

# results TODAY

03

ENGLISH EDITION

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Michael Hauser, new CEO of GF AgieCharmilles

## EDM AND MILLING - TOGETHER UNBEATABLE!

In the past few years, a serious technological competitor for Electric Discharge Machining - EDM has arisen with High Speed Milling - HSM. HSM puts pressure on EDM wherever the speed of removal counts above all. GF AgieCharmilles are excellently in the picture about what performances milling is capable of, because the world market leader in high speed milling, Mikron Agie Charmilles, is part of their own family.

GF AgieCharmilles therefore also know where EDM can continue to play its strong points in full: First of all in higher precision and wherever complicated forms, such as the smallest radii or cavities are required which, in part, can not be achieved with any other machining system. The two technologies thus complement each other in various fields of application. In this issue of «resultsTODAY» we report about customers who work successfully with machine tools from GF AgieCharmilles in the most varied fields of application. Enter into the world of car making, aeronautics, mould making, medical implants, instruments and devices. And on the last

page read how EDM and HSM – correctly employed – potentiate each other.

↓ Mould insert of an injection mould for the production of terminal blocks. The cavities for the ribs and webs of this multifunctional plastic part were ED die sunk and the large-area volumes were machined by hard milling.



### DEAR READERS,

A year ago, we presented ourselves to the machine tool branch for the first time as a unified brand: GF AgieCharmilles as a merger of leading technology competence for electrical discharge and milling machines, as well as automation solutions from one hand, which is unique worldwide. A merger, too, which means a sum total of over 250 years of experience in top technology which have been brought together for the customer's even greater success.

Dr. Jürg Krebs, my predecessor as CEO of GF AgieCharmilles and for 14 years a member of the Group Management of Georg Fischer, gave up his function on 1 August 2008, at his own request, in order to devote himself to important Georg Fischer Group projects from now on.

After spending over twenty years in the machine tool industry, which has taken me to Italy, Germany and Switzerland up to now, I have taken on the succession as CEO of GF AgieCharmilles with pleasure. Because our undertaking is not only a pioneer in the electrical discharge machining sector, but, with the Mikron products, has also established itself as market leader for high-speed milling machines. I want to strengthen this position and expand it with a unique service. And you, as customer, are intended to profit from this. In this «results TODAY» you learn of customers who already do so today.

Sincerely yours,

Michael Hauser  
CEO GF AgieCharmilles



Achieve more...

## AERONAUTIC | NORTHEAST EDM <sup>2</sup>



## SUCCESSFUL WITH INGENIOUS USE OF ED MACHINING

### MASTERING ALL FACETS OF ELECTRICAL DISCHARGE MACHINING

Northeast EDM, based in the state of Massachusetts, belongs to a small group of firms which participate in the NADCAP (National Aerospace Defence Contractor Accreditation Program) as ED contract firms. That means that Northeast EDM can supply this organisation with parts that are manufactured wholly or partially using electrical discharge machining. A recognition which is based on how Northeast EDM has used electrical discharge machining since it was founded in 1981. The 7 ED machines from GF Agie-Charmilles which, thanks to the generator technologies «Clean Cut» when ED wire cutting and

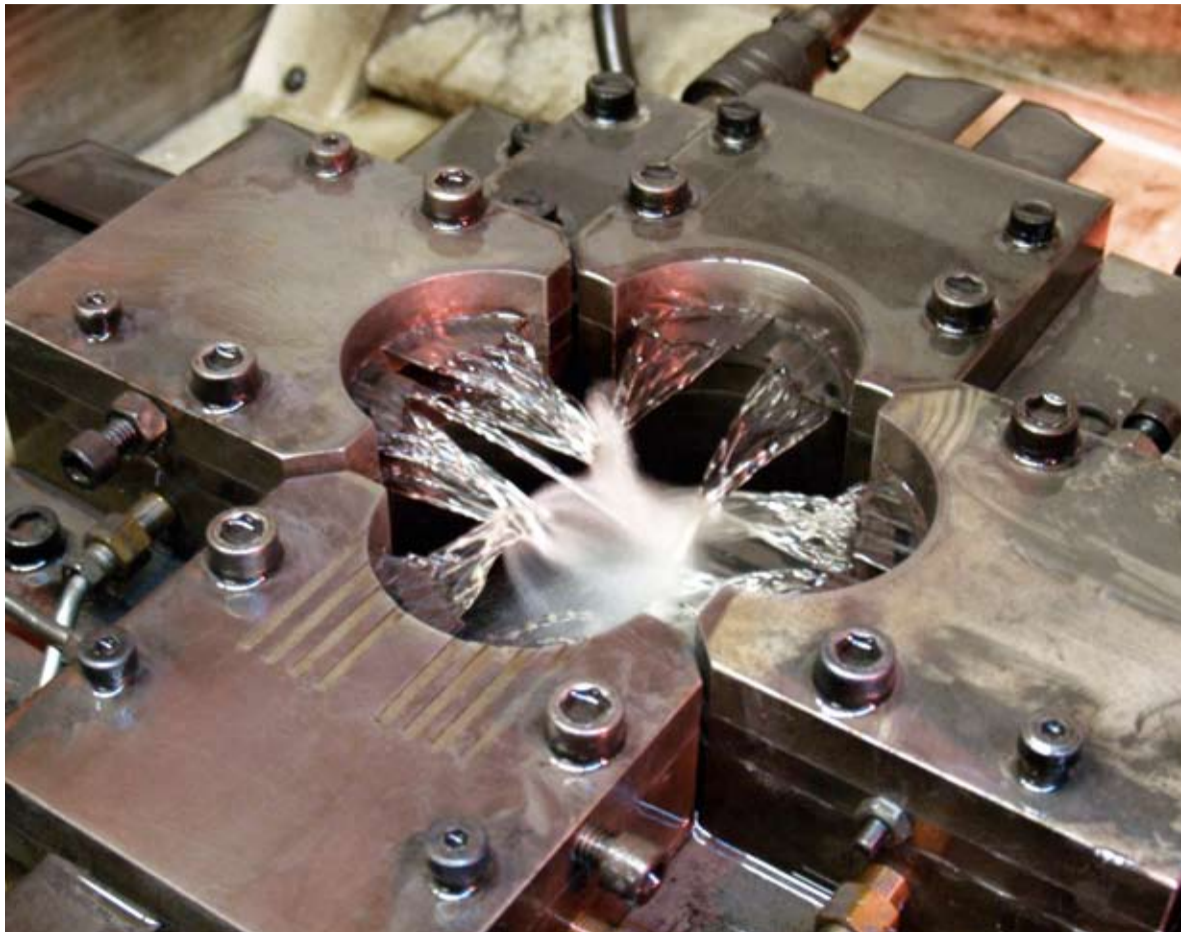
«GammaTEC» when ED die sinking, achieve surfaces which do not show any microcracks or destruction, have also contributed to the success. Jennifer Molin, President of Northeast EDM, has 7 highly motivated employees at her side who master ED machining in all facets of the application. Whether complete or complementary machining, whether steel or titanium, whether finest slits or large cavities, whether micro or macro dimensions – Northeast EDM's spectrum extends over the whole range of electrical discharge machining. An order from the aerospace industry to cut slits in a rotating compressor seal shows Northeast EDM's ingenious method of procedure.

→ The large work tanks on the FO 51 ED die-sinking machine allows multiple clamping, thus enhancing the flexibility of the use of the machine.



As a contract EDM company, Northeast EDM goes unconventional ways in the electrical discharge machining production of highly complex parts. The North American company successfully supplies the high-tech branches aerospace, power generation, medicine and machine construction with its products.





NORTHEAST EDM

↑ The four electrodes made of graphite are clamped between two devices provided with shallow flushing channels. In the so-called reversal process, the workpiece becomes the electrode.

↑ The rotating compressor seals are made of Inconel, a metal based on a nickel alloy.

→ A static air compressor seal, machines with ED wire cutting and die sinking and exceptional mould electrodes give a small impression of the wide production range of Northeast EDM.



### MAKING THE WORKPIECE INTO THE ELECTRODE

First reflections led to the conclusion that conventional ED wire sinking to make the slits would be too expensive. Because each individual slit would have had to be ED machined with protracted positioning of the mould electrode. Once again, Northeast EDM took an unconventional way: Why not make the workpiece into the electrode? The idea was as simple as it was persuasive, because the EDM sequence could even be automated. For this Northeast EDM had a total of 12 mould electrodes manufactured out of Poco C graphite with 0.25 mm (0.01 inch) undersize. Then 4 electrodes in each case were clamped between two devices, with the lower part provided with eight shallow paths. Channels thus result on the upper half for the necessary flushing as the machining is not carried out in dielectric. Then the four devices with electrodes are clamped in the work tank of the FO 51 at an exactly defined distance from each other. The prefabricated, tube-shaped and approx. 0.34 kg (0.75 lb.) heavy rotating compressor seals made of Inconel, a nickel-based alloy, were mounted on the electrode holders and thus hung up as «electrodes» in the electrode magazine of the FO 51.

### USING MACHINES ACCORDING TO MACHINING REQUIREMENTS

For the machining of the rotating compressor seals Northeast EDM selected the FO 51 as it has a large work tank. Thus during the order series for rotating compressor seals, the device with the electrodes can remain in the machine although other workpieces can nevertheless be ED machined on the same machine. This gives Northeast EDM the flexibility to be able to react quickly to new orders without jobs in hand having to be interrupted or re-clamped. Jennifer Molin, President of Northeast EDM observes: «The art of the ED contract firm lies in having all 7 of our ED machines used to equal capacity as far as possible». The EDM process proper for making the slits begins with the change to the rotating compressor seal. This is charged negative and the electrodes in the work tank positive. The current thus flows from the bottom upwards, which is why one speaks of a «reversal process». First the accuracy of the angle of the rotating compressor seal to the electrodes is checked. Then four slits are ED machined per row, with the right height being reached via Z-axis, and positioning via X and

Y-axis to the four electrodes, and then ED machining. The Z-axis descends and in the next row and in conclusion in the third row the four slits in each case can be ED machined with a final roughness of Ra 3 µm (125 RMS). For the total of 7 rotating compressor seals to be produced, 20 minutes were taken with setting up, 7 hours for ED die sinking and 8 minutes for inspection. An order which Northeast EDM was able to handle automated, thanks to the reversal process, thus once again proving the undertaking's competitive ability in the fiercely contested market in the New England states.

«For us the FO 550 GammaTEC is a unique ED die-sinking machine. Of all the comparable products, which we have got to know since our company was founded in 1981, it achieves the best surfaces».

Jennifer Molin,  
President of Northeast EDM

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#### Machines from GF AgieCharmilles

- 1 AC Classic 2S
- 1 FI 440 CC
- 1 FO 810
- 1 FO 55
- 1 FO 51
- 1 FO 550 GammaTEC
- 1 FO 40

#### Clamping system

System 3R

#### Programming

Mastercam  
Esprit  
AutoCad  
SolidWorks  
Mechanic

#### Measuring, testing

Fowler Trimos Micro-Hite  
Coordinates measuring machine from Brown & Sharpe



www.northeastedm.com

## MEDICAL IMPLANTS | LIST <sup>4</sup>



# MILLED AND ED-MACHINED IMPLANTS MAKE BACKS MOBILE AGAIN

With spinal implants tested in its own operating theatre and the appropriate operating instruments, Innovative Spinal Technologies (IST) is a worldwide leader for products for minimally invasive spinal surgery. The Massachusetts-based undertaking develops, designs and prototypes all the products itself. ED machining and 5-axis milling are the key technologies.

### MANUFACTURING COMPETENCE FROM ONE HAND

Founded in 2002, IST quickly advanced to become a leading undertaking for innovative products for spinal surgery and today has 38 employees on its payroll. Always endeavouring to offer the best products, IST is already developing the next generation of spinal implants and operating instruments. The company has a competent partner at its side to advise on how these components can best be manufactured from a production technology and economic point of view. Ken Otzel, from

«High Performance Machinery, LLC», is the local GF AgieCharmilles representative who analysed the machine requirements. On this basis, IST decided to develop its own technology center, with the machine equipment by means of which new products can be realised from the idea to the finished implant within hours and days. In addition, IST has a specialist with Jeff Kazmierski who brings 30 years of experience with ED machining, milling and turning with him from the medical devices industry. He recognised that with the exacting manufacture of IST products, the demands made on ED machining and milling also

rise. IST invested in a MIKRON HSM 400U 5-axis milling machine with pallet changer, an AT Spirit 2 ED die-sinking machine, as well as an FI 240CC ED wire-cutting machine – all from the Swiss manufacturer GF AgieCharmilles.

→ The basic form is first turned from a cobalt-chrome alloy billet (left), with the upper part remaining in place as a holder and only being removed after 5-axis milling on the lathe.



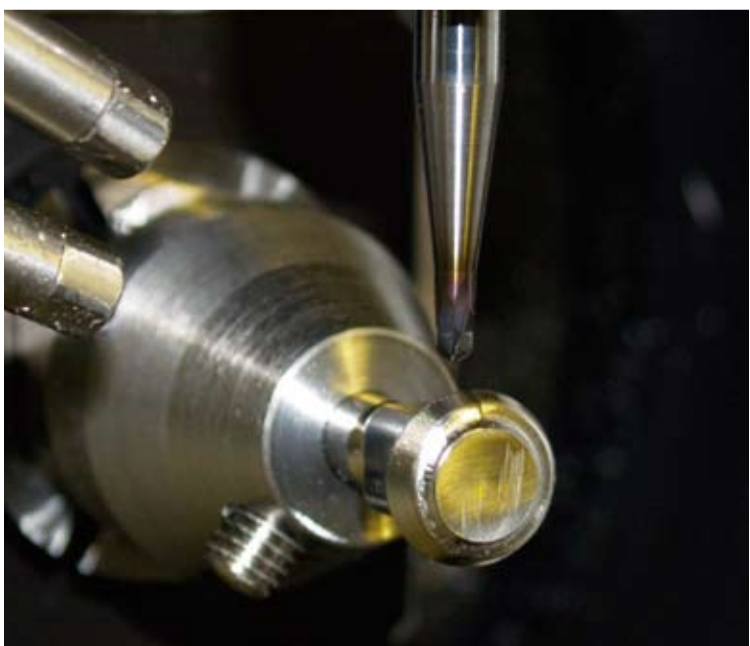
↓ Jeff Kazmierski, Production Manager of IST, in front of the 5-axis high speed milling machine MIKRON HSM 400U.



**WHEN MILLING, 5 AXES GIVE VIRTUALLY EVERY FREEDOM OF SHAPE**

A billet made of a cobalt-chrome alloy is the starting material for the implant component. The first machining step is to turn the outside contour. At the same time, the operator leaves an approx. 3 cm long peg in place which serves as the support for all the further machining steps. The part is then clamped with System 3R on the 5-axis high-speed machining center, MIKRON HSM 400U, and machined using the CAM program

generated by «Powermill». The machining is carried out by Ken Nadeau using in an oil mist with 3 TiN-coated milling cutters of 5, 3 and 1.5 mm diameter used at speeds of 10,000 to 40,000 rpm<sup>-1</sup>. The enormously fast swivelling round table with direct drive makes simultaneous HSC machining of all 5 axes possible, as well as extremely fast rotating and swivelling movements. Coupled with high dynamism and stability, this gives the quality values for these components which IST expects: 6 RA (Ra 0.1 µm) surface quality and ± 10 µm shape tolerance over the



**INNOVATIVE SPINAL TECHNOLOGIES**



↑ Workpiece, electrodes as well as a titanium fixing plate and a self-locking screw-driver system give a small insight into IST's diversified manufacturing spectrum.

← The implant system from IST allows the lumbar vertebra to move. The patient can bend over, stretch, rotate and lean sideways. This in contrast to if this vertebra has been made stiff operationally in order to relieve vertebral pains.

**MACHINING COMPLEX MOLDS FROM EXOTIC MATERIALS**

The close collaboration with renowned surgeons allows IST an economic implementation of medical requirements for implants and operating instruments ready for use. Working directly with surgeons the IST engineers can prepare drawings immediately at first hand which are then designed by «Solid Works» in CAD. The example of the components for a new prototype for an implant system shows how Jeff Kazmierski defines the best possible machining technologies and what the individual manufacturing steps are.

← The program generated by Powermill is loaded into the MIKRON HSM 400U. For this machining, from roughing to fine finishing, IST uses three TiN-coated «Seco Jabro» milling cutters with diameters of 5,3 and 1.5 mm.

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**Machines from AgieCharmilles**  
- 1 MIKRON HSM 400U with quadruple pallet changer  
- 1 AT Spirit 2  
- 1 FI 240CC  
- 1 HD 30

**Clamping system**  
System 3R

**Programming**  
Delcam, Powermill, Solidworks  
DP Esprit

**Measuring, testing**  
Coordinate measuring machine from Mitutoyo  
Measuring machine from Vision Inspection

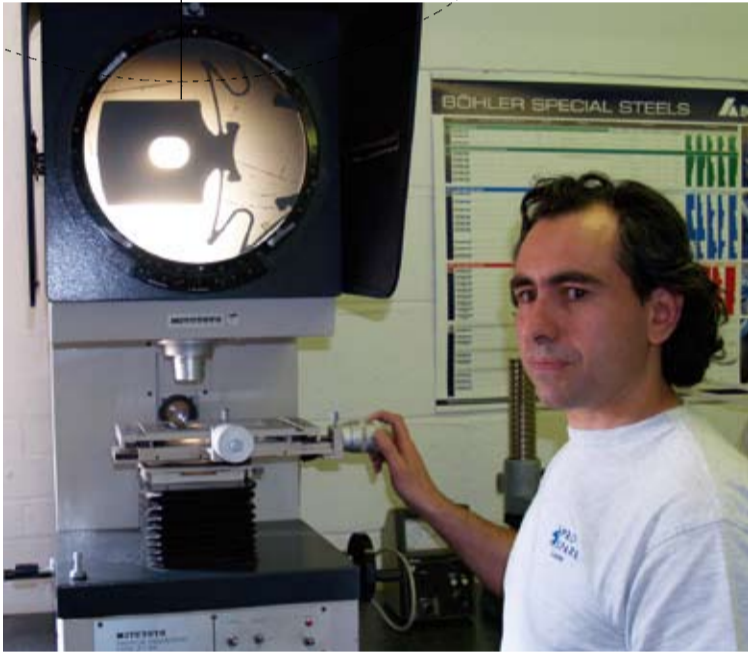
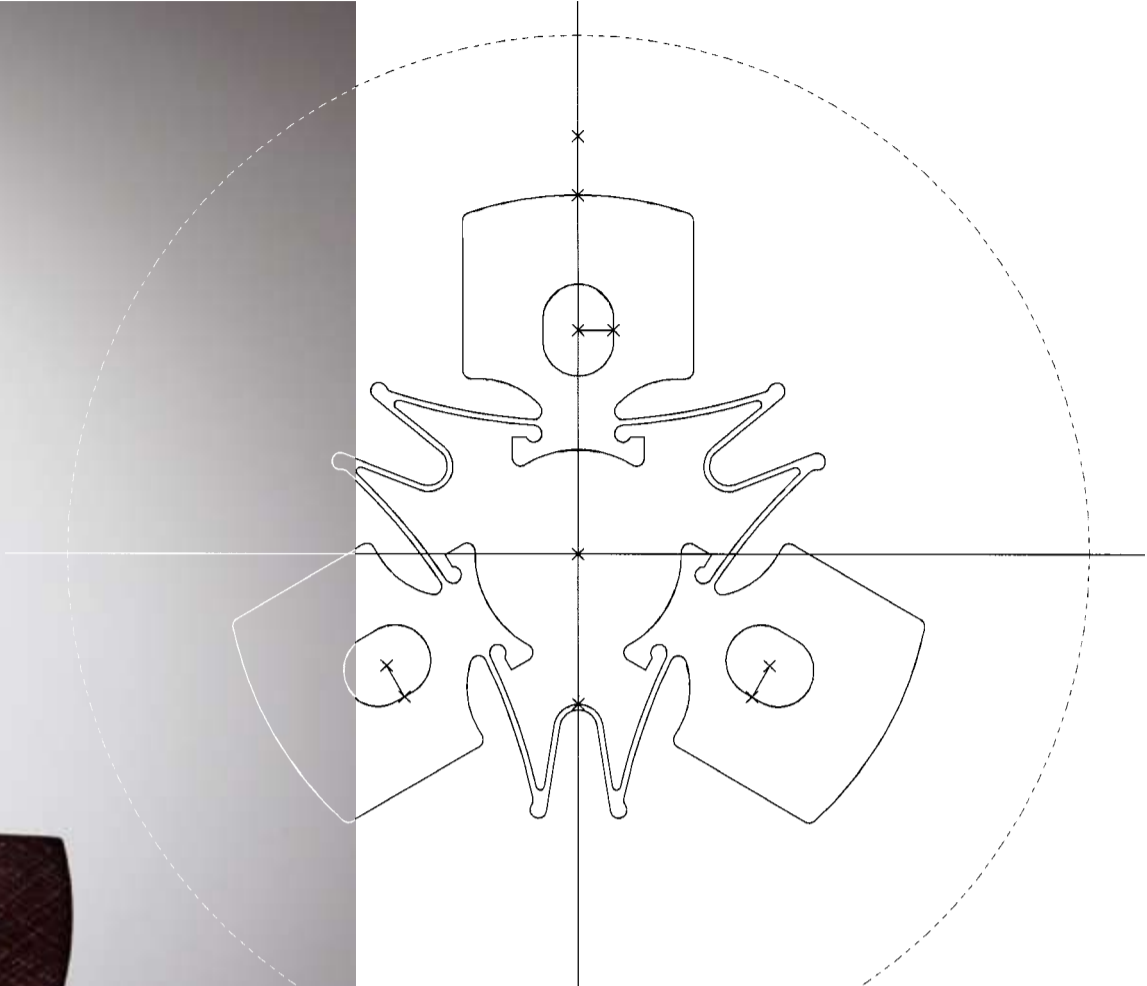
«The MIKRON HSM 400U fits our production's specification requirements exactly, and for ED machining we have also invested in machines from GF AgieCharmilles. So we have excellent service and advice from one hand».

Jeff Kazmierski, Production Manager of IST – Innovative Spinal Technologies.



www.istspine.com

# MEDICAL APPLIANCES | PRO SPARK<sup>6</sup>



Sheffield in England is the home of the company Pro Spark Ltd which manufactures high-tech parts for the medical technology, energy production and machine construction branches using two EDM wire-cutting machines from GF AgieCharmilles. With its lean structures, the company can react quickly and flexibly to orders which are executed with constantly high quality.

## PRODUCING PARTS ECONOMICALLY USING EDM WIRE CUTTING

**A FLOOD DISASTER BROUGHT THE CHANGE**

The year 2007 was not auspicious for Pro Spark. Flooding caused by the five rivers Don, Sheaf, Rivelin, Loxley and Porter breaking their banks put the undertaking under water. All the machine tools were made unusable within hours and Paul Turner, who had founded the company in 2000, had to act quickly in order to be able to continue running Pro Spark successfully. A market survey brought about the contact with GF AgieCharmilles ED wire-cutting machines. The circumstances were, it is true, due to natural causes, but Paul Turner utilised the situation for investments in the future by deciding on two AC Progress V3 which had most convinced him with their jaw width, mechanical concept and high precision on the workpiece.

**SERIES PRODUCTION WITH OPTIMAL USE OF ED WIRE-CUTTING**

One example of the flexibility and ingenious use of ED wire cutting at Pro Spark is the manufacture of medical parts in series. For the production of insertion springs for hip operations, first of all a billet of stainless steel of 1 m length is halved using ED wire cutting. Then 2.15 mm sections are cut unsupervised at night on the AC Progress V3 which the operator removes individually in the morning with a separating cut. All the discs are then hardened externally to 50 to 52 Rockwell and ground to 2 mm thickness. Back at Pro Spark the discs are stacked 20 to 40, and triple welded on the outside contours. Two stacks in each case are then welded to a retaining plate which serves as a fixation during ED machining.



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**Machines from GF AgieCharmilles**

- 2 AC Progress V3
- SD 1

**Clamping system**

Erowa  
Hirschmann

**Programming**

Peps from Camtek

**Measuring, testing**

Profile projector  
Measuring machine from Mitutoyo  
Quality Control Technology

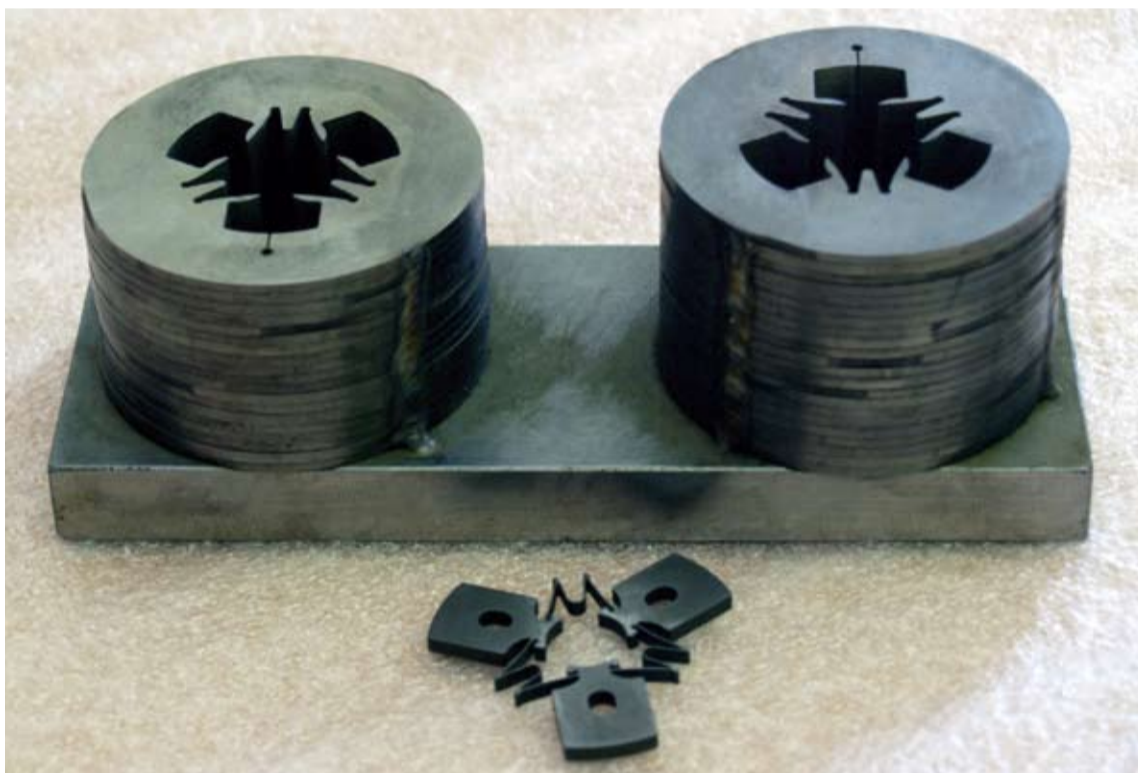
**HIGH AUTONOMY OF THE MACHINE MAKES UNMANNED MACHINING POSSIBLE**

The next step is to make 5 starting bore holes per stack on the SD 1. Four bore holes for the inside contours and one bore hole for the outside contours. With the help of Agiesetup 2 D, the holder is then centred for length and width on the AC Progress V3. Using a 0.25 mm thin brass wire, first of all the inside contours, then the outside contour are cut. This takes place unsupervised, again at night, so that all the operators have to do in the morning is to carry out the separating cuts and remove the drop-out parts. After a 180-degree rotation, the machining of the second stack lasting 5 hours can be carried out. A surface quality of Ra 1.6 µm and a contour tolerance of ± 50 µm is achieved on all the insertion springs for hip operations. For Paul Turner, thanks to AC Progress V3, the right relation of quality and time.



«With hindsight we can say that the flood in Sheffield a year ago brought us to GF AgieCharmilles. Simply because the two AC Progress V3 have the better mechanism concept and provide better results».

Paul Turner, Managing Director and Proprietor of Pro-Spark Ltd.



↑ Further components, such as e.g. for machine construction, medical technology or energy production, prove how masterly Pro Spark employs ED wire cutting.

↑ A ready ED machined insertion spring for hip operations made of hardened steel. The two stacks welded to a retaining plate are the «residual product» after ED wire cutting.

← All the starting holes drilled for ED wire cutting, as well as micro drill-holes are carried out on the SD 1 from GF AgieCharmilles.

→ The geometry program generated with «Peps» is linked specifically to the machining technologies directly on the AC Progress V3 with the help of the «Agievision» control system.



[www.pro-spark.co.uk](http://www.pro-spark.co.uk)

## AUTOMOTIVE | GREAT LAKES MOLD <sup>8</sup>



## UNIQUE IN UNSUPERVISED MILLING JOBS



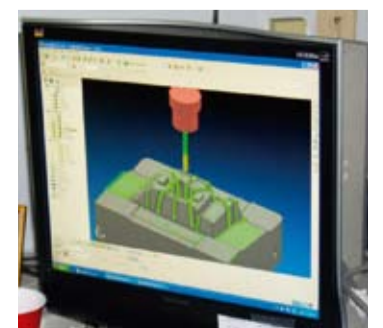
Great Lakes Mold is based in the US state of Michigan and constructs complete injection molds for components for the automobile, electronics and medical industries. The medium-sized enterprise also supplies individual tool elements, such as mold inserts, slides, ejectors or repair parts. For this, Great Lakes Mold makes use of the HSC and EDM machining processes as key technologies in tool making.

### HSC AND EDM ARE THE SUPPORTS OF THE COMPANY

With 18 highly qualified employees, Great Lakes Mold & Engineering has the ideal company size in order to be able to react flexibly to technical mold-making orders. Unsupervised operation of the machine tools is indispensable in this connection if high precision is to be implemented with economically viable production.

With GF AgieCharmilles, the company, founded in 1994, has staked on a manufacturer that offers milling and EDM machines and the accompanying service from one hand. The latest investment is the MIKRON HSM 800, a high-speed machining center, that is mainly used at Great Lakes Mold for high-precision, filigree machining jobs, as the mold insert for an injection mold for the production of steering-wheel covers shows.

↓ At Great Lakes Mold, the milling paths are simulated in real form on the solid model of the workpiece.





**GREAT LAKES MOLD**

**TOOLMAKING KNOW-HOW HELPS THE CUSTOMER SAVE**

Great Lakes Mold selected a steel sintered to over 60 Rockwell for the mold insert for the «Steering wheel cover» injection mold in order to achieve the greatest accuracy of shape and the exactly defined material thickness for injection molding. The CAD program for this mold insert was generated to suit the tool with Powermill. For Great Lakes Mold, being suitable for the tool means that more economic production methods can be selected with simple modifications to the product design, which cut the cost of the product as such and can be passed on to the customer. If the program is loaded on the MIKRON HSM 800, milling strategies can be selected with the control system iTNC 530 from Heidenhain which are appropriate for this application type. The operator can then further optimise them in accordance with his own values drawn from past experience.

↓ For Great Lakes Mold, the MIKRON HSM 800 is the undisputed highlight in unsupervised machining jobs, giving precision straight off.

**MACHINES ALWAYS RUN TO OVER 80 PERCENT CAPACITY**

For the machining of the «Steering wheel cover» mold insert, Great Lakes Mold selected TiN-coated milling tools made of hard metal with a diameter of 5 mm which were used both for roughing and also for fine finishing. The MIKRON HSM 800 has a spindle from StepTec with an HSK-E40 tool holder that is designed for 40,000<sup>-1</sup> rpm that this machining job could be executed without problem at 25,000 min<sup>-1</sup> and 508 cm/min. (200 in/min.) feed rate. After 2 hours of milling, a mould tolerance of ± 2 µm was achieved on the workpiece and under the microscope a surface as though polished was certified. Quick attainment of fitting accuracy straight off is the main reason why not even 8 weeks passed from the preparation of the drawing to the finished tool. For Great Lakes Mold an economic viability factor which quickly pays off and contributes to the machines running at 80% capacity.

→ ED machine a mold insert and an experienced toolmaker assembles the injection mold.

↑ With a total of 8 machine tools from GF AgieCharmilles, the tool-making division of Great Lakes Mold is excellently equipped for ED die sinking, wire cutting and drilling machining jobs, as well as milling for demanding technical mould making.

↑ ED die-sunk and wire-cut mould inserts for complex injection moulds prove the high standing of ED machining, too, in tool making at Great Lakes Mold.

«I know no other milling machine that could carry out certain machining jobs coming up for us better in unsupervised operation than the MIKRON HSM 800».

Ron Kriss, Vice President of Great Lakes Mold & Engineering.



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**Machines from GF AgieCharmilles**

- 1 MIKRON HSM 400
- 1 MIKRON HSM 800 with quadruple pallet changer
- 2 AT Advance 3
- 1 AT Spirit 4
- 1 AC Progress 2
- 1 AC Progress 3
- 1 AC Classic 2S
- 1 Drill 11

**Clamping system**

System 3R

**Programming**

Powermill  
Mastercam  
Surfcam

**Measuring, testing**

Profile projector, coordinates measuring machine from Mitutoyo, Zeiss and Qickvision



## DEFENCE | EDM XPRESS <sup>10</sup>



### NOTHING IS MORE NORMAL THAN TO SUPPLY HIGH QUALITY QUICKLY

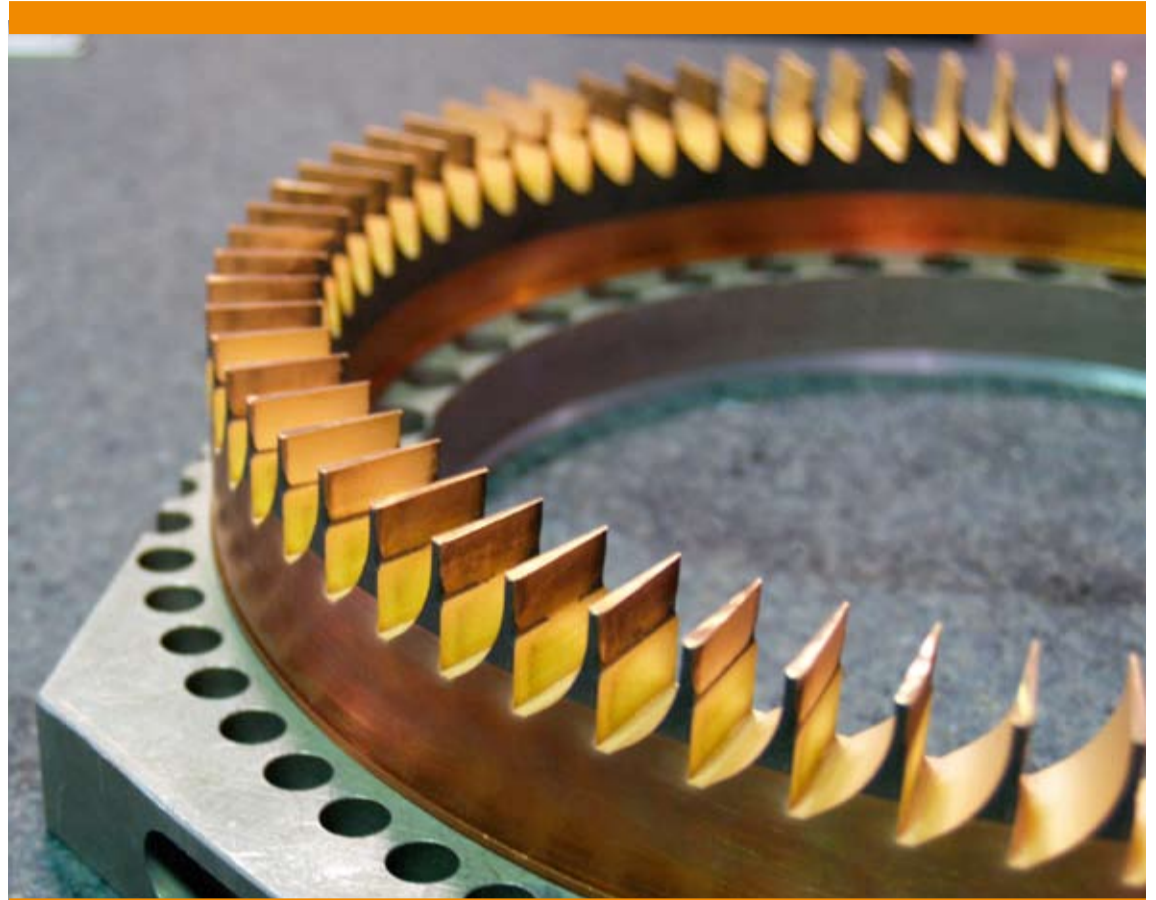
The present Managing Director and co-owner of the company, Frank Zsemlye brought over 30 years of EDM practice to EDM Xpress, Inc. when the company was founded in 2002. EDM machines from GF AgieCharmilles were and are the supports for the constant business success of the company based in Placentia near to Los Angeles. No matter how unusual the ideas for production may be, no matter how complicated the workpieces, no matter how exotic the ma-

terials, no matter how tight the deadlines, no reason for EDM Xpress not to find a solution with ED wire cutting and die sinking. Thus EDM Xpress received the contract to manufacture 50 exit valve guides spread over a year. A real challenge, for the workpiece is made of Inconel 625, a material difficult to cut based on a corrosion-proof nickel alloy.

↑ Astonishingly enough, 30% of the customers of EDM Xpress are themselves EDM users, an indirect compliment for the Californian company's high quality and adherence to deadlines. In addition, the two casings ED machined from an aluminium alloy are excellent examples of machining from EDM Xpress

**MANY YEARS OF EDM  
EXPERIENCE MAKE  
EXCEPTIONAL  
RESULTS POSSIBLE**

The company's name, EDM Xpress, already express the corporate philosophy: Supply of ED machined parts by the specified deadline. The Californian undertaking offers job ED machining of the highest precision and is a partner in great demand, even among customers with their own ED machining application.



EDM XPRESS, INC.

«Knowing and correctly applying ED machining's potential is our job, with which we earn money. You just have to leave the long-established production path and come to solutions that benefit us and the customer».

Frank Zsemlye Sr, Managing Director of EDM Xpress, Inc.



### DIFFICULT ELECTRODE PRODUCTION

For Frank Zsemlye it was clear that the actual production of the exit valve guide had to be carried out in one piece using ED die sinking in order to achieve the required form accuracy and a homogeneous surface quality of VDI 27. The difficult part was the production of the electrode for which EDM Xpress did, however, also find a solution. The geometry data for the production of the electrode are generated from the customer's drawing and, as a first machining step, the gear ring is ED wire cut in the 3 segments made of copper. In the course of this, EDM Xpress leaves some surplus material protruding upwards so that all the teeth can be brought to the same and at the same time 100 percent horizontal height on a grinding machine. All the outside and inside contours are milled to the specified dimension. Then the three segments are assembled and the ends of each segment ground. Inside and outside contours are ED wire cut and milled to the final dimension.

### STABLE PROCESS EVEN IN THE CASE OF A LARGE PLANE OF ACTION

The «tool» electrode is checked on the company's own measuring and test systems and the actual «production» of the exit valve guide with ED die sinking can begin. On account of the workpiece's external dimensions, EDM Xpress selects its FO 55 P for this, as it has an appropriately large work tank available. In addition, the ED die-sinking machine has a heavy-duty generator which brings the discharges, evenly apportioned, to the whole ring of the exit valve guide. This makes a stable process possible and homogeneous surfaces are achieved on the workpiece. As explained, electrode production requires great experience for each machining step so that worn fine finishing electrodes used in this application can also be reused as roughing electrodes, and thus employed twice. With just one week of complete production time, EDM Xpress has once again proved that complicated parts can also be supplied in a short time.



↑ Tight delivery deadlines allow hardly any rest period for the total of 11 EDM machines from GF AgieCharmilles.

↑ The exit valve guide was ED die sunk with a surface quality of VDI 27 on an FO 55 P.

↑ The finished assembled electrode consists of three part segments made of copper.

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#### Machines from GF AgieCharmilles

- 1 FI 440 CC
- 1 FI 510 P
- 1 FI 240 CC
- 2 FI 2020 SI
- 1 FO 55 P
- 3 FO 35 P
- 1 FO D10
- 1 FO HD8

#### Clamping system

System 3R

#### Programming

Esprit

#### Measuring, testing

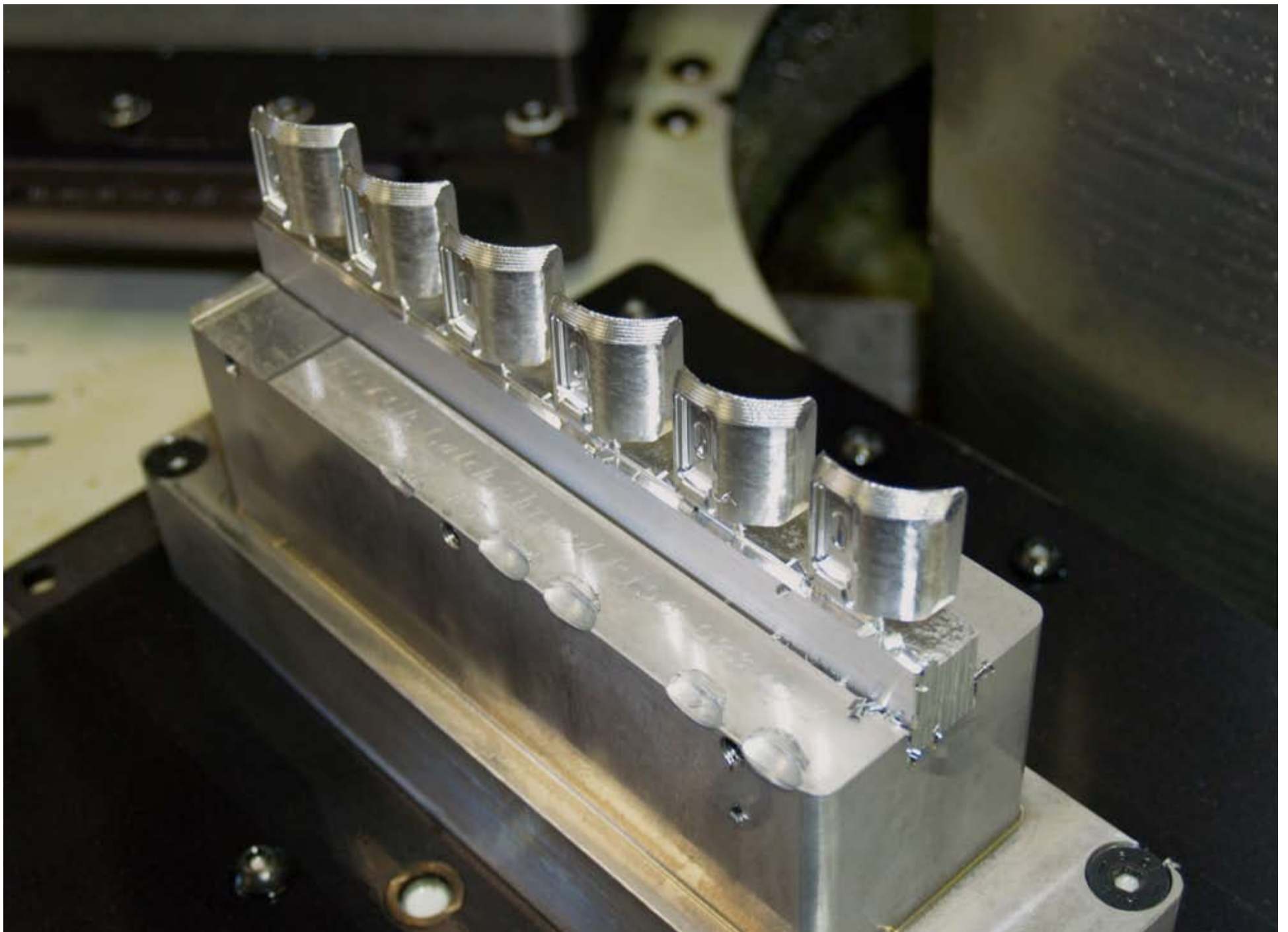
Video Sciencescope XT-2000 Pro

↑ With many years of know-how, EDM Xpress uses ED wire cutting, grinding and milling in a virtuoso manner for the manufacture of the copper electrode.



www.edmxp.com

# PRECISE MILLING FOR HIGH-GRADE PRODUCTS



Since 1997, Frazero has been in great demand as a supplier of design, development and production for the automobile, aerospace and shipping industries. With its focus on conceptual interior fitting components, personalised projects and small series, the English company cooperates with the world's best known car manufacturers. In production, Frazero puts its trust in milling machines from GF AgieCharmilles.

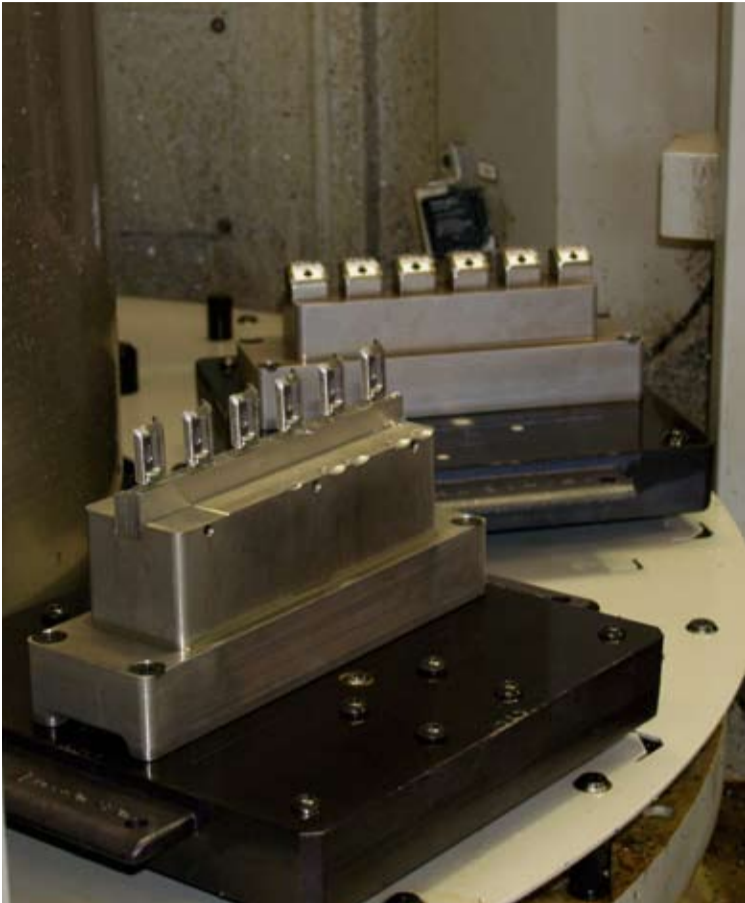
## HIGH-TECH MANUFACTURING COUPLED WITH CRAFT SKILL

Bentley, Rolls Royce, Bugatti, Jaguar, Cadillac, Morgan, Spyker – hardly a luxury make which was not a customer at Frazero and hardly a special wish which Frazero could not fulfil.

The company, located near to Silverstone, has 73 employees on its payroll today and a mastery of all machining processes required to shape, cut, bond or mill demanding materials, such as aluminium, wood veneers, vacuum molds, vinyls or ABS. High-speed cutting in particular has a high standing at Frazero,

because almost all casings, functional parts of 3D decorations are manufactured using this machining procedure, as the example of the humidior for cigars shows.





FRAZERO LTD.



**USE THE PALLET CHANGER PRECISELY IN THE CASE OF SMALL SERIES**

In addition to the two lids, the side walls, the cigar receptacle as well as further functional parts, the locks for the humidor also have to be manufactured from aluminium. For this, 6 workpieces in each case are clamped to a pallet for which Frazero has developed a solution of its own allowing fast and precise fixing of the workpieces. This takes place regardless of the current machining, as 4 pallets of 600 x 600 mm can be loaded. Thus the lock is machined in two stages, with the curved basic body first being milled in one clamping with 6 pieces and then, in a second clamping, the frontal milling is carried out. The pallet changer on the MIKRON XSM 600 gives Frazero the flexibility to plan small series production, such as these locks, staggered in time or according to priority.

**PRIORITY-ORIENTED CONTROL FOR INDIVIDUAL MACHINING**

The milling of the lock of the humidor from aluminium 2014 has two fundamentally different machining aspects. On the one hand, the basic body has to be machined in one piece, and then, on the other hand, the Rolls Royce emblem has to be made three-dimensionally on the visible surface of the lock. The priority for the first milling process is on time, and for this Frazero uses milling tools of 6 mm diameter. Then, accuracy is the first priority for the three-dimensional reproduction of the Rolls Royce emblem and milling tools of 0.5 mm diameter are used. In both machining jobs Frazero profits from the Operator Support System on the MIKRON XSM 600. Thanks to the intuitive user interface of the iTNC 530 2P control from Heidenhain, the target quantity speeds, accuracy, surface quality, as well as the workpiece weight and complexity are specifically defined. For Frazero the ideal instrument in order to be able to carry out every machining job with the best possible parameters. Thus the complete production of 6 locks on the MIKRON XSM 600 takes just 27 minutes in best quality.



↑ In many working steps, milled aluminium casings and components are assembled. According to the customer's wishes, high-grade woods, vinyl and also natural leather are used - to suit the customer's luxury make.

↑ A pallet, loaded with 6 ready-milled locks with the Rolls Royce emblem made of aluminium for the humidor can now be taken out of the pallet changer on the MIKRON XSM 600. Alan Sawyer, Managing Director of Frazero, shows as an example of filigree milling technology lettering milled in one piece which was also produced on the MIKRON XSM 600.

«We best manage the exact reproduction of details, decorations but also the precision in the case of functional parts made of aluminium with the MIKRON XSM 600. Our customers are demanding, and so are we in the case of machine tools».

Alan Sawyer, Managing Director of Frazero Ltd.

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**Machines from AgieCharmilles**  
- 1 MIKRON XSM 600  
with pallet changer  
- 1 MIKRON VCE 800  
- 1 MIKRON UCP 600

**Clamping system**  
System 3R  
Macro Loc  
Own solutions

**Programming**  
Gibbs CAM  
Solidworks

**Measuring, testing**  
Coordinate measuring machine  
from Wenzel  
Vision Inspection



www.frazero.com

## MEDICAL INSTRUMENTS | CLASSIC WIRE CUT <sup>14</sup>



# EDM WIRE CUTTING IS THE HEART OF PRODUCTION

Initially a specialist in using wire EDM to produce incredibly small part, Classic Wire Cut of Valencia, California has become one of the most innovative manufacturers of surgical instruments and implants for the medical industry. As the company evolves, wire EDM remains a key technology for its high-tech production.



### APPLYING EXPERTISE AND INNOVATION

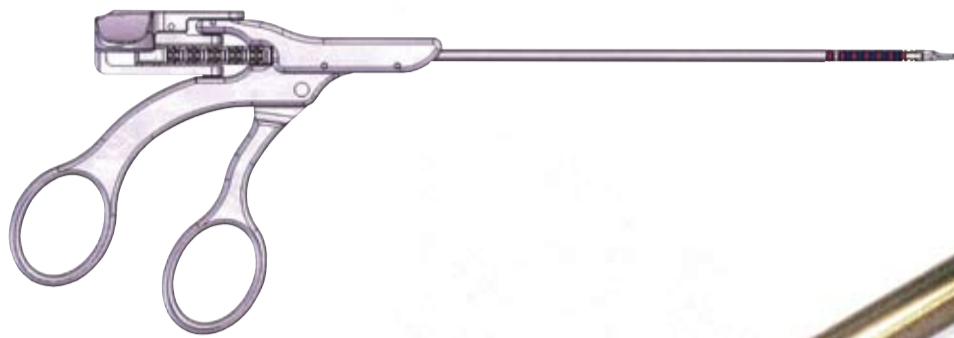
Classic Wire Cut was founded in 1984 and today employs over 120, in its 83.000 sf state-of-the-art facility. With nearly a quarter-century's expertise, the company continuously refines its processes, using wire EDM to produce the medical industry's most innovative surgical instruments and implants. Classic routinely attends medical seminars and live surgeries to

obtain extensive first-hand information concerning current surgical techniques. The company also partners with renowned surgeons, undertaking thorough analysis to enhance surgical procedures. This highly proactive approach plays a significant role in achieving success. Recently Classic applied its expertise to the design and production of a surgical instrument used during frontal paranasal sinus operations.

← Classic Wire Cut uses «SolidWorks» for the creation of new products such as an instrument for paranasal sinus surgery. At this stage, the manufacturing approach and innovative strategy is determined.

**A MASTERPIECE OF DESIGN**

In designing the new instrument, Classic's most significant challenge was to optimize functionality. The paranasal sinus instrument required single hand use, making ergonomics key. The company integrated both articulation and locking function into a single, thumb-operated lever. Without repositioning, the front finger lever then actuates the micro-scissors at the instrument's distal tip. GF AgieCharmilles' equipment consistently delivers the close tolerances to ensure a smooth operation. An added benefit is the fine surface finish of Ra 0.25 µm.



↑ The instrument for frontal paranasal sinus surgeries was manufactured from stainless steel using EDM, CNC milling and lasers.

↓ Brett Bannerman presents one of the latest Classic Wire Cut innovations.



**CLASSIC WIRE CUT**



**THE ART OF MICRO-MANUFACTURING WITH WIRE EDM**

Classic uses «Esprit» to generate toolpath directly from solid models, which is electronically loaded onto the company's FI 240 wire EDMs using wireless DNC. Classic machines intricate contours and features throughout the instrument. The unique capabilities of the paranasal sinus device depend on precise component geometry. Both proximal and distal ends incorporate chains of components where any deviation is magnified. The surgeon's success depends on a tactile instrument «feel» that wire EDM assures.

Throughout the machining and assembly processes Classic verifies specification compliance. The result-ENT surgeons can now operate directly through the nose, in areas previously inaccessible. This allows for a shorter, less invasive medical procedure with reduced patient suffering. Through the use of innovative machinery from GF AgieCharmilles, Classic Wire Cut has helped improve the lives of patients around the world.

«It is really very satisfying that my employees and I develop and manufacture products that improve the quality of people's lives. GF AgieCharmilles plays a vital role in that pursuit».

Brett Bannerman,  
Chief Executive Officer.

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**Machines from GF AgieCharmilles**  
- 3 FI 240 CC  
- 4 FI 240, two of them with Workmaster from System 3R  
- 2 FI 240 SL  
- 1 FI 240 CC F1 with Toolpal from System 3R  
- 1 FO 40

**Clamping system**  
System 3R

**Programming**  
Solidworks  
Esprit



← The EDM machines from GF AgieCharmilles meet Classic's high standard for electro-discharge machining.

← EDM wire-cut parts are subjected to a visual inspection.



[www.classicwirecut.com](http://www.classicwirecut.com)



## IMPULSE GENERATOR FOR INNOVATIONS IN MILLING

With the production of stretch blow molding tools, Krones AG offers its customers the service to manufacture PET bottles. Bavaria-based company uses the latest HSM machines from GF AgieCharmilles for the exactly detailed reproduction of the customer's design.

### HSM MILLING FOR HIGH DETAIL REPRODUCTION

At its Neutraubling site, not far from Regensburg, Krones AG manufactures stretch blow molding tools for the production of PET bottles. The customers are drinks producers from all over the world who offer their beers, mineral waters, juices or soft drinks in unique «packagings». Hardly one bottle is like another, and Krones has to meet more and more unusual designer requirements with stretch

blow molding tools. Five-axis high-speed milling is of special importance in this connection, for it is the machining technology with which Krones indirectly realises the details, surfaces and forms on the PET bottle required by the customer, with the stretch blow molding tool. In a first step, the CAD program is prepared in accordance with the customer's design with «Unigraphics». In this phase, which milling tools will be used for what working step is also determined. For the machining of the «bottom cup»,

Krones employs 10 to 15 milling cutters of the most varied diameters in order thus to realise drill holes, threads, cavities and finest surfaces in one clamping operation.



### HIGH-SPEED MILLING BRINGS PET BOTTLES INTO SHAPE

The actual production of the «bottom cup» for the stretch blow mold tool begins with the automated sawing off of segments from a rod. The blanks made of the aluminium alloy AlMgSi are then fixed with a 0-point clamping system from System 3R and fed for machining on a lathe/milling center on which the outside contour is turned and the cooling spiral is cut in the bottom. The next step is to load the pallet-changer of the MIKRON XSM 400U with pre-engineered workpieces. Thanks to the optimal accessibility, this is carried out easily and with an overall view of the operation. «GF AgieCharmilles has solved

the relationship of automation to the assembly area in an optimal manner, and this is unique for this machine type», is the comment by Georg Hofmeister, Head of the Production Team FE 1 Blowing Molds at Krones AG. And in addition: «The mechanical concept of the MIKRON XSM 400U and 600U also absorbs the high accelerating and braking forces of the 5 simultaneous axes superbly. This is shown on the workpiece with the precise reproduction of all details». But also the surface qualities, which are achieved with the two MIKRON models XSM 400U and 600U, are decisive for the match with the stretch blow mold tools, for they ensure the absolutely smooth outside surfaces on PET bottles.



KRONES



↑ After the outside contour as well as the cooling spiral in the bottom have been turned and milled in the blank made of the aluminium alloy AlMgSi using a lathe/milling centre, the workpieces are loaded into the pallet changer of the MIKRON XSM 400U.

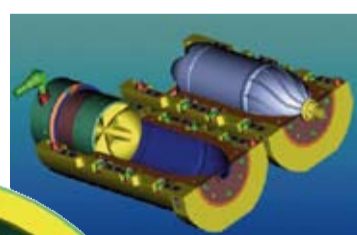
→ Georg Hofmeister, Head of the Production Team FE 1 Blow Molds of Krones AG, in front of one of the 12 MIKRON XSM 400U on which the «bottom cups» are also milled.



→ The «bottom cup» is milled, drilled and threads tapped on the MIKRON XSM 400U. For this, Krones uses 10 to 15 HSK-clamped milling cutters. The ± 15 µm tolerance achieved over the whole mould prove the high precision of the 5 simultaneous axes.



→ The CAD solid model shows the general arrangement of a stretch blow mold tool for the manufacture of drinks bottles made of PET. Apart from the two halves of the mould, the so-called «bottom cup» is the main component of these tools.



### WITH OPTIMAL PLANNING USE MILLING MACHINES UP TO 90% CAPACITY DAILY

Krones AG, with some 10,000 employees on its payroll, has production units which act as internal system suppliers for its various production sectors. So the production unit «FE 1» supplies blow molds for customers all over the world. The 46 employees in this production unit are often confronted with customers' changes in design at short notice. The challenge then is to plan these express orders to fit into the current production without trouble. An important aid for this is the 0-point clamping system from System 3R, with which orders can be inserted at any time without any set-up time. Anyway, Krones has taken all the set-up and non-productive times away from the machines, as a look at the spindles' operating times shows: All the 5-axes ultra-high-speed machining centers MIKRON XSM 400U and 600U record around 7500 spindle hours annually. Georg Hofmeister, once again, when asked about this figure: «Our milling machines are in production 365 days a year 22 hours per day (annual average). Normally the machines work through the current orders

in hand. However, if there are express orders to be dealt with, they can be inserted at any time». The rolling planning at Krones makes short machining times possible which, in the case of the «bottom cup», amount to just one day, and consist of 10% programming, 10% turning, 50% HSM milling, 15% polishing, 5% cleaning and 10% assembly. If these 50% HSM milling are extrapolated, it becomes clear what a huge volume of stretch blow mold tools the production unit «FE 1» at Krones copes with daily, weekly, monthly, annually with the MIKRON XSM 400U and 600U. Also a show of confidence in GF AgieCharmilles and especially in the availability of spare parts, for which Krones, as a demanding partner also gave impulses for new standards in service. All the machine tools are subject to a 3-year investment cycle. So Krones always has machines from GF AgieCharmilles with state-of-the-art performance values for better surfaces, speed and precision.

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#### Machines from GF AgieCharmilles

- 12 MIKRON XSM 400U
- 2 MIKRON XSM 600U

#### Clamping system

System 3R

#### Programming

Unigraphics for CAD and CAM

«Since 1999, we have bought 20 high-speed machining centers from GF AgieCharmilles. In this period, Krones gave the impetus several times for new developments which have today been successfully implemented in many milling machine models».

Georg Hofmeister, Head of the Production Team FE 1 Blowing Molds of Krones AG.



www.krones.com

# ED MACHINED PRECISION IS TO BE SEEN ON THE FINISHED PRODUCT



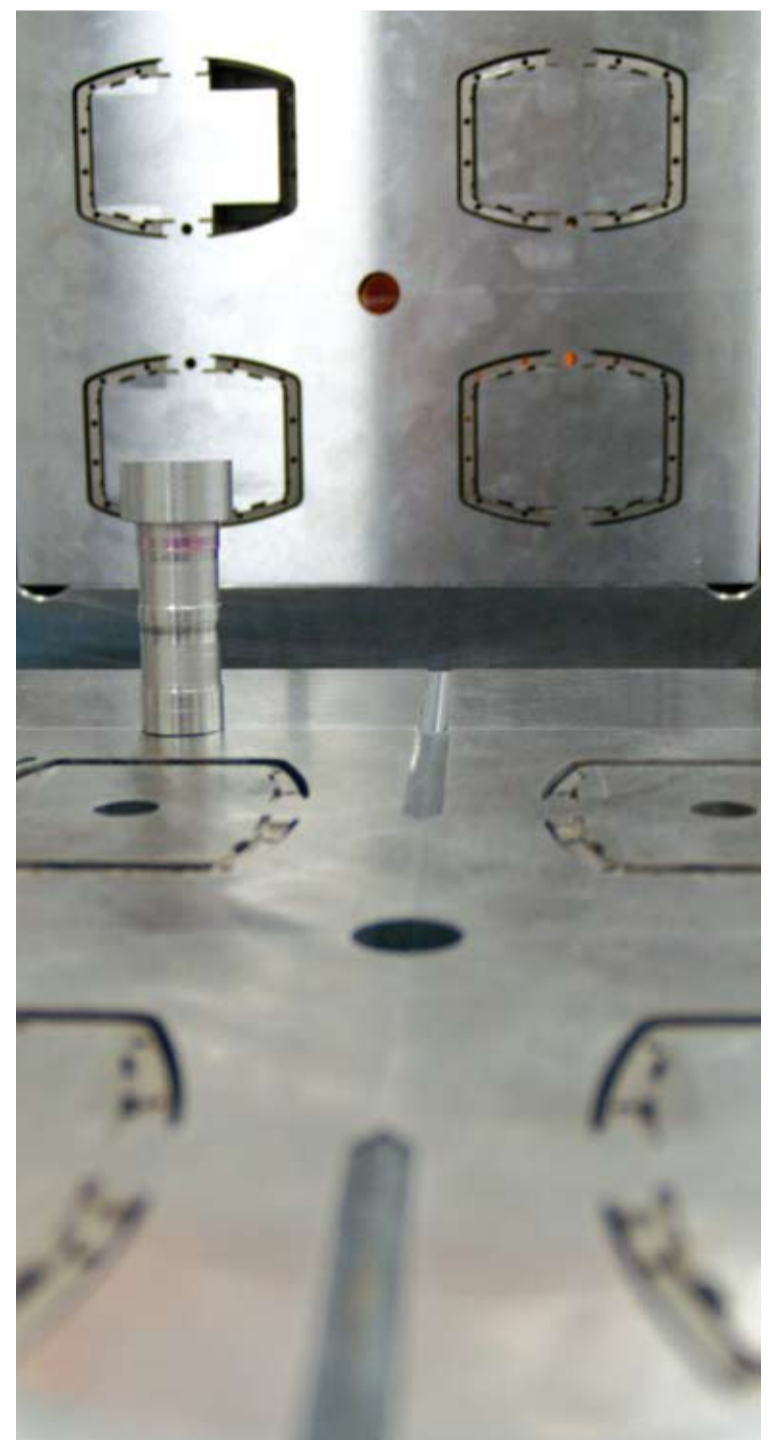
Whelen is the only American manufacturer of emergency warning systems that manufactures its products completely within the USA. Robotics, many years of know-how, highly motivated employees and, finally, state-of-the-art machine tools, such as ED wire-cutting and die-sinking equipment from GF AgieCharmilles are the key to sustainable competitive ability in the global market.

## PRECISION-GIVING PARTS ARE ED MACHINED

It all began with an «Anti-collision lamp» when George W. Whelen founded the company in 1952. Magnetically adhering light signals for the police, ambulance and fire services were then the next steps for an exceptional success story which still lasts today and will be effective in the future. With 550 employees on its payroll today, Whelen Engineering Company, Inc. produces light and warning systems at two sites for a worldwide market, and new patents each year give evidence

of the American company's great innovative capability. Charlestown, in the State of New Hampshire is the second production site which was opened in 1987 to expand capacity, and where mold making is now also based. With milling, turning, lasing, hardening and ED machining, Whelen has all the machining processes in house which make economic and precise production possible. The crucial element are the 5 EDM machines from GF AgieCharmilles with which Whelen manufactures the precision-giving parts and mold inserts for its injection molds, as the following example shows.

↑ The partition webs are fitted between the various light modules of a light bar. Whelen's modular system allows each product of this kind to be equipped in accordance with individual requirements.



**ED WIRE CUTTING BRINGS FITTING ACCURACY STRAIGHT OFF**

An injection mold had to be designed for partition parts for the light bars which are mounted on security and ambulance service vehicles. For this, first the CAD program was created with SolidWorks, from which then the program for ED wire cutting was generated with Esprit. As a production of 10 million part was planned, the tool was designed for eightfold production. For the ED wire cutting this meant manufacturing 8-fold 100 percent identical mold inserts from a steel hardened to 50 to 54 Rockwell. Jim Putnam, Workshop Manager of Whelen in Charlestown, used an FI

240 CC for this which, with its performance specifications, was outstandingly well-suited for the purpose: cutting speed up to 500 mm<sup>2</sup>/min, surface quality up to Ra 0.20 µm as well as intelligent automatic threading by preheating the wire. The integrated collision protection on FI 240 CC is also regarded by Whelen as the highlight of the machine as it offers the operator safety both when setting up and during ED machining. The production time consisted of 5% programming, 30% ED wire cutting, 20% milling, 30% ED die sinking and 15% fitting and assembly. Nearly two thirds were thus allotted to ED machining, thus making it clear why Whelen gives the machines from GF AgieCharmilles this high status in tool production.



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**Machines from GF AgieCharmilles**

- 1 FI 440 CC with workpiece changer from System 3R
- 1 FI 240 CC
- 1 FO 23
- 1 FO 550
- 1 FO 350

**Clamping system**

System 3R

**Programming**

- Edge CAM
- Esprit
- Solidworks
- Moldflow



«With the ED machines from GF AgieCharmilles we achieve fitting accuracy straight off and the shape accuracy is impressive, as is to be seen on many parts manufactured by Whelen».

Jim Putnam, Workshop Manager of Whelen in Charlestown.

↑ Mold inserts for an 8-fold injection mould for the production of partitions for light bars which are mounted on security and ambulance service vehicles.

↑ Whelen copes with the growing volume of work in ED wire cutting with the FI 240 CC and FI 440 CC machines, both models for high cutting speeds and with integrated collision protection.

← Jim Putnam with the two mold inserts which were cut on the FI 240 CC ED wire-cutting machine.



[www.whelen.com](http://www.whelen.com)

# POTENTIAL EDM - HSC <sup>20</sup>

## EDM AND HSM – TWO PROCESSES ENHANCING EACH OTHER'S POTENTIAL

Electrical Discharge Machining (EDM) and High Speed Cutting (HSC) are the key technologies today in mold and tool making, as well as in the manufacture of precision parts. Each process has strong points for itself alone, but also weak points resulting from the process. Used together, however, the disadvantages of one process can be compensated for by the advantages of the other process.

### ELECTRICAL DISCHARGE MACHINING

The Russian invention was put into industrial use in 1954 by the then Agie and Charmilles companies when each of them put the «Principle of thermal removal by means of the discharge of electric impulses» into practice with a first ED die-sinking machine. The formerly exotic manufacturing process quickly developed into precision-giving machining in tool and mold making. The process was given a further impetus in 1969 when Agie brought the first ED wire-cutting machine onto the market. Today, ED die sinking and ED wire cutting are the acknowledged key technologies for the construction of injection molds, punching tools and progressive dies. High repeating accuracy and the unrestricted use for machining all electrically conductive materials are the well-known advantages of ED machining also for the manufacture of precision parts.

↓ **ED die sinking**, the process that works with electrodes as the tool, is employed everywhere where high-precision cavities and molds have to be created or if surface structures have to be implemented.



### HIGH-SPEED CUTTING

For decades, conventional milling machines were characterised by their low dynamics and equipped with low-speed spindles, as a result of which the machining spectrum was limited to unhardened tool steels. Only in 1992, when the Mikron company integrated a high-speed milling spindle with 42,000<sup>-1</sup> rpm into conventional milling machines, did milling take the decisive step to become a fast, high-precision production process by which hardened steels could now also be machined. A further innovative impetus brought the introduction of 5-axis simultaneous HSC machines, expanding the geometry spectrum by an additional dimension. Apart from EDM, HSC has today established itself as a further key technology for the manufacture of tools and precision parts and is in part advancing into precision fields which were previously the reserve of ED machining.

↓ **High Speed Cutting** stands for large removal volumes to filigree machining jobs, for components from medical technology to electrode production in tool and mold making.



### THE «GREY AREAS» OF BOTH PROCESSES

If reference is made to the complexity of a geometry to be machined, one could ask: «Where does HSC stop and from when is EDM more economic?» Or conversely, with respect to the machining speed, it could be asked: «Where does EDM end and where does HSC sensibly begin?» Neither question can be answered in black and white, as freedom of shape can be to the detriment of the machining speed, and vice versa, as a result of which there is an overlapping «grey area» between the two processes EDM and HSC. So let us limit ourselves to the respective strong points of both processes. As mentioned at the beginning, there are also process-induced weak points which are, however, only to be recognised as such under the aspect of machining speed in the case of ED machining or with regard to freedom of geometry and material in the case of high-speed cutting. However, this can be compensated in the case of GF AgieCharmilles machines in that the profitability as a result of machining time and operating costs is increased by individual automating concepts. The steps range in this case from «isolated» with an electrode changer to «complete» with the expansion into a fully automated manufacturing cell.



### HOW THE TWO PROCESSES ENHANCE EACH OTHER'S POTENTIAL

Both EDM and HSC have characteristics resulting from the process used which can be optimally combined. In particular, ED die sinking combined with high-speed milling produces the best synergies. Thus large-volume cavities in tool and mold making are implemented with advantage by machining in part with HSC and then carrying out the details, such as complex geometries, fine webs or slits with ED die sinking. The electrodes needed for this can also be HSC milled. If special structures are to be implemented, the geometry can be for the most parts prepared by means of HSC milling cutters, and the required surface then generated by ED die sinking. Accordingly, the outside contours of a mold insert for an injection mold can be HSC milled and then the actual shaping and surface structuring can be carried out by means of an ED die-sinking process. The same applies for progressive tools for which the outside contours of the base, punch, punch holder and cutting plate are HSC milled, and the guides, dies and punches are ED wire cut exactly to size with the smallest cutting gap. But there is also an enormous potential in the case of production parts to use both processes to improve profitability. Precision and eco-

↑ **ED wire cutting**, in which a wire running off its spool serves as the tool, is preferentially used when making cutting tool, punches and drawing dies, as well as for the generation of high-precision profiles.

nomic requirements determine when which process is best used for which machining job. HSC milling is a fast machining process, but has restrictions in the case of inside contours and extremely hard and tough materials. ED machining, for its part, is very precise in execution, but is characterised by comparatively longer machining times. If one knows these limits and potentials of both processes, HSC and EDM, if applied purposefully, can clearly cut machining times and operating costs. EDM and HSC thus have the potential to enhance profitability.

## results TODAY

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