

FAGOR
AUTOMATION



Open
to your
world

MAGAZINE

No. 7 - September 2021 - Newsletter

NEXT GENERATION AUTOMATION SOLUTIONS





INNOVATION

NEXT GENERATION AUTOMATION SOLUTIONS
THAT INCREASE PRODUCTION CAPACITY **6**

TESTIMONIALS

MOLDMAK AT THE FOREFRONT OF INDUSTRY 4.0
IN INTELLIGENT MOLD PRODUCTION **12**

AZ MACHINE
CUSTOM GRINDING MACHINES FOR COMPLEX PARTS **16**

CHETO ALL IN ONE **20**

MAR REFERENCE IN THE WORLD OF GRINDERS **24**

TECHNOLOGY

HMelite MORE FLEXIBLE AND FUNCTIONAL **28**

SERIES3 FROM SMALL S3 TO LARGE L3 **30**

FAMILY WITH FUNCTIONAL **SAFETY** **32**

COMMITMENT TO THE **CIRCULAR ECONOMY** **34**

CASE HISTORIES

CUTLITE PENTA
EFFICIENCY AND PRAGMATISM AT THE SERVICE OF PRODUCTIVITY **36**

BEIJING HI-POWERFUL CNC MACHINE **38**

RIERGE ATTENTIVE TO TECHNOLOGICAL EVOLUTION **40**

JIANGSU JITRI JINGKAI HIGH PRECISION GRINDING MACHINES **42**

OPEN TO YOUR FUTURE

FAGOR DIGITAL SUITE
DIGITIZATION PROCESS OF PRODUCTION PLANTS **44**

POWER2POWER
MORE ENERGY, LESS ENVIRONMENTAL IMPACT **50**



José Pérez Berdud (Pepe)

We are living in times of change in which the great challenges facing humanity are forcing us to modify the standards on which our society's development is based. Among them are the standards on which our industry is based.



R&D&I
>10%
OF SALES

PRESENCE IN MORE THAN
50 COUNTRIES

At this time, the adaptability and flexibility of our companies are more important than ever, qualities that are in the DNA of Fagor Automation.

Our greatest assets are an investment in R&D&I of over 10% of sales and an extensive commercial network with a presence in more than 50 countries. All this is precisely at the service of the adaptability and flexibility we have mentioned.

In this issue of the Fagor Automation magazine, we present some examples that we have developed both in technology and application (HMIelite, Series3, SAFETY encoders, Fagor Digital Suite, etc.), in close collaboration with our customers, who have always been our main driver. Together with our customers, we look for the answer that best suits their needs. We are always considering the integral solution for the whole life of the machine.

In this magazine, I invite you to discover how at Fagor Automation we work side by side with our customers, wherever they are, offering comprehensive solutions for their production plants to advance in digitization and become more efficient, competitive, safe, and environmentally friendly.

JOSÉ PÉREZ BERDUD (PEPE)

CEO Fagor Automation.

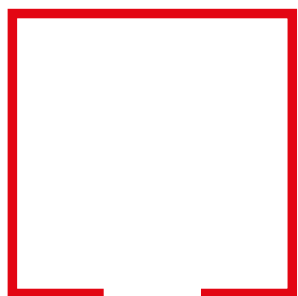
**A NEW
GENERATION
OF CNC
SYSTEM**

Quercus

Series3

**NEW
LINEAR
ENCODERS**

NEXT GENERATION



Automation solutions
that maximize
production capacity

Integrate. Transform. Evolve. Combining decades of knowledge and experience in the machine tool sector with the technological advancements of the future. All of this has culminated in advanced automation solutions that increase production capacity. Introducing the QUERCUS Automation System and Series3; transformational technology that leaves everything else behind.

At Fagor Automation, we develop next-generation automation solutions. QUERCUS seamlessly updates the entire global CNC automation system using the latest technologies available from Industry 4.0. This automation solution is made more complete with the new family of latest generation linear encoders called Series3, offering nanometric resolution at high working speeds.



Quercus

Powerful. Compact. Smart

This is QUERCUS, the new automation technology that responds to the demanding needs of today's market while also being prepared for the future. This system will allow our clients to continue growing and evolving thanks to the new developments that have been incorporated. This new CNC automation system offers infinite advantages and possibilities.

Advanced technology, completely redesigned.

The Quercus system incorporates: control algorithms and circuits made up of the most advanced technology, with an innovative and flexible architecture, an easier, safer, and more efficient assembly, and with improved and up-dated hardware.

New regulation bus

The Sercos III bus, based on Industrial Ethernet, allows the speed to be multiplied up to 100 MBd.

Thus, the CNC can receive and manage much more information, automating, even more, the configuration of the system, with a significant simplification of the wiring type Ethernet STP.

A completely digital system

The system inputs are prepared for protocols of communication signals: FeeDat (Fagor), SSI... which enables a fully digital system.

These inputs are homogeneous for all the elements connected to the control bus, now more manageable and compact.



Reduced size

The Fagor CNC and drive modules occupy less space while also being powerful than ever. The new extremely compact Q7 CNC hardware platform allows a space reduction between 45% and 60%. In addition, drive modules now have single and double variations to save space in the closet, which allows that now a single servo module can control two axes.

Suitable for all CNC machines

The main control unit is mechanically compatible with all variations of machines and third-party monitors. The control console machine can be equal to any type of machine, although varying the model CNC, which allows greater flexibility in the configurations of the CNC monitor integrated.

A new system of modular installation

The VESA mount adapter allows attaching a CNC unit directly to a Fagor PC panel or third-party monitor regardless of size. This expands the possibilities of the manufacturer to customize the display size and aesthetics of

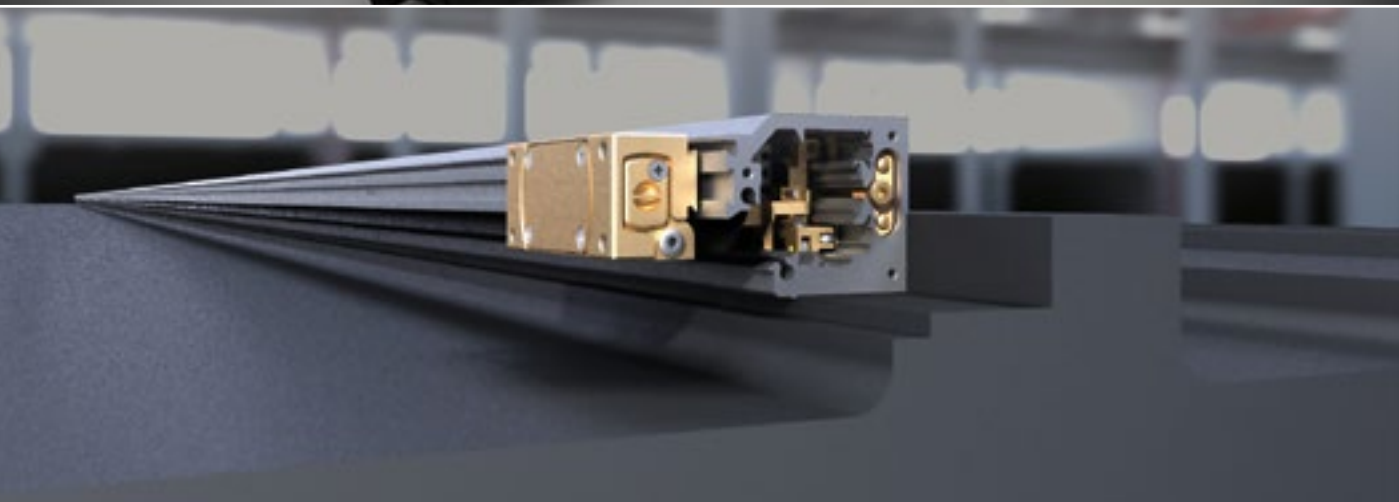
their machine. In addition, the control is more compact than ever with a thickness of only 36.5 mm, allowing you to create a neatly organized control cabinet.

Easy to program and platform-independent

The new generation of CNC presents a revolutionary multiplatform Human Machine Interface called HMIelite, built using HTML5 technology with renewed, more modern, and simplified aesthetics. The software allows modifying and customizing the format, aesthetics, and functionalities in a really simple way. Screens have been redesigned to adapt the work environment to the operator.

Ready for the future

QUERCUS is FAGOR's next-generation automation system, built to be future-proof and adapt to the requirements of the futures market. QUERCUS allows our customers to benefit from all the new developments from Fagor Automation that will soon be at your disposal.



Nanometric resolution at high speeds

Series3

Connected, Robust and Accurate

Series3 is the result of decades accumulating knowledge and experience while seeking to exceed customer requirements in the automation industry. Thanks to the advances made in recent years, this new family of linear encoders incorporates an opto-electronic technology fully developed and patented by Fagor Automation: 3STATECH.

The encoders of the Series3 family communicate with the CNC system through its own Feedat communication protocol, which makes it possible to achieve very fast position loops with nanometric resolutions to achieve precise finishes.

They are suitable for all sizes of precision machinery, from as little as 70 mm or as long as 50 meters. These encoders share benefits of ease of installation, robustness, precision, resolution, and communication with the rest of the Series3 models. The L3 model has exclusive characteristics, such as stainless steel tape designed to avoid incorrect assembly, as well as a unique tensioning system that allows the readerhead to be mounted on either side of the encoder.

These are the main characteristics of the new encoders of the Series3 family.

Robustness

Series3 encoders feature a rigid clamping system and improved mechanical technology that provide high resistance to contamination and adverse machine conditions common in the machine tool industry.

Optimal communication

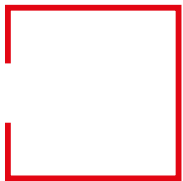
The digital Feedat protocol provides optimal communication with the Fagor control system. In addition, custom development allows additional information to be sent to the CNC system that can be utilized to implement unique characteristics, resulting in improved performance of the equipment.

Accurate measurement

The encoders stand out for providing repeatable micrometric precision over time, as well as nanometric resolution at high working speeds, that contribute to achieving smooth, precise, and repeatable shaft control.

Easy assembly

The wide variety of mounting options where there is no need for nuts, and a complete set of accessories and tools, allow the encoder to be installed in the best location and easily ■



The Portuguese company Moldmak is the result of more than 35 years of experience, research, and development in the manufacturing of molds. The company is based in Carregosa. Oliveira de Azeméis is a pioneer in Industry 4.0 and is dedicated to designing, developing, producing, and marketing CNC machines that optimize the moldmaking process. António José Oliveira de Castro Barbosa, Moldmak Engineering Department Director, explains that the objective of his company is to offer technically and economically more efficient solutions, as well as to cover the lack of applications in the market for intelligent mold production systems.

MOLDMAK

AT THE FOREFRONT OF INDUSTRY 4.0 IN INTELLIGENT MOLD PRODUCTION

Since its foundation, Moldmak has been comprised of engineers with extensive international experience in CNC Machine design.

António José Oliveira de Castro Barbosa points out that «only with the accumulated experience of the team, the deep knowledge of the mold production process and the mastery in the development of high precision CNC machines is it possible to raise the bar and create new products that generate great impact in the sector».

The great advantage of the Moldmak machine equipment comes from its multitasking ability to perform large milling, end milling, drilling, tapping, and deep hole drilling (deep hole & STS) and CMM (coordinate measuring machine). All of this allows the machines developed by Moldmak to cover all the needs of milling and quality of the mold with only two configurations thanks to great thermal, dynamic and static stability.

The companies manager points out that another of the singularities of the Moldmak design is «the large angular capacity with a rotary table that allows the machine to mill and drill in areas that are usually difficult to reach in the mold or piece».

Pioneers in Industry 4.0

Moldmak offers the latest generation of CNC digital servo controllers on their machines, with

software that allows detailed monitoring and management of production KPIs, event anticipation, and analyzing process trends, in line with Industry 4.0.

Moldmak is committed to this new industrial revolution and assumes a position as a leading operator and leading supplier of CNC machines for Industry 4.0 in mold manufacturing. Moldmak is exploring the capabilities of connected production systems in its projects. Its products and services are developed and designed to make Industry 4.0 a reality.

Barbosa assures that the Moldmak/Fagor partnership is key to offering advancements adapted to Industry 4.0. «For us, it's essential to outfit our machines with equipment from Fagor Automation. Both the Quercus CNC systems and Series3 high accuracy encoders. Thanks to both pieces of equipment, our machines are much more advanced».

The Moldmak Engineering Department Director highlights that Fagor products are «very reliable and robust, easy to install, and use together with a guaranteed technical service anywhere in the world».

António José Oliveira de Castro Barbosa assures that «the union between Moldmak

COMPACT HMC 30% FASTER

and Fagor Automation has shown that when two high-level companies collaborate and both provide the most advanced products on the market, new developments are carried out in a very short span. The implementation of these developments to the new models is carried out almost instantaneously and with guaranteed success».

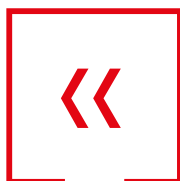
The new Compact HMC

Their long experience in the mold-making industry, as well as their privileged position in the sector, have led them to develop the concept of a horizontal drilling/milling machine with a large angular capacity. It is the new Compact HMC that, thanks to its horizontal architecture, allows the operator wide and comfortable accessibility to his work area as well as access to the bridge over the screen. This structural arrangement results in a highly secured machine with great capacity in hard or hardened chip removal processes.

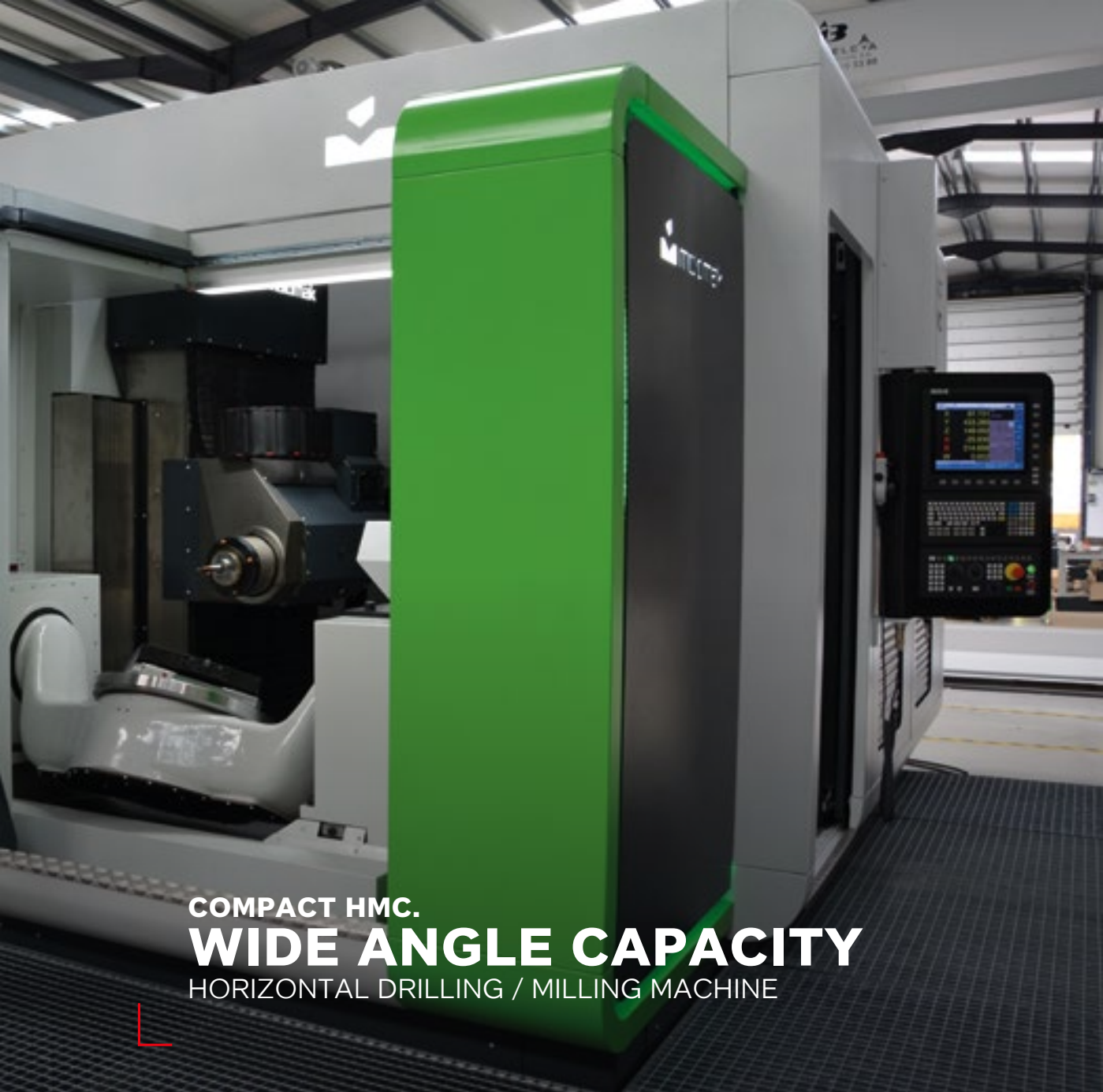
The new Compact HMC allows broad machining access to the entire volume of the part and takes advantage of all the machining capabilities with 3 + 2 and 5 continuous axes. The Compact HMC is also equipped with an automatic tool and pallet change system, process control, and interfaces designed for Industry 4.0.



Mr. António José Oliveira de Castro Barbosa,
MOLDMAK Engineering Department Director

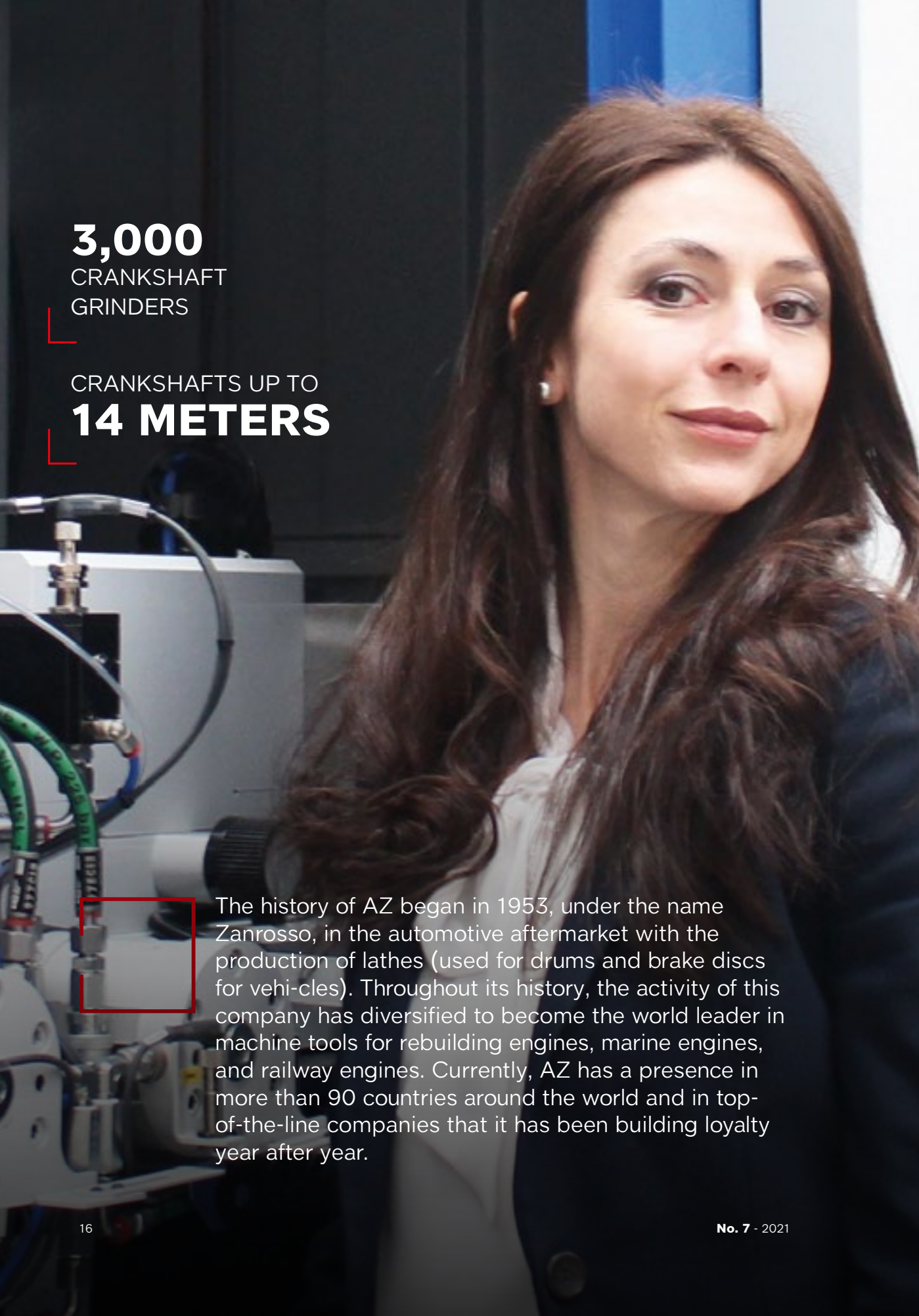


Fagor products are very reliable and robust, easy to install and use»



COMPACT HMC. **WIDE ANGLE CAPACITY** HORIZONTAL DRILLING / MILLING MACHINE

The new Compact HMC stands out because it is 30% faster than other conventional solutions. «One of the great advantages of the Compact HMC is that it reduces delivery and setup time, leaving more time available for production. In addition, thanks to the capacity of the machining head and the horizontal cut, lead times are shortened. To guarantee work without errors, a dimensional control ensures (at the end of every task) that only the geometrically validated part advances to the next step», summarizes the Moldmak Engineering Department Director ■

A woman with long, dark, wavy hair is looking towards the camera with a slight smile. She is wearing a dark jacket over a light-colored shirt. In the background, there is industrial machinery, including a large vertical structure and various pipes and cables. The lighting is soft, highlighting her face.

3,000

CRANKSHAFT
GRINDERS

CRANKSHAFTS UP TO

14 METERS

The history of AZ began in 1953, under the name Zanrosso, in the automotive aftermarket with the production of lathes (used for drums and brake discs for vehicles). Throughout its history, the activity of this company has diversified to become the world leader in machine tools for rebuilding engines, marine engines, and railway engines. Currently, AZ has a presence in more than 90 countries around the world and in top-of-the-line companies that it has been building loyalty year after year.

AZ MACHINE

CUSTOM GRINDING MACHINES FOR COMPLEX PARTS

During its almost 70 years of history, this company based in Thiene (Veneto region, Italy) has grown to become a world leader in the manufacturing of crankshaft grinding machines up to 14 meters in length for various sectors. The business figures show AZ's relevance: it has sold more than 3,000 crankshaft and roller grinding machines around the world.

In 2006, AZ entered the market for grinding machines for the aerospace industry. This sector has evolved towards increasingly complex machining and processes; For this reason, the current main objective of AZ is to address the particular needs of its customers by providing them with custommade machines.

AZ Machine has become a technology partner for multiple clients, offering numerous specific grinding solutions with high innovative content.

Errors are unacceptable

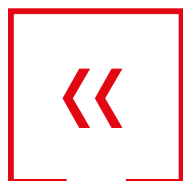
Sarah Pizzolato, marketing director of AZ SpA , points out that «betting on the aerospace sector means working on very expensive unit parts, following strict production procedures with special work cycles that guarantee their traceability, and above all else ensure 'zero defects' in the final pieces. For machine tool suppliers,

and particularly finishing machines (i.e grinding machines), errors are not allowed».

To this end, AZ has a wide range of grinding solutions designed specifically for the aerospace industry called AZ Aerospace. AZ Aerospace provides solutions for the manufacturing and maintenance of aircraft engines and landing gear components. «AZ grinding machines are all customizable, energyefficient, safe, reliable, and meet all Industry 4.0 requirements», says Sarah Pizzolato.

The grinding machine specifically has always required a certain degree of customization. Pizzolato comments that «specialization will continue to be one of the main obligations that will be demanded in our sector, along with digitization, Industry 4.0 ... as well as other improvements in machine dynamics through linear motors or similar technologies».

Aircraft landing gears, turbine engines, mechanical transmissions, bearings, recirculation bolts, and tie rods are some of the parts that are checked during maintenance. These are often cylindrical grinding operations, given the extremely high micrometer precision and required quality.



Fagor Automation's fast and personalized response especially helps us to retain our customers»

“ZERO DEFECT”

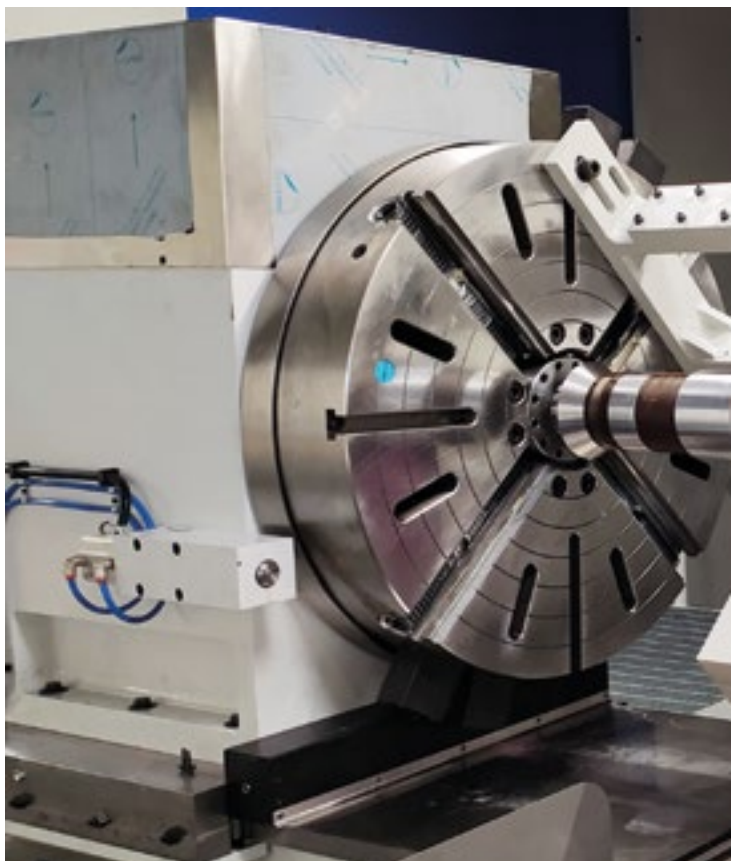
IN FINAL PARTS

The marketing director of AZ SpA affirms that «our long experience in the aeronautical sector allows us to offer integrated, as well as innovative, grinding solutions that are also very flexible and adaptive to the needs of each client. The modular design allows us to create one-of-a-kind machines, which are highly valued by the international aviation industry, direct, indirect EOM and MRO».

Maximum precision, superior durability

AZ incorporates Fagor Automation products in their machines. Sarah Pizzolato assures that «our clients require machining of the highest precision as well as optimum surface quality. For this reason, it is vital for our machines to have highly accurate and robust measuring systems. From the beginning of our relationship, Fagor has offered us total involvement in our projects with only the most appropriate products, understanding our needs and providing solutions».

The marketing director of AZ SpA explains that «despite the fact that the results that are sought in our machining are observed at the micrometric level, the working environment of our machines is usually the most aggressive».



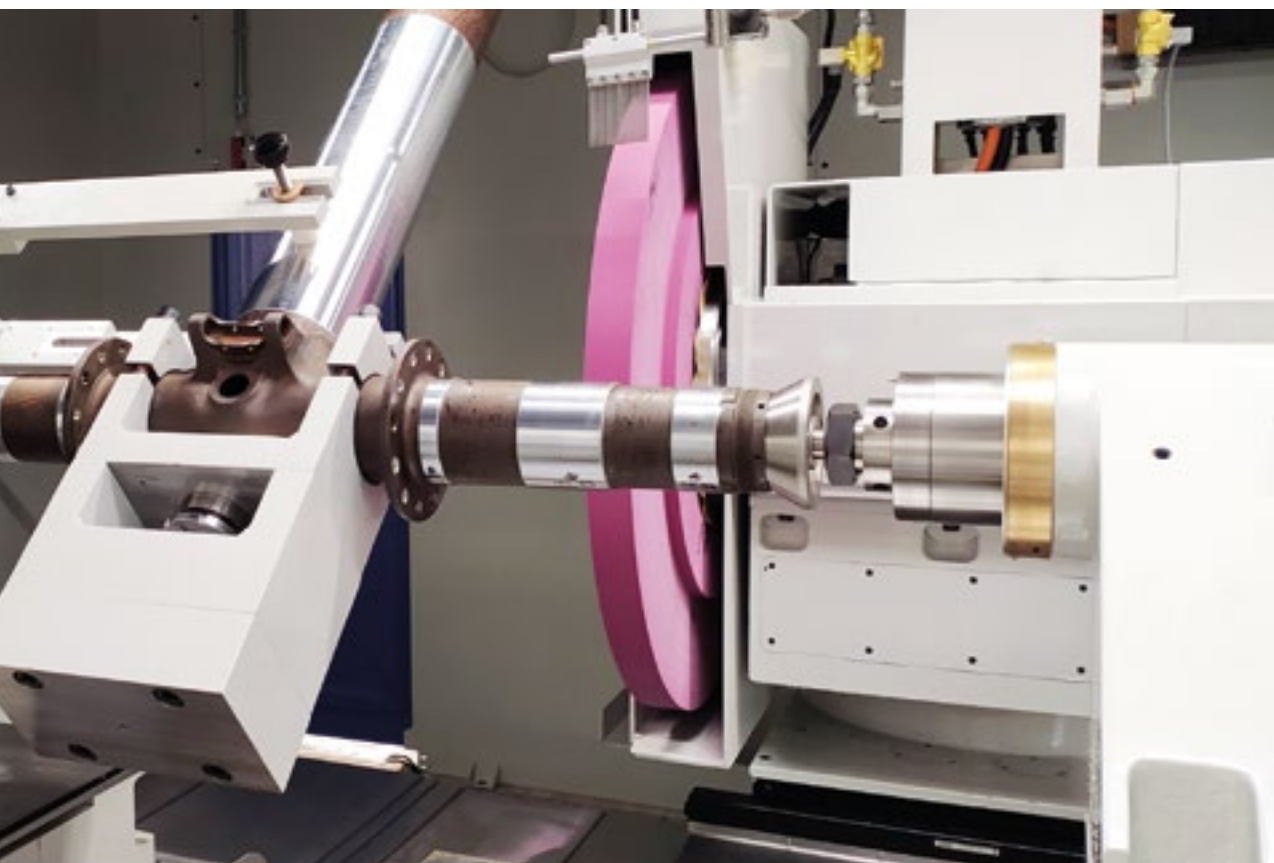
Pizzolato highlights the performance of the new Fagor encoders with 3STATECH technology. «Besides offering the accuracy we need, this technology provides greater resistance against the condensation generated in the machine, as well as resistance to chemical agents used during the machining processes such as lubricants, coolants or cutting oils» indicates.

Likewise, Sarah Pizzolato underlines that «Fagor is one of the world leaders in feedback systems and has the right product range for our machines. They have products that are technologically equipped for our machines and that are really easy to integrate. In addition to the range of products and the ease of integration, I would

also highlight their reliability, which is essential in the sectors where we operate».

In a sector as competitive and demanding as aerospace, it is essential that incidents are resolved in the shortest time possible. In this case, the marketing director of AZ also shows her satisfaction with the availability of the Fagor Automation team, as she says «is really excellent».

«Both in the set-up of our machines, and in the service, they have always been very fast and professional. This quick and personalized response especially helps us to retain our customers, who in the event of an incident in the machine have indicated in just a matter of hours that they were ready to continue working» comments Pizzolato ■





CHETO (Create High-Efficiency Technology Obligations) is a Portuguese deep drilling and milling CNC machine manufacturer that develops solutions for process automation.

Carlos Teixeira, CEO of CHETO. **Sergio André**, CTO of CHETO

CHETO

ALL IN ONE

The company was officially founded in 2009 in Loureiro, Portugal, by a team of people with extensive scientific knowledge including more than 30 years of accumulated experience in molding and manufacturing of molds with the aim of developing multi-task machining centers. The company began by offering deep-hole milling and then added radial drilling, tapping, and boring to its machining centers. Today, the company is internationally recognized for its innovative deep hole drilling technology.

CHETO is known internationally for its innovative deep drilling technology, but also produces a range of multi-function machining centers that combine milling, deep and radial drilling, threading, and boring technology.

CHETO's hallmark is keeping as close as possible to market demands and offering optimized processes with machines that perform multiple operations at the same time. In the mold-making industry, drilling deep holes can be a critical and time-consuming process. «It is an area with many problems and few solutions», says Carlos Teixeira, CEO of CHETO.

«Usually everyone focuses their investments on finishing operations like milling, but 50% of the production process can be drilled, especially in really large molds. It is a process that is sometimes dirty and takes a long time», explains Teixeira.

Multifunction machining centers

To offer a solution to the challenges of drilling and molding, CHETO has developed new models of machines with greater advances, thus saving time in the production process, reducing production costs, and increasing process efficiency; which ultimately results in shorter delivery times.



An example of its innovative nature is that in 2018 CHETO, in their work to automate production, created an ATC (Automatic Tool Changer) for the automatic change of Gun Drills and patented it. The ATC is an automatic deep hole tool changer and software package, specially designed to save time and increase the efficiency of the production process. This enables automatic switching between drilling and milling on your machines.

With a 5-position radial drilling arm and rotary table, the company's products can machine in 6, 7, or even 8 axes, depending on the configuration. In addition, CHETO installs automatic tool changers on drills.

Thanks to this CHETO system, the operator can change the deep drilling tools in automatic mode and also automatically change the deep drilling process mode to the milling process without any manual intervention. Before starting machining, the user can place the workpiece on the table and equip the drilling machines with up to 150 tools and 5 drills. In this way, the machine can mill and drill automatically.

Reliability and ease of use

CHETO is a brand of excellence, internationally recognized in the mold industry. The CEO of the company remarks that «CHETO machines represent an excellent investment thanks to their multitasking functions».

«The IXN is CHETO's best-known model because it has all the options. It can reach up to 8 axes and is available in large sizes to cut large and heavy pieces» describes Teixeira. This model is equipped with a control system, Quercus system, and Series3 encoders all from Fagor Automation.

Teixeira points out that all CHETO models are equipped with Fagor CNCs and adds that the solutions offered by the Quercus system, in addition to presenting a very attractive interface, «fit perfectly with the developments that CHETO wants to implement in its machines».

In addition, it indicates that the new Series3 encoders are especially efficient because they eliminate «problems in machines that work in very demanding environments, due to coolant and high-pressure emulsions».



MULTITASKING FUNCTIONS



UP TO **150 TOOLS**
AND **5 BITS**



5-POSITION
RADIAL DRILLING

This combination of factors creates fogs that settle on surfaces like those of the scales», explains the CEO of CHETO.

Teixeira adds that if something stands out about Fagor products, it is, «above all, their reliability, in addition to their ease of use».

Another of CHETO's reasons for choosing Fagor is after-sales service. Teixeira affirms that «Fagor's technical assistance service has always been the best and stands out from the competition due to its response capacity and extremely high technical knowledge. I would also like to highlight Fagor's global service».

CHETO is also a company that combines efficiency with respect for the environment. «Our machines use very little energy since all our motors are direct drive or have inverters for high efficiency» explains Teixeira. CHETO's machines also use an emulsion cooling system that is mostly water with just a little oil, 8-10%. The consequence of this is that the workshop is cleaner and more efficient, odors, fire risks, and the possibility of slipping and falling are reduced. ■



If something stands out about Fagor products, it is both their reliability and their ease of use»



MAR srl was born in San Marino in June 2015 under the inspiration of five friends who already had extensive experience in the grinding machine sector. Today, MAR's strengths are installation, assistance, inspection, retrofit, and production of automatic machines. The company prioritizes customer satisfaction, establishing long-lasting solid relationships to increase mutual trust, and quickly achieve the best results. This excellence-based approach is backed by a highly specialized team of technical experts dealing with any aspect of cylindrical grinders.

MAR

THE BENCHMARK IN THE WORLD OF GRINDERS



«The ease of use that the Fagor software provides to our specialized equipment can always be relied upon to be intuitive, complete, and efficient for user customization»

Enrico Bollini *MAR Sales Manager*

MAR srl is a young company that has already vastly grown in just a few years. When it was founded, it was only in charge of the assembly, assistance, and inspection of the machines; focusing on providing fast and efficient quality service meeting all customer needs. Since then, its range of services has been expanded with the reengineering and design of machines to offer the customer a 360° service. In 2017, the company completed its offering with the design and manufacturing of grinding machines under the MAR brand. These machines are distinguished by their flexibility, modularity, and high performance to satisfy any requirement.

MAR has designed several innovative machines. The first of its product line is TITAN, a universal grinding machine suitable for any task. Titan is joined by three machines of various sizes belonging to the family of compact grinding machines with mobile uprights: X1000, X500, and MCR.

MAR combines all its services, with the outsourcing of assembly activities, through a highly qualified staff that operates autonomously for all manufacturers of automatic machines and plants that require fast and efficient service. MAR's growth has led the company to be located in a 1,500-square-meter facility for the production area.

3Statech

Machines at full
productivity with little
maintenance

Personalization specialists

To offer the best possible service, MAR srl collaborates with important companies in the sector to provide its clients with all the necessary customizations. Thanks to the excellent reliability of MAR grinding machines, customers can perform highly specific duty cycles and create a high-quality end product.

Among the companies with which MAR collaborates is Fagor Automation. «Our relationship with Fagor goes back a long way. Even before founding MAR. We started using Fagor Automation's optical encoders and feedback systems in 1996, during our founders time at a previous company. In 1998, we incorporated the 8055 TCO CNC, with its intuitive conversational interface, for an innovative grinding machine model» explains Enrico Bollini, MAR Sales Manager.

With the creation of MAR srl itself, the relationship with Fagor Automation has become even closer and intensified. «Fagor Automation collaborated with us from the beginning of development for our solutions. When we started our own business in 2015, with more complex and demanding products, it was natural for us to maintain and continue the link with Fagor by integrating its more modern 8065 CNC. This is the standard equipment of all our grinding machines» states Enrico Bollini.

For MAR, the primary value of Fagor products is the extreme customization it offers to its customers. «At MAR, we are specialized in custom grinding machines, and the Fagor CNC package is the soul of this customization. I also want to compliment the extreme reliability of all its components. More than twenty years after the first installations, we have customers who have only had to replace a few batteries.

As for the new products, we appreciate the new Quercus system for reducing the physical spaces required and the ease of connectivity. Soon, we will also implement the new linear motors in our product ranges», says the MAR Sales Manager.

Bollini also emphasizes the new Fagor Series3 linear encoder family and describes MAR's reasons for working with them: «The working environments of our machines are very aggressive and highly dirty due to the chemical agents used in the grinding machines. Because of this, we are integrating the new family of Series3 absolute encoders. Thanks to its 3Statech technology, we will be able to keep the machines at full productivity with hardly any maintenance despite most extreme machining conditions».

Closeness, involvement, and reliability

One of the hallmarks of the MAR grinding company is that it establishes lasting relationships with its customers. Therefore, it's not surprising that you look for identical values with your suppliers, such as Fagor Automation.

Bollini says that their relationship with the Italian subsidiary of Fagor Automation is «excellent». «More than a supplier, it behaves like a partner, getting involved in our projects and offering extreme attention to each of our requests, both technical and commercial. We have developed a direct and friendly relationship with many people at Fagor, which constitutes the fundamental basis for a good association. We also appreciate being close to Fagor HQ, who recently visited us with R&D representatives to present their new products and analyze future joint projects», he explains.



But the closeness and cordial treatment, although important, are not always enough to build good business relationships. There must also be a solid product and reliable services.

«Reliability is essential in our market. As an OEM, we appreciate the fast learning curve needed for the individual products, as well as the ease of the software, that Fagor provides in the different products. This alone greatly reduces the time needed to personalize the user experience» states the MAR Sales Manager.

Integration and interconnectivity

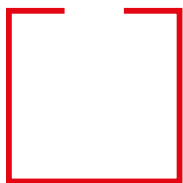
As an innovative company, MAR srl tries to anticipate the needs of its customers. They understand that in the future, «there must be an ever-closer integration with factory systems. Tools must be utilized more extensively for remote and predictive diagnosis».

Interconnection is already a key element at present. «In a work environment increasingly focused on Industry 4.0, both the Numerical Control and the measurement systems will have to be increasingly connected with third-party systems and will have to manage and exchange data in real-time with different applications. In an increasingly «smaller» world, the exchange of experiences between different sectors will be essential to better focus solutions to individual problems», remarks Enrico Bollini ■



HMIelite

MORE FLEXIBLE, MORE FUNCTIONAL



Gone are the days of non-customizable and unimaginative HMIs (Human Machine Interfaces). Users increasingly expect more from HMIs, such as more functionality, adaptability to new devices, and simpler and more modern options.

At Fagor Automation, we work to offer the most versatile range of features in our HMIs, all packaged in the CNCelite Series model. Below, we summarize the features of this HMI based on the new functionalities.

Easy to program and customize.

The CNCelite Series HMI runs on HTML5 web technology and can run on a remote CPU. This gives the OEM the complete freedom to configure and customize the HMI independently of the real-time part of the CNC, in turn freeing up real-time CPU resources and improving machine performance. Moreover, thanks to the universal language it uses, it is very easy to customize.

For any device

The user is no longer limited to the same screen configuration or computer to access the software. Series CNCelite offers the possibility of connecting the HMI to any other device (such as tablets or smartphones) remotely, and with a single web design everything is seen correctly in any device, as it is adaptable to all screen formats (responsive).

With the HMlelite, the user can simply slide their fingers across the screen to change the working mode. In addition, a short press on the display allows access to new data. If pressed longer, the contextual help will display the calculator when needed.

With FGE (Fagor Geometry Editor)

The new CNCelite offers a top to bottom redesign of the current profile editor. The new editor is based on the same programming philosophy, but with CAD-based improvements:



Interactive CAD: allows drawing, using the «standard» CAD tool philosophy, defining as many support lines and arcs as necessary to obtain the desired geometry.

- New operations: Rotations, scaling, symmetries and movement of parts of the drawing can be used.
- Hole management: allows filtering holes by radius and displaying them sorted by patterns.
- Ease of modification: It is not necessary to follow an order in the generation of the sections. Once the profile is generated, just one click is enough to reverse the direction or change the starting point.

With a friendly and accessible working environment

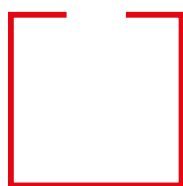
In addition to all these advantages, there are new features in terms of the working environment. In the new CNCelite, a new home page has been created where the main modes are offered and expanded with the OEM and can be customized to create a list of «favorites».

In addition, the conversational work mode has been included in the «ISO» mode, where you simply SHIFT + ESC to access the conversational cycles. There are also improvements in maintenance, where new modes are offered for better machine and program management ■



Series3

FROM SMALL S3 TO BIG L3



Fagor Automation has launched the L3 linear encoder with steel tape and lengths up to 50 meters, thus completing the Series3. The Series3 family includes encoders with optical glass: the S3, SV3, and G3. All Series3 encoders have been designed to increase productivity and reduce costs. They are, without a doubt, the most advanced linear encoders that Fagor Automation has ever developed.

The modifications and innovations implemented in Series3 affect all the technologies currently present in an encoder; from mechanics, optoelectronics, to software.

Series3 encoders all share unique features and technologies, including ease of installation, sturdiness, precision, and resolution; as well as a wide range of absolute signals for various control systems.

Easier to install

The mechanical redesign of all the families, especially the L3, has made it possible to reduce the size of the encoders. They can be installed

in smaller spaces and offer multiple mounting options without the need for nuts.

More robust

The new Series3 incorporates a set of developments that result in more robust encoders with excellent performance in demanding machining environments such as high contaminants or high levels of vibration.

The new Series3 Thermal Determined Mounting System is more rigid and maintains a certain behavior in the face of thermal variations. In addition, the readerhead and aluminum profiles

LINEAR ENCODER

UP TO 50 METERS

have been dimensionally optimized to reinforce their section where it brings more benefits.

Changes in the geometry of the aluminum profiles have made it necessary to modify the protection lips. This has been used to optimize its mechanical design and chemical composition. Specifically, these families are manufactured with a fluoropolymer, a material highly resistant to hydrocarbons and other chemical agents.

In addition, the new patented 3STATECH optical reading technology offers critical improvements to optoelectronic sub-assemblies when the encoder works in harsh machining conditions. This technology amplifies the levels of resistance to condensation and vapors, minimizing downtime and increasing machine availability.

Higher precision and resolution

The L3 family, as well as the rest of the Series3 encoders, share improvements in precision and resolution.

These aspects have been perfected by redesigning the mechanical systems that minimize the effect of alignment differences between the mobile and fixed parts to which the two parts of the encoder are joined. These modifications, along with the quality of the etched substrates and the single-window optical design, result in micro-precision encoders that are ideal for repetitive measurement and positioning.

Simultaneously, powerful electronics and custom-designed embedded software deliver nanometric resolution at high operating speeds. The result is smooth, repeatable, and accurate control.

Wide range of connectivity

The entire Series3 line has a wide range of connectivity through serial digital communication protocols, including FeeDat, the protocol developed by Fagor Automation. Through the protocol, the position (as well as other additional information) is communicated to the control system.

In the case of FeeDat, all data gathered from the encoder (most importantly position) are transmitted. However, each of the other communication protocols offers its own possibilities in regards to what additional information can be sent. That additional information can be leveraged to implement advanced capabilities and maximize performance.

L3 series

Long-range absolute linear encoders

The L3 Series is the most recent addition to the Fagor Automation catalog, reinforcing the world leadership in very long absolute linear encoders. In addition to including all the Series3 advancements, it has exclusive features focused on mounting encoders for long applications.

The L3 model integrates air and electrical connections on both sides of the head, making it possible to choose either of the two output directions without having to manipulate the head.

In addition, the redesign of the steel tape tensioning system allows the readerhead to be inserted at both ends even with the steel tape installed and tensioned. This is a well-known feature that saves time and money.

An important innovation is that the steel tape substrate used has an anti-error system that prevents its incorrect assembly. Thus, untimely and long delays during installation are avoided.

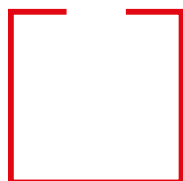
The new modules required to assemble a very long linear encoder have specific machining at the ends that easily guide the installation of the next module. Here, a rubber gasket practically prevents the entry of solid and liquid contaminants into the encoder.

The optoelectronic components are sealed. This, together with the 3STATECH optical reading technology, makes the encoder practically immune to the presence of solid or liquid contaminants ■



FAMILY WITH FUNCTIONAL SAFETY

Series3



To ensure the safety of individuals operating or working near a machine, it is imperative that machines operate within safety parameters. In such cases, the different axis of the machine must be controlled in a safe way assuring that a non-controlled movement of the machine axis cannot occur.

FAGOR AUTOMATION **is committed to the requests of our customers and partners**, especially in regards to making applications safer, which is why we are proud to launch to market the G3-FS, S3-FS, and SV3-FS family of linear encoders **with functional safety**.

The G3-FS, S3-FS, and SV3-FS encoders fulfill the functional safety standards for machinery EN ISO 13849-1:2015 and EN 61800-5-2:2016. These families of encoders also achieve the standards for relevant electronic equipment on functional safety IEC 61508:2010 as well as the newest standards IEC 61800-5-3:2021, specific for encoders. According to these standards, FAGOR safety encoders can be operated as single-encoder systems for SIL 2 or Performance Level D applications. FAGOR has been audited

and certified by TÜV SÜD during all the development processes.

Currently, these single-encoder systems can be used in conjunction with SIEMENS DRIVE-CLiQ® interfaces.

To achieve these functional safety levels, all the hardware, optics, and software of the Series3 encoder family was specifically re-designed to take into consideration the safety-related requirements. The hardware was designed to manage position data redundantly. This allows having a double stream of position data immediately on the start-up of the encoder so the machine can be operated safely just after switch on.

To accomplish this feature, Fagor has implemented a **new patented optical technology** for these safety encoders. This new optical design



will acquire redundant information of the absolute position simultaneously. Having this extra absolute position information makes the encoder start-up safer.

During the encoder operation, the software also manages all this redundant information and makes continuous checks of the determined position to assure that it is correct and it is not out of the safe position value. Furthermore, it can detect any hazardous failure that may compromise the safe operation of the machine axis. The objective is to assure the highest performance and highest safety for the machine operator under all potential dangerous circumstances.

In addition, our safety encoders include the successful 3STATECH technology. The use of the patented 3STATECH technology, already included on all Series3 encoders, provides an outstanding performance boost against contamination and the harshest machining environments.

In our new Series3 encoders, the absolute position is coded along the optical glass (or steel tape), using a pseudorandom binary code of zeros and ones. As in the traditional absolute encoders, Fagor 3STATECH encoders are able to detect the zeros and ones of this binary code. But, additionally, thanks to a redesigned optics and the smartest image processing algorithms, the encoder is able to detect if there is contamination over the measuring standard of the scales and encoders. This allows having a third state of data related to the absolute code: the «no good» data. The traditional absolute encoders are not able to detect this third data state so, under some circumstances, these encoders are not being able to determine the absolute position giving an absolute position alarm and stopping the machine or not allowing it to start up.

In contrast with the traditional absolute encoders, the Series3 encoders, using this third state information are able to detect if there is some «no-good» data. The Series3 encoders, don't use

this data for the absolute position determination. Moreover, the new optics is able to read more portion of the binary code than the actually needed to correctly calculate the absolute position. This implies that there may be more «no-good» data over the measuring standard without affecting the determination of the absolute position.

Finally, **additional verification is made on the absolute position determination.** The read absolute code is checked against all the absolute code of the encoder to assure that the position is the correct one and does not correspond to the other position of the encoder.

This exclusive **Fagor technology makes a big difference in robustness against contaminants**, especially against oil vapors that commonly accumulate after a non-operating period of time.

Concerning incremental signals, a new optoelectronic ASIC (application-specific integrated circuit) is used on Fagor safety encoders. This new ASIC has been specifically developed for safety-related applications. Also, using the experience gathered over the 40-year history of Fagor Automation on high accuracy systems, this new ASIC is able to provide the lowest sub-divisional error possible. Moreover, the software and hardware of the encoder monitor the analog signals, adapting and controlling them to provide the best signal quantity and quality. This contributes to the strongest performance against contaminants.

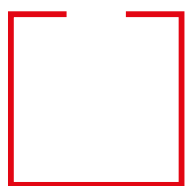
As with all Series3 encoders, the accuracy and repeatability of the safety encoders have been greatly improved. Thanks to a new design and optimization of the encoder readerhead mechanics, our safety encoders are able to minimize repeatability errors, providing the best solution on the market.

To summarize, the Fagor G3-FS, S3-FS, and SV3-FS functional safety encoders are not only ideal to fulfill the functional safety-relevant standards, but also provide high repeatability, robustness against contaminants, and the best performance ■



COMMITMENT TO THE CIRCULAR ECONOMY

AND EXTENSION OF THE LIFE CYCLE OF PRODUCTS



Fagor Automation is committed to the Circular Economy. For years, FAGOR has incorporated measures to increase the life cycle of its products. Promoting the repair and maintenance of all types of electric motors, promoting retrofit, offering a three-year warranty to manufacturers, maintaining the availability of spare parts for a period of 10 years or more, and achieving the elimination of lead or other hazardous substances in more than 99% of the materials.

3 YEARS GUARANTEE

FOR MANUFACTURERS

10 YEARS.

SPARE PARTS AVAILABILITY

The European Union is moving towards the Circular Economy. Its commitment is firm and is supported by the new Circular Economy Action Plan (CEAP). This is one of the main pillars of the European Green Deal, the new European agenda for sustainable growth.

The European Green Deal provides an action plan to transform the EU into a modern, resource-efficient, and competitive economy, helping it achieve its goal of being climate neutral by 2050.

One-third of the investments of 1.8 trillion euros of the Recovery Plan NextGenerationUE will be used precisely to finance the actions of this pact.

CEAP promotes initiatives that cover the entire life cycle of products, trying to recover the right to repair and extend the useful life of products.

Motorlan: Repair and Maintenance

Fagor Automation is aware of the need for these initiatives. For years, FAGOR already applied some measures in line with the Circular Economy:

- The Motorlan Repair Center is dedicated to the repair and maintenance of all types of electric motors and their electronic regulation. When dealing with the maintenance or repair of engines, Motorlan focuses on their consumption being efficient. Motorlan has an impact on sustainability and is committed to reconditioning this type of engine. In addition, years ago Motorlan launched a website for the sale of used engines.

- Fagor Automation makes it easy for users to extend the life of their machines by promoting the retrofit of the machine tool, which consists of updating or modernizing the obsolete machine. Thanks to retrofitting, the entire CNC and drive system can be renewed while maintaining the mechanics of the machine, achieving a practically new machine at a lower cost.

- So that the assembly and storage times of the machines do not penalize or reduce the guaranteed time that reaches the end-user, Fagor offers a de facto three-year guarantee to manufacturers. In addition, it maintains the availability of spare parts for a period of 10 years or more.

- Although the production activity has a very low environmental impact, Fagor Automation works to offer solutions that further reduce the environmental impact. The elimination of lead and other dangerous substances has already been achieved, following the European RoHS directive in more than 99% of the materials. The requirement for the RoHS certificate by the supplier has been included as part of the process of homologation of raw materials and commercialized products, in addition to undertaking the necessary investments to guarantee it in the production processes.

These types of measures aimed at greater sustainability reaffirm Fagor Automation in its Cooperative Principles since they are the values that sustain the company and are part of its hallmarks. As an agent of social transformation, FAGOR commits to solidarity and sustainable development ■



Mr. Delio Mugnaioni, CEO of CUTLITE PENTA

CUTLITE PENTA

EFFICIENCY AND PRAGMATISM AT THE SERVICE OF PRODUCTIVITY

Founded in 1992, the Italian company Cutlite Penta SRL is a market leader in CO2 laser systems for cutting metal, plastic, wood, and die materials. The engineer Delio Mugnaioni, CEO of Cutlite Penta, explains that the company's objective is «to provide the customer with the best possible machine, designed according to their needs and with an excellent value for money»

Measurement resolution enables precision and repeatability.

Why have you incorporated Fagor linear encoders into your machines?

We started using Fagor products in 2019 because we were looking for a partner who could provide us with a high-performance, high-tech product; that would also be in a position to develop new projects with our company.

How do Fagor feedback systems work?

The technological solution that we have chosen from Fagor is the tensioned model for very long, high-precision exposed encoder. Thanks to an aluminum guide glued or screwed to the surface of the machine, and a suitably tensioned graduated steel strip, we obtain a thermal behavior equal to that of the clamping surface of the same strip. This is fundamental in guaranteeing repeatability and precision.

What characteristics stand out for Fagor linear encoders?

Multiple characteristics come to mind, the most important being precision. We know that all Fagor linear encoders offer precise control over the entire measurement path. The transmission signal includes various communication protocols that are supported by leading CNC manufacturers. Also, the measurement resolution allows us to obtain precision and repeatability. And, last but not least, speed. Being manufacturers of laser cutting machines, having a measurement system capable of withstanding high speeds and accelerations is a fundamental requirement.

What is your opinion of the Fagor Automation service?

We are very satisfied, our Fagor Italia representatives are always available to promptly provide solutions to the requests we have made, both technical and commercial. The relationship is personable and this greatly facilitates collaboration.

What needs do you think the CNC market will raise in the short and medium-term?

From a technological point of view, evolutions are always on the agenda. Particularly in the world of laser cutting, we are moving in the direction of large machines and therefore with increasingly long measuring paths. Therefore, we need to have a partner who knows how to promptly provide us with open contactless measurement rules that can satisfy these types of needs ■



CUTLITE PENTA

Company: Cutlite Penta

Address: Via Guimaraes 7/9. 59100 – Prato

Employees: 120

Production surface: 10000 SQM

Sector: Fiber laser and CO₂ laser

Activity: Design and development of fiber laser systems for metal cutting and CO₂ laser systems for cutting plastic, wood and dies

北京海宝精机数控机械有限公司
Beijing Hi-powerful CNC Machine Co., Ltd.
数控可转位刀片周边磨床



北京海宝精机
Beijing Hi-powerful

HP250 PLUS

BEIJING HI-POWERFUL CNC MACHINE

Beijing Hi-Powerful CNC Machine Co., Ltd. was founded in 2010. Since the establishment of the company, Beijing Hi-Powerful has been focusing on the research, development, and manufacturing of high-end intelligent equipment.

Beijing Hi-Powerful's main products, CNC indexable blade peripheral grinders and electrofusion pipe joint wiring machines, are well received by customers for their excellent performance, efficiency, and high stability.

What are your company's main products?

What makes your products have a higher share in the market?

Our company's main product is CNC indexable blade peripheral grinders. There are many factors that have led to today's success, but the most important one is our long-term experience accumulation and our knowledge of blade grinding technology.

Why have you incorporated Fagor Automation control and feedback systems in your machines?

Beijing Hi-Powerful CNC Machine Co., Ltd. has a long friendship with Fagor Automation. We have been familiar with Fagor products since the early 1980s. We select Fagor products as our machine tool's standard configuration without any hesitation at the beginning of Beijing Hi-Powerful running in 2010.

How would you rate the performance of the Fagor Automation solution? Would you consider their solutions «tailored» for your machine/sector?

Our customers give the Fagor products very high praise.

Fagor supplies us with an integrated solution: CNC, digital servo motors and drives, linear and angular encoders, almost every electronic element for our machine. These elements all work in perfect harmony, intelligently selecting and executing the machining algorithms ensuring seamless integration, guaranteeing robust machine design and extreme performance to obtain maximum efficiency.

With the help of Fagor Automation, we have developed a special CNC interface for blade grinding. The operator does not need any professional programming knowledge, they only need to input a few process parameters. Once the adjustment of the blade grinding program is completed, the machining process is more efficient and convenient.

What features of the entire Fagor Automation package would you highlight?

Currently, we use Fagor's next-generation product Quercus in the manufacturing of our machines. It includes CNCs, Servo drivers, Power supplies, and related accessories. Fagor Automation redesigned its products with a combination of decades of knowledge and experience in the machine tool sector with technological advancements

of the future. These next-generation products include a wide range of outstanding new features.

The CNC hardware has been redesigned with a more powerful CPU and expandable functions. All models support more powerful and agile control algorithms. The CNC is open to integrate future enhancements to ensure our product continues are future-proof. Quercus also allows the configuration of the machine to be more simplified and efficient.

Likewise, Fagor Automation has redesigned all servo controllers and power supplies with state-of-the-art components. The new products are more compact and easier to assemble.

What demands do you think the CNC market will set in the short and medium-term?

With the development of modern manufacturing, CNC systems should be developed towards intelligence, networking, and openness. In the development process, it is also necessary to solve network manufacturing interface problems, cross-platform operation communication mechanisms, and advanced control algorithms. But in the short and medium-term, different sectors have different demands. So specialization and customization are very important for CNC ■



Company: Beijing Hi-Powerful CNC Machine Co., Ltd.

Address: Yangfang Industrial Park, Changping District, Beijing (102205)

Employees: 40

Production surface: 3000 SQM

Sector: Grinding Machine tool

Activity: CNC indexable blade peripheral grinders

Number of machines produced per year: 60



Mr. Santiago Riera, manager of RIERGE

RIERGE

IS ATTENTIVE TO TECHNOLOGICAL EVOLUTION

Rierge was founded in 1954. Since 1990, it has specialized in the design and manufacturing of Machining Centers tailored to the client. The company has always been attentive to the constant change in trends, technological evolution, and new materials. Santiago Riera, manager of Rierge, explains the relationship between his company and Fagor Automation.

THE MARKET WILL DEMAND GREATER AUTOMATION, GREATER CONTROL AND DATA PROCESSING

How did you start working with Fagor Automation products?

We incorporated Fagor Automation linear encoders into our machines seven years ago. Subsequently, a client asked us to integrate a Fagor CNC into a new machine and we found it interesting to have another supplier of numerical controls.

What have you discovered about Fagor Automation products with your machines?

Our company manufactures machining centers for different sectors such as aeronautics, automotive, aluminum, wood ... we have to build each machine under the client's requirements. Fagor allows us to adapt to each case and obtain the most appropriate technical configuration.

What characteristics would you highlight about Fagor products?

With Fagor's product line, we cover our automation needs from the simplest to the most complex machine. The new Quercus and Optima platforms both enhance existing qualities, as well as provide robustness, that allows us to connect with third parties and fully integrate the different systems of a machine, exceeding current automation standards.

Fagor systems allow us to manage the data of all the elements of the machine.

What is your opinion of the Fagor Automation service?

Our technical service must be fast and efficient because our clients cannot afford machine shutdowns, especially with breakdowns or incidents. With Fagor, we can directly contact the technicians responsible for each product area. This facilitates good service management and reduces waiting times for our customers. It is undoubtedly a distinct advantage.

What demands do you think the market will mark in the short and medium-term?

Rierge's R&D departments have been developing flexible machining solutions for years. Mass-produced machine series are long gone and customers are looking for flexibility and rapid adaptation of the machine to product manufacturing changes.

Once this flexibility is achieved, we need to digitize our processes and generate management solutions for raw materials in their storage and in the loading/unloading of machining centers. These should be done automatically, eliminating unnecessary material movement processes, to make the investments profitable.

To optimize and achieve the maximum performance of the facilities, we need to have an online control of the production capacity, to know at all times how the order is, and to be able to manage that information appropriately.

We believe that the market will require greater automation, greater control, and data processing. This is obtained by using axis control elements and software that helps to process the data that we obtain from the system.

The integrators, together with the developers of Fagor systems, have to go hand in hand to achieve results that meet the expectations of our customers ■



Company: Rierge

Address: Pol. Martorelles. C/ Sant Martí, 65-71.
Recinto Industrial, Nave 14. E08107 Martorelles
(Barcelona)

Employees: 50

Number of production units: 40 units

Sector: Manufacture of custom machines

Activity: Development of plasma and laser
pantographs as well as numerical control
machining centers



JIANGSU JITRI JINGKAI

Jiangsu Jitri Jingkai High-value Equipment Technology Co., Ltd. is located in Kunshan City, Jiangsu Province, and was established in April 2019. The company provides solutions for optics, medical equipment, automobiles, molds, high-end equipment, and other fields. It focuses on the research and development, manufacturing, sales, and services of high-end equipment manufacturing. They apply different technologies such as processing, detection/measurement, system integration, and other key industrial technologies.

The company cooperates with innovative and entrepreneurial companies in the field of high-end equipment manufacturing. Prioritizing its R&D platform, Jiangsu Jitri Jingkai formed its own industrial cluster in the field of high precision CNC grinding machines.

What are your company's main products? What makes your products have a higher share in the market?

We are mainly specialized in manufacturing high precision grinding machines.

The basis of our success and our rapid growth is the ability to offer high-quality, high-performance grinding machines at very competitive prices.

Why have you chosen to incorporate Fagor Automation CNCs and feedback devices in your machines? How long have you integrated their solution?

Since the birth of the company in April 2019, Fagor became an immediate partner, rather than just a simple supplier, because they understood our idea and understood what we were looking for with our products. This allowed us from our very first generation of grinding machines to be able to offer our customers multiple options. This continued support from Fagor, along with the quality and flexibility of their products, made future projects easy.

How would you assess the performance of Fagor Automation's solution? Are they «tailored» solutions for your machine/sector?

The sector in which we operate often requires the customization of the machines to the needs of our customers. Fagor has allowed us to offer these customized solutions to our customers, especially with its new generation of CNC machines that offer unparalleled ease of adaptation.

The speed, accuracy, and other performance characteristics of Fagor QUERCUS and feedback products meet our requirements perfectly. With a full set of Fagor configurations, the installation and commissioning of our grinding machine are very convenient. In addition, the smaller size of the drive and power supply allows our electrical cabinet size to be made smaller. What I like the most is the openness and ease of using of the system, which is very convenient for us to develop special grinding programs for».

What features of the entire Fagor Automation package would you highlight?

There are many Fagor functionalities that we use in our machines, but more than highlighting any of them in particular I would highlight Fagor's adaptability to provide us with tailor-made solutions. This allows us to scale the machines exactly to the requirements of our customers in terms of quality and price.

What is your opinion of Fagor Automation service?

Machines like ours require a fast and quality after-sales service. As we do not manufacture standard machines, we need

specialized people to serve our customers correctly. We have found Fagor Automation to be the right partner because they have highly qualified engineers who are able to travel and solve problems within 24 hours.

What demands do you think the CNC market will set in the future?

In the world of grinding, linear motors will become increasingly important drives, and CNC systems will have to focus on high speed, high precision at very competitive prices. We believe that our collaboration with Fagor will lead us to implement these solutions and make a continuous improvement of our machines ■



Company: JIANGSU JITRI JINGKAI
HIGH-VALUE MANUFACTURING CO.,
LTD.

Address: No.108, Fengqin Road,
Development Area, Kunshan, Suzhou
City, Jiangsu Province.

Employees: 70

Production surface: 20000 SQM

Sector: Machine tool manufacturing

Activity: Grinding machine,
High-precision motion platform

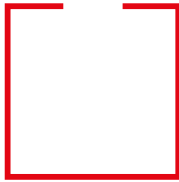
**Number of machines produced
per year:** 30



Machines in production plants will be even more efficient and competitive with industrial digitization.

FAGOR'S MAIN OBJECTIVE IS TO OVERSEE THE DIGITIZATION PROCESS OF PRODUCTION PLANTS

A dialogue with Fagor Director of Business Services, Igor Murguiondo



Fagor Digital Suite, Fagor's digitization platform covers all needs, both for users and manufacturers.

We have been talking about Industry 4.0 (i4.0) for several years. How do you assess the current situation?

The truth is that we have been talking about it, let's call it i4.0, digitization, or any other terminology, for many years. Virtually all the technologies applied in this area, and the potential for their development, already existed even before the terminology i4.0 became fashionable. What is happening in recent years and now is that we are going from a «media boom». In many cases, i4.0 remained in theory with few real applications to real market demand with offers of value of technologies derived from digitization that bring significant benefits to users.

This growing demand is fueled in two ways. One is the real need of users who need to improve the profitability and management of their assets (availability, efficiency, productivity, quality ...). And the second is the push of governments, both national and European, that promote the modernization and digitization of assets with direct aid to the sector.

We have gone from talking a lot about I4.0, where all the agents in the sector wanted to position themselves (but without a clear supply-demand or effective applicability) to a situation in which real needs have been

defined together with the development of the offer of value to the customer.

What evolution has Fagor's product had in the technologies related to i4.0?

As I mentioned, the technologies applied are not new, as all of them have been incorporated into Fagor products for years. This means that the entire Fagor product range in the current catalog and the equipment sold beyond even the last decade are ready for the complete digitization of the machines on which they are mounted.

It is also true that current equipment includes a series of new features and protocols that have been standardized in the sector and that facilitate and improve implantability and interoperability with other systems present in production plants, taking the degree of digitization and connectivity to levels far superior.

Fagor's offer, both in terms of product and services (being that we are experts in machine automation) applies the most advanced technologies, even well ahead of other agents that are present in our sector. Many of the technological evolutions applied come from multiple national and European collaboration projects with partners such as technology centers, universities, manufacturers, users, and other agents in the sector.

What does Fagor Automation understand of digitization or i4.0?

The terminology used (i4.0, IoT, digitization, connectivity, monitoring...) can give rise to many interpretations. In reality, it is the sum of all of them that we understand as i4.0. The application of technologies such as sensorization and data capture (« big data»), analytics, and artificial intelligence locally or in the cloud (edge or cloud computing), allow integrating processes that were isolated, generating information flows from automated and optimized production.

What benefit does a user or manufacturer obtain with the solution that Fagor offers?

The main objective of Fagor is accompanied by the process of digitalization of the production plants of our customers, enabling connect their assets with other systems production and management. To do this, we can implement a hardware and software infrastructure in a fast, simple, and non-intrusive way, allowing us to capture all the necessary data and transform it into valuable information to facilitate decision-making. Based on this infrastructure and a standard catalog, the offer is scalable up to the point of implementing customized projects and developments adjusting to the needs and requirements of each client.

Furthermore, Fagor's value proposition allows interoperability with many of the systems involved in a production process, including machines with automation packages and CNCs

from manufacturers other than Fagor, provided that they are prepared with the technologies and protocols of adequate connectivity and established as standards currently.

Of course, with the volumes of information transferred, it is essential today to offer all these services with a level of security that is validated by the corresponding entities. Thus, the solution implemented by Fagor has ISO / IEC 15408: 2009, ISO / IEC 18045: 2008, and Common Criteria certifications that fully guarantee data security.

What is Fagor Automation's offer in the field of digitization? Who is the entire offer of i4.0 aimed towards from Fagor?

Fagor's digitization platform covers practically all needs, both for users and manufacturers.

It is aimed at users who seek to have indicators to improve the availability and efficiency of their machines by integrating information on the machine, technical office, personnel, planning, and production more efficiently and managing the maintenance of their assets. The modules that make up the standard offer provide valuable information in areas such as availability, efficiency, quality, OEE, electrical data, and energy consumption, production and reject costs, and reporting.

On the other hand, it is also aimed at manufacturers who want to manage their assets, also enabling new services on them. Specifically, a suite of tools is provided to the machine builder that enables the creation of new digital products and services.

 CERTIFICATIONS

ISO/IEC **15408:2009**,
ISO/IEC **18045:2008** AND
COMMON CRITERIA.



Igor Murguiondo, Services Business Director , Fagor Automation S. Coop.

What evolution is expected in the medium or long term in this area?

Digitization is not a fad, it has come to stay.

With the arrival of the «Internet of things», sensorization, interoperability of systems, processing and analysis of large volumes of data from various sources within industrial environments either locally or in the cloud and its accessibility, The development of cybersecurity and communications have provided companies with previously unthinkable capabilities and potential for rapid intelligent decision-making. It involves implementing a new way of responding effectively to production needs, with much more agile, almost automatic decision-making methods.

In short, all the machines in the production plants that want to be more efficient and competitive will be digitized, even forcing changes in the capabilities of employees when moving from ordinary tasks to monitoring automated processes and decision-making.

ADVANTAGES OF FAGOR DIGITAL SUITE FOR USERS

The modules that make up the standard offer provide valuable information in areas such as:

Availability:

- Oriented to Production Headquarters.
- Histories of machine work states, reasons and downtime, the evolution and comparison of availability by shifts, manufacturing order, part program, etc.

Efficiency:

- Oriented to Production Headquarters.
- Real-time and historical data by periods, evolution, and comparison of the real and theoretical machine efficiency by shifts, manufacturing order, part program, etc. identifying the reasons for greater or lesser efficiency.

Quality:

- Oriented to Production Headquarters
- Historical by periods, evolution, and comparison of quality and rejections reported by machine, shifts, manufacturing order, part program, etc.

OEE:

- Oriented to Production Headquarters.
- Comparison of OEE progress based on availability, efficiency, and quality data by shift, build order, etc. helping you know where to act appropriately and improve your productivity.

Electrical data and energy consumption:

- Oriented to Production and Maintenance Headquarters.
- Have the data of production by machines, shifts, manufacturing order, etc., crossed with electrical data and energy consumption.

Production and reject costs:

- Direction Oriented.
- Overview of machine production vs objectives, a summary of rejects, cost analysis, etc. per machine, day, shift, etc.

Reporting:

- Oriented to all profiles.
- Generation of automatic and periodic specific reports for each type of profile: Management, Production, Maintenance, Quality ...



ADVANTAGES OF FAGOR DIGITAL SUITE FOR MANUFACTURERS

The suite of tools for the machine builder enables the creation of new digital products and services:

All user-oriented services: Manufacturers will have access to all modules and features related to machine data.

Personalized virtual cloud with the management of assets, accesses, users, etc.

Teleservice and maintenance: Allows remote access and diagnosis, management of notices and alarms, etc.

The platform enables the **remote update** of firmware, PLCs, etc.

Development and administration of APIs: It allows the development and deployment of applications in your machine park, with global or individualized management, and that can be oriented to new features, maintenance, etc. ■



POWER2POWER

MORE ENERGY, LESS ENVIRONMENTAL IMPACT



Fagor participates in an ambitious European project that aims to provide silicon-based energy solutions and contribute to decarbonization

Power
2
Power

The Power2Power project brings together 43 partners from 8 countries to develop silicon-based electrical semiconductors with higher energy efficiency and electrical density.

This type of technology will increase the performance of a large number of applications in industry, mobility, the supply network, and renewable energies; and it will contribute significantly to the reduction of carbon dioxide emissions.

Project partners have established pan-European pilot lines with advanced aspects of Industry 4.0 to develop innovative electrical electronic devices suitable for the future.

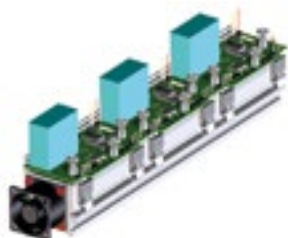
They have prioritized silicon because it outperforms new emerging materials for its high reliability and excellent price-performance ratio. Power2Power will strengthen the dominant position of silicon-based electrical semiconductors in the world market over the next decade.

The project began on June 1, 2019, has a duration of 3 years, and has a budget of 74,257,768.75 euros financed by the European Commission and the Ministry of Energy, Tourism, and Digital Agenda.

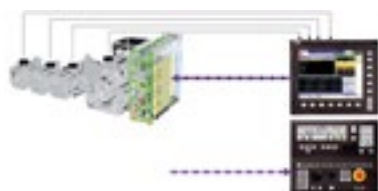
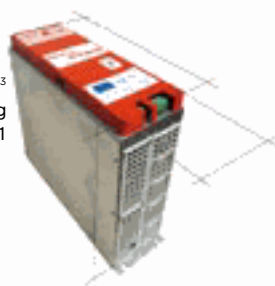
The project is led by the German multinational Infineon Technologies AG, a world leader in semiconductor manufacturing.

74.257.768,75 EUROS

43 PARTNERS FROM 8 COUNTRIES



22.262 cm³
18,6 kg
55,4 kW S1



Minimize the impact on the carbon footprint

In Power2Power, Fagor Automation's participation corresponds to the design, qualification, and reliability of a demonstrator for a flexible and configurable compact inverter/converter module.

Currently, Fagor's market in CNC Regulation requires having, for different equipment, multiple references of which a small number of units are manufactured.

Fagor wants to adapt the product to the requirements of its market and maximize the reduction of extra costs originated by the management, the material control processes, the storage of materials, scrap, penalties in unit costs, etc.

Fagor Automation has set itself the objective of rationalizing and reducing energy consumption, thus minimizing the impact of its activity on the carbon footprint. To do this, FAGOR is designing a new family of products that allow it to manufacture, with the minimum of materials, most of the product references that the market demands.

Basic power module

Achieving this objective is possible by having a base element called IPBB (Inverter Power Building Block). It is a complete three-phase H, which includes the power IGBTs with the Gate Drivers, DC / DC converters, current sensor, DC-Link capacitor, cooler, and fan. All this forms a semi-finished base power. Combinations of these components generate different capacity Inverters / Converters that are multiples of the base power capacity, allowing the manufacture of a wide catalog of products such as that required by the Fagor Automation market.

For the designed demonstrator, a box has been chosen that includes five IPBBs, called MACS (Multi-Axis Control System), which can form a compact module for a complete machine (milling machine) composed of a regenerative source plus ahead and three axes. And a lathe with a regenerative source, a dual power base head, and two axes.

The versatility of the product allows you to combine the five IPBBs included in the box in any way you want, multiplying or not their base power capacity.

Likewise, it is also possible to combine different MACS, enabling configurations for multi-axis machines of the desired power.

Digital Twin

Fagor Automation is designing a Digital Twin together with UPM, CSIC, and TST.

The aim is to develop a Digital Twin that is executed as an option in Fagor CNCs and that provides predictive control of the status of the machine's regulators and, as a novelty, also of the motors. For this, a data acquisition card designed by TST must be integrated into the motor, which communicates and feeds with the drive through the two wires provided for the thermal probe in the feedback cables ■



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Fagor Automation holds the
ISO 9001 Quality System Certificate and the
CE Certificate for all products manufactured.

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