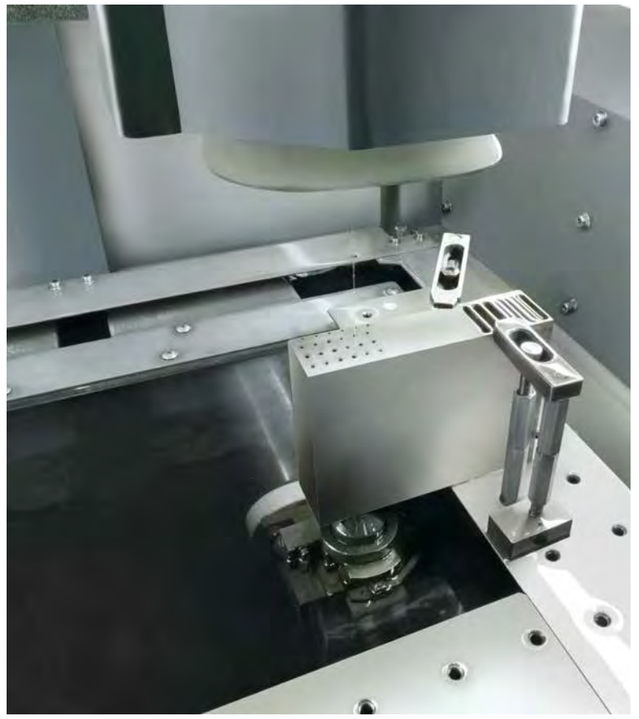
Adding to this, Pat comments: “Over the last number of years, John and Conor in our design department have the Mitsubishi wire eroder in mind from the very beginning when they are doing the initial design of components. This

Over the years we have discovered that we can stack parts and prepare them on the EDM and it is more efficient.

Pat Amond, Director at Carlow Toolmaking Services



The new user interface with a 19-inch touchscreen offers integrated CAD/CAM programming to optimise the work process.



Capable of cutting all materials – from graphite to PCD and with high precision.

For many jobs, we produce our own designs and the machines can run overnight.

allows us the benefit of working overnight unmanned and our customers get the benefit because, from the very outset, there are no modifications. We provide a concept from the very beginning and then we supply a finished product that is ready to go.”

New opportunities with the MV2400R

Commenting upon this method of working, ETG’s resident EDM expert, Mr Scott Elsmere says: “Carlow Toolmaking has intelligently adapted its strategy whereby the profiling of multiple components can be undertaken on an EDM machine as opposed to a machining centre. By using an EDM machine to profile parts rather than rough milling, manufacturers like Carlow Toolmaking can reduce labour and costs by profiling parts overnight unmanned. This adds capacity to milling departments whilst reducing cutting tool costs, power consumption and even eradicating excessive swarf from the process.”

Looking closer at the component modelling and the difference between the oldest FX10 Mitsubishi Electric and the new MV1200R and MV2400R machines, John says: “With the Mitsubishi FX10 machine, we had a capacity of 350 by 250 by 220 mm in the X, Y and Z axes. When we purchased the first MV1200S, we effectively had the same capacity – but it was a much more efficient machine with the modern interface. Eventually, we needed extra Z-axis capacity so we moved up to the MV2400R. This machine has 600 by 400 by 305 in the X, Y and Z axes. That capacity opened up a lot of doors for us

with extra capacity in the Z-axis that we couldn't cut on the other machines. Customers were asking for us to machine larger parts and we had to turn work away because we didn't have the capacity."

Looking at one specific component for gripping the bristles of toothbrushes during production, John says: "Once we have the CAD modelling done, we create a 2D profile for this particular part, and this can be transferred directly into the machine to wire-cut the part. The tolerances are very tight on this part because the fibre on your toothbrush is very fine. With the Mitsubishi machine, it is really easy to reproduce that part again, so if we need to replace or interchange parts – this is very easy as we can guarantee that it will be a like-for-like process."

Service that no one can beat

Pat concludes: "What has changed for us here over the years at Carlow is the way that we do our work. We now do a lot more medical device and oral care work, which now accounts for around 70% of our business. Over the last six or seven years, we have changed our processes and it has made us a lot more efficient, and both Carlow toolmaking and our customers have both benefited from that. The service and support that we have received from ETG on the Mitsubishi machines have been second to none. Over the years, we have always gone back to ETG because they are so easy to contact and they will always help you out, whether it be on the service side or a programming issue or anything like that. The ETG team are always at the end of the phone and they will get back to us straightaway to resolve any of our queries – no money can buy that kind of service level."

Concluding on this level of service, ETG's Scott Elsmere says: "At ETG, we provide comprehensive 5- or 8-day training programmes, which is beyond the realms of our competitors. Mitsubishi Electric machines are also equipped with technology capable of data output, in order to establish a live connection from the machines to approved service computers. This maximises machine uptime and provides unparalleled levels of remote support."

70%
OF OUR BUSINESS
IS IN MEDICAL DEVICES AND ORAL CARE PRODUCTS

Unparalleled remote support.

The ETG team are always at the end of the phone and they will get back to us straightaway to resolve any of our queries – no money can buy that kind of service level.

Pat Amond, Director at Carlow Toolmaking Services

Carlow Toolmaking Services

Employees
12

Founding year
1994

Director
Pat Amond

Core business
Production of components, devices and fixtures for medical technology, oral care, the pharmaceutical industry and the automotive industry

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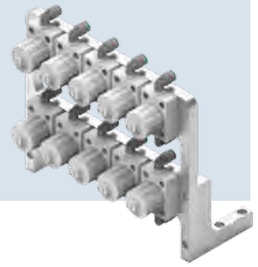
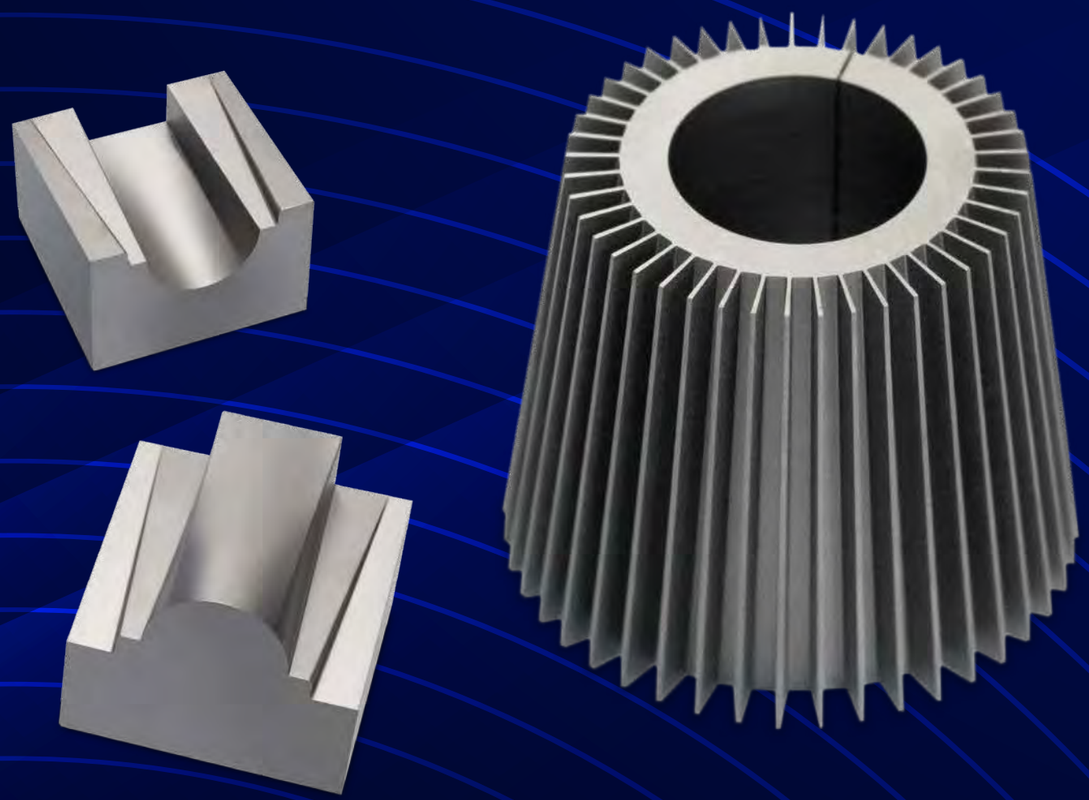


Alois Maibaum Metallbearbeitung

52 years, 52 employees.
Hard-wired experience.



“We make pretty well anything except railings,” is how Dominic Janoschka, Managing Director of Alois Maibaum Metallbearbeitung GmbH, jokingly describes his company’s range of services. The family-run metalworking business, owner-managed for over 50 years, produces a sizable range of subassembly components. With its broad-based pool of advanced machinery, Maibaum can quickly respond to even unusual customer requests and meet tight deadlines. With its latest investment in a Mitsubishi Electric MV4800R, the company is underlining its claim to quality.

Wide range of assembly components.

*There may be more innovative descriptions of companies' capabilities, but '**a tradition of quality**' describes us just perfectly. Our customers can expect us to quickly deliver the highest standard of quality at market prices. We produce subassemblies and complex individual parts in different batch sizes.*

Dominic Janoschka,
Managing Director of
Alois Maibaum Metallbearbeitung GmbH

Stefan Menke (left) and Dominic Janoschka (right) in front of the latest addition – the Mitsubishi Electric MV4800S NewGen wire-cut EDM machine.

"There may be more innovative descriptions of companies' capabilities, but 'a tradition of quality' describes us just perfectly," Janoschka explains. "Our customers can expect us to quickly deliver the highest standard of quality at market prices. We produce subassemblies and complex individual parts in different batch sizes." Above all, customers appreciate the company's high degree of vertical integration. With its machinery, the company covers all machining processes requested by its customers in machine manufacture and toolmaking. The machining processes available include milling, turning, wire cutting, grinding and CNC turning with a counter-spindle and Y-axis plus a bar feeder.

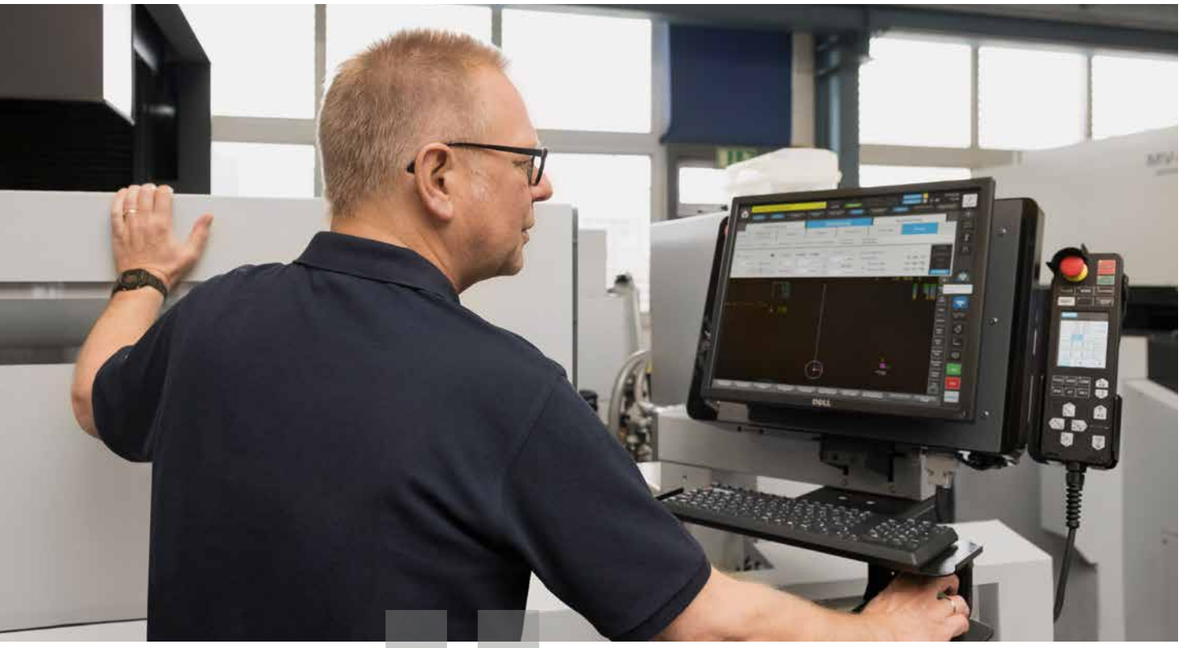
New sales office

Alois Maibaum founded the company in 1970. "52 years on, we now employ 52 people," says a gratified Janoschka. "We carry out production at our two locations in Kirchlengern. This where we turn, mill, erode and grind metal and, for some years now, high-grade plastic parts as well." In a forward-looking move, Maibaum set up a sales office in Hannover two years ago. "Until then, we didn't have our own sales organisation. Customers came to us, saw our work and trusted us," Managing Director Janoschka reports. "On the strength of our quality, we have simply built up a customer base step by step over the years". In view of its size and the goals it has set itself, however, active business acquisition is now important for the company if it is to develop further.

The new sales office has a number of tasks that go beyond pure sales. Although Maibaum has a comprehensive range of machinery with a high degree of vertical integration, "new tasks also call for new processes," Janoschka explains. So as to be able to continue to give customers an all-round service with innovative machining, new, dependable cooperation partners are needed. The Hannover office is responsible for finding and coordinating these partners. With its first of these, Maibaum has managed to expand its range of services in the turning sector. "Until recently, we were limited to workpieces up to one metre across in the turning sector. With our new partners, we have virtually no limits and can handle almost all turning jobs," Janoschka proudly reports.

Broad-based production

Since its founding, Maibaum has concentrated on production. "Our customers provide the design, and we are the manufacturing specialists," says Janoschka. "We handle all our work exclusively on the basis of customer data". Its customers come from right across industry. Companies from machine building, the automotive industry, medical technology and toolmaking – to name but a few – place their trust in Maibaum's quality.



We were able to go into full-scale production with the second and third machines from day one. On the Mitsubishi machines, we were also impressed by the software link to our VISI system. Our job scheduling runs entirely on the PC.

Stefan Menke, head of EDM at Maibaum

The product range is highly diversified. It includes the one-off output of classical toolmaking, the production of turned and milled parts in small batches and series in the order of 500,000 units per year. “An integral feature of our small series production is EDM technology,” adds Stefan Menke, head of EDM at Maibaum. “We have been cutting grooved bushings for a customer for several years. For the first order, it was some 100 bushings that we cut. The order volume is now a little bigger, and we have already cut 70 bushings in the first quarter of the year alone.”

Benefits of using identical machines

Since the beginning of this year, six wire-cut EDM systems have been in use at Maibaum, two Mitsubishi Electric MV2400s and, since March 2022, an MV4800. For over 25 years, the company used machines from different manufacturers for EDM. It was only in 2014 that the first Mitsubishi Electric machine, an MV2400, went into operation at Maibaum. “When we bought the first machine,” says Menke, “Mitsubishi won us over with its pricing and technically it was okay.”

In the meantime, the company has come to appreciate the benefits of using the same or similar machines. The controls of the three machines operate in the same way, and this keeps the time needed to learn the ropes to a minimum. “We were able to go into full-scale production with the second and third machines from day one,” Menke confirms. “On the Mitsubishi machines, we were also impressed by the software link to our VISI system. Our job scheduling runs entirely on the PC.” The data is then transferred to the machines, which works perfectly.

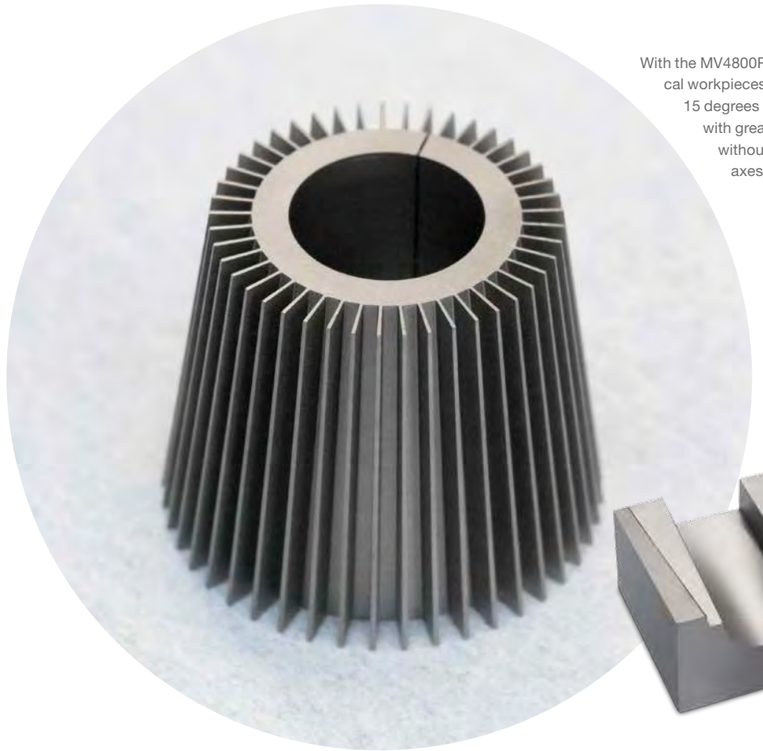
Flawless threading

Menke makes a point of highlighting the machines’ threading function. “It can be relied on to find even tiny 0.5 millimetre holes in the plate,” Menke stresses. “We have come to expect the jobs we start in the evening to be finished by the next morning.” Good support and a rapid supply of spare parts are also important to the head of EDM. After all, wear parts have to be replaced regularly to keep the machines running. And wear and spare parts are usually expensive. “But the Mitsubishi prices are fine,” says Menke. “You look at the bill and say ‘That’s okay’.”

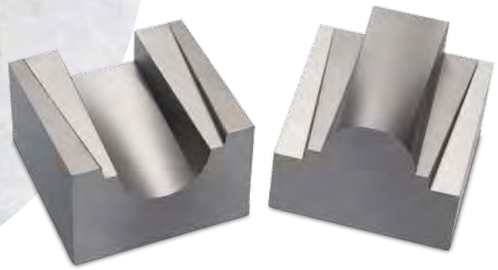
The customers supply the data and specify the machining precision.

With our new partners, we have virtually no limits and can handle almost all turning jobs.

Dominic Janoschka, Managing Director at Alois Maibaum Metallbearbeitung GmbH



With the MV4800R, conical workpieces of up to 15 degrees can be cut with great accuracy without additional axes.



Complex contours with high surface quality

Different wires and their running times

As a subcontractor with six wire-cutting machines, Maibaum is able to react swiftly and flexibly to almost all requests and cut workpieces up to a height of 500 millimetres. “A key point in terms of overheads is wire consumption, which we always keep an eye on,” Menke explains. “And this includes trying out different wires.” On the new Mitsubishi Electric MV4800S NewGen, Menke has compared workpiece machining with a classic brass wire and a coated wire. “Beforehand,” says the head of EDM, “we serviced the machines so that all parameters were really set to zero for the test. We replaced the contacts, cleaned the machines completely and put in new filters.”

Menke selected work on a grooved bush for the test cuts. Such jobs regularly come up at Maibaum. Cut with a classic brass wire, the job was completed on the MV2400R in about 12 hours. Using a coated wire on the same machine reduced machining time by 30 per cent. “To test the performance of the new MV4800S NewGen, we cut the workpiece with the same materials. With the coated wire, the MV4800S NewGen took seven hours to do the job.”

Technical data

EDM	
Travel	Up to 1,000 mm
Workpiece size	Up to 1,400 mm
Weight	Up to 4 tons
Taper	Up to 15°
Cutting height	Up to 500 mm
Superfine machining	Down to 0.1 mm wire
Standard diameter	0.25 mm
Turning	
Diameter	900 mm up to 6 m length
Milling	
Workpiece size	700 x 700 x 2600 mm

Nothing escapes Stefan Menke’s tutored eye.

Then they examined the quality of all cuts and measured wire consumption. All grooved bushes were machined to the desired quality and no significant differences were found in wire consumption. All chucks were machined to the desired quality and no significant differences were found in wire consumption. “But there’s one difference that shouldn’t go unmentioned,” says Menke. “We did the cutting on the MV4800S NewGen with 0.25-millimetre wire and the cuts on the MV4800R with a 0.3-millimetre wire. We’ve given the coated wire the nickname ‘turbo wire’ and it has a good chance of becoming the standard one.”

Alois Maibaum Metallbearbeitung GmbH

Employees
52

Founding year
1970

Represented by:
Christian Maibaum
Dominic Janoschka

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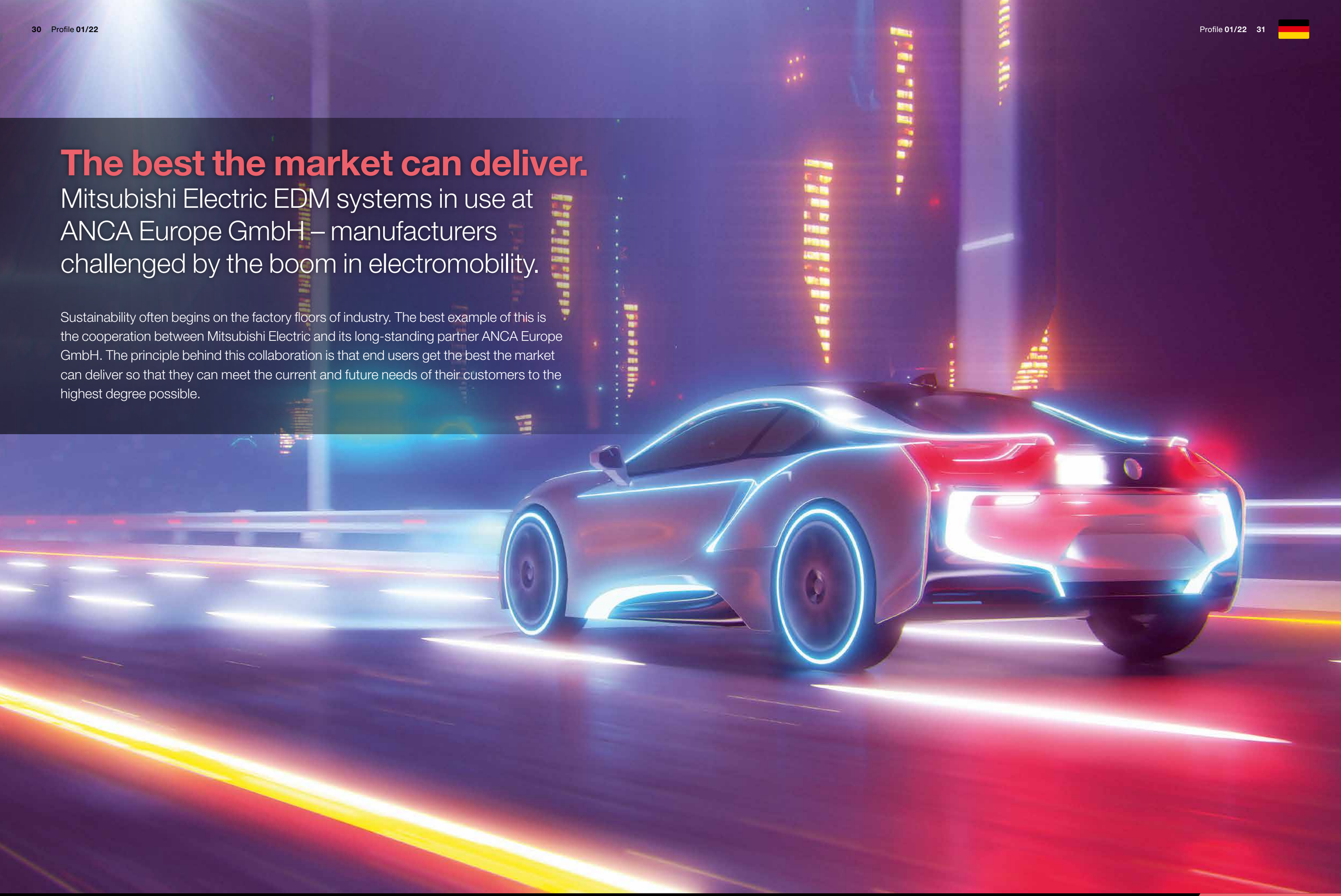
The best the market can deliver.

Mitsubishi Electric EDM systems in use at ANCA Europe GmbH – manufacturers challenged by the boom in electromobility.

Sustainability often begins on the factory floors of industry. The best example of this is the cooperation between Mitsubishi Electric and its long-standing partner ANCA Europe GmbH. The principle behind this collaboration is that end users get the best the market can deliver so that they can meet the current and future needs of their customers to the highest degree possible.



Boosting precision and effectiveness for electromobility.

“It’s a no-go
without **gearing”**

Spark-erosive dressing with Mitsubishi Electric EDM systems offers enormous advantages.

Enhancing precision and effectiveness while cutting costs can be achieved with metal-bonded grinding wheels machined on Mitsubishi Electric EDM-DRESS.

Grinding tool EDM-dressed ready for production

ANCA is a leading manufacturer of tool grinding machines. And gearing is becoming increasingly important in the target industries of the company founded in Australia. Shaping of this kind is familiar, for example, from the internal gearing of a planetary gear. However, these shapes are also more susceptible to defects because they are becoming progressively smaller and, in addition, more complex in their contours. The issue of sustainability is a key factor here. The boom in electromobility has led to huge demand for complex gearing (this is a strategic focus). And that’s not all.

For gearboxes in aviation are also being built increasingly lighter and more durable, and energy efficiency is also a major issue here. Even the tiniest components such as pinions can contribute a great deal to this.

Engineers in the sector are already stressing the vital importance of gearing.

And now Mitsubishi Electric EDM (electrical discharge machining) is coming into play. Mitsubishi Electric’s EDM machines known as EDM-DRESS are excellent for dressing metal-bonded grinding wheels, which are vastly superior to the resin-bonded grinding wheels still commonly used. They are much more dimensionally stable and allow significantly higher grinding feed rates. This means that the e-mobility-driven challenge of improving precision and efficiency while reducing costs can be met with metal-bonded grinding wheels machined on the Mitsubishi Electric EDM-DRESS.

As a result, the grinding wheels conditioned on

*www.ingenieur.de/fachmedien/vdi-z/fertigungstechnik/elektromobilitaet-nichts-geht-ohne-verzahnungen

Straightforward set-up of EDM-DRESS

Mitsubishi Electric EDM-DRESS machines enable ANCA machine tools to perfectly meet its customers' high complexity requirements. This cooperation is of great benefit for all customer groups, especially with regard to the increasingly demanded skiving.

The first successfully implemented joint projects already illustrate the advantages of the EDM-DRESS in daily production. After only a short period of use, customers are reporting enormous improvements in the precision of the manufactured tools, as well as major productivity gains in the triple-digit percentage range.

Productivity gains in the **triple-digit percentage range**

The cooperation with Mitsubishi Electric boosts efficiency.

Interview with Edmund Boland, Managing Director of ANCA Europe GmbH

Mr Boland, what were your reasons for the current cooperation with Mitsubishi Electric? What do you hope to gain from this, both for ANCA itself and for its customers?

We have long seen our role as that of partners serving our customers. The cooperation with Mitsubishi has grown naturally, so to speak, and makes sense for all parties involved. We expect further benefits from the current, closer cooperation. And in terms of integration in the meeting of customer requirements. For the user, it is always advantageous when two processes that are in essence so closely linked, such as grinding and dressing, come more or less from a single source. With ever higher expectations of precision, cycle times and geometrical complexity, this is becoming even more important. For ANCA, integration along the process chain is also a strategic focus.

You mentioned the buzzword of "integration". To what extent is our cooperation important for ANCA Integrated Manufacturing System (AIMS)? How does the cooperation play into this strategy?

AIMS is, after all, a holistic solution for our customers' end-to-end toolmaking challenges. In other words, optimised manufacturing with linked-up tool production

EDM dressing is already in a different league.

Edmund Boland, Managing Director of ANCA Europe GmbH

The ANCA GCX, machine for skiving cutter production. Linear axes boost performance and precision, and skiving cutter tools can be produced in a single clamping thanks to integrated measurement.

processes that are integrated into the customers' IT systems.

And AIMS is a modular and growing concept. This year, at the flagship trade fairs GrindingHub in Stuttgart and IMTS in Chicago, we will be showing the automated, integrated process from job scheduling to the finished ground tool, linked to the company's systems. This amounts to medium-level integration. Our clear objective is to expand the processes that can be integrated, and this will certainly include dressing with the aid of EDM-DRESS from Mitsubishi in the longer term.

> Skiving is **six to eight times more efficient** than moulding, more flexible than broaching and is capable of creating internal and external meshing.

It started with a mini computer

When Pat McCluskey and Pat Boland founded ANCA over 40 years ago in 1974, they purchased a mini computer for $4,000. Their basic idea was to replace the hardwired controls of the time with a standard computer. Adding the computer to NC thus CNC resulted in a much more powerful and flexible technology than the hardwired logic designs that were current at the time.

Today ANCA is a thriving business with over 1,000 employees and a world leading manufacturer of CNC grinding machines, motion controls and sheet metal solutions. While the global headquarters remain located in Melbourne, Australia; due to the niche market it services, it exports 99% of its products with customers in over 45 countries and offices in the UK, Germany, China, Thailand, India, Japan, Brazil and the USA as well as a comprehensive network of representatives and agents worldwide.

Skiving cutter tools are based on a pair of gears with crossed axes. A pair of gears with crossed axes only touches a single point. The profile and geometry of a skiving tool is more complex than that of an impact tool.

Growth is driven by e-mobility.

Many types of tools can be produced easily and quickly thanks to the holistic AIMS strategy.

And to what extent is the cooperation with Mitsubishi technologically significant for ANCA? How is it positively affecting technology trends such as skiving?
Skiving places high demands on the machine and the tool. The precision and complexity of the profiles demand finely balanced, high-precision processes, which incidentally also applies to other important applications such as other gear cutting tools and even taps. The coordination of the processes and ongoing refinement in the collaborative development process are crucial for users here.

Is skiving all set to grow further in importance in the near future?
The figures for skiving are impressive – the market has recently been growing at a constant rate of 30 per cent per year. The growth is driven by e-mobility, but also by power generation, for example. In principle, it's all about greater accuracy and smaller, more closely spaced gear teeth with challenging interference contours. The higher efficiency and accuracy compared to comparable processes are pushing the demand for skiving tools.

Do you think the factors you mentioned – tolerances and geometries – will become even more important for customers from now on?
Definitely. The existing applications alone are set to grow steadily, considering the social, political and economic importance of e-mobility. But they will certainly be joined by other applications.

Do you also see productivity gains from using grinding wheels dressed by EDM?
EDM dressing is already in a different league than comparable processes, always of course with regard to the process conditions and efficiency. For certain geometries, we know there is no alternative to erosive dressing, but its superior productivity also justifies the investment in an EDM-DRESS from our point of view. Otherwise we would not be so clearly in favour of the product.

To what extent does our cooperation increase the quality of the services you provide?
As mentioned, it is in line with our higher-level strategy to support our customers fully in all aspects of the overall process of tool production and as comprehensively as possible. This cooperation contributes to this. Our customers appreciate this and also tell us so. For example, a customer planning to launch the production of taps recently paid a visit to us at our Weinheim showroom during our Technology Days. For this customer, the joint presentation including a demo on the Mitsubishi machine on site was of massive value and contributed to his planning security for this strategic step.

Market growth
in **skiving**
30 per cent per year

ANCA Europe GmbH

Employees
72 (ANCA Group: 1100)

Founding year
1991 (ANCA Group: 1974)

Management
Edmund Boland

Core business
Mechanical engineering company in Weinheim, Baden-Württemberg. Leading global manufacturer of CNC grinding machines, motion control systems and sheet metal solutions. ANCA has changed tool grinding for good with its innovative ideas and technologies.

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69469 Weinheim
Germany

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Fax +49 6201 87508 13

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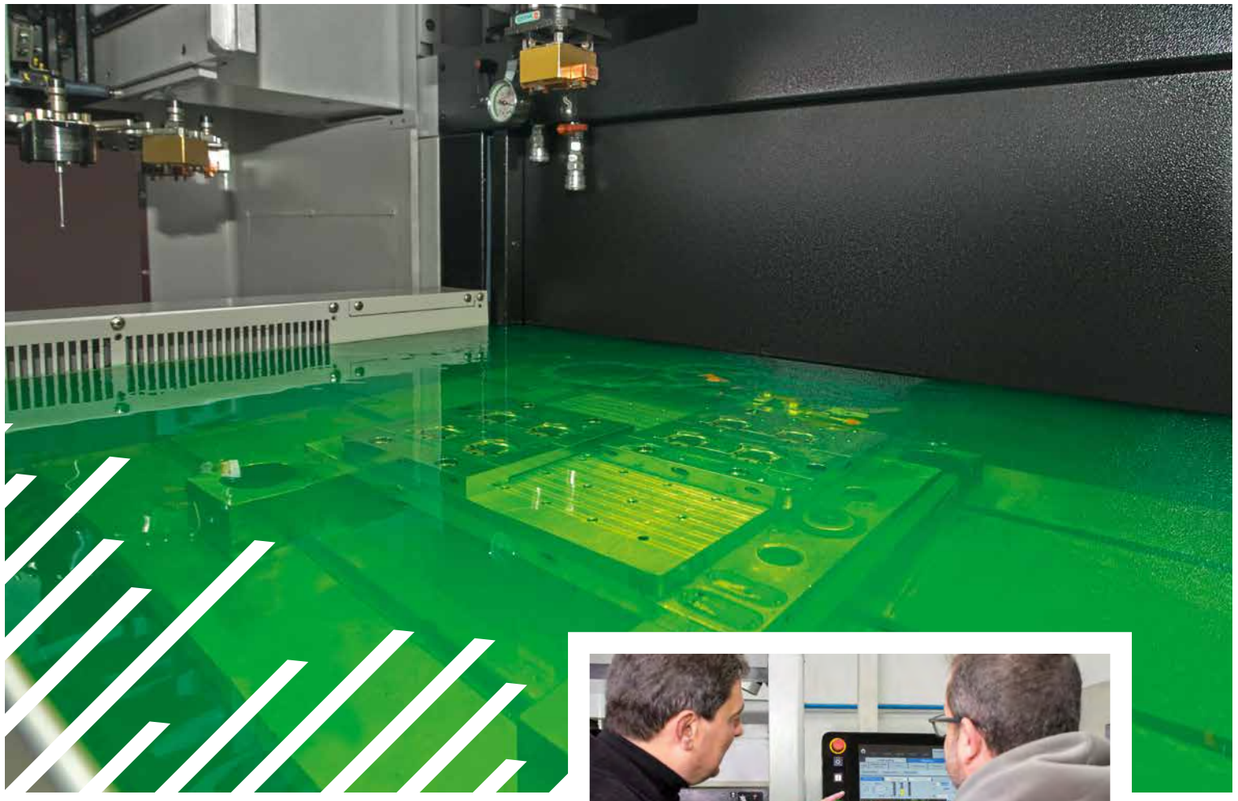
www.anca.com

Mold-tecnic

Quality and precision with Mold-tecnic. A story of success.

Over 20 years of experience in mould making.



Good accessibility and user-friendliness thanks to the three-sided, lowerable work tank – for easy handling.

On the Natural User Interface (NUI), the touchscreen is similar to that of a tablet PC, which greatly simplifies navigation through the various functions.

Despite being a relatively new company, Mold-tecnic R&D can boast many years of experience in the plastic injection-moulding, blow-moulding and thermoforming sectors. Their team includes professionals who have over 20 years of experience in mould production. They have equipment with the necessary technology to offer a complete service, from the design and adjustment of parts to achieve maximum quality, via the manufacture of prototype moulds, printed prototype parts or even printed prototype moulds, culminating in the final production mould. Ongoing technology development, continuous training of their teams and research into new technologies enable them to guarantee a first-class service to their customers.

As we all know, plastic injection moulding requires exceptional precision and the moulds must be able to withstand a large number of production runs.

Mould manufacture requires high specifications

Most of Mold-tecnic's activity is focused on the production of plastic injection moulds. A large proportion of these moulds are designed for the manufacture of vehicle interiors. As we all know, plastic injection moulding requires exceptional precision and the moulds must be able to withstand a large number of production runs. Mold-tecnic also manufacture dual-material moulds (double-shot moulds). These moulds allow the injection of two different materials, which gives the parts specific characteristics for their application. In the automotive sector, it is common to inject two materials with different degrees of hardness, so that composite parts can be manufactured in a single mould. This results in a large cost reduction and also avoids the need for assembly when the part is manufactured separately.

For the design and creation of these moulds, they use software to design, virtually simulate and machine them, so that they are developed according to the customers' requirements. With the aim of providing the best possible service, Mold-tecnic use the well-known TopSolid 7 software, using TopSolid Mold for the design of the moulds and TopSolid Cam for the machining. The superior production quality provided by Mold-tecnic enables suppliers to the automotive industry to produce thermoplastic components with very complex surface finishes. Today, Mold-tecnic manufactures high-quality, precision moulds for different industry sectors with the aid of Mitsubishi Electric EDM technology.

Highly reliable EDM

The decision to purchase the two Mitsubishi Electric EDM machines was driven by the need for a technology

SG12S Mitsubishi Electric die-sinking EDM machine. Compact and user-friendly design.

SG12S

This machine features maximum versatility and flexibility to deliver the best performance in any workshop.

The SG12S EDM system makes production more efficient by saving on electrodes. In addition, the lowerable working tank offers the operator easy access for trouble-free and user-friendly handling.

The machines in this series are equipped with a large control screen, as well as quality graphics and dialogues for easy programming of each operation.

that would offer reliability, speed and precision mould manufacture. Previously, their EDM equipment was not fully reliable and did not offer sufficient performance for manufacturing high-quality and precision moulds. Therefore, in order to improve their processes and part quality, Mold-tecnic purchased an MV1200R Connect wire EDM machine and an SG12S die-sinking EDM machine from Mitsubishi Electric. This investment was due to a number of factors.

Higher production, speed and precision

With its current range of wire EDM machines, Mitsubishi Electric is continuing its innovative and future-oriented approach, while retaining its tried-and-tested features. When we spoke to Rubén, he highlighted the many unique features of the Mitsubishi Electric machines compared to other EDM machines they had worked with up to that point. The MV1200R wire EDM machine stands out for its great flexibility of use.

Based on the first few months of using it in the workshop, the machine has proved to be extremely reliable. Thanks to this machine, they have been able to double their production and thus minimise their production costs. In addition, wire consumption has been visibly reduced. The MV1200R is designed for optimal wire consumption and perfect threading in even the most complicated situations. Other features include shorter machining times and more flexible processing. All this, combined with the machine's high level of precision, has contributed to the choice of Mitsubishi Electric and COMHER.

As for the SG12S die-sinking EDM machine, Rubén pointed out that they have greatly reduced their electrode usage. "With the Mitsubishi SG12S, we have reduced electrode consumption by almost half compared to our old machine, which saves us a lot of time and expense in manufacturing the moulds." The machine, equipped with an automatic 20-electrode changer, allows the process to be carried out hands-free. For die-sinking EDM, as for wire EDM, the programming and operation of Mitsubishi Electric's fine-tuned control technology make the operator's job much easier. This thus facilitates the production of high-quality moulds in a flexible and efficient way. In conclusion, Ruben credits both machines with the same strengths: reliable, precise, fast and user-friendly.

COMHER, an exceptional provider of solutions

The quality of the Mitsubishi Electric machines themselves was not their only requirement when purchasing them, but a quality after-sales service was also a determining factor. COMHER, the official distributor of Mitsubishi Electric EDM in Spain, has been offering the best industry solutions for more than 55 years. It was, therefore, no surprise that Mold-tecnic placed its trust in COMHER's experience and technical team when deciding to purchase the machines. José Francisco Martínez, Product Manager for Mitsubishi Electric at COMHER, provided the necessary advice to Rubén and the Mold-tecnic team on the acquisition of this new equipment, helping them to significantly improve quality and production in their workshop. COMHER's extensive experience in the machine tool sector, as well as having personnel with extensive knowledge and training in EDM, was a key factor behind the business relationship between the two companies.

With step-by-step guidance, less experienced users can navigate their way through complete process control. In addition, the intuitive hand control makes it easy to adjust the part in the machine.

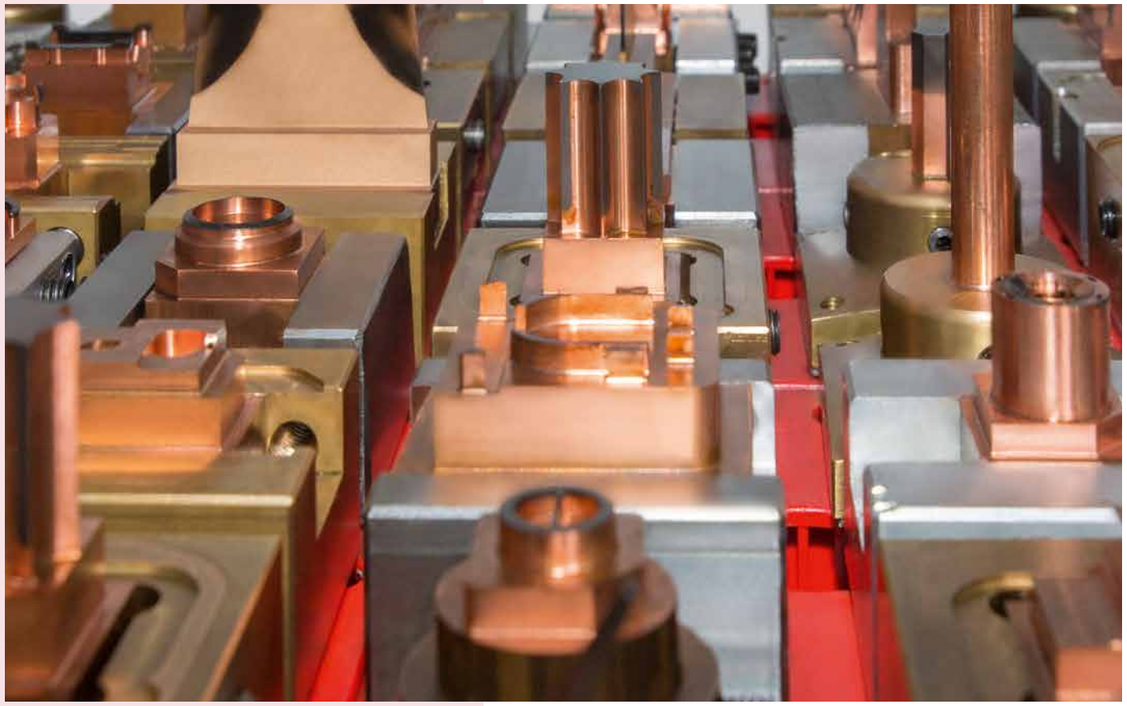
MV1200R Connect

The innovative Tubular Shaft motor drives give the MV1200R exceptional precision. Combined with carefully adjusted parameters for current flow and wire and feed speeds, it is possible to produce components that meet a wide range of requirements. This minimises machining times while maintaining sufficient precision.

The new generator technology guarantees high surface quality and achieves a significant reduction in wire consumption.

MV1200R wire EDM and SG12S die-sinking EDM, the perfect duo for any workshop's EDM section.

Erowa ITS pallet-mounted electrodes. The machine comes equipped with a C-axis head with the Erowa interface as standard.



Electrodes ready to enter the 20-position magazine.

Mold-tecnic R&D

Core business
Moulds and CNC Machinery

Director
Rubén Pleguezuelos

Contact
Carrer Holanda, No. 2
08520, Les Franqueses del Valles (Barcelona)
Spain

Tel +34 667 648 628

comercial@mold-tecnic.com
www.mold-tecnic.com

The user-friendly nature of the machines and their exceptional operation meant that the start-up process was very simple. Mold-tecnic received training from COMHER's technical staff on how to operate the machines, thereby enabling them to be used correctly and optimally for the mould production process.

This close relationship between the two companies continues on a daily basis. The COMHER team is at Mold-tecnic's complete disposal to resolve any queries and provide technical assistance, offering an excellent after-sales service.

Our philosophy is based on continuous progress in technology and expertise in order to offer the most complete solutions to our customers.

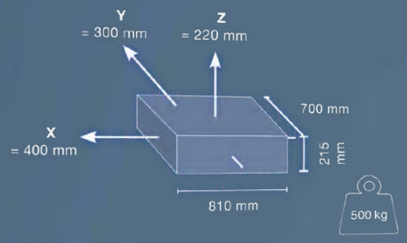
Staff with excellent knowledge and experience.

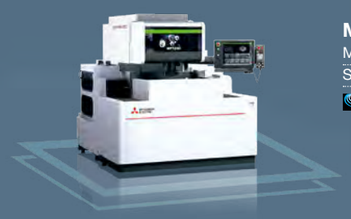
The job lot.

Wire-cutting and die-sinking EDM for all applications.

Wire-cut EDM

MP Series – High Accuracy

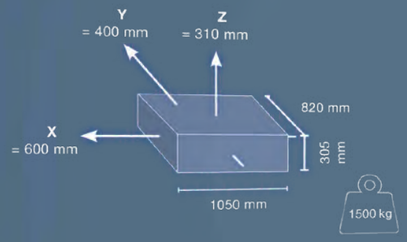


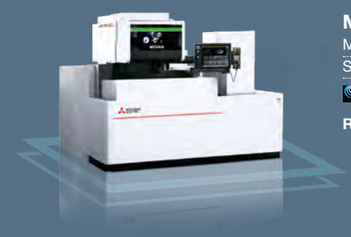


MP1200 Connect

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

Maisart





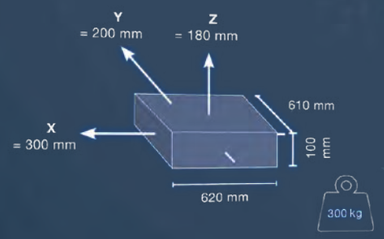
MP2400 Connect

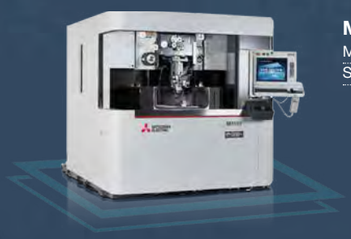
Machine height	2150 mm
Surface finish in the standard version	Ra < 0.10 µm

Maisart

Reports on pages 68 and 88

MX600 – Precision in Oil

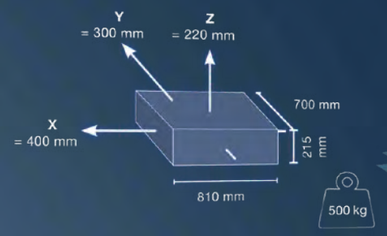


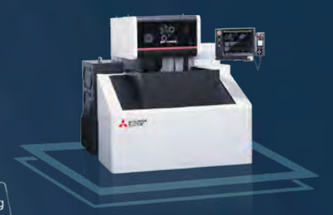


MX600 Advance Tubular

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

MV-R Series – Power for Precision



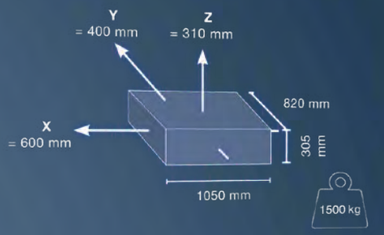


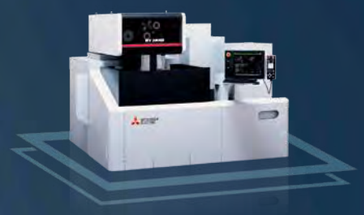
MV1200R Connect

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

Maisart

Report on page 40





MV2400R Connect

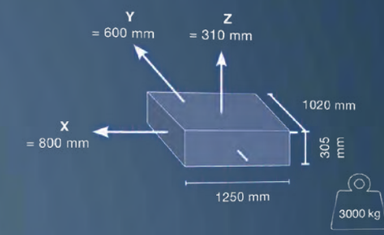
Machine height	2150 mm
Surface finish in the standard version	Ra 0.25 µm

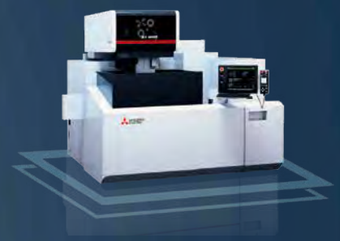
Reports on pages 16, 22 and 60

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





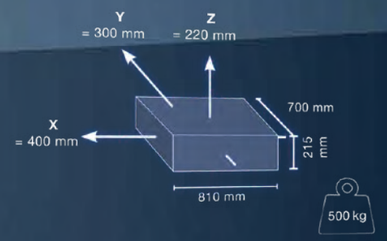
MV4800R Connect

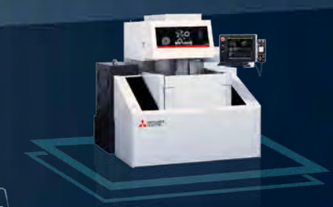
Machine height	2415 mm
Surface finish in the standard version	Ra 0.25 µm

Maisart

Report on page 80

MV-S Series – Ready for Production

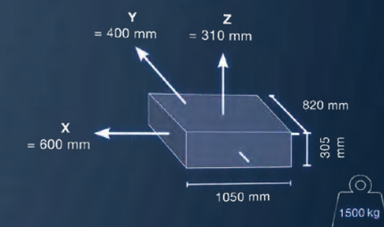


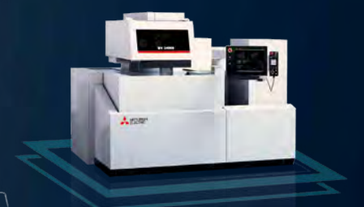


MV1200S New Gen

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

Reports on pages 6 and 14



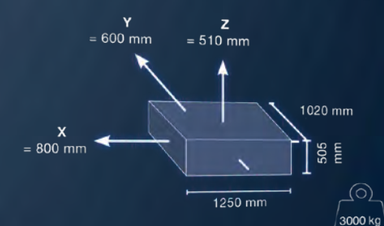


MV2400S New Gen

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

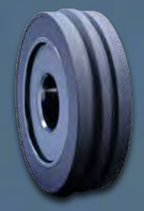


MV4800S New Gen

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

Report on page 22

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

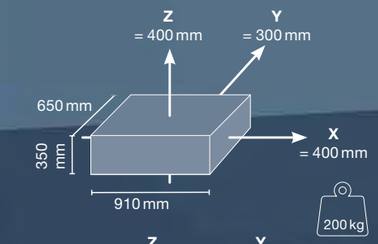
EDM-DRESS

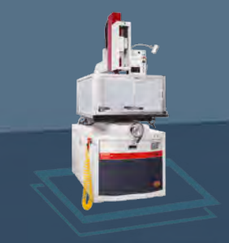
- 100% reproducible results
- Unmanned machining
- Increased grinding productivity
- Extended grinding wheel life

Report on page 30

EDM Drilling

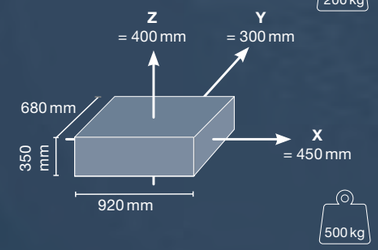
start Series – Drilling Power





start 43Zi

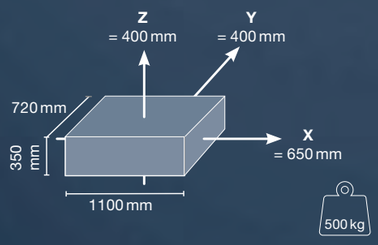
Machine height	2200 mm
Possible electrode diameter	0.3–2.5 mm

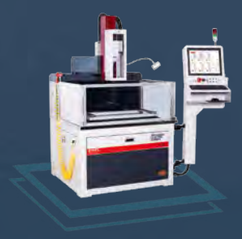


start 43Ci

Machine height	2130 mm
Possible electrode diameter	0.3–2.5 mm

Report on page 60



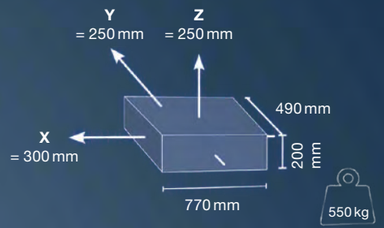


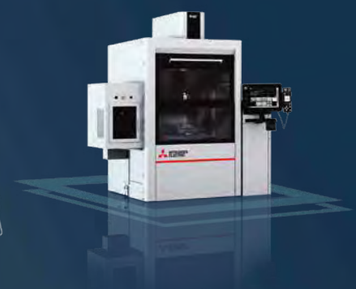
start 64Ci

Machine height	2100 mm
Possible electrode diameter	0.3–2.5 mm

Die Sinking

SG-R Series – Power for Precision

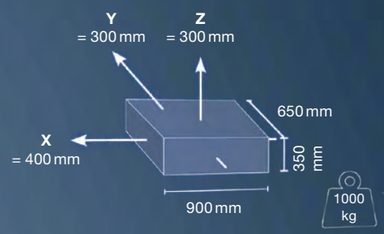


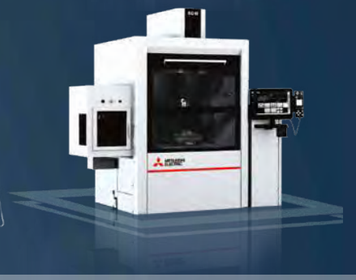


SG8R

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

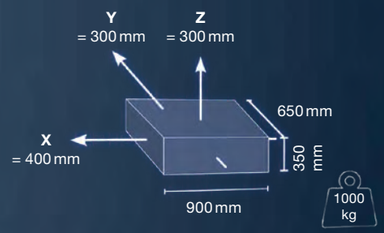
Maisart

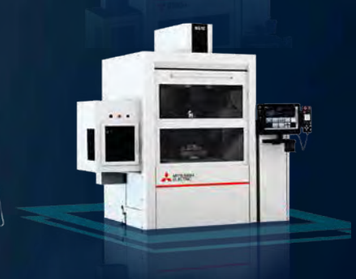
SG-S Series – Power for Precision

SG8S

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

Maisart





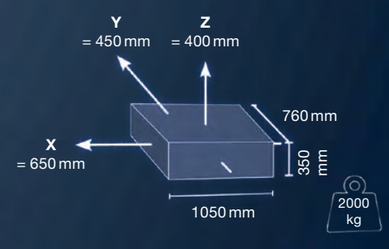
SG12S

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

Maisart

Report on page 40

PREVIEW: SG28 – presentation at the AMB in Stuttgart from 13–17.09.2022, Hall 7 Stand C71



SG28

Machine height	2745 mm

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

Maisart

Maisart

Artificial Intelligence in your machine?

PART 1

What has AI got to do with me as a machine operator?
Probably much more than you suspect ...

Mitsubishi Electric has filed more than 380 patents for AI in machines, systems and vehicles in the last 6 years. Find out on the next pages what this is all about (p. 54) and where it is already built into EDM machines (p. 56) and laser systems (p. 58).

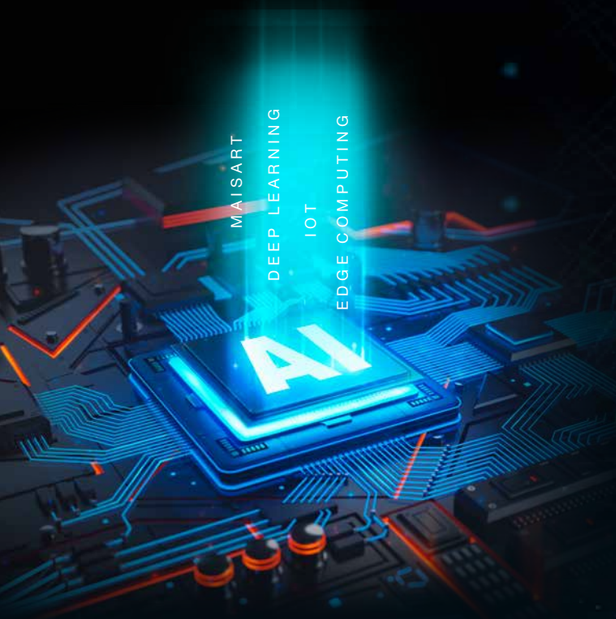
More of this in the next issue of Profile!

More than 380 patents for AI in machines, systems and vehicles.

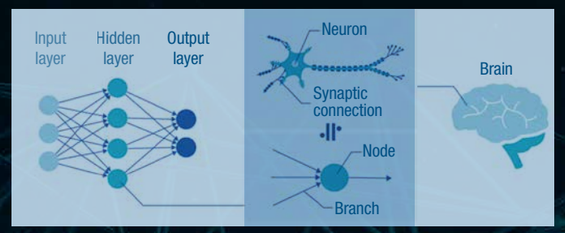
All about AI:
What is Artificial Intelligence all about?

Many people still associate Artificial Intelligence with the supercomputer Deep Blue, the first chess computer to beat a world champion in 1997. The 480 processors were capable of calculating around 200 million moves per second. Compact AI with little computing power will change the world in a big way. Mitsubishi Electric has made AI so compact that it can be used on almost any device and make anything more intelligent.

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.



The neural network



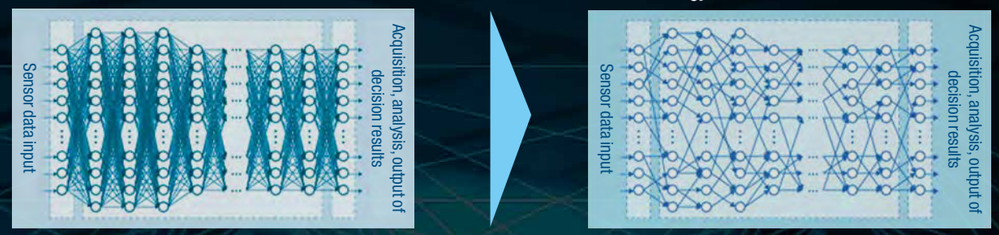
Deep Learning – compact Mitsubishi Electric algorithm

AI, or Artificial Intelligence, is a technology that uses computers to perform intellectual functions like logical inference or learning from experience, just as humans do. AI has evolved rapidly in recent years as computing devices have reached higher levels of performance. Nowadays, AI is an important technology supporting our society. Machine learning is one field of AI, and deep learning is one type of machine learning. Deep learning is based on neural networks, which reproduce the network of human brain neurons as a mathematical model. A neural network is composed of three kinds of layers; the input layer, the hidden layer and the output layer. By processing information in multiple layers, neural networks are capable of high-level recognition, identification, analysis, etc. There is a great expectation that this technology will make computers more like humans.

Strengths of Mitsubishi Electric – dramatically less calculation for the same inferential accuracy

There are several issues that need to be addressed for deep learning to become more widespread. One such issue is the great amount of calculation. It can be a challenge to equip factory automation, automobiles, and other equipment with deep learning because it is so hard to fit high-performance computing devices and high-capacity memories in small devices. Mitsubishi Electric has developed a proprietary algorithm that greatly reduces the amount of calculation while maintaining a high level of inferential accuracy. The input, hidden and output layers of a neural network connect to each other in complex ways, like tree branches spreading out. A massive amount of calculation is required to process data this way.

The branches have been reduced by Deep Learning to only 1/30 to 1/100 of their previous total number.



Drawing on our machinery knowledge built up over many years, we successfully compressed the amount of calculation to just 1/30 to 1/100 the original amount by "cutting the branches" that are less essential. This makes it possible to implement deep learning in a wide range of devices and further expands the potential of AI.

What is reinforcement learning?

Reinforcement learning is a type of AI machine learning. Computers usually act following a human-created program. With reinforcement learning, however, a computer can understand the current situation by itself, set its own rules and determine what action to take. Humans do not need to set the rules with a program. For a computer to determine what action to take next, it needs a lot of experience, including the experience of failure, just as humans do.

When we teach a robot some action, tightening a screw, for example, we make it try that action again and again. This is how it learns. During reinforcement learning, a computer makes repeated attempts at actions and is evaluated (rewarded) based on how well it achieved the objective. It revises its action to get a higher evaluation, gradually getting closer and closer to the objective. Reinforcement learning is the part of AI that learns through the principle of "practice makes perfect." It is the part of AI that finds success from failure.

Up to **99 %** less computing power required

Strengths of Mitsubishi Electric – reducing the number of pre-learning trials by estimating the degree of success

Reinforcement learning does not require a human to set rules with a program. However, learning can take a lot of time because a huge number of trials are needed for pre-learning. Mitsubishi Electric has developed proprietary technology that reduces the number of trials to about 1/50 the conventional total. Conventional reinforcement learning senses trial results and sets control parameters based on evaluation of the same.

In addition to that, Mitsubishi Electric's technology uses knowledge of the machinery that incorporates the AI to estimate the degree of success of trial results and sends feedback to the AI on what motions would get the equipment close to the target state faster. Control parameters are then set accordingly. This allows learning with fewer trials, making it possible to greatly reduce the time and cost of implementing AI.

Far fewer computations for the same inferential accuracy.

Why is Artificial Intelligence currently conquering EDM...?

... and what's the point?

The "brain" of the Mitsubishi Electric EDM and laser-cutting systems is the Maisart artificial neural network technology developed by the Japanese manufacturer, which imitates the neurons of the human brain and is also used in automobiles for accident prevention. Used in production installations, this revolutionary innovation opens up totally new possibilities.

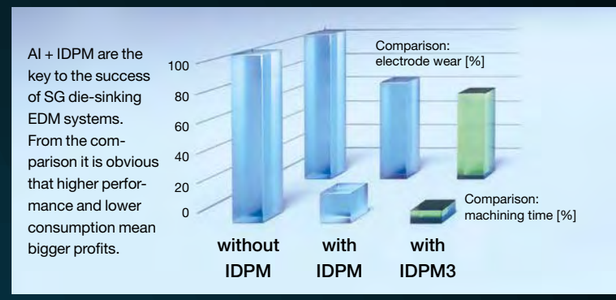
The SG series – Artificial Intelligence in die sinking
A characteristic feature of the die-sinking systems from Mitsubishi Electric is their ease of operation and programming. They allow the operator time for what matters, i.e. the sensible planning of the various EDM tasks. The D-CUBES control generation of the SG series shines with the Artificial Intelligence developed by Mitsubishi Electric. The outcome:

- Predictive machining strategies
- Self-learning process optimisation
- Continuous adaptation of the generator parameters

Conclusion: higher productivity, less wear ... EDM can be so simple.

Everything under control – intelligent helpers so you achieve your goals faster
With the die-sinking systems of the SG series, it is possible to calculate machining time in advance. Thanks to new algorithms and Artificial Intelligence, machining times can now be calculated much better in advance and processes planned and optimised more effectively. The control system "learns" continuously during the various machining operations and thus steadily improves the accuracy of the machining times calculated in advance. Production processes can thus be made significantly more efficient and time-saving.

AI + IDPM – the key to success
The digital Power Master IDPM guided by Artificial Intelligence is the key to the SG-R's outstanding performance. Minimal wear of the graphite electrodes combined with high removal rates is visibly supported by this technology. The formation of deep ribs with a uniform surface structure is another feature of the new IDPM with AI. The IDPM's performance is available not only for the machining of steel but also of carbide. Significant improvement of the removal rate over conventional machines: up to 40 % higher machining speed can be achieved with carbide – thanks to the new IDPM. The use of copper-infiltrated graphite significantly increases the removal rate. The finish with tungsten copper electrodes compensates for slightly higher wear – performance and precision combined. Also in carbide.



AI + IDPM are the key to the success of SG die-sinking EDM systems. From the comparison it is obvious that higher performance and lower consumption mean bigger profits.

Data Management 4.0
On top of this, the die-sinking systems of the SG series come with a wide range of tools for intelligent data analysis, such as prediction of erosion times, complete production data analysis and support for external data processing right through to job costing. All thanks to Artificial Intelligence.

With the SG series, it is possible to make production processes significantly more economic and time-saving. The control "learns" continuously during the various machining operations and thus steadily improves the accuracy of the machining times calculated in advance.

The generator with IDPM in action
This way to the video:
www.mitsubishi-edm.de/idpm

Artificial Intelligence – put to good use.

Mitsubishi Electric

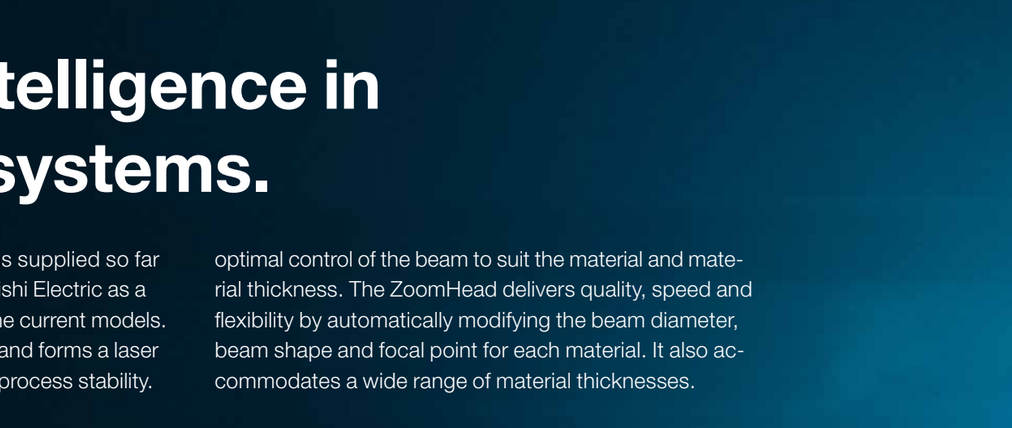
Artificial Intelligence in fibre laser systems.

The over 18,000 laser-cutting systems supplied so far demonstrate the experience of Mitsubishi Electric as a global player. This is also reflected in the current models. Maisart is the basis of the GX-F series and forms a laser system for maximum productivity and process stability.

AI-Assist makes it intelligent – support from Maisart
Using audio and light sensors, the cutting process is monitored in real time and parameters are automatically adjusted to optimise cutting performance. If the process is sufficiently stable, AI-Assist even increases the cutting speed. This raises output to the next level and also significantly improves process stability. Irregularities are detected immediately. Parameters are automatically adjusted and damaged nozzles are replaced, thus ensuring unbeatable results.

Mitsubishi Electric ZoomHead – stepless laser beam adjustment faster than a pit stop
Mitsubishi Electric's proprietary optical system features optimal control of the beam to suit the material and material thickness. The ZoomHead delivers quality, speed and flexibility by automatically modifying the beam diameter, beam shape and focal point for each material. It also accommodates a wide range of material thicknesses.

Since it is not necessary to change the machining lens according to thickness and material, set-up time is significantly reduced. The operator can therefore switch between different material thicknesses without affecting cutting quality, and even without contact. The optional nozzle changer automatically cleans, calibrates and changes the nozzles between the different material types, thus saving time spent on set-up.

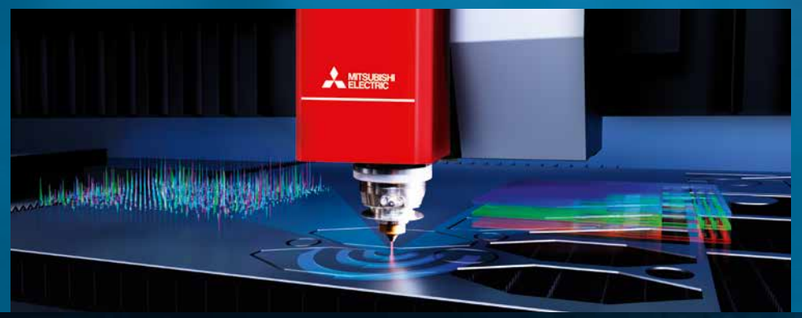


TO BE CONTINUED
In the next issue, PROFILE will report on new Maisart technologies in EDM.

AI diagnostics – for better results

Audio and light sensors monitor the cutting process in real time and automatically adjust parameters to ensure a stable process and optimise cutting performance.

When a poor cut is detected, the Artificial Intelligence makes the necessary adjustments to improve or restore the cut. The system is also able to optimise cutting speed.



AI nozzle monitor – intelligent support

Nozzle OK
Automatic process parameter adjustment

The AI nozzle monitor uses a camera system to monitor the condition of the nozzles. If no damage to nozzles is detected during the check, the process parameters are automatically adjusted. Faulty nozzles detected by the AI nozzle monitor are automatically replaced with back-up nozzles to ensure continuous, long-term production.

Nozzle not OK
Nozzle changer automatically changes the nozzle

Artificial Intelligence – put to good use.

Mitsubishi Electric

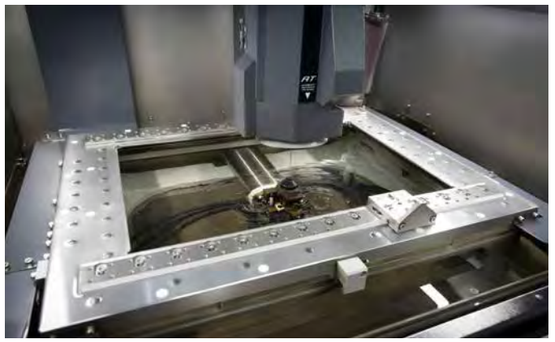
Formenbau Schneider

Wire-cut EDM as a key technology.

Formenbau Schneider pursues insourcing.

Quality always enjoys top priority at Formbau Schneider. The two managers of FB Schneider GmbH are certain that their future lies in highly advanced moulds, the production of which is demanding and requires a good deal of expertise. To make this possible, the company needs high-tech machines, such as the Mitsubishi Electric MV 2400 R wire erosion system installed in February 2021 and the Mitsubishi Electric 43 C Start start-hole drilling system.

The MV2400R Connect has been in operation at FB Schneider since spring 2021.



One focus at FB Schneider is on the the design and fabrication of injection moulds.

Precision and flexibility are key cornerstones of the company.

“Precision with passion.” This slogan sums up the ambition of the company for the two managers of FB Schneider GmbH, Ulrich and Maximilian Schneider. “It describes the aspiration of our company today and at the same time also defines our plans for the future,” Maximilian explains. “We have always given the company a long-term outlook and have looked at the skills and technologies we need. We don’t see our future in the making of simple moulds that can be produced with little expertise, as they can be made at locations with low production costs. For us, this means that we have to deliver superlative-quality and high-precision moulds.”

Beginnings in the barn

In the mid-1990s, they repaired their first moulds in their own barn and purchased their first machines. There was no need to go to great lengths to attract customers. They started up the business unassisted and won over customers with quality and an attractive price-performance ratio.

Today, 15 skilled employees work for the company, which purchased a building in Reddighausen in northern Hesse in 2014. “We’re a classic tool and mould maker with a broad base,” Maximilian explains. “Our customers come from right across industry.” In addition to product development and toolmaking, Schneider’s focus is on the production, modification and repair of injection moulds. This is where the broad spectrum of prototype tools with aluminium or steel inserts begins, ranging from pre-series moulds to high-cavity moulds for series production.

Every customer counts

“Our aim is to always offer the customer the solution they need. If the customer needs an all-round no-worry package, a complete solution, he gets it. But we are also a subcontractor and fabricate tools and moulds to customer specifications. For us, it is always important to respond quickly and flexibly to our customers’ wishes.”

It is not only the large-scale orders for bigger tools and moulds that are taken seriously at Schneider. Equally important to the managers are the smaller contracts, repair jobs or orders for spare parts. This is where rapid processing is usually called for. “Customers with such requests often call us because they know Schneider will take good care of them,” Ulrich continues. “Our team of employees is highly motivated and ready to support our customers even in stressful situations under deadline pressure.”

Machinery for high precision

So that it can operate successfully with this commitment and in a customer-focused manner, Schneider

Precision with passion

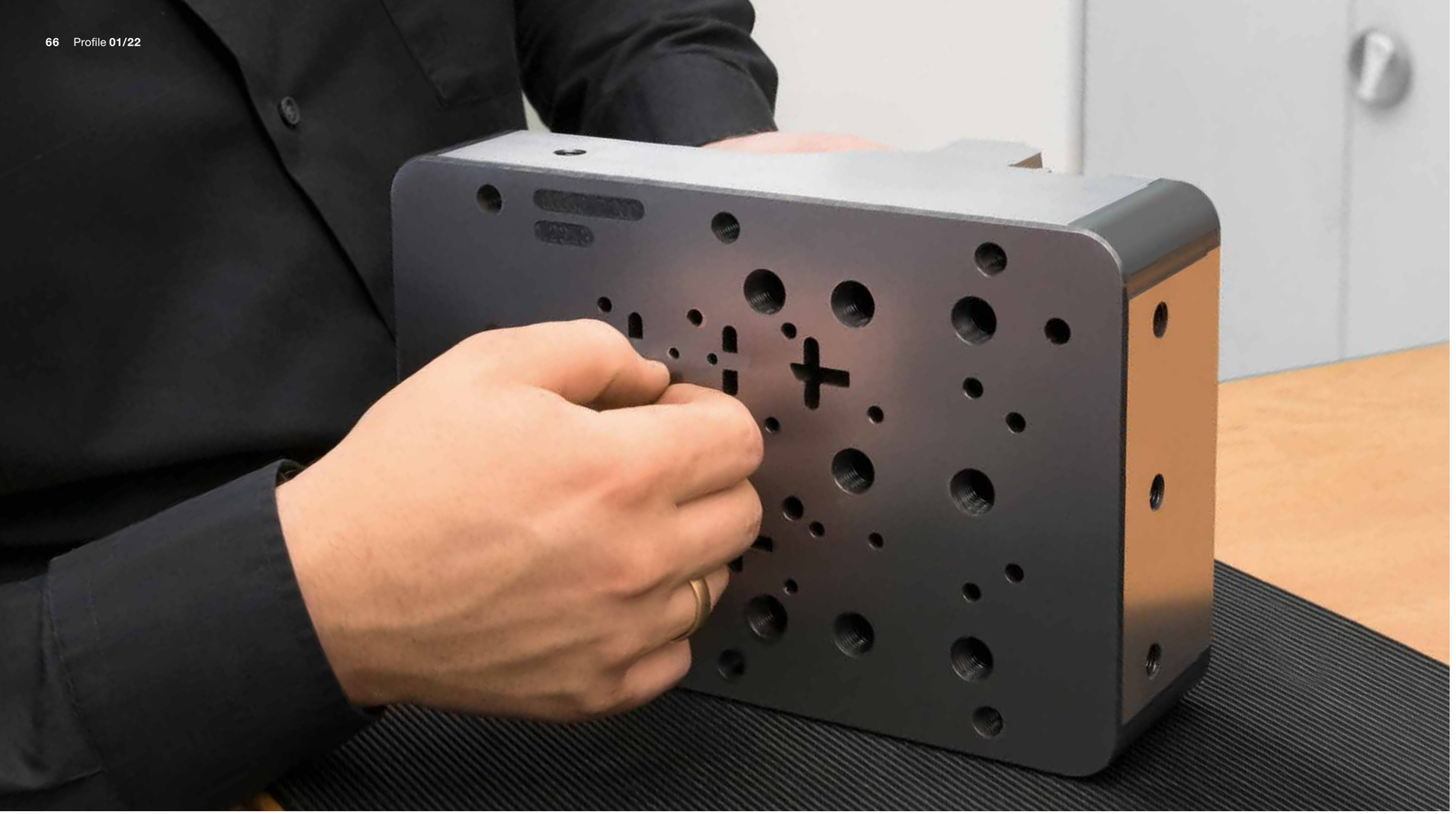
Manager Ulrich Schneider tells Profile journalists how the investment came about.

To get the most out of the new MV2400R, FB Schneider has invested extensively in a new clamping system.

Formenbau has given itself a broad technological base. All the key machining steps can be carried out with high precision on the in-house machines. On the modern 3- and 5-axis machining centres, Schneider can also machine graphite in addition to the metals commonly used in toolmaking, as the systems are fully encapsulated. Conventional and CNC turning operations are also among the company's standard processes. In the grinding sector, the company has both cylindrical and surface grinding machines.

Key technologies in-house

"In the EDM sector, we concentrated solely on die-sinking EDM with our own machines until the beginning of 2021," Ulrich reports. "For wire-cutting, we drew on the services of an external provider, whose work we were also very satisfied with. But we want to develop our company further, so we take a regular look at all areas." For Maximilian and Ulrich Schneider, there were two factors that prompted them to invest in wire EDM at the beginning of 2021. Firstly, there was the considerable volume of wire-cutting orders outsourced each year and, secondly, their assessment of wire EDM as a key technology. "We looked at the costs of our external EDM jobs and compared them to the investment and operating costs of a new wire EDM system. Everything favoured



From mould making to sampling, the customer gets everything from a single source at FB Schneider.

Formenbau Schneider GmbH

Founding year
1996

Director
Ulrich Schneider, Maximilian Schneider

Employees
15

Core business
Injection moulds, prototype, pre-series, series and slide moulds, multi-component, measuring and handling devices, single components/custom-made products, milling, CNC start-hole drilling, wire-cut EDM, die-sinking EDM, turning, grinding, assembly and tuning of sub-assemblies

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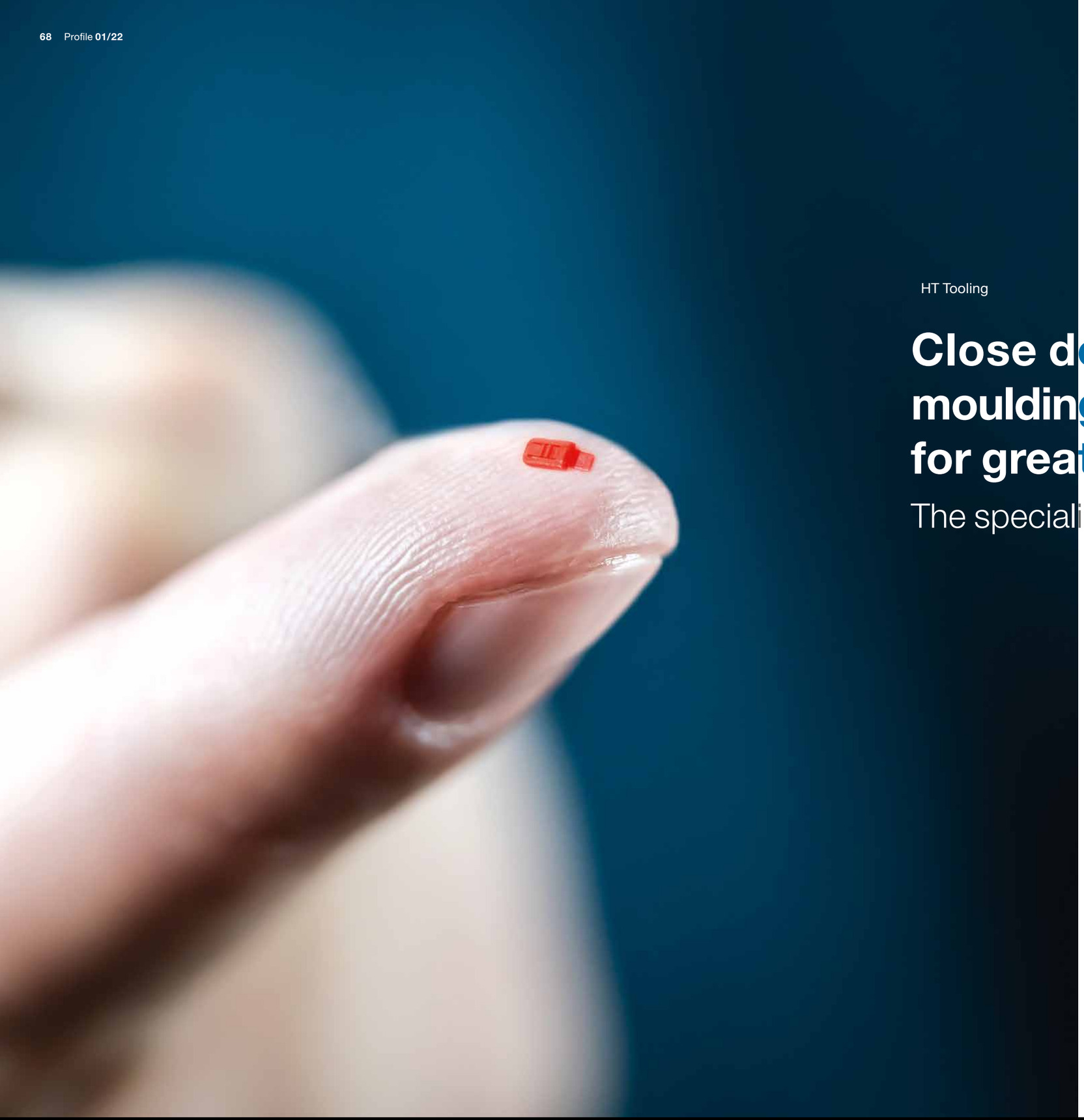
the purchase of the new system," says Maximilian. So as to be able react quickly to customer requests, it is important for the business to always have unrestricted access to the relevant key technologies. "So we obviously want to bring the know-how of this technology in-house – in other words, pursue insourcing when we see the value of introducing new processes," Maximilian stresses. Since the wire EDM system has been added to the range of machines, this technology has been used more frequently in design engineering. "We have only been using the wire EDM and start-hole drilling systems from Mitsubishi since the beginning of 2021. So our experience with it so far is relatively limited. But we can already observe a rethink in design. A lot of work that used to be preferably milled is now wire-cut. If you have the ideal technology on site, it is readily and willingly resorted to." Looking ahead, FB Schneider plans to implement wire-cutting in other areas, such as in the machining of cemented carbide.

Healthy growth

The existing premises are already full. To realise their plans, FB Schneider intends to expand production by adding a roughly 400-square-metre shop in the third quarter of 2022. "So that we can continue to live up to our aspirations, we need larger air-conditioned facilities where we can do our work under defined conditions," says Ulrich, outlining their plans. "In our new building, we have decided that two thirds of the space for production and measurement will be fully air-conditioned. We are currently working a single shift and want to keep it that way." From now on, the company wants to push ahead with the automation of its equipment so as to raise productivity.



HT Tooling

Close dovetailing of injection moulding and toolmaking for greater flexibility.

The specialists in delicate products.

“Small, but with maximum precision” is how manager Philipp Türk describes HT Tooling’s products. The medium-sized company in Bergisch Gladbach specialises in the production of small injection-moulded parts measuring between one and 60 millimetres. These delicate components weigh only a few grams and require the highest precision throughout the production chain. At HT Tooling, this starts right at the toolmaking stage. With its latest investment in a Mitsubishi Electric MP2400 Connect, the company is underlining its quality aspirations.

Tiny, but with maximum precision.

Plastic parts for hearing aids are, as ever, part of the product range.

As a medium-sized company, it is good to have two mainstays. HT Tooling GmbH from Bergisch Gladbach has made a name for itself in the fields of injection moulding and toolmaking. As a spin-off of the hearing aid manufacturer Interton, the specialists have been producing tiny components with high precision for some 60 years: injection-moulded parts between one and 60 millimetres and weighing between 0.4 milligrams and 50 grams.

“After spinning off our injection moulding and toolmaking operations at the beginning of 2000 and converting them into a company in its own right, our initial focus was on the production of injection-moulded parts for hearing aids,” Türk explains. “We quickly expanded our customer base and acquired new orders for small and tiny injection mouldings.”

HT Tooling is broadly positioned and serves the global market with its products. Although the latter are not always visible, they perform important tasks. Most of them are small products that require specialised expertise or are made of unconventional materials. These include cable grommets and pushbutton rockers, for which metal plates are inserted during the injection moulding process.

Toolmaking and injection moulding operate hand-in-glove

For HT Tooling’s customers, the combination of injection moulding production with competent toolmaking is very important. “There are two points I’d like to stress here that our customers bring up again and again,” says manager Hans-Herbert Türk. “It is our expertise in toolmaking and injection moulding that is combined on a single site and that customers can always rely on.” In addition, the close dovetailing of injection moulding and toolmaking offers the advantage of rapid access to all in-house resources. This means they can meet delivery deadlines even if there is damage to the moulds during production.

At HT Tooling, injection moulding and toolmaking are located in the same building. The distances are short, communication between the departments is efficient and the teams in both areas are highly flexible. Repairs to and modifications of the moulds can thus be carried out quickly. “We produce many small and very small series as well as prototypes,” explains Philipp Türk. “In these areas, adjustments and changes are an everyday occurrence. By dovetailing toolmaking and injection moulding, we can respond very quickly to customer requests and implement changes.”

Moulds for in-house production and for customers

In the toolshop, the specialists make all the tools and moulds for in-house production activities, while also supplying customers with high-precision tooling. “As yet we haven’t actively advertised our toolmaking services,” says Hans-Herbert Türk. “Our customers come to us thanks to word-of-mouth recommendation.”

In addition to their wire-cutting and die-sinking EDM machines, the specialists have high-precision CNC milling and turning machines at their disposal. Specifically for rapid repairs and reworking a laser welder is installed, which can be used for smoothing out minor irregularities.

Advanced software tools and expertise

Customers come to HT Tooling with definite ideas and finished 3D design solutions. “Together with our customers, we analyse the data and check them with our advanced software tools. Often we then find solutions that can significantly improve the workpiece.”

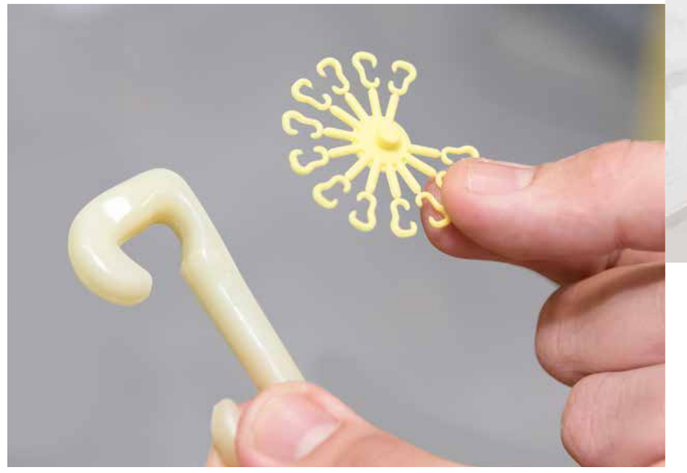
Rotary EDM

A new project the company started two years ago is

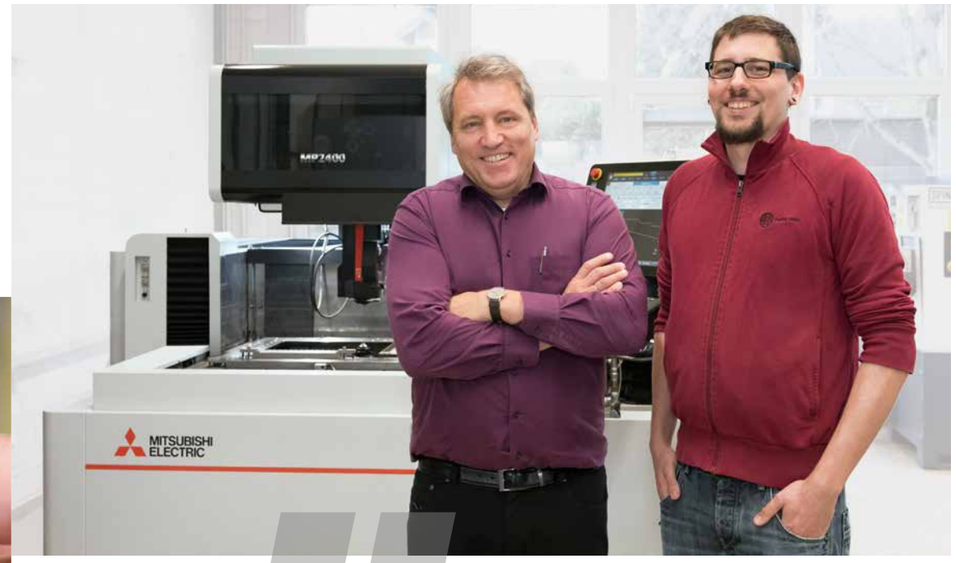
Bending dies with the highest surface quality – advanced machines lend shape to customers’ ideas.

Interior of the MP2400 Connect with mounted vice. Even tiny 5 x 5 mm sheets are machined at HT Tooling with a tolerance of 5 micrometres.

Fixture for wire-cutting mould inserts. HT Tooling can also respond quickly to customer requests when it comes to very small series.



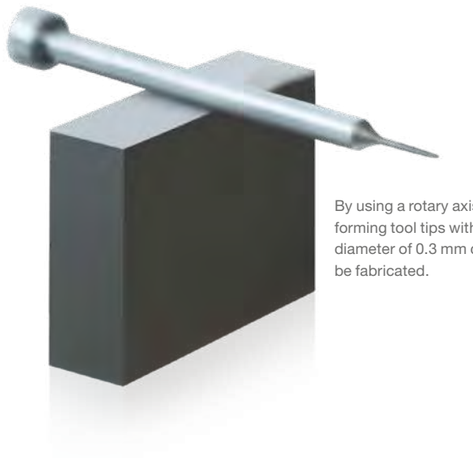
Plastic parts for the textile industry



Managers Hans-Herbert and Philipp Türk (from left to right)

rotary EDM or erosive cylindrical grinding. “After slight initial hitches, we are very satisfied with the results we have now achieved,” says Philipp Türk, describing the current situation. “We have now built a reputation and established a market that makes us optimistic about the future.” The basic principle of rotary EDM is simple. The workpiece is clamped onto a rotary spindle for machining and shaped with the EDM system.

HT Tooling currently machines workpieces with diameters from 0.15 millimetres upwards. In doing so, the company is able to machine a wide variety of materials, including cemented carbide. It is very difficult to machine such products with the desired precision using conventional methods such as grinding or turning.



By using a rotary axis, forming tool tips with a diameter of 0.3 mm can be fabricated.

Better surface finish and faster cycle times

High surface quality is required in the production of small injection-moulded parts and tools. “For this reason, when we purchased a new EDM system, we opted for a Mitsubishi MP2400 Connect,” says Türk, “as it delivers top-quality surfaces. The EDM systems of comparable manufacturers and the existing machines achieve similarly good values, but have significantly slower cycle times.” The Mitsubishi Electric MP2400 Connect has been running in HT Tooling’s toolshop for a good year now. “So far we’ve been very happy with our Mitsubishi system’s performance,” says a delighted Türk. “Our customers are happier with the quality of the machining.”

HT Tooling’s management knows that a change of manufacturer is always associated with extra work and expense. That’s why they thought long and hard before taking the plunge. The decisive factor in the end was the after-sales service. “In the event of failures, which always happen once in a while, we expect a service that is quickly on hand with advice and spare parts,” Türk explains. The maker of the old EDM machines was not always up to the mark. “We were looking for a manufacturer who, firstly, has outstanding machines in its range and, second, provides outstanding service,” says Türk, summing up the requirements. “In Mitsubishi I can say we’ve found the right one.”

In Mitsubishi I can say we’ve found the right one.

Philipp Türk, manager at HT Tooling

HT Tooling GmbH

Founding year
2009

Employees
14

Management
Hans-Herbert Türk, Philipp Türk, Benedikt Türk

Skills
Product development, tool and mould design, workpiece machining, injection mould making, injection moulds – modifications and repair, prototype moulds, production of injection-moulded and stamped parts

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Polish Academy
of Sciences

15,000 no-sweat tests.

Robots from Mitsubishi Electric and AI in biotechnology.

Thousands of individual samples can now be tested every day – the AGAMEDE robotic system has been put to use at the Institute of Bioorganic Chemistry of the Polish Academy of Sciences (ICHB PAN) with the participation of Mitsubishi Electric, Labomatica and Perlan Technologies as technology partners. It was developed to significantly speed up the diagnosis of SARS-CoV-2, but that's not all. For it can also be used to research new drugs, develop personalised therapies for cancer patients or even formulate cosmetics – thanks to state-of-the-art automation technology combined with Artificial Intelligence.

AGAMEDE is an interdisciplinary project that combines the worlds of robotics, computer science, industrial design, mathematics, biology and chemistry. The solutions used in it are innovative and unique. The outcome is a scalable throughput of 100,000 analysable samples per week.

Artificial Intelligence combined with automation technology.

15,000
tests per day, 7 days per week,
with Mitsubishi Electric robot

AGAMEDE is considered the first female scientist in history. Homer described her in the Iliad as living in the 12th century BC and being conversant with the healing power of all herbs and knowing how to mix them properly. Her name has been given to the laboratory automation system developed at the Institute of Bioorganic Chemistry of the Polish Academy of Sciences (ICHB PAN). What makes AGAMEDE unique is not its automation of laboratory work, but its integration of automation and Artificial Intelligence used for data interpretation using Labomatica's Gene Game™ software. Thanks to this combination, the system is a "closed loop" in which the robots prepare experiments, read the results at a fixed point in time and interpret the data to autonomously prepare the next cycle of experiments. The operator's tasks are limited to defining the problem, designing the experimental set-up and monitoring the correct running and operation of the system. The system's task is to conduct experiments around the clock and deliver results.

AGAMEDE is a high-throughput system that combines Artificial Intelligence with automation. A crucial breakthrough, because most automated high-throughput systems require a human operator to subjectively analyse the results and plan the next series of experiments once a cycle is completed. "On the other hand, thanks to the Artificial Intelligence module, AGAMEDE interprets the experiments on the basis of mathematical models without human intervention," Radosław Pilarski, PhD, inventor and chief engineer of the system, stresses.

"AGAMEDE can be used by centralised diagnostic laboratories, pharmaceutical companies engaging in drug development, and oncology laboratories looking for personalised therapies for patients, as well as in the R&D departments of chemical and biotechnology companies for the optimisation of bioprocesses," he adds.

Thanks to the Artificial Intelligence module, AGAMEDE interprets the experiments on the basis of mathematical models without human participation.

Radosław Pilarski, PhD, inventor and chief engineer of the system

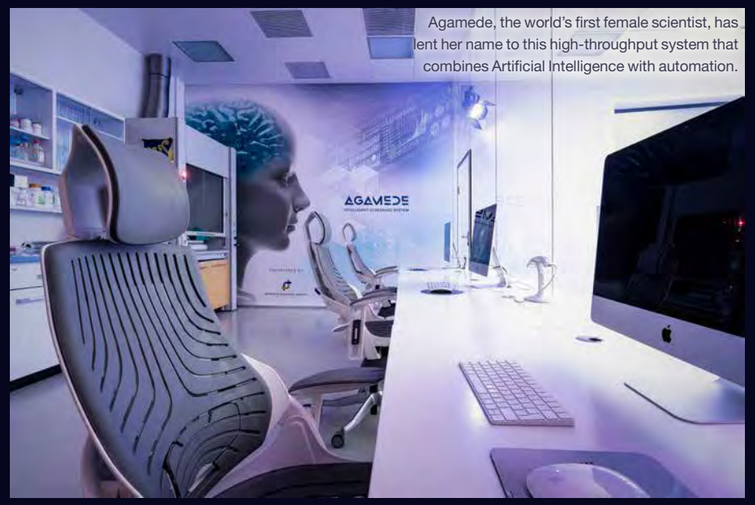
EPICELL project

Work on AGAMEDE got underway at the Institute of Bioorganic Chemistry of the Polish Academy of Sciences in 2015. The system was originally developed for the EPICELL project, which was funded by the National Centre for Research and Development (NCBiR) as part of the STRATEGMED programme "Prevention and Treatment of Civilisation Diseases". The aim of the project was to develop optimised media for the harvesting of cardiomyocytes with therapeutic potential from induced pluripotent stem cells (iPSCs) previously derived in the process of muscle cell (myocyte) differentiation. Combining expertise in small molecule epigenetic modulators and experience in cell reprogramming, the EPICELL consortium (Institute of Bioorganic Chemistry PAS, Institute of Human Genetics PAS and three hospitals from Poznań) conducted studies that will result in the future development of methods for transforming induced iPSCs for the purposes of regenerative medicine – targeted implantation in the hearts of patients after heart attacks. The idea is to restore cardiac output to its pre-infarction state. The challenge was the sheer number of experiments needed for the design of a suitable "cocktail of small molecule epigenetic modulators". For the 10 components of the cocktail and 10 different concentrations, this called for a total of 10,000,000 experiments. "With AGAMEDE, we searched for the right combination of compounds in a multidimensional system of solutions, and from this we developed the composition of the 'EPICELL One' reprogramming medium," Prof. Wojciech T. Markiewicz, head of the EPICELL project, explains.

15,000 tests per day

At the end of March 2020, the situation changed. The Institute of Bioorganic Chemistry of the Polish Academy of Sciences has been investigating RNA and DNA nucleic acids since its inception – and had all the facilities required for SARS-CoV-2 diagnostics. "Our institute was the first in Poland to develop a test – MediPAN – for the detection of SARS-CoV-2. We soon decided to combine AGAMEDE's automation with our testing and developed a high-throughput diagnostic protocol that allows us to test 15,000 samples per day. This at least is the potential, because ICHB PAN as a scientific entity does not have an accredited diagnostic laboratory. This is an excellent outcome, because a human sample analyser can only process a few hundred samples at most," says ICHB PAN Director Prof. Marek Figlerowicz.

The Mitsubishi Electric robot is the central component of the system. It continuously operates the analytical equipment on the basis of specifications, conducting 15,000 tests per day, 7 days per week.



Agamede, the world's first female scientist, has lent her name to this high-throughput system that combines Artificial Intelligence with automation.

Robots, PLC and software from a single source

The AGAMEDE project was set up with the participation of several technology partners: Mitsubishi Electric, Labomatica and Perlan Technologies. Mitsubishi Electric contributed a 6-axis robot, PLC controls and its MELFA Basic software. The Mitsubishi Electric industrial robot with its long arm reach is the central component of the system. It reproduces the work of a laboratory technician who continuously operates the analytical equipment on the basis of the experimental protocols entered by the operator into the control software.

An integrated set of robotic tools permits microscale experiments on 96- and 384-well microassay plates. This suite comprises industrial cell culture incubators, plate and tip feeders, pipetting stations, labellers, barcode scanners, plate sealers, fluorescence readers and spectrophotometers. The HCA automated confocal microscope with four fluorescence channels occupies a special place in the experimental array. For the biotechnology community, this instrument is the equivalent of the Hubble telescope applied to the microcosm. Instead of astronomical objects, it photographs and analyses millions of cells and tissue structures with similar quality and efficiency.

„The support from Mitsubishi Electric's international structure dedicated to innovative projects was very helpful.

Roman Janik, coordinator of solutions for the life science industry in Poland

The device is supplemented by an acoustic dispenser that doses liquid quantities in the nanolitre range (millionths of a millilitre). The rapid dispensing of such small volumes of solution cuts research costs and increases throughput. It allows experiments to be conducted using the collection of over 115,000 chemical compounds.

Working under high pressure

"Implementing Poland's first such advanced system that combines robotics with laboratory equipment, we benefited from our international experience. The support from Mitsubishi Electric's international structure dedicated to innovative projects was very helpful," says Roman Janik, coordinator of solutions for the life science industry in Poland. Looking back on work on the project, he says: "We were all working under time pressure to develop a solution that would take the strain off lab technicians as soon as possible. We were able to deliver a weekly throughput of 100,000 samples, which is scalable," adding: "This is a phenomenal result".

Bringing together many worlds

"The task, which would have been complicated in any case, was not made any easier by the time constraints. The AGAMEDE project is an interdisciplinary project that brings together the worlds of robotics, computer science, industrial design, mathematics, biology and chemistry. The solutions used in it are innovative and unique. As with many projects, the biggest challenge was to define the goal and how we wanted to achieve it. The key to achieving the goal was to find a common 'technical language' so that people from different sectors could communicate on the same level and clearly articulate their expectations. It was often difficult to bridge the gap between the academic world, which thinks in abstract terms, and the industrial world, which usually follows a fixed pattern," Tomasz Scholz, a robotics engineer at Mitsubishi Electric, recalls.

Classical antiquity and futurism

The outcome is a system that not only works well, but also looks intriguing. "The visual identification refers to ancient Greece and is a tribute to the beginnings of scientific thinking in our civilisation and especially to women in science. To the poster we added futuristic elements that visualise the mythical AGAMEDE. This is how the figure of an ancient sculpture and a cyborg came about.

The blue, glowing brain and the bit motif unite human thought processes with Artificial Intelligence. The figure is intended to call to mind a humanoid robot that solves combinatory tasks symbolised by the manipulation of cubes like a Rubik's Cube. We're putting it on all promotional materials, including product packaging and prototypes created with the help of AGAMEDE. Following the current trends in the Artificial Intelligence industry, the website www.agamede.ai that advertises the project was set up in the national domain of the Caribbean island of Anguilla, which has the suffix abbreviation .AI," Radosław Pilarski mentions.

New approaches for laboratory planning

At the planning stage, Pilarski emphasises, attention was also paid to the laboratory space in which the equipment was installed. A cleanroom for aseptic cell culture, which is dark and windowless in most labs, was given a completely new look here and broke with existing standards. Thanks to large, carefully sealed windows, it is well lit. Glass panels have been added to allow constant monitoring and control of the system without having to wear uncomfortable cleanroom suits.

The illumination of the apparatus with stage spotlights added a modern touch. Three beams of light in the colours blue, red and white mix on the AGAMEDE equipment, and the whole is accentuated by reflections of the beams on metal elements.

The workbenches are made of snow-white Corian, an extremely smooth but malleable composite material that has become very popular with designers and architects in recent years. Work is facilitated by high-resolution 4K monitors and cameras that allow remote monitoring of AGAMEDE and experiments anywhere in the world.

Image sources: Institute of Bioorganic Chemistry – Polish Academy of Science

AGAMEDE – developed by …

www.agamede.ai

MITSUBISHI ELECTRIC Changes for the Better

Globally active manufacturer of electrical and electronic products

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Supplier of equipment, instruments and complete solutions for medical laboratories

ICHB PAN

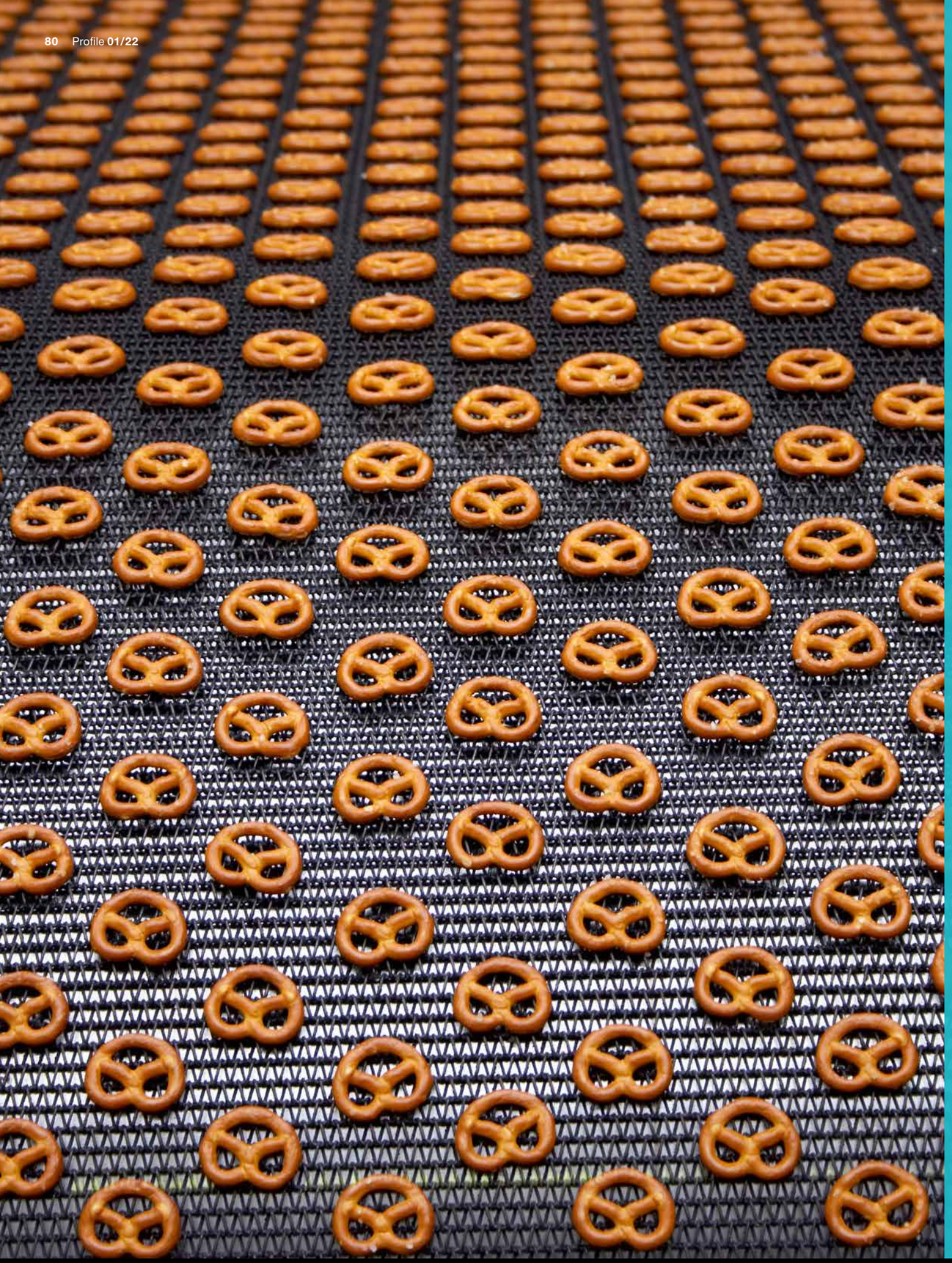
Institute of Bioorganic Chemistry of the Polish Academy of Science

labomatica LABORATORY AUTOMATION

Manufacturer of modern robotic systems, Artificial Intelligence software and laboratory management systems

Combination of classical antiquity and futurism.

Polish Academy of Sciences



Handtmann Maschinenfabrik

EDM to get your teeth into.

Extending the production spectrum wire EDM.

Designer food is a big talking point. To be able to productively manufacture meat, sausage and and dough products with imaginative shapes, Albert Handtmann Maschinenfabrik in Biberach, Swabia, develops and builds automated filling, portioning and packaging machines. Wire erosion is indispensable for producing the complex geometries and contours of the shaping tools.

Albert Handtmann Maschinenfabrik GmbH & Co. KG in Biberach an der Riss ranks as the world's leading manufacturer of advanced machines for meat and dough processing. As Georg Briegel, Production Manager in Biberach, proudly reports, Handtmann machines perform outstandingly every day all over the world in the production of sausage and dough products: "From small rural butchers and bakers to nationwide meat factories and bakeries, a multitude of companies in the food industry use our modular machines, which can be flexibly configured to individual requirements and needs. Pet food is also produced on our machines."

He goes on to explain what the machines do: "It's always about feeding, dosing, portioning, wrapping and finally packaging pasty foods, such as bread and pizza dough, and meat and sausage mixes." Machine manufacturer Handtmann focuses primarily on largely automated processes with high productivity. This is the only way to produce food in the large quantities required today economically and at sufficient speed. As an example, Briegel cites smoked sausage, which is sold among other things in discount markets and at petrol stations. "Stuffing the sausage casings with precisely metered mix, sealing the ends of the sausage and packaging the sausages attractively, either one or several at a time, cannot be done manually in quantities of several hundred thousand sausages a day. Only our sophisticated, interlinked machines are capable of this." Handtmann's highly innovative technology also ensures that sausage manufacturers can stuff, seal and package up to 3,600 per minute of the 'Wienerle' sausages very popular in Germany, with 0.5 g accuracy.

Hard and tough materials

According to Joachim Haller, head of toolmaking and prototypes at Handtmann, food processing machines require a large number of components made of highly chemically resistant materials. These are primarily high-alloy and corrosion-resistant steels, but also nickel castings. The task involves fabricating a variety of components, each of which is fitted in the filling, portioning and cutting machines. "We can machine numerous parts exclusively with wire erosion. These include, for example, so-called forks for our wire cutting stations. We have to cut deep holes with diameters of only 0.3 to 0.6 mm in steel parts hardened to 60 HRC," says Fabian Ruf, NC programmer at Handtmann in Biberach. He also shows us pump rotors for vane cell pumps. These components have a diameter of around 200 to 300 mm, depending on the variant. Radial star-shaped grooves up to 120 mm deep and only about 4 to 8 mm in diameter have to be machined into certain rotary parts.

For the automated feed, portioning, dosing, filling and packaging of dough and sausage mixes, Handtmann builds modular machines.

Handtmann Maschinenfabrik in figures

The bell founder and master mechanic Christoph Albert Handtmann founded a brass foundry in Biberach in 1873. From 1954, the newly founded machine factory produced the first portioning, filling and linking machines for sausages.

1954
Founding of the machine factory

30,000 m^2
of production space

20
branches and production sites

in over **17** countries

The pump rotors are made of a stainless steel alloy, e.g. grade 1.4301. The vanes slide in the grooves and, in conjunction with the drive and the non-circular pump housing, ensure that the pasty sausage or dough mixes are fed by changing the volume of the various pump chambers. As Rudolf Renz, senior toolmaker at Handtmann, confirms, such geometries can only be produced by wire EDM.

Milling or grinding geometries with these extremely large depth-to-width ratios, especially in hard or hardened materials, simply isn't on. "That's why we invested in an FA20 wire-cut EDM machine from Mitsubishi Electric back in 2012," he explains. Previously, the Biberach-based machine builders had collaborated with a subcontractor specialising in EDM. "In the long term," Briegel explains, "we lacked the flexibility so important for us and we often had to wait unnecessarily long for individual components. We were no longer

In stainless steel alloy pump rotors, 2 to 4 mm narrow grooves up to 120 mm deep can be cut with the wire alone.

willing to accept the resulting delays in delivery times for our machines, which is why we brought the wire EDM technology in-house and acquired the necessary expertise ourselves.” “The FA20 machine has proven itself very well,” Renz adds. “It’s easy to program and extremely reliable.” Since the demand for complex components has steadily increased, the Biberach machine manufacturers opted to invest in another wire EDM machine in 2021.

Flexible thanks to a large workspace

The toolmakers at Handtmann use wire-cut EDM machining mainly because of its technological advantages. It can be used to produce a huge range of component geometries. In addition, the machines operate reliably unattended for long periods of time and are therefore cost-effective – despite long machining times.

“Since we wire-cut about six to ten components for each of our filling and portioning machines, we’ve supplemented our existing FA20 with an MV4800R wire EDM system. In its large workspace, we can not only cut large components, but also several smaller components from a larger block or plate. This makes our work much more flexible,” Renz continues. In this way, the specialists in Biberach manage to machine up to 30 workpieces in a multiple clamping overnight without an operator.

To make this possible, the MV4800R has a wire station for the supply of wire extended to accommodate 20 kg reels. The automatic wire threader of the MV4800R has proven to be extremely useful in unmanned production. “Even up to 120 mm deep in the water tank, the machine reliably rethreads the wire straight into the kerf after a break. This has a large hand in our ability to produce the required components highly flexibly and economically,” Haller explains.

Open for innovation

The machine manufacturers in Biberach are increasingly benefiting meanwhile from the wide-ranging, universal machining capabilities of the MV4800R wire-cut EDM machine. The machine is equipped with a sturdy and large B-axis (dividing head). “This enables us to act at very short notice in following a current trend in the food industry. Many traders currently want to market original and creative designer food products. These include sausage and and dough products with symbolic geometries, such as in the shape of a heart, star or pretzel, or as a stylised Christmas tree,” says Production Manager Briegel.

The moulds required for shaping the sausage and also dough are produced on the MV4800R. A conical inner geometry is cut from round rods up to 120 mm long. This transitions from a cylindrical hole at one end of the round rod to

Many function-critical components for our filling and portioning machines can only be produced by wire EDM.

Fabian Ruf, NC programmer at Handtmann

the desired geometry – a pretzel, star or heart shape for example – at the other end of the rod. On the portioning machines, via these shaped tubes, the sausage and dough mixes are fed, cut and discharged as a strand. Fabian Ruf points out that the specialists in Biberach have meanwhile acquired the necessary expertise for this. “Above all, arranging the position and sequence of the wire cuts so that the waste pieces (slugs) drop out of the shaped tubes, whose inner contours are cut conically with changing geometries, always requires considerable spatial imagination and very skilful NC programming,” Ruf adds. He has been working with an external NX-CAM NC programming system for the last two years, and a special postprocessor is available for this. This means he can even program free-form surfaces and complex geometries, such as the contour transitions in the shaped tubes, without any problems.

Impressive performance and quality

When machining the contours on the shaping tools, wire eroding on the MV4800R wire EDM system offers further benefits. Renz says: “We need a high surface quality so that not only do

Only by wire eroding can holes with a diameter of 0.3 to 0.6 mm be produced in forks of hardened steel (60 HRC) for the guidance of cutting wires.

the sausage and dough mixes slide well, but the components of the machines can also be hygienically cleaned with ease. On the MV4800R, we achieve roughness of Rz 2 µm. After blasting the eroded contours – with glass beads, for example – we produce high-quality surfaces that meet all requirements without any further finishing.”

For NC programmer Ruf, the control system technology has proven to be particularly beneficial. “The current programming and user interface with a touchscreen was quick and easy to grasp and learn. It is useful to be able to switch between the conventional and innovative interfaces,” he reports. Due to a lack of electronic components, the touchscreen envisaged by Mitsubishi Electric was initially not available. The specialists in Ratingen therefore fitted an alternative screen so that the production technicians in Biberach were supplied their MV4800R on time and were able to get straight to work.

Haller stresses: “This is just one example of the excellent and professional service provided by Mitsubishi Electric for wire EDM machines. You get practical support and in-depth information and detailed answers to all your questions from skilled specialists.”

Mould for sausage and also dough. A conical inner geometry is cut from round rods up to 120 mm long. This merges into the desired geometry of a cylindrical hole at the end of the rod .

Mitsubishi Electric has impressed us all round with its rapid delivery times and always available, highly professional service.

Joachim Haller, head of toolmaking and prototypes at Handtmann

Ruf confirms this: “Especially because of the special geometries of our shaped tubes, we learn something new almost every day with the support of the Mitsubishi Electric service in Ratingen. Starting with the standard parameters provided by the control system, we are constantly optimising the EDM processes. In conjunction with the high reliability of the wire EDM machines, this puts us in an ideal position to cost-effectively and efficiently fabricate the wide range of different components for our filling and portioning machines.”

FA20-S Advance and MV4800R Connect working side by side in harmony.

Handtmann Maschinenfabrik GmbH & Co. KG

Founding year
1954

Managers
Harald Suchanka (CEO),
Dr. Mark Betzold,
Valentin Ulrich

Core business
Manufacturer of vacuum fillers and portioning systems for the food industry

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Vogt & Käfer GmbH toolmaking and punching shop

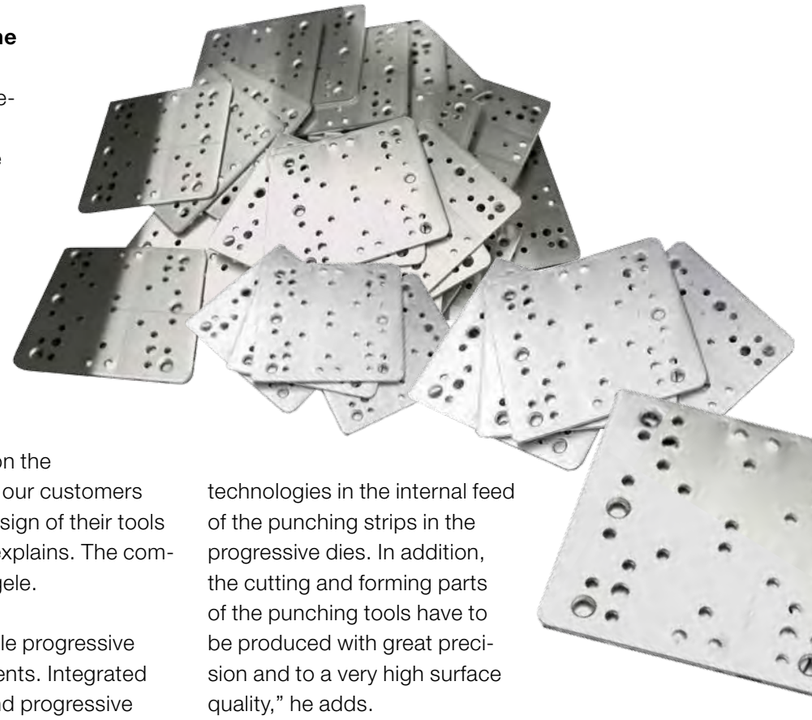
High productivity and high precision.

The Vogt & Käfer GmbH toolmaking and punching shop in Esslingen machines the cutting edges of its punching tools for thin foils and sheets with high precision on an MP2400 Connect wire-cut EDM system.

For the automotive industry, manufacturers of electrical and domestic appliances, and suppliers to the electronics industry in the Swabian region, the Vogt & Käfer GmbH toolmaking and punching shop produces precision parts in large series mainly from thin and super-thin sheet metal. These can be electrical contacts and terminals as well as spring circuit boards, for example.

In its punching shop, Vogt & Käfer produces sheet metal parts in large series for the automotive industry and for electrical and household appliances.

As Managing Partner Mike Kuhlmann reports, his company firstly designs and produces the necessary progressive dies on the basis of the client's component drawings. In addition, the Esslingen-based firm has a number of high-productivity punching presses on which it punches and forms the required sheet metal parts in large series from the strip. He can thus flexibly provide each of his customers with the optimum service, he says.



From the component drawing to the punching tool

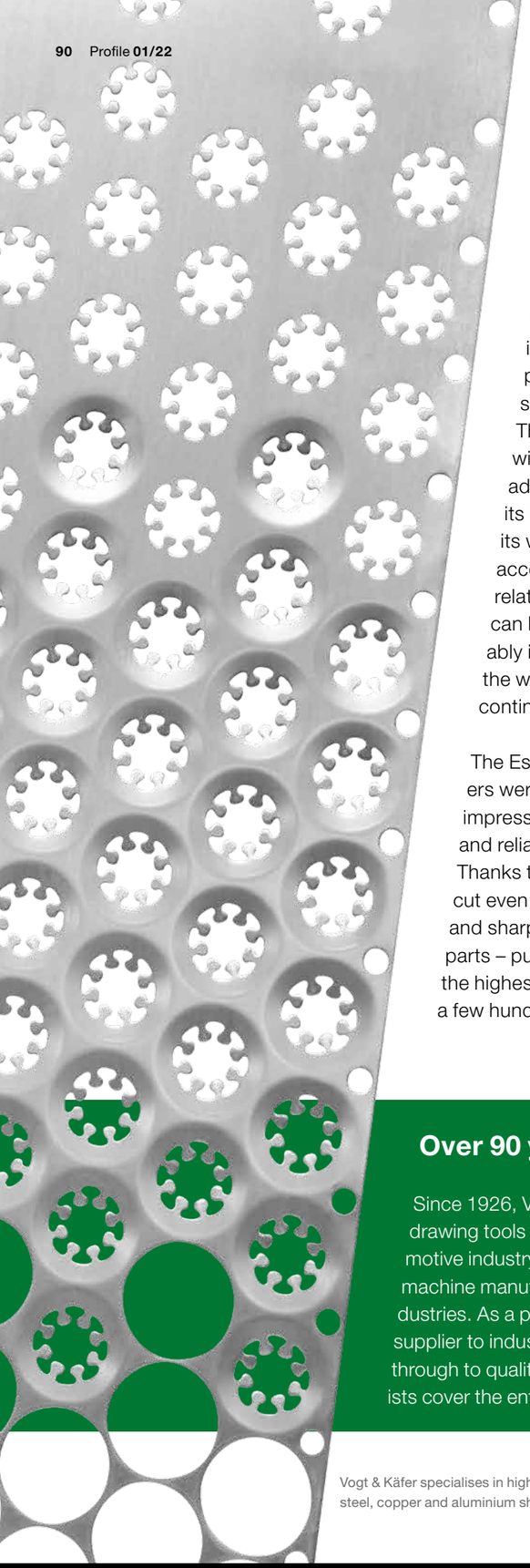
The toolmakers in Esslingen usually design progressive dies to their clients' component drawings. "In addition, we also advise our customers so that we can produce the desired components in the best possible way," Kuhlmann adds. "Sometimes even minimal adjustments to the geometries of the punched parts can help to make the punching tools much simpler. The result is that the punching tools can be made more economically and work more reliably on the presses. With this advice, we support our customers so that they can realise the optimal design of their tools and their punched parts," Kuhlmann explains. The company's technical contact is Rainer Hägele.

The specialists design and build reliable progressive dies even for highly complex components. Integrated into these tools are not only cutting and progressive forming – bending, piercing and drawing – but also joining techniques, such as the riveting of contacts. The type of components requiring punching imposes special demands on the design and on toolmaking, Kuhlmann continues.

"In electronics and for sensor applications in particular, but also for food packaging, very thin sheets and foils often have to be punched. This calls for special technologies in the internal feed of the punching strips in the progressive dies. In addition, the cutting and forming parts of the punching tools have to be produced with great precision and to a very high surface quality," he adds.

High precision, reliability and productivity

The toolmakers in Esslingen can machine the cutting and forming parts of the punching tools to the required accuracies by wire EDM alone. Although they have had the right machines for this for many years, due to the growing volume of orders, they decided to expand production capacity in 2021. Kuhlmann explains: "We already had two wire EDMs and some experience of this machining technology. However, we were now looking for wire EDM machines that would perform significantly better in certain important respects. That's when we came across the machines from Mitsubishi Electric."



After the demonstrations by the Japanese manufacturer in Ratingen, the toolmakers were soon won over and invested in an MP2400 wire-cut EDM machine in July 2021. “That proved to be the absolutely right decision. This machine comes with a number of special advantages. Thanks to its height-adjustable tank, its workspace is highly accessible. Even heavy, relatively large steel plate can be easily and comfortably inserted and clamped in the workspace,” Kuhlmann continues.

The Esslingen toolmakers were also thoroughly impressed by the accuracy and reliability of the MP2400. Thanks to thin wires, they can cut even the tiniest geometries and sharp corners on cutting parts – punches and dies – to the highest accuracy in kerfs only a few hundredths of a millimetre wide. This is where the automatic wire threader has proven particularly reliable. “We have no worries about running the machine with a multiple clamping during unattended shifts and can be sure the components are cut error-free,” Kuhlmann elaborates.

As an extra bonus, it turns out that the MP2400 cuts significantly faster and thus with higher productivity than the wire EDMs of other manufacturers. The toolmakers use it to machine not only individual parts for newly designed tools, but also replacement parts for worn-out punching tools. Thanks to the MP2400’s dependability and high productivity, it does so quickly and highly flexibly. In this way, with the aid of the MP2400 wire-cut EDM machine, the toolmakers can minimise unproductive downtime in the punching shop.

Efficiently organised training and after-sales service

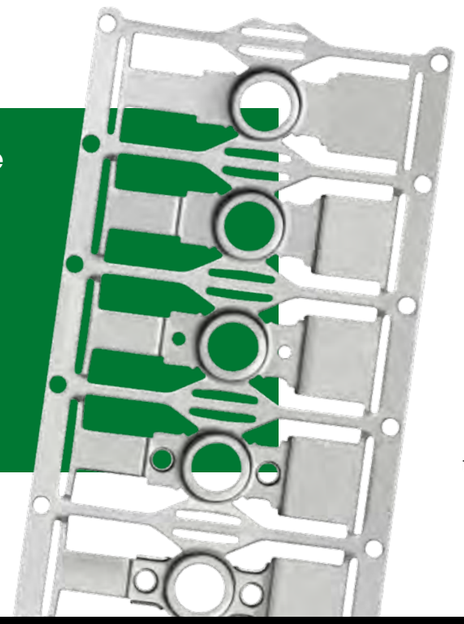
“During the installation and commissioning of the MP2400, we were particularly impressed by Mitsubishi Electric’s after-sales service,” Kuhlmann admits. In just one week of training in Ratingen, the programmers and machine operators of the Esslingen-based toolmaker gathered all the important data they needed for productive operations on the MP2400.

Using a PEPS programming system they write the NC programs for the components they want to cut. In their view, setting up the MP2400 and programming it with the required parameters is particularly easy. Operation of the current software with large buttons on the touchscreen is particularly straightforward and quick to learn, they confirm.

Thanks to their wire EDM experience, the toolmakers in Esslingen can adapt the parameters specified by Mitsubishi Electric to their individual requirements and optimise them to obtain the best surface quality and accuracy. The MP2400 wire-cut EDM system is particularly reliable, Kuhlmann affirms. “In our experience, the hotline at Mitsubishi Electric is also very well organised. If we have questions, regarding certain parameters or special functions, for example, a competent contact person is always available at very short notice, who immediately provides expert advice and

Over 90 years of punching experience

Since 1926, Vogt & Käfer has been producing cutting and drawing tools and progressive dies for the regional automotive industry, electrical appliance manufacturers and machine manufacturers, and the electronics and sensor industries. As a punching firm, Vogt & Käfer is also a reliable supplier to industry. From design, toolmaking and punching through to quality assurance, the Esslingen-based specialists cover the entire spectrum from a single source.



Vogt & Käfer specialises in highly intricate punched parts made of thin steel, copper and aluminium sheet.

The tool and die makers produce high-precision progressive dies for use by customers and in the in-house punching shop.

A few days of training in Ratingen were sufficient to get the new MP2400 working productively.

instructs our specialists at the machine," Kuhlmann continues. This clearly sets the Japanese machine manufacturer with its specialists in Ratingen apart from other machine manufacturers. "The MP2400 was the perfect choice, because this wire EDM machine delivers an outstanding price-performance ratio across the board," says Kuhlmann summing up his experience.

*The **MP2400** was **the perfect choice**, because this wire EDM machine delivers an outstanding price-performance ratio across the board.*

Mike Kuhlmann, Managing Partner at Vogt and Käfer

Vogt & Käfer GmbH toolmaking and punching shop

Founding year
Founded by Georg Vogt and Karl Käfer in 1926

Management
Mike Kuhlmann, Rainer Hägele

Employees
19 overall, 8 of them toolmakers

Business fields
Design and production of high-quality punching, drawing and forming tools and progressive dies, and production of small precision parts in large series from thin sheet metal

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Interview in brief

How is the current situation in the aftermath of COVID and in Ukraine affecting your business?
Mike Kuhlmann: We have experienced considerable declines in incoming orders and orders on hand. The business strategy of just-in-time procurement is now proving to be highly critical. Just as we are expected to deliver at short notice, we are now losing orders at very short notice, sometimes within a matter of days. This, of course, puts a strain on planning or even makes it impossible.

What other effects are you currently noticing?
Mike Kuhlmann: We're confronted with mostly rising costs that change on a daily basis. In addition, it is becoming more difficult to procure sheet steel in sufficient quantities, at least a far as selected materials and steel grades are concerned.

How will you respond in the medium and long term?
Mike Kuhlmann: We shall continue to diversify our business. We want to be less dependent on the automotive industry, so we are looking for more customers in the electrical appliance and domestic appliance industries, for example, but also in precision mechanics and apparatus engineering in general.

Horoscope

for hard-wired EDM experts.

Capricorn
22 December – 20 January

You really appreciate your EDM machine's user-friendliness. But right now, you sometimes wish your partner were as easy to handle. But humans are not MV-Rs and operate without D-Cubes control. What's more, your wire-cutting skills are of no help to you either. So try kindness and creative surprises instead.

Aquarius
21 January – 19 February

On the road, you leave lasting impressions on other motorists and catch them by surprise by driving on the wrong side of the road. Fortunately, you can operate your SG-R without such life-threatening manoeuvres. But you'd better take some time out and ease your foot off the accelerator – regrettably, your EDM's Crash Protection System isn't available for motor vehicles.

Pisces
20 February – 20 March

At the moment, there are signs of a promising development in your life. Not only exciting erotic assignments are coming your way, but also totally new challenges at work.
And in your private life as well you seem to be heading for a change ... an exciting time is on the horizon! Equip yourself for it with an extra healthy lifestyle.

Cancer
22 June – 22 July

Fascinated by its versatile functions, you delve into the technology of your MX600, immerse yourself totally in its inner workings and explore it to unimaginable depths. Only in the morning, when the cleaning staff start scrubbing the floor under your feet, do you slowly come to your senses again and wake up from the euphoric state that EDM dreams are made of.

Leo
23 July – 23 August

The current planetary constellation tells you that wire EDM systems are not everything in life. Treat yourself to a change and take a weekend trip into the hills or down to the coast. It could be worth it.
Your stars are currently in favour of new friendships. So use up your remaining holiday or exchange overtime hours for time off.

Virgo
24 August – 23 September

Obstacles are there to be overcome. If the cutting wire should break once too often, don't lose heart but switch instead to the tried and tested MV series right away.

In your love life, too, you'll surprisingly experience fewer breakages in the next few weeks. So the excitement continues!

Aries
20 March – 20 April

You can really do with a holiday. You'll realise this at the latest when you find yourself daydreaming of the sea, beach and sun when gazing into the water tank of your wire-cut EDM. Take a week or two off and book a relaxing beach or wellness holiday. Afterwards, with your reserves recharged, you'll be back to your usual quality of taper.

Taurus
21 April – 21 May

You're incredibly inventive. With your robotic parking aids for the customer car park and your voice-controlled turbo coffee machine, no one is safe from your flashes of genius. But beware – the technical licensing authorities may not be as enthusiastic about your inventions. So reduce your erosion rate and stick to more conventional travel paths.

Gemini
22 May – 21 June

The warm temperatures and the longer days provide you with renewed energy. This is the best time for large-scale tidying and cleaning-up.
But don't limit your big clean to your home. Your wire EDM system could certainly do with thorough treatment with the VP143 cleaner and will perform even better afterwards.

Libra
24 September – 23 October

Put yourself first for a change. Jupiter will make massages, abundant grapes and wavers of palm fronds available to you – joined by a good drink, of course.
Afterwards you'll find you achieve outstanding surface quality again with ease. Your partner is also a fan of smooth surfaces, so give yourself a close shave today.

Scorpio
24 October – 22 November

You'll be bursting with energy over the next few weeks. This may be due not only to all the sunshine, but also to working with your ever-precise MP2400. A sociable Scorpio like you is also welcome at every company party and among workmates. But pay enough attention to your private life as well. A healthy work-life balance puts you in the mood for more.

Sagittarius
23 November – 21 December

One comet doesn't make a summer, but with your easy-going attitude over the next few weeks, summer is just a feeling anyway, albeit a good one. Under the influence of Mars, you examine your self-image and find out what it is about you that deserves recognition. A sure-firing Sagittarius who is always on target is destined for better things.