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The right machine for every customer's need

Gamma 20: the perfect addition to the range

Is it time to consider pursuing medical parts work?

The next generation…

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SUMMARY

Medical Industry

New Engineering Solutions for the Human Body

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Dmin. 4 mm

TANGGRIP

- Excellent part straightness and improved surface finish
- Unique tangential clamping method
- Increased tool life

SWISSCUT

A compact tool design for Swiss-type automatics and CNC lathes, providing reduced setup time and easy indexing without having to remove the toolholder from the machine.

SOLIDDRILL

The unique requirements of the medical industry make specially tailored drills essential for optimal performance.

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DARE WITH INNOVATION, WIN WITH SERVICE!

As is the case with the bar turning businesses and general manufacturers that are our customers, in France as elsewhere, Tornos has endured unprecedented economic hardships.

Brutal, long lasting and heavy hitting

These three aspects of this economic crisis summarise the catastrophic situation that many among us have not taken lying down. It is by working shoulder to shoulder with our national and local governments, and thanks to our financial partners that we can look forward to a brighter future.

With Tornos, thanks in particular to short-time working and different training plans, our workforce numbers have remained stable and they are ready to resume full-time work, which will occur very soon indeed. Tornos, like many machine tool manufacturers is preparing for its future with a lot of faith and hope.

The R&D engineer teams have been working tirelessly to ensure we face 2010 with the best "weapons" to face increasingly fierce global competitors. We all hope for a change for the better in 2010, with our commitment remaining wholehearted to ensure our businesses model remains competitive. Despite a difficult year in 2009, the foundations of Tornos remain firm and healthy and this offers investors, a long-lasting and profitable investment.

As with the automotive industry, we have made daring alliances to offer you machine tools that better suit your needs and this is coupled with an ever better service.

- The Delta and Gamma machines (see page 22) are perfect examples of this: these formidable little machines will convince you to increase productivity and replace your camshaft turning machines.
- The Sigma machines meet the exacting machining requirements encountered in the automotive industry quickly and perfectly (see the articles on this subject relating to our partner Ugitech, page 22 and Sigma 32, page 6). Easy to understand and operate, with unique power and machining possibilities enabling you to effectively meet the demands of the ultra-competitive subcontracting market.
- The EvoDeco machines that were revealed at the grand unveiling at Simodec (see page 18) are the high-tech machines of the future, and will transcend the revolution in bar turning brought by the Deco 2000. Applied technologies for the medical, aeronautical, connectivity business and general industries are already our challenges for tomorrow and you will be able to discover these at Simodec 2010 (Hall A, Stand C32/D23).
- High productivity and precision remain the prerogative of our multi CNC and our engineers are continuing to work to offer a large surprise of offerings in 2010

Dear customers, in 2010, you will be pleased to know that Tornos will continue to offer you a technical and sales team that maintains its high levels of motivation, experience and expertise. The entire team at Tornos Technologies France wishes you a successful year and invites you to attend the Simodec exhibition from the 2nd to the 6th of March 2010.

Patrice Armeni

Sales director of Tornos Technologies France

UNPRECEDENTED SUCCESS!

Both a marker of social distinction and a recreational tool, this product has seen extraordinary growth over the last 100 years. From 250,000 units in 1907, this figure grew to 50 million in the 1930's and over 300 million in 1975. In 2007 annual production went over 70 million units and the global fleet may exceed a billion in 2010 and 3 billion by 2050. There are an estimated 100,000 patents associated with today's models. The loyal companion of man in industrialised countries, this product stirs up the passion of many. Welcome to the world of the automobile.

To discuss this subject, we met with Brice Renggli, the Head of Marketing at Tornos.

Following the markets

Rarely has a product been the source of as many controversies. The automobile is a product that evokes and stirs up the passion of many… and in the background, its effect on industry is very important. *"At Tornos, we have been following the evolution of the markets in a very detailed manner. We have been suppliers to the automotive industry for several decades and we wish to offer solutions that respond to the latest trends in component manufacturing,"* notes Mr Renggli.

Some facts and figures

The European, Japanese and American markets can be considered to be mature. In 2008, they suffered the full force of the global financial crisis that caused sales to fall by approximately 15%. The Brazilian, Russian, Indian and Chinese markets (BRIC) continued to increase and could grow past the level of the American market quite rapidly. In the USA, the figures show that for every 1000 people who have a driver's license, 900 have a car at their disposal. In Europe and Japan, the more developed public transport infrastructures and higher population densities mean this figure is reduced to 600. In Russia, this figure is less than 200, in Brazil 130, in China approximately 30 and in India less than 10.

Global market

As we have seen above, the sale of vehicles is a global operation and production follows this evolution. Import taxes can force manufacturers to produce

THE FULLY ELECTRIC CAR? IS IT JUST A DREAM?

If today a fully electric car seems impractical, the evolution of technology particularly in the manufacture of Lithium Ion batteries may change this radically. Studies show that between now and 2025, a third of new cars sold may be electric. Ten automobile manufacturers have announced they will be producing electric cars before 2012!

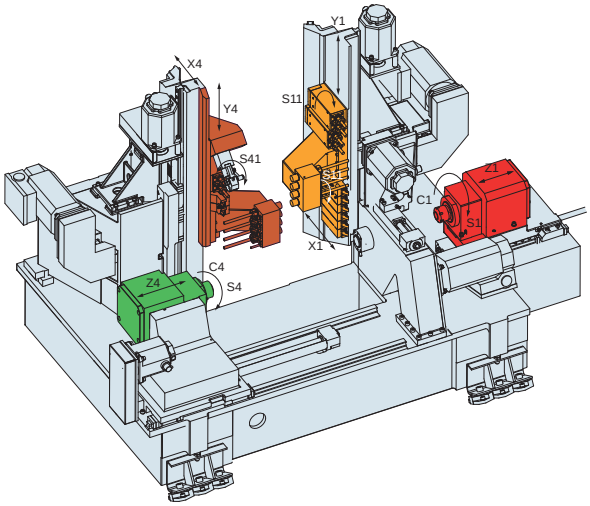
vehicles in the countries they are targeting. In this context, automotive subcontractors ought to think on a global scale, as well as manufacturers of capital goods.

There will always be parts

Volume is not the only evolution. Manufacturers are increasingly turning their attention to alternative solutions within the manufacture of cars. The future is clearly 'zero emissions' and all manufacturers are working on new hybrid, hydrogen or fully electric models. Mr Renggli tells us: *"The end is not quite in sight for the internal combustion engine, but the evolution of norms towards reduced emissions and consumption is already creating new challenges for our part producing customers. The complete change of technology will create new parts and challenges, but we will not abandon our customers".* The company's experience in the automotive field and its constraints is a real advantage in this partnership.

Machines to produce the parts

All this information is interesting to machine manufacturers for several reasons, particularly for developing production methods that meet current requirements. Traditionally, short parts with a configuration of straightforward to medium complexity are made



with multi-spindle lathes. With the arrival of the MultiAlpha machines, Tornos has again improved the capabilities of this type of production, particularly in terms of machining and secondary operations.

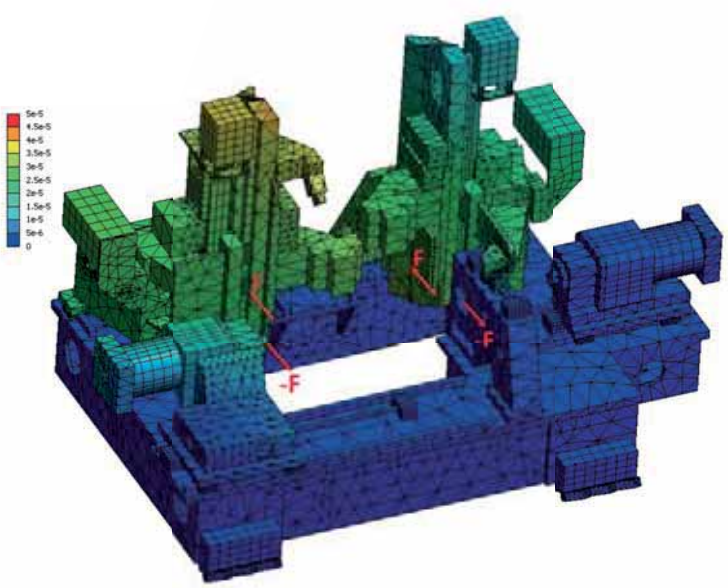
Long parts that require major removal of materials at sustained speed are made using single-spindle turning machines with sliding headstock. The Sigma 32 turning machine is particularly well designed for this type of machining that is widespread in the automotive industry.

Sigma 32: automotive partner

Tornos, using the best designed tools through the finite element method has designed the Sigma 32 with complete balance between operation and secondary operation. The machine benefits from rigidity during operation comparable to the best machines in the 32 mm market. However with its counter spindle with a power of 6.0/7.5 kW (identical to the main spindle), its rigidity in secondary operation up to 3x greater than its competitors and a wide range of tools identical to those available for main operation, this machine uniquely allows perfectly parallel machining operations. In addition to perfect tool holding and machining quality in secondary operations, the Sigma 32 provides returns 30% greater than most of its competitors.

Rigidity… and more

The entire machine was designed using finite element simulation. Rigidity in operation and secondary operation is therefore not reduced by other components; the entire structure is very rigid and was designed for heavy machining. Its capabilities are further reinforced by the addition of a deburring tool to the guide bush.

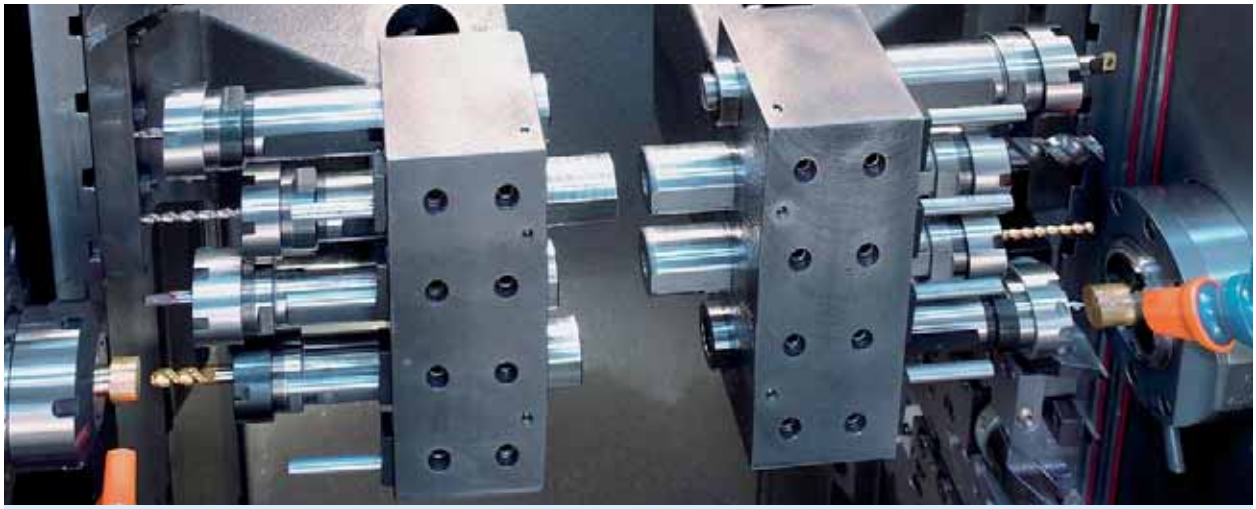


In this way, the machine is the only one on the market equipped with two tool systems able to engage three tools simultaneously into the material.

All these characteristics will result in the creation of a large volume of swarf. The evacuation of swarf has therefore been carefully developed, as well as the accessibility of the tools. The 14 tools (of which 8 are rotating) available in normal operation and the 8 (all turning if required) in secondary operation can be pre-set and can be fitted with quick change devices (for more information, see the Ugitech article on page 27).

Designed to serve the user

The ergonomics give the ideal combination of the technological aspects and working conditions. If the deburring tool is easily accessible, it is still ideally positioned at a working angle of 180° with the finishing tool. In this way a single cutting force vector is generated, which of course minimises the risk of vibrations. The minimal heat dissipation of the spindles (cooled) also contributes to ensure the precision of the machine. To conclude, Mr Renggli tells us: *"In the automotive field, our customers require machining equipment that they can rely on. The architecture of the Sigma 32 machine and its high rigidity allow it to complete relatively complex parts with high levels of precision and a perfect finish. With excellent repeatability, production with the Sigma 32 is synonymous with peace of mind"*.



EXAMPLES OF MACHINING AUTOMOTIVE PARTS

Michel Raveane, product engineer with Tornos gave us some example of parts produced by the Sigma 32. He tells us: *"We have carried out numerous tests as have our customers. The Sigma 32 affords them significant gains in productivity since there is no need to compromise machining in secondary operation".*

1. Hydraulic slide valve

Diameter 30 mm, length 76 mm
9 SMn Pb28K steel
Turning: Cutting speed: 350 m/min
Feed: 0.25 mm/turn
Time: 4.5 min/workpiece
Drilling: Cutting speed: 120 m/min
Feed: 0.12 mm/turn

Production of the finished workpiece on the Sigma 32 turning machine

2. Pump shaft

Diameter 16, length 150 mm
Steel: 100Cr6
Turning: Cutting speed: 95 m/min
Feed: 0.25 mm/turn
Time: 34 sec/workpiece
Swarf height: 2.5 mm

Production of the finished workpiece on the Sigma 32 turning machine

3. Equipment

Diameter 28, length 70 mm
Steel: 303 stainless steel
Turning: Cutting speed: 200 m/min
Feed: 0.25 mm/turn
Time: 78 sec/workpiece
Pass height: 4 mm
Tapping with cutting tap: M16x2
Cutting speed: 12 m/min
Drilling: Cutting speed: 55 m/min dia 6
Feed: 0.08 mm/turn (concurrent operation time)

Production of the finished workpiece on the Sigma 32 turning machine

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Habegger Führungsbüchse 3 Positionen
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THE RIGHT MACHINE FOR EVERY CUSTOMER'S NEED

How Tornos makes its product range evolve to meet customers 'expectations
An article by Dr Willi Nef, head of Sales and Marketing for Tornos.

The world changes
Just some years ago, customers invested in machines that fit into their workshops in an ideal way that allows them to produce different parts that may come up in the future. The highest quality requirements and tremendous price pressure force customers to now look more specifically for products that just satisfy the actual needs – leaving behind machine features that could be needed in the future, but due to price pressure are not considered anymore. To answer to this trend, Tornos has invested tremendous efforts in its new products.

3 main product groups
Today Tornos produces single spindle machines, multispindle machines, machining centers, mill-turn centers and specialist machines. While it is well known that Tornos produces single spindle and multispindle products, many may not realise that other types of machines are also available. Integration of the Almac company in 2008 significantly extended the Tornos product range and many new applications can now be covered with these new machines in the Tornos portfolio.

Changing markets needs
In 1996, when the Deco machine was introduced it was a revolution, a paradigm shift. Capability and productivity were brought to a completely new level. A similar effect occurred with the MultiDeco in 1997. Why do we need other machines, other platforms, if Deco is so capable?
The main reason is the cost pressure our customers face for producing a specific part. When the parts

to be produced require high accuracy, are complex and high productivity is needed the choice is easy – a Deco from Tornos.
However, there are a lot of parts out there that do not allow customers to invest in such an advanced machine that also comes with a related price tag. Today's markets push customers to invest into paying the absolute minimum for a machine perfectly adapted to the parts. Obviously different parts mean different ways to produce them. To avoid starting each time from scratch, machines with the same concept and many identical elements are developed and form a product platform.

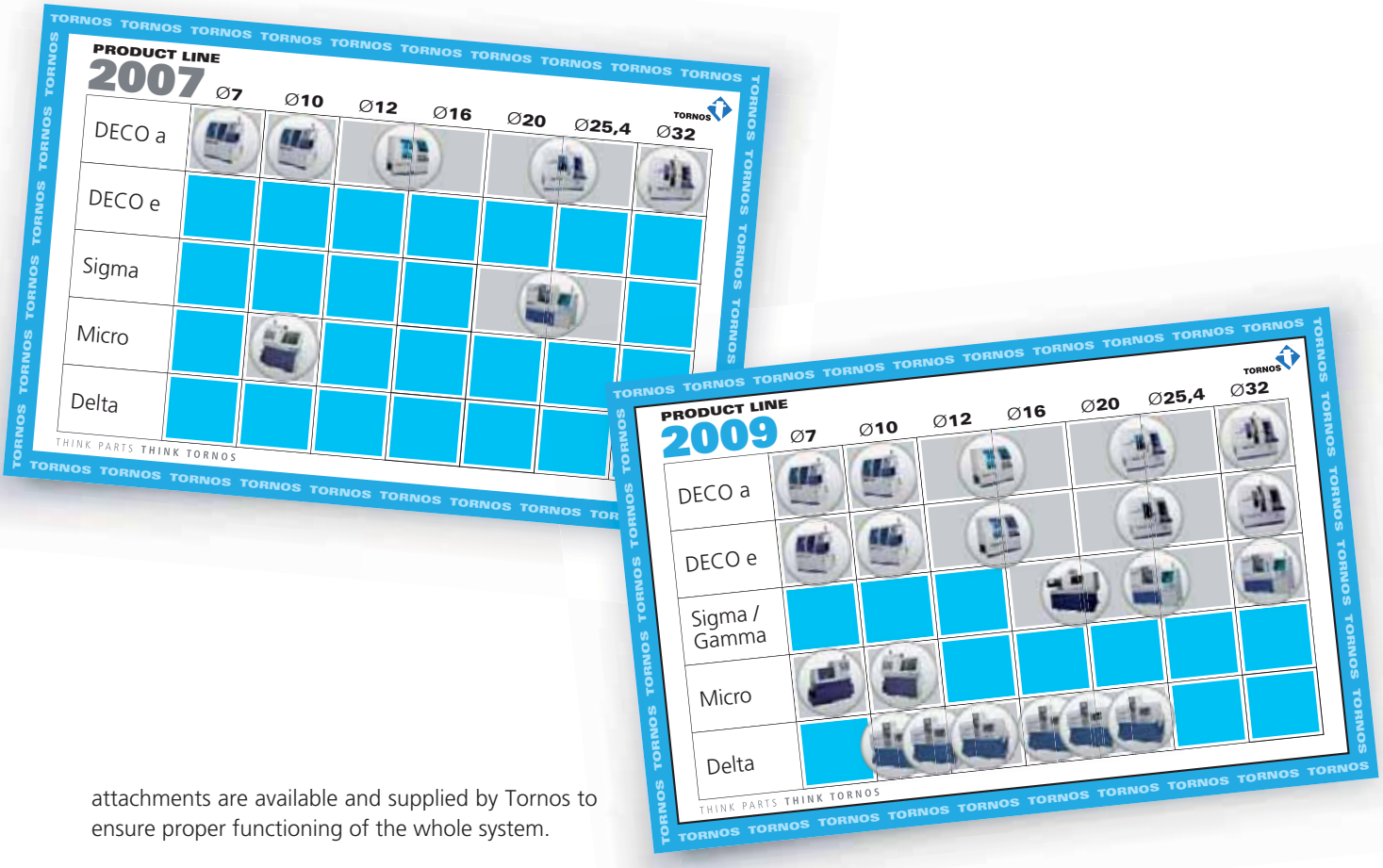
Reasons for platforms
In the 1980' the automotive industry started to realize that time and cost needed for developing a new car was just no longer affordable. Companies started to develop cars based on the same concept with basically the same drive train. Then, according to the model that was under development the specific body was designed and engines, gear boxes and brake systems could be adapted easily. And further, having various platforms allowed manufacturers to keep the number of key elements to be developed such as engines to a minimum as different platforms could use the same engine. For instance, despite different shapes and performance parameters, the Skoda Octavia and the Audi TT share around 60% the same parts.
Using the same platform improved the two most critical criteria – developing cost and time to market. But many other areas could also benefit from the spirit of product platforms. The higher volume of specific item allowed companies to standardize processes and reduce the manufacturing and assembly cost. The items were individually tested and refined and its reliability increased significantly. Further, the whole service network could be organized more efficiently and lower numbers of spare parts were required to be kept in stock. An advanced machine tool company like Tornos faces the same challenges.

SINGLE SPINDLE

Deco product line
When capability is the keyword – look closely at the Deco product line. It consists of 4 'Deco a-line' models and 4 'Deco e-line' models. The 'a-line' typically comes with 10 linear axes and a C-axis on each spindle[1]. The e-line is a simplified version of the a-line with 2 axes less. The capability is maintained but the productivity is slightly reduced, but so is the price. Both, the 'a-line' and the 'e-line' include 4 machine models that go up to 10, 13, 20 and 26 mm. With preparation of the bar end on the 26 mm machine, parts up to 32 mm can be produced.

Over 5'800 machines have been installed in an extremely diverse range of industries. Whether it is for bone screws, electronic connectors or other complex parts where accuracy and productivity is required, the Deco platform is the answer. To produce such advanced parts the peripherals play a significant role. Bar feeders, high pressure coolant and many special

[1] Deco machines have 12 axes; only the Deco 10 has 9 axes + 2 C axes, i.e. 11 axes.



attachments are available and supplied by Tornos to ensure proper functioning of the whole system.

Sigma product line

When power is needed, the 20 mm and the 32 mm Sigma machine are what you should look for. These are 6 linear axis machines with a C axis on each spindles. Dedicated for demanding applications like in the automotive industry, the machines are of very rigid construction, very powerful and have a symmetric layout meaning the main spindle and the pick-up spindle with their tool positions are identical.

It is also obvious that symmetric parts or parts with significant counter spindle work are ideal applications. Such parts are axles, shafts but also bone screws, electronic connectors and many others. The Sigma 32 is a true 32 mm machine (no bar end preparation needed). The Sigma 32 is able to balance machining between identical spindle and counter-spindle and of course carry out simultaneous machining on two workpieces. To machine parts that have large diameter differences (typically shafts), we need a unit for rapid diameter reduction. The rough-finishing unit also enables simultaneous machining with two turning tools on the main spindle and is the answer to this requirement.

Gamma product line

When cost effectiveness for medium complexity parts is the buzz word – here we are! There are 2 models, the 5 and 6 axes machines. First shown at EMO 2009 in Milan and first deliveries foreseen in April 2010, it will be a versatile machine for many different applications. With its 31 tool positions it is capable of producing quite complex parts. The basic machine is simple and cost effective but can be equipped with C axes plus attachments for 3 cross hole operations plus many more add-ons. Another highlight is the potential to easily change over from a sliding headstock into a fixed headstock machine and vice versa. Programming can be done simply in ISO code on the machine.

Delta product line

The Delta line is an inexpensive machine for producing relatively simple parts. They come as 3, 4, or 5 axes machines for 12 or 20 mm bar diameter with a platform that includes 6 machine models. Each comes with different configurations like with or without C axes or attachments for 3 cross hole operations for instance. Like the Gamma platform, each model can be easily changed over from a sliding headstock into a fixed headstock machine. Programming is done in ISO code on the machine.

Micro product line
Highest accuracy for small parts – the Micro is the answer!
An 8 mm fixed headstock machine or a 7 mm sliding headstock machine both with 5 linear CNC axes and 2 C-axes make up this platform. Ideal applications can be found in the watch industry, the medical industry and industries where small, high precision components have to be produced.

A unique feature on the Micro 8 allows it to keep a diameter within + /- 1 microns in production.
Some industry trends are indicating that parts are getting smaller and smaller and needing more and more accuracy. In this regard, this platform has a great potential.

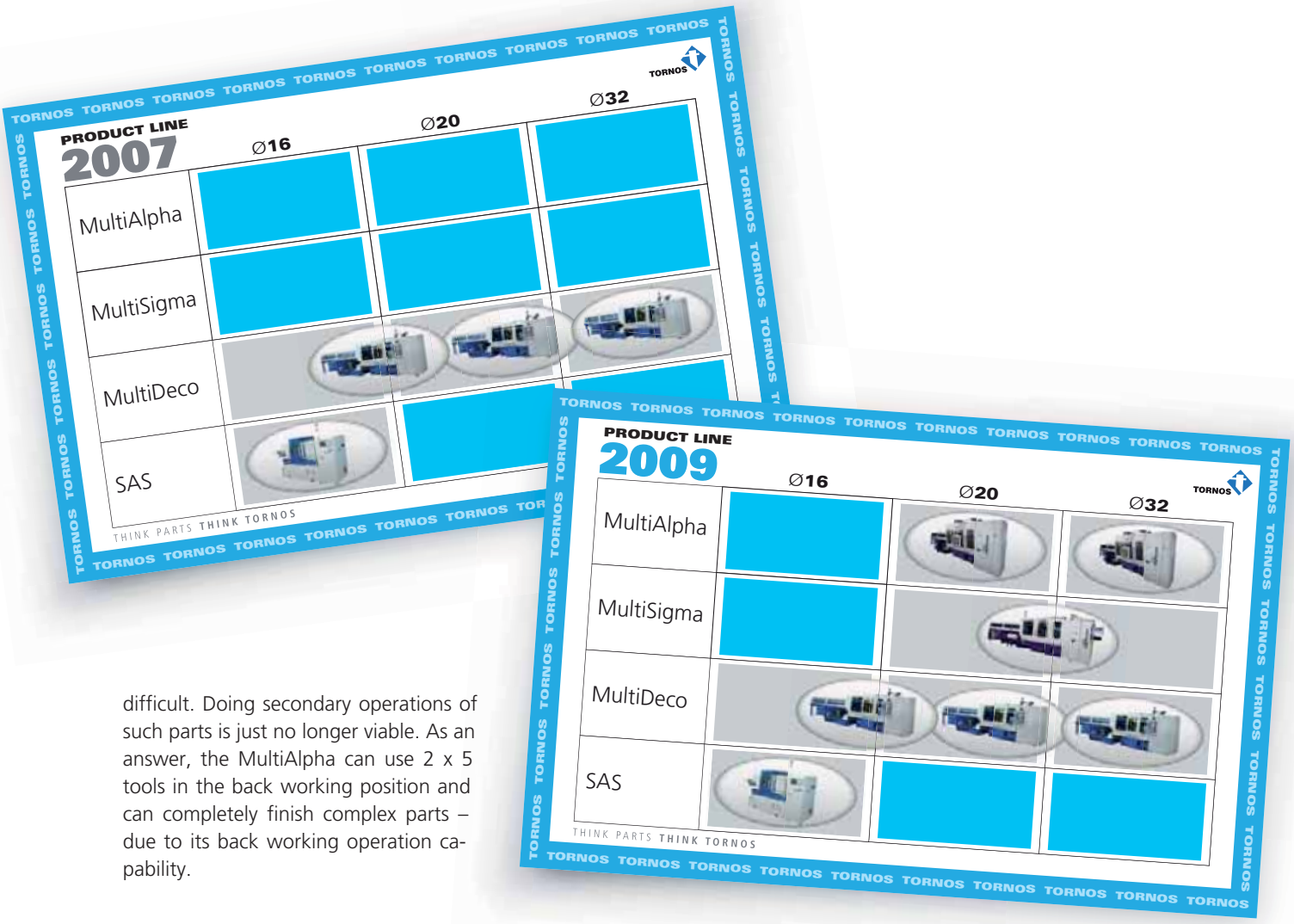
MULTISPINDLE

SAS 16.6
Productivity at its best! Once set-up it just runs and runs…
True, it is the only cam multispindle machine produced nowadays by Tornos. With more than 4000 installed, the SAS 16.6 is the unbeatable solution for parts up to 16 mm diameter in very high volumes.

MultiDeco product line
Highest productivity for middle complex parts. This platform consists of 3 machine models. The MultiDeco 20/6b 20 mm 6 spindle machine and the MultiDeco 20/8b 20 mm 8 spindle machine use the same components for the cross slides, spindles, frontal units and many more. The MultiDeco 32/6i, a 32 mm machine uses the same machine base as the MultiDeco 20/8b and basically the same enclosure. These MultiDeco machines are typically used when very high volumes of medium complexity parts must be produced. Due to its attractive price over 700 machines from this platform has been sold.

MultiSigma product line
This line is the answer to complex parts in high volumes. The MultiSigma 8x24 comes in various configurations such as working from bar or from a blank, single cycle or double cycle, one or two pick-up units, with or without robot or palletizing; hence a huge variety all based on the same platform. The 8 spindle technology has high performance parameters with motor spindle technology that offers incredible possibilities for difficult materials, tight tolerances and complex parts.

MultiAlpha product line
This series allows very complex parts to be produced in one hit! The MultiAlpha 8x20 comes as a 8 spindle 20 mm machine, respectively the MultiAlpha 6x32 as a 6 spindle 32 mm machines has the same capabilities as the Sigma machine but largely increased back working capabilities.
Today's parts have often complex shapes, tight tolerances and the machining capability of the material is



difficult. Doing secondary operations of such parts is just no longer viable. As an answer, the MultiAlpha can use 2 x 5 tools in the back working position and can completely finish complex parts – due to its back working operation capability.

ALMAC - ADVANCED MACHINING CENTERS AND SPECIAL MACHINES

High precision machining center product line
Almac offers the highest level of precision for complex machining! This platform consists of a variety of different machining centers; the most common is the CU 1005 model. High positional accuracy combined with high speed spindles, a tool changer and a variety of peripherals make it a unique product. It is often combined with a robot cell for automatic loading and unloading, pre-cleaning, measuring and palletizing. Two machining centers commonly combined with 1 robot cell.

A typical application is the machining of the base plate for the watch industry or dental implants made out of Zirconium oxide.

Bar end machining center product line
Permits the production of complex shapes thanks to advanced milling capabilities! This unique machining concept allows finishing of complex parts in one go. With its 7-axes and numerous tools it looks more like a mill-turn center.

Special machine product line
Engraving and marking with special machines based upon many identical components are available from Tornos. This platform of machines finds itself widely used in the watch industry but also in the cosmetic or other industries where visual surface interventions are required.

The right machine for any customer's needs
The variety of today's applications and requirements are huge and such a large portfolio of machines is needed to match today's customers' needs. Obviously the machine is an important part, but many other factors play a key role such as machine peripherals, cutting tools and coolant, the operator, and above all knowledge regarding specific applications and sectors. So, when a customer is considering buying a new machine whether it is milling, turning or engraving – Its time to look closely at Tornos. They may have exactly what you are looking for!

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THE NEXT STEP IN THE EVOLUTION…

During the Siams 2002, Tornos unveiled the Deco 13a, a machine which offered all the advantages of the Deco 10a machine launched 6 years earlier. Since that time, over 1500 of these machines have been sold and used to produce technical parts all over the world. During Simodec 2010, Tornos will present the next step in Deco's evolution with the EvoDeco 16a. The first thing that stands out is the departure in terms of design compared with the classic rounded Deco models. To find out more, we met with Philippe Charles, product manager for Tornos.

A winning team is never replaced

If the Deco 13 machines were a success, it is due to the fact that customers found definite advantages to using them. In terms of major components that have not changed, we can cite the kinematics and its four independent tool systems. This will ensure customers can continue to machine their parts with safety and efficiency. These kinematics make it possible to work with no risk of collision between the tools and to maximise concurrent operations. The four independent tool systems make it possible to work simultaneously on the bar and a secondary operation with three tools engaged simultaneously in the material if necessary.

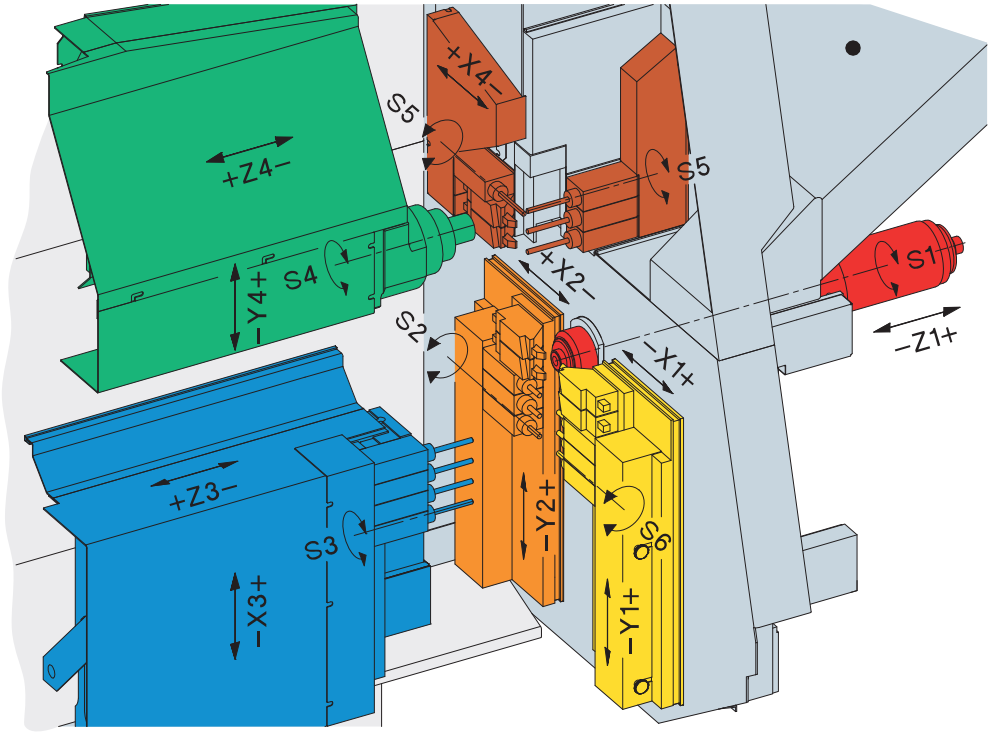
A second point which remained unchanged was the number of axes. The machine still has 10 axes (plus 2 C axes) for the a version and 8 axes (plus 2 C axes) for the e version. The latter are managed simultaneously and can be perfectly interpolated with one other.

The final item to remain unchanged, which is by no means the least, is the current devices, tool hold-

ers and tools which are completely compatible with those of the Deco 13a. In this way, a customer who is already well-equipped will be able to benefit from this interchangeability. This kinematic makes it possible to achieve a productivity that is to date unequalled on the market confirms Philippe Charles: *"Most of the high-end machines made by our competitors make do with engaging 2 to 3 tools simultaneously into the material, Deco is the only one that can engage 4 tools simultaneously into the material"*. He also invites us to come and (re)discover the machine on the Tornos stand at Simodec, where it will be machining a part by engaging 4 tool simultaneously into the material.

Smooth transition

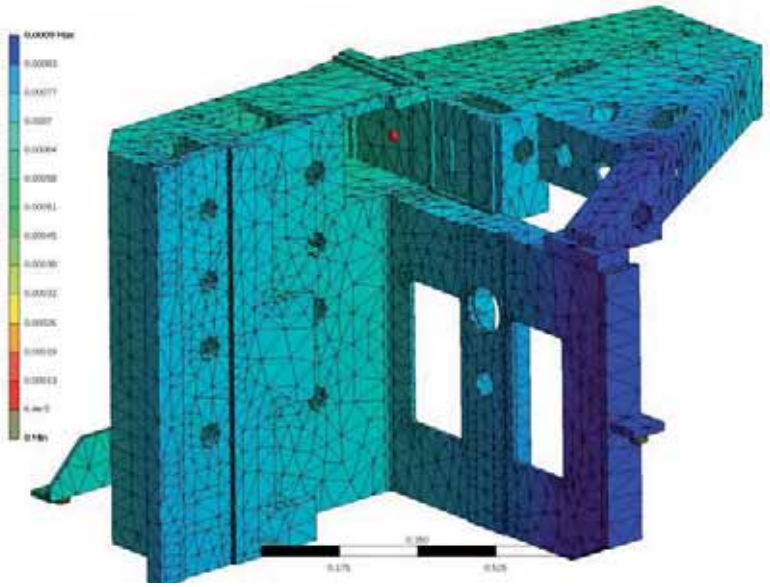
By maintaining these three elements, Tornos ensures a smooth transition between the two generations of products. The same operating logic or setup are a given. Even the presetting procedures remain the same, which is an undeniable advantage for users.



12,000 RPM POWERED SPINDLES FOR IMPROVED PERFORMANCE

The plus points:

- Powered spindle technology with integrated chiller unit.
- Reduction of unproductive time (stopping, indexing, acceleration, deceleration).
- Reduction of noise (up to 12 dB at 10,000 rpm)
- Reduced maintenance.
- Constant torque and power over the main part of the speed range.
- Stopping, acceleration and deceleration time of the spindles reduced by a factor of 2.



What also remains the same, is the company's desire to offer efficient and effective solutions. This is why the new machine capitalises on the advantages indicated above, but also delivers much, much more. Let's take a look at the new elements that will put it even further ahead of the game from March 2010.

New items that offer even more!

In addition to the immediately arresting new design, the engineers at Tornos decided to switch to 16 mm. This makes it possible to work up to this diameter with no preparation. The standard SBF-216 feeder is already designed to cover the entire range of diameters that the EvoDeco 16 will be able to machine (2 to 16 mm bars). Another significant evolution is that the spindles and counter spindles are identical and are powered spindles. The torque and power available have been notably increased compared with the Deco 13.

Design: technological aspect

Another new item is the design components that have been completely overhauled to benefit from creation using finite elements, making it possible to calculate precisely the rigidity and the frequencies that the housings are able to withstand. This tool guarantees that all the component parts of a machine are at the same level of performance. It is well known that a machine is only as good as its weakest component. The machining tests carried out show the optimised performance (in terms of speeds and feedrates) and increased productivity. With modern tools and oils, it was often the machine that limited performance. This is no longer the case today.

Improved rigidity also means better finishes and greatly improved lifespan of the tools.

Heat is no longer a problem

Temperature response characteristics have an obvious effect on precision. Special attention has been paid to the speed of the temperature conditioning and the capacity to remain in a stable temperature range. The spindles and counter spindles are cooled by an independent circuit. The electrical enclosure is ventilated by an independent air to air heat exchanger and its temperature does not affect the housing of the machine.

OVERVIEW OF TECHNICAL SPECIFICATIONS

Bar diameter at the spindle	16 mm
Max. part length (with synchronous guide bush)	180 mm
Max. part length (working with collet)	50 mm
Max. spindle and counter spindle speed	12,000 rpm
Max. number of tools	28 (18 op. and 10 c.-op.)
Rotating tool section	12x12 mm

Design: ergonomic aspect

The second aspect of the design is the man/machine interfacing. This must be as ergonomic as possible. The EvoDeco 16 has been designed with this aspect in mind. Settings and maintenance are optimised by excellent accessibility. The pivoting control panel follows this ergonomic logic. The operator can access the controls and have a perfect view of the machining area at the same time.

The equipment: a clear advantage…

The machine comes with excellent basic equipment. It includes all the drive systems for the rotating tools, the C axes, interpolation in polar coordinates (transmit function) and automatic central cyclical lubrication. These additional items are often sold as supplements and increase the cost of the machine. Even with all these technical innovations, the EvoDeco 16 will be sold for considerably less than the previous Deco 13a turning machine!

But that is not all, the engineers at Tornos have prepared other advantages that customers will be able to benefit from.

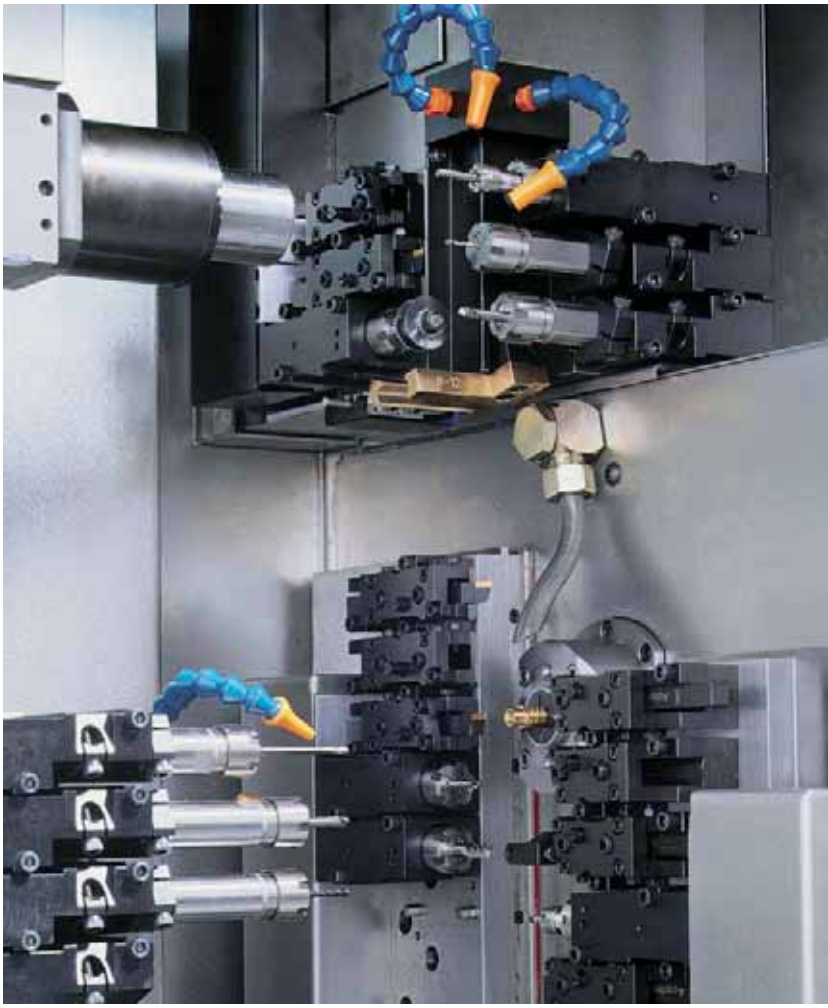
…no guide bush: yet another advantage…

Depending on the type of part, a guide bush is not essential. In the case where short parts are being made, it is possible to work with the EvoDeco 16 without a guide bush. In this case, the quality of the material may be lower. This is the first saving; the second, of course, being a decrease in the length of the scrap.

…and new tool holders, offering you even more!

Even if interchangeability between the different generations of products is guaranteed, EvoDeco 16 will also be arriving on the market with a new range of tool holders. These tool holders make it possible to fit more tools, typically three tools on two positions. With 18 tools operating and 10 in secondary operation, the possibilities for manufacture with these machines are greatly increased compared to the tool holders of the Deco 13a. Backwards compatibility is also possible with the Deco 13a machines. An adaptor for the pre setting equipment is provided.

To conclude, Philippe Charles tells us: *"We have worked in partnership with our customers and have retained the strengths of the Deco machines. For the new developments, we also used the experience gained from having sold over 6000 Deco machines. The results are a significant evolution of the Deco range with a new look and modern technology. I would like to invite all our customers and all users of turning machines to come and discover the new range at Simodec, they will not be disappointed".*



GAMMA 20: THE PERFECT ADDITION TO THE RANGE

Tornos presented a new family of machines at the EMO exhibition in 2009. Positioned between the Deco machines, designed for manufacturing complex parts and the Delta machines that have been highly successful in manufacturing straightforward to moderately complex parts, the new Gamma turning machines complete the manufacturer's range for creating moderately complex parts. We met up with Serge Villard, Tornos Product Manager, to find out more.

Position within the Tornos range

Gamma differs from Delta in several respects; notably it has a very large number of fixed and rotating tools and the option of adding special equipment for inclined drilling or thread whirling. The options for counter-operation work are also greater than with the entry-level turning machine from the Delta range. Gamma is also characterised by greater axis strokes and increased power for the rotating tools. This means that this turning machine with two tool systems has exceptional capabilities for its category. The Sigma turning machine, which also has two tool systems, is still ideal for machining symmetrical parts requiring a lot of work on the rear or for removing large amounts of material (see the article on page 6).

And if productivity is a critical factor, the turning machines in the Deco range with four tool systems are still unbeatable. On this topic, Willi Nef, Tornos Sales Director, told us: *"The most important thing is that Tornos is able to offer a large range of products from among which the customer is able to find the machine that perfectly corresponds to his needs. Now more than ever, we are offering platforms of products to ensure that our customers can always find a machine that exactly meets their requirements."* (See the article on page 11).

Classic kinematics

The Gamma line is made up of two models equipped with 5 and 6 axes respectively. Above all, we should note that these two models are sliding headstock turning machines where the longitudinal movement of the main spindle is along its Z1 axis. The 5-axis model is equipped with the tried-and-tested classic kinematics that were behind the success of the Delta range. It includes a linear tool system known as a platten, comprising axes X1 and Y1 for working on the bar. The counter-spindle support carriage is mounted on 2 linear axes X4/Z4 that enables it to take the workpiece to the cut and to move laterally opposite the block independently of the counter-operation tools, which may be fixed or rotating. The kinematics enable simultaneous machining for bar-turning work and counter operations.

The 6-axis version has the same kinematics, but the difference is that the counter-operation block has a vertical linear axis. This has the advantage of being able to double the number of tools available. In total, 8 tools are arranged in 2 rows of 4 tools. A maximum of 4 of these can be rotating. These 4 additional tools increase the options for performing complex machining on the rear of the workpiece. This axis also enables digital centring of the tools on the counter-operation block and a work movement for cross drilling.

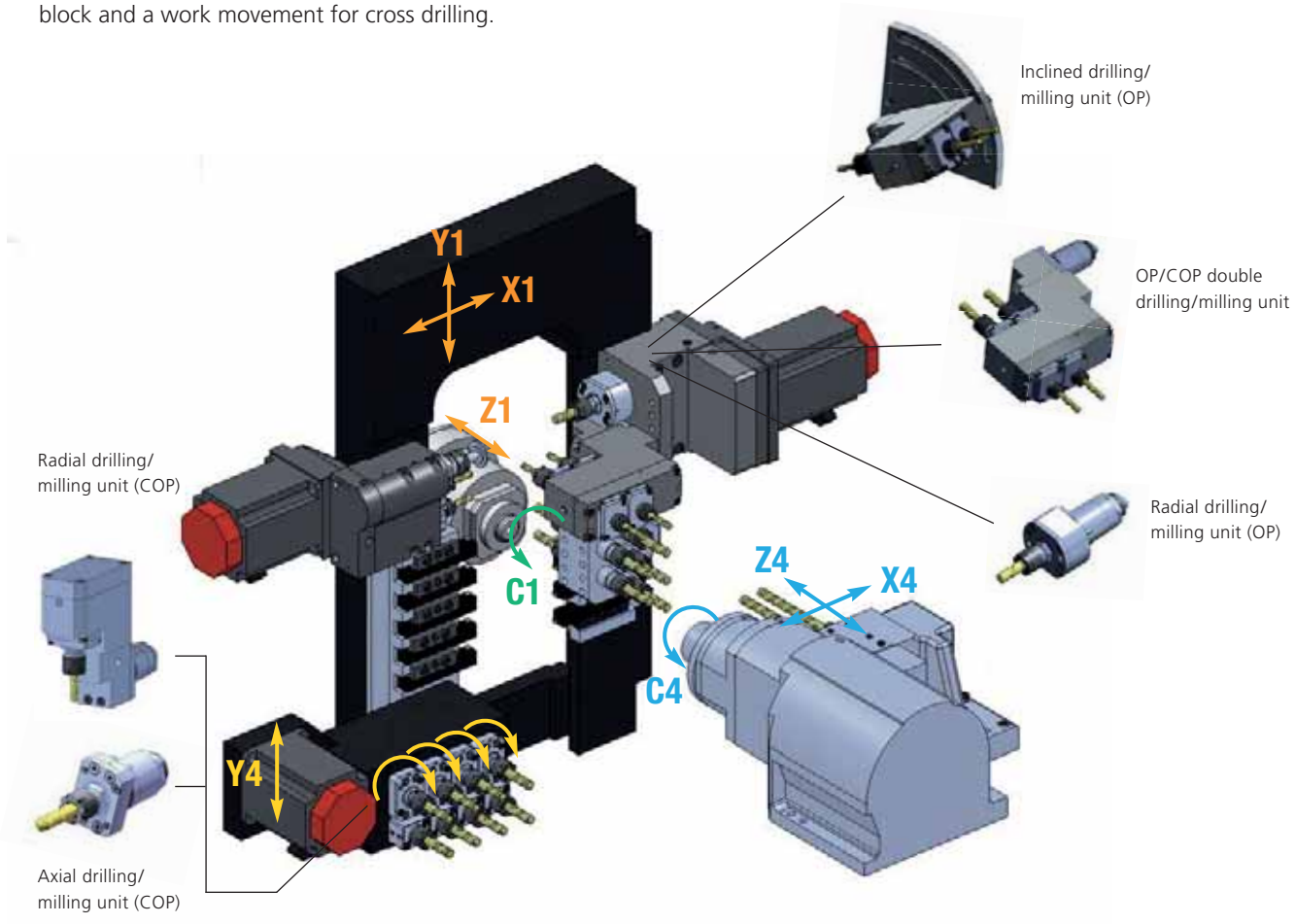
Large number of tools available

The 5-axis version is able to take up to 35 tools, of which 15 may be powered. The 6-axis version may be equipped with a maximum of 39 tools, of which 15 are rotating. In addition, a vast range of attachments and accessories are available with this turning machine.

Powered spindles with or without guide bush

The spindle and counter spindle are both powered by an integrated motor. They are characterised by the low operational noise level and their rotation speed of up to 12,000 rpm. Power at the spindle is 2.2 kW (3.7 maximum) and 1.5 (2.2 maximum) at the counter spindle. These characteristics guarantee high-performance machining.

As for the guide bush, this turning machine can be converted by the customer, in the same way as the Delta line. In other words, it is possible to transform a classic sliding headstock machine working in the guide bush so that it works like a fixed headstock machine in just 30 minutes. In fact, the headstock



SEVERAL BASIC VERSIONS

The Gamma range will be sold in 3 standard equipment versions, allowing the customer to select the machine that best corresponds to individual needs.

Two equipment levels are proposed for the 5-axis version. The 2 configurations called **Gamma 20/5 A** and **Gamma 20/5 B** each include:

- powered synchronous rotating guide bush
- 8 turning tool positions
- a support block for 5 fixed axial tools
- 3 transverse spindles for drilling/milling work on the bar
- a support block for 2 deep-bore drilling tools on the bar
- 4 tool positions on the independent counter-operation block
- an auxiliary motor for driving extra optional tools on the main X1/Y1 tool system
- a pneumatic workpiece ejector with a workpiece unloading system and conveyor belt
- Fanuc type 31iA numerical control fitted on a pivoting arm. The programming system is ISO.

The **Gamma 20/5 B** configuration will also have:

- a motor to drive the 4 tool positions on the counter-operation block and 2 axial rotating spindles
- additional 20 bar pump and 5 independent outputs, plus cleaning of the counter spindle collet.

The 6-axis version, known as **Gamma 20/6 B**, has only one basic version with the same equipment level as the 5-axis B version, plus:

- counter-operation block on the Y axes and 8 tool positions, of which 4 can be powered.

This basic equipment can be supplemented by other equipment and accessories, enhancing the capabilities of this turning machine:

- Fixed or rotating axial drilling on the bar
- Fixed or rotating axial drilling on the rear
- Transverse drilling/tapping/milling on the bar and on the rear
- Front drilling (fixed tool) up to 100 mm
- Inclined drilling/milling on the bar
- Threadwhirling on the bar
- Machining of profiled bars

still slides, but the guide bush is replaced by a dummy guide bush into which the tip of the spindle slides, preventing the machining fluid and swarf from getting into the spindle compartment. This ingenious system allows you to efficiently create shorter parts (up to 45 mm) which do not require guidance, with the advantage that you can use more inexpensive bars of material (enhanced quality) and you no longer have long pieces of scrap material, which are also costly.

Guide bush rotating at up to 12,000 rpm

If, on the other hand, you wish to work using a synchronous rotating guide bush, the technology employed on the Gamma machine will be of interest in several respects. The guide bush is effectively driven by an integrated independent motor in the same way as the spindles. It is liquid cooled, lubricated and pressurised to prevent any infiltration. This highly efficient principle enables the user to machine workpieces of up to 210 mm in a single clamp setting and without any speed constraints, as the integrated motor does not restrict the high performance of the spindle in any way.

Good working conditions

The turning machine has a large machining zone with an arrangement of tools in operation and counter operation that makes adjustment easy for the operator and thus aids the productivity of the machine for small series of parts.

The control panel is articulated and can be used whilst maintaining a good view of the work zone. Programming is performed in the conventional way, according to the ISO system. The turning machine is equipped with user-friendly FANUC 31i-A numerical control with a 10.4" colour screen.

Particular attention is given to the autonomy and maintenance of the machine, for example the swarf and oil containers are generously dimensioned and fitted with castors and the centralised lubrication system limits the need for maintenance work. This ensures that working conditions for the operator are at an optimum level.

Good presence on the market

Customers have already had the opportunity to view the turning machine and, at EMO in Milan in particular, everyone was full of praise for the new Gamma 20. Mr Villard told us: *"the capabilities of this turning machine were very quickly understood by our customers. Particularly when we announced the price of the higher level of standard equipment we had described, customers realised that this turning machine would rapidly become a benchmark in the*

category of 20 mm capacity machines equipped with two tool systems, which is very popular both in Europe and further afield." Mr Villard added that Tornos will soon make a Gamma machine available in each of its European branches so that all customers are able to discover for themselves how Gamma 20 can meet their specific needs. In addition, the company will participate in numerous trade fairs (see inset), at which the new turning machine will of course be present. He concludes: *"I would like to invite all manufacturers of bar-turned parts to visit us at these events. The Tornos staff will be extremely happy to present the new Gamma 20 turning machine to you."…*

WHERE TO SEE THE GAMMA IN THE NEXT SIX MONTHS

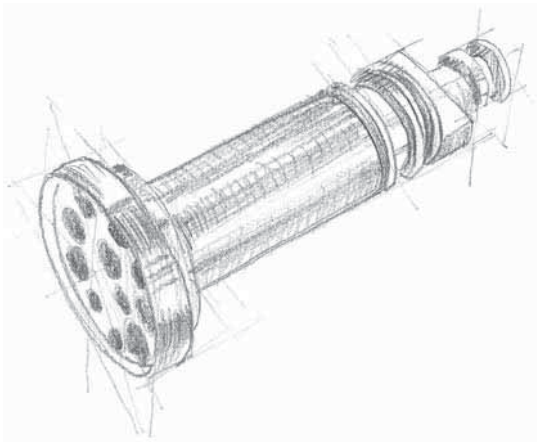
METAV Düsseldorf	23-27 Feb. 2010
SIMODEC La Roche-sur-Foron	02-06 March 2010
MECSPE Parma	25-27 March 2010
SIAMS Moutier	04-08 May 2010
BIEMH Bilbao	31 May - 05 June 2010
MACH Birmingham	07-11 June 2010

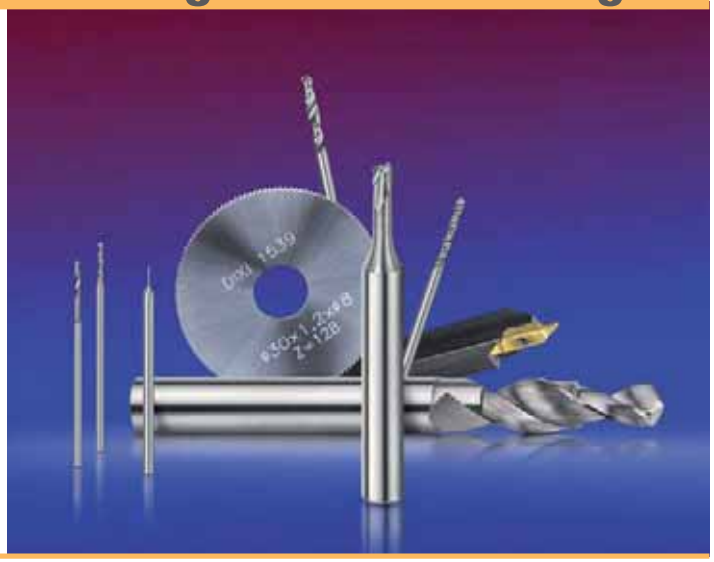
Comment: The above list was correct at the time of going to press. If you are interested, please contact Tornos to confirm that the machine will be on display.

Tungsten carbide and diamond precision tools

DIXI 4

Turning-screw cutting





Our know how compliments your experience

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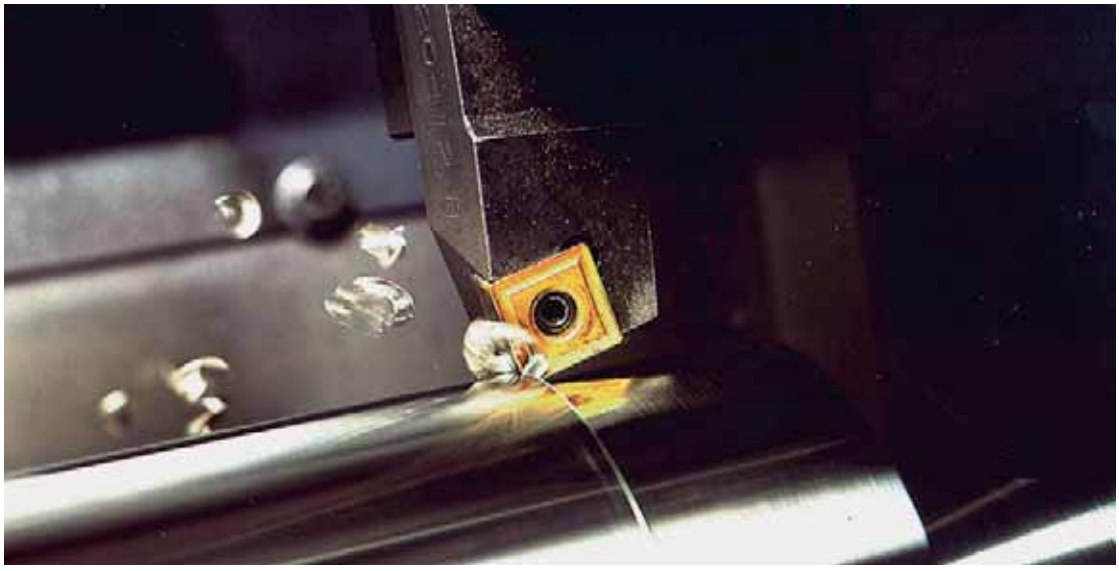
NOTHING IS LEFT TO CHANCE…

The stainless steel long component sector of the Schmolz and Bickenbach Group of which Ugitech has now become a member is a world leader in the sector, with over 350,000 tonnes delivered in 2008. To remain the leader in this market, Ugitech relies on its research centre based in Ugine (Savoy, France), where 60 people, including around ten engineer, are employed.



Ugitech has numerous methods at its disposal for testing machinability.

Three types of mission

Firstly, the laboratory must be tuned in to the customers needs, understand what they do in order to promote the use of stainless steels and recommend the grade that is best suited to the customer. Secondly, they must develop new products and this is at the heart of the role of Ugitech researchers. Thirdly, they must perfect innovative production processes compatible with a sustainable development policy. Although these three missions are very closely related, in this article we will be concentrating on the first one.

Tuned in to customer needs

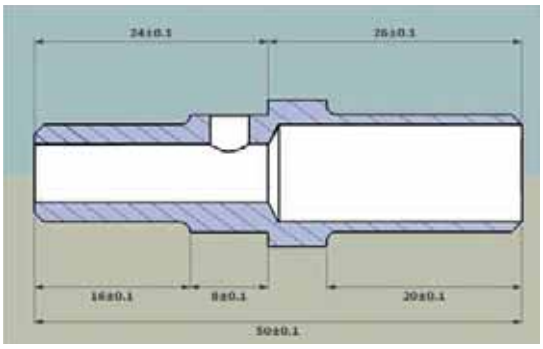
The research centre has many machines at its disposal for testing machinability. The research centre carries out tests on commercial industrial machines under realistic conditions, measured so as to understand the machining process. In the context of bar turning, a part is created using turning, axial and transverse drilling, sectioning and milling operations. Ugitech has recently acquired a Sigma 32 machine from Tornos to carry out these tests.

Why a new CNC bar turner?

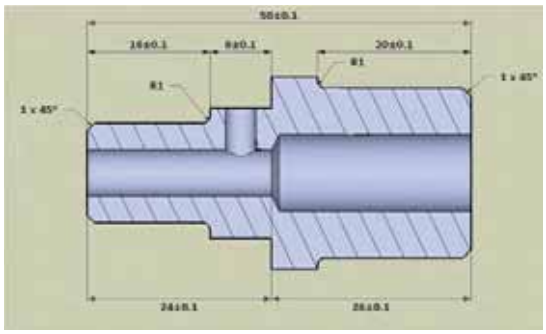
Mr Minola, Technical Application Manager for Ugitech explains: *"We purchased this machine to stay abreast of the technical progression of the market and to have a machine that closely matches those used by our customers. We wanted to have a counter spindle, C-axes, high rotational speeds, an automatic loader and the*

The Tornos Sigma 32 machine is permanently linked to measurement and monitoring units, so that all operations are scrutinised in detail.

Presentation day at Ugitech. Numerous bar turners made the trip to discover more about machinability.



Service life testing. The workpiece is machined without lubricant in a 15 mm diameter stainless steel bar. Conditions: carbide-coated tools, turning 6 and 9,9 mm diameter and then drilling, face milling, 4 mm diameter as well as transverse drilling and sectioning.



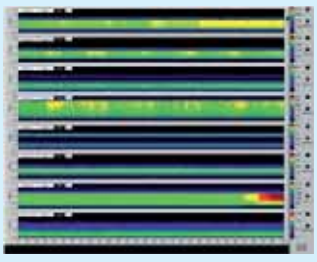
Dry machining of a 25 mm diameter bar. Machining: carbide-coated tools, turning, 6 and 9,9 mm diameter and drilling and face milling 4 mm diameter then transverse drilling and sectioning.

THE TESTS CARRIED OUT

Ugitech performs two main types of test. The manufacture of parts in 15 mm bar diameter for stainless grades where the parameters are VB15/0.15 < 350m/min.[1] and the machining of a 25 mm diameter bar with VB15/0.15 < 350m/min parameters. In both cases, the tests are trying to find the cutting conditions with a carbide coated tool to produce the equivalent of 1,024 parts without changing the tool. The test is repeated three times to confirm the conditions. The tools are monitored constantly.

These tests make it possible to determine or refine the best grades according to their required use.

[1] Speed VB15/0.15: result of the turning tests with an insert reference CNMG120408 and a cut depth of 1,5 mm from ray and a feed of 0.25 mm/rev. This test involves performing an endurance test where we research the cutting speed that will produce a metal removal rate for the insert of 0.15 mm in 15 minutes of machining time. These tests are performed dry.



All the stresses on the tools are continuously displayed graphically.



possibility of control via NC, and we especially wanted the high power and rigidity necessary for machining stainless steels".

Why the Sigma 32 from Tornos?

The Ugitech laboratory wanted a machine that was rigid and ergonomic making it possible to machine parts of medium complexity and with a high power capability. These parameters match this model perfectly. Mr Minola added: *"With our tests, we need to check the wear of the tools every 64 parts and we wish to use the Capto quick tool change system by Sandvik. Furthermore, the mixed TB-Deco and standard ISO programming system affords us total flexibility. To these purely technical criteria should be added two things. Firstly, the fact that Tornos has a good reputation and its accessible after-sales department is recognised to be efficient and, secondly, that the manufacturer was able to provide us with a solution adapted to our needs in terms of instrumentation with the objective of having data relating to machining (speed and power of the spindles and turning tools)".*

Results that are immediately put into action

Ugitech provides its customers with technical advisors who assist them in getting the best out of the quality of their products: for example, the Ugima product line (stainless steels with enhanced machinability) can increase productivity considerably with Ugitech specialists' expertise in stainless steels and their machinability. The latest generation of Ugima 2 products enabled those customers who chose to make further advances in productivity (an extra 10 to 20%) and at the same time in tool durability (multiplied by 2 to 5 times depending on the case in question).

These specialists assist users in choosing the stainless steels adapted to their requirements. They are therefore tuned in to the new requirements that the markets may create, and can respond on a day-to-day basis to any technical problems customers may have. Finally, they follow the development of new Ugitech products with the users.

During the Medtech days, Tornos, Ugitech and their other partners that supply tooling and oil demonstrated the extensive interaction that goes on between all the elements involved in machining. The Ugitech laboratory allows them all to be clearly identified.

Would you like further information on Ugitech stainless steel solutions? Contact Mrs. Frédérique Tissot, Ugitech head of communication.

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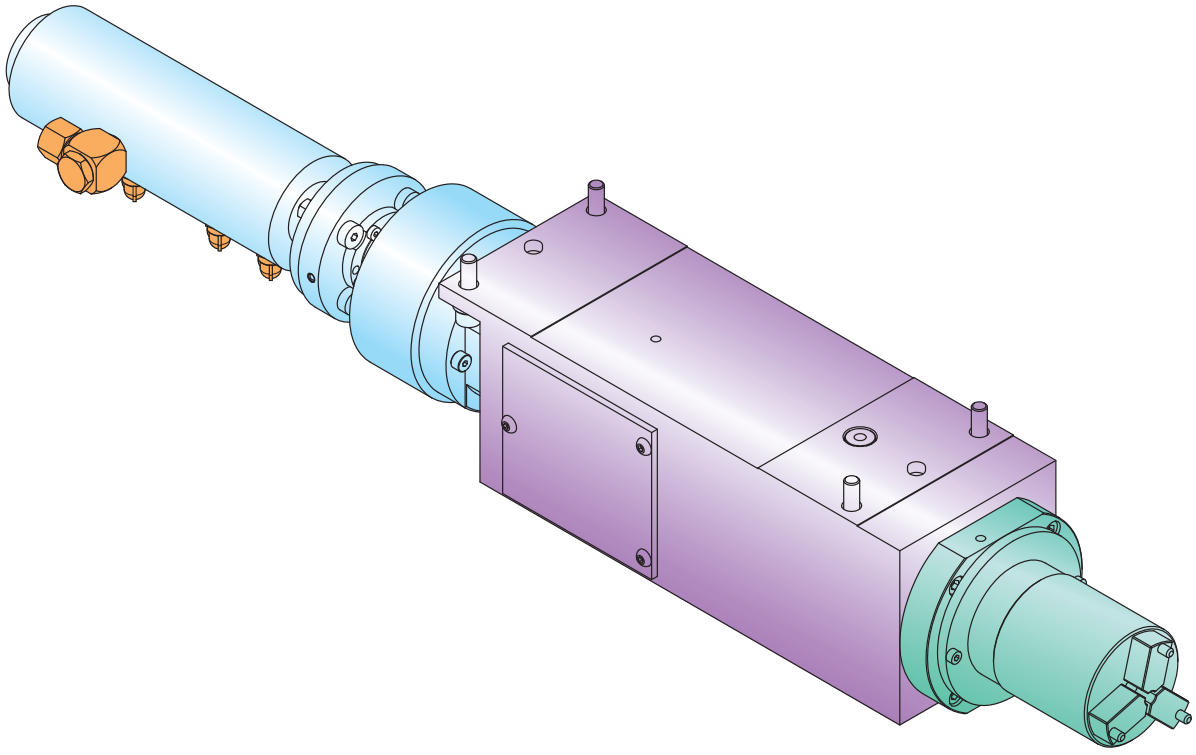
NEW OPTIONS FOR THE DECO 20 AND DECO 26

The range of operations that can be conducted on the Tornos Deco 20 are constantly expanding. For the winter of 2009-2010, Tornos is offering two new options for the Deco 20a. Firstly, the 2, 3 or 4 jaw gripper chuck. Fitted to the counter spindle, it allows 'long stroke' clamping for taking and clamping the part in the counter spindle over a shoulder section. The second option is the turning spindle for tip drilling using high pressure coolant (up to 210 bar) through the tool.



Option

2, 3 or 4 jaw gripper chuck for Deco 20.

(On request, under specific development)

Principle

The chuck has a gripping travel of 3 mm around the diameter and makes it possible to go over a larger diameter or thread to grip the parts over an adapted range.

Benefits

- Better gripping quality and capabilities.
- Makes it possible to complete parts with a geometry that is not ideal.
- Avoids gripping parts on the thread.
- Greater machining performance in counter-operations, thanks to improved gripping.
- Jaw grippers can be machined directly on the counter spindle.
- Greater geometric tolerances for circularity and concentricity of the part.

Compatibility

Deco 20a

Availability

This option is already available ex-works. Fitting at the customer's premises on machines that are already installed can be possible with the necessary balancing (delivery of a balanced counter spindle and chuck).

Technical specifications

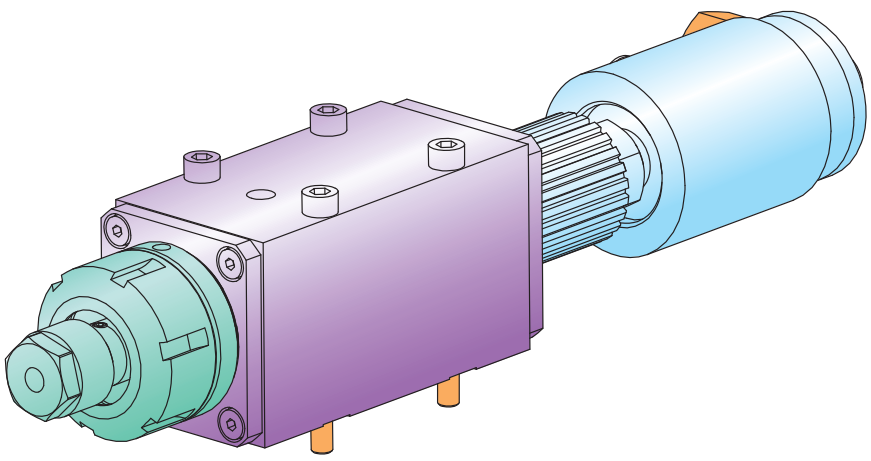
Max tightening travel:	3 mm at the diameter
Max. rotational speed:	5,000 rpm
Clamping force:	3,000 N at 5 bar
Chuck diameter:	66 mm
Overhanging length of tip:	min 50 mm
Inner capacity diameter:	10 mm
Number of jaws:	3 standard
Number of jaws on request:	2 or 4
Jaw material:	mild steel or tempered steel
3 step slip ring:	1 x open (air) 1 x close (air) 1 x clean (cutting oil or air)

Option

Rotating drilling unit with high pressure (210 bar) coolant in the secondary operation on the Deco 20 or Deco 26.

Principle

In the context of specific applications for certain markets such as medical, automotive, aeronautic, hydraulic or other markets, certain components



require drilling operations with deep eccentric holes using high pressures.

Depending on the dimension of certain small drill holes or extremely hard materials, a pressure of up to 200 bar is necessary in order to carry out high performance operations under optimum cutting conditions with adequate removal of swarf.

Benefits

- Rotating spindle with rotation up to 8000 rpm on the end attachment or in secondary operation.
- It is possible to add rotation speeds for the tool and main spindle or counter spindle (differential speed), which also improves concentricity and allows optimum cutting conditions.
- Collectively, this makes it possible to reduce the rotation of the main spindle and in this way reduce the risk of micro vibration associated with a 3 metre bar in rapid rotation in the feeder
- The finish and the lifespan of the tools are improved.
- It is possible to carry out eccentric drilling in normal and secondary operations.

Technical specifications

Max. rotational speed:	8,000 rpm
Max pressure:	210 bar

Compatibility

Deco 20a and Deco 26a

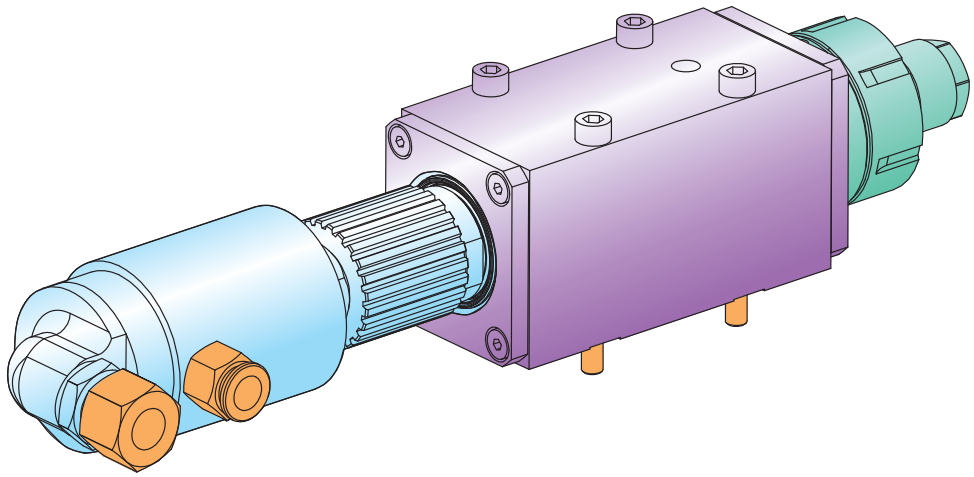
Comments

In order to ensure the pressure arrives at the tip of the tool, it is necessary to adapt a slip ring to the unit; this allows the lubricant to pass through the spindle and then the tool.

A similar option (3310) exists for pressures up to 120 bar.

Availability

This option is already available ex works. Installation on pre-installed machines is possible.



THREAD WHIRLING IS AS COMMON AS EATING *FOIE GRAS*

Those who think that "only" *foie gras* and fine wine come from the Périgord, have not heard of VCN!

Jean-Michel Vacher, founder and owner of the company, is no doubt a foie gras connoisseur, but not only that! He also delights in taking on complex challenges and he is not intimidated by any new challenging part geometries!

When he was contacted for the feasibility of a mechanical component with four eccentrics, distributed over two axes that were off-the-part axis and opposed at 180°, he replied with a beaming smile *"We can handle this"!*

The machine line-up at VCN includes a Tornos Deco 13 and 26 mm, which are more than capable. All that remained was for Mr Vacher to think of the machining method for the large diameters of 7 and 10 mm off-centre main operations.

Given the complexity of the part, for Mr Vacher, thread-whirling was the most suitable machining process to use for this type of part. Machined in Z15 CN 17.03, very similar to the reference 1.4057, two parameters would determine the machining. The circularity of the two diameters and the condition of their surface.

It was in partnership with Utilis France that the geometry of the plates to machine this diameter was developed. Sparing the details, the plate was specially ground for this diameter thread whirling operation.

TOLERANCES REQUIRED FOR THE THREAD-WHIRLED Ø

Material: Z15 CN 17.03 (1.4057)

Ø 7 ±3µ

Ø 10.50 ±4µ

The two diameters are positioned at 180° ±15' from the two eccentric diameters.

The programme developed by Mr Vacher was interesting. The idea was to machine an eccentric on the main spindle of the machine, directly on the bar diameter with no prior turning. The blades allow a chip height up to approximately 3.5 mm. Beyond this, this machining method requires simultaneous programming of the X – Y – Z axes. The lathe feeding of the Z-axis was 0.3 mm and the X and Y axes moved in interpolation around the Z-axis. The programming method also gives the freedom to machine a conical eccentric

For the initial tests, a thread-whirling head with z = 9 blades was chosen. For production, a head with z = 12 was introduced to increase productivity and the working life of the blades.

With a view to obtaining high performance from the tool, Mr Vacher set a very high cutting speed for the blades, close to 300 m/min. This translates to a thread-whirling speed of 8,000 rpm^{-1}. At the input, the results obtained were very significant on their own, particularly with regards to circularity.

If the surface finish still needed improving, the figures measured during the circularity check were astonishing. Mr Vacher had managed to obtain circularity within 0.002 mm in a thread-whirling operation! This seemed incredible! Yet, all the other parts produced continued to bear the same results.

The circularity was met with total satisfaction, all that remained was to find the feed parameters to obtain the surface finish required by the customer. By adjusting the parameters of the feed, tooth by tooth the in production the values measured during the production of the parts proved stable and showed a regular R_a value of 0.15 to 0.18. The set limit value being R_a 0.4 the surface finish was therefore satisfactory.

For VCN, this new fabrication process pushes back the boundaries for fabrication on a sliding headstock even further, particularly on a Tornos machine. For Utilis, this shows that machining by thread-whirling has only just begun and only confirms what was thought about this machining method.

IMPLEMENTATION PROCESS TO MEET THE QUALITATIVE REQUIREMENTS

- Machine choice: Tornos Deco 13a
- Certain specific adaptations were made to the Tornos thread-whirler
- Programme: 65500 lines
- Thread-whirler Rotation Speed: 8000 rpm
- Z1 feed rate: 0.3 mm/rev (S1)
- C1 axis feed rate: 5000 mm/min

Information:

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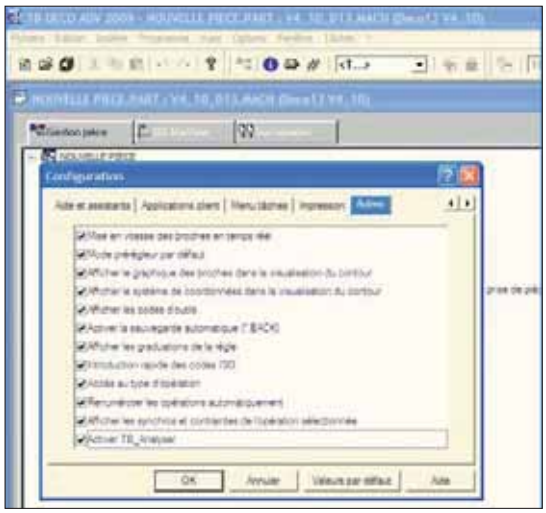
SIMPLIFIED DEBUGGING OF MACROS

The TB-Deco ADV is a powerful programming system and an increasing number of experienced users are creating their own macros in the PELD programming language. Because of the complexity of this language, programming can be a relatively slow process.

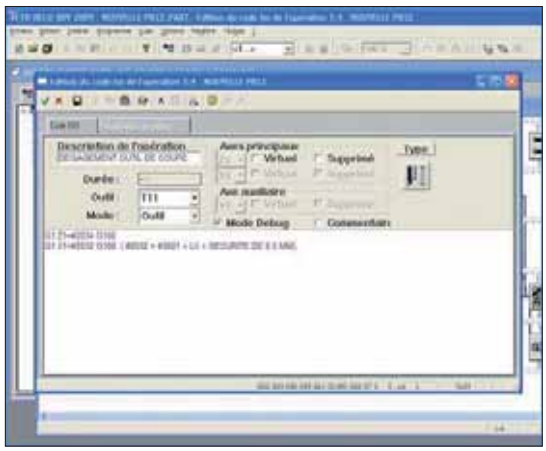
To allow its customers to quickly debug these macros, Tornos is proposing an innovative solution developed by its engineers; a new efficient function called TB-Analyser. Let's have a look at the menu to see how it is used.

Activation

Tick the 'Activate TB_Analyser' option in the menu by following the 'Options' – 'Configuration' –



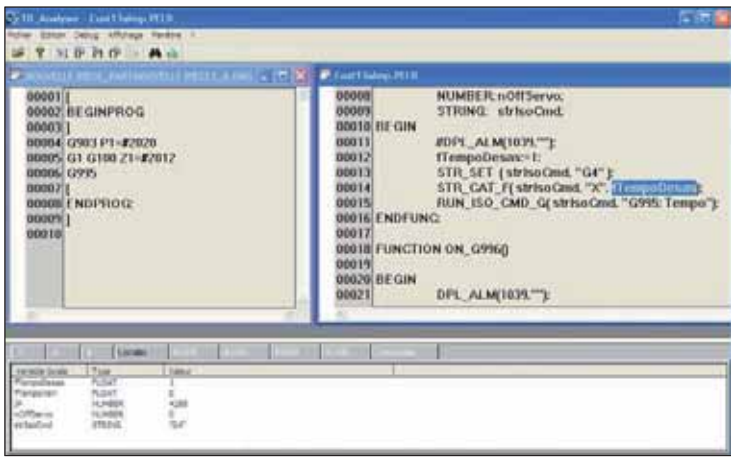
'Miscellaneous' tab. This will cause the 'Debug mode' checkbox to appear in the edit operations window. Operations must not have the type 'System'.



How does it work?

When performing an interpretation (F7 or F8), TB-Analyser allows you to see the progression of the functions that are implemented in the PELD programming language and called up by one or more operations. When TB-Analyser finds PELD, a window opens. It contains the lines of PELD code.

The TB Analyser application window is made up of a title bar, a command bar, a toolbar, an area for displaying the PELD and DBG file windows plus a window for displaying variables with 9 tabs and a status bar. TB-Analyser allows you to place break points at certain positions in the PELD code and then advance step by step or to go to another break point, so as to



display the variables when you are interpreting a part. The variables %, #, $, #1000, #2000, #3000, #3100 and the variables specific to the function in question can be displayed.

- Start execution (F5) "Go"
- Execute an instruction (F10) "Step over"
- Execute first instruction of the following function (F11) "Step into"
- Execute all the following instructions of the operation in progress (F12) "Step out"
- Stop the debugging (Shift + F5) "Stop"
- Insert/remove a break point (F9)
- Remove break points (Shift + F9)
- Execute a break point "Execute Break"

The current break point of the interpretation is indicated in the status bar, together with the name of the window (PELD or DBG file) and the line number. For example, in the image above, Cust13aImp.PELD line: 0015

The toolbar groups together certain commands, which are represented by an icon.

 Corresponds to the 'Open… Ctrl+O' command in the 'File' menu

 Corresponds to the 'About TB_Analyser…' command in the '?' menu

 Corresponds to the 'Go F5' command in the 'Debug' menu

 Corresponds to the 'Step Over F10' command in the 'Debug' menu

 Corresponds to the 'Step Into F11' command in the 'Debug' menu

 Corresponds to the 'Step Out F12' command in the 'Debug' menu

 Corresponds to the 'Execute Break' command in the 'Debug' menu

 Corresponds to the 'Find Ctrl+F' command in the 'Edit' menu

 Corresponds to the 'Go to line… Ctrl+G' command in the 'Edit' menu

TB-Analyser allows you to quickly find a programming error in the PELD language and, therefore, to spend less time debugging customer macros. TB-Analyser will be included in TB-Deco ADV Version 30 in the form of a CD-ROM and should be available by March 2010. If you are interested in this new feature that will make life easier for many programmers, contact your usual Tornos sales network for more information.

IS IT TIME TO CONSIDER PURSUING MEDICAL PARTS WORK?

And if you do, what are the best ways to be productive (and profitable)?

The U.S. medical market represents about half of the world market and is strong for several reasons, including the fact that the U.S. has an aging population. Today there are 35 million people 65 and older and by 2075 there will be 69 million[1]. Generally older people are wealthier and so they will be able to pay for innovative new technologies… and we all know that paying customers attract entrepreneurial spirit (according to the Wall Street Journal, the 78 million Americans aged 50 and older control 67 % of the country's wealth).

In other parts of the world we see a similar trend. Beyond the growing demand for healthcare, the rising costs of healthcare are another reason why the medical sector is an attractive new business arena for those involved in manufacturing. Insurers and healthcare providers are creating pressure to reduce costs by increasing productivity – and this spells opportunity for manufacturers of innovative medical parts and devices.

How does Swiss turning fit in?

There are several diverse segments to the medical sector and all of these can be served using the Swiss turning machining process. Interventional cardiology devices (stents, catheters, and surgical tools), orthopedic devices (bone screws, implants, and joint replacement), minimally invasive surgical devices and equipment (laparoscopic devices), diagnostics (point-

[1] Source: The U.S. Market for Medical Devices – Opportunities and Challenges for Swiss Companies, published by the Swiss Business Hub. Edited by Martin von Walterskirchen with contributions from Darren W. Alch of Jenkens & Gilchrist, Christian Brinkmann of Kessler & Co Inc., Richard M. Franklin of Baker & McKenzie, David Kouidri of the Swiss Business Hub USA, Simon Kunzler of Kessler Consulting Inc., Scot Orgish of The Swiss Business Hub USA, Klaus Peretti of Kessler & Co Inc., Daniel A. Wuersch of Wuersch & Gering LLP, and Mark S. Zolno of Katten Muchin Zavis Rosenman.

of-care testing instruments), wound care (staples, suture anchors, and clips), and dental (equipment and implants) segments all have parts that can be efficiently and profitably machined on a Swiss turning center. And each of these markets is valued in the billions of dollars globally.

Of course you've heard that the medical sector requires special documentation and certifications. Your customers will be required by the FDA to follow good manufacturing practices (GMPs), register with the FDA, and list devices that are sold directly to the end user with the FDA. And additional requirements for your medical customers (or their customers) include 510K and PMA approvals depending on the device class. But there are machine tool manufacturers, like Tornos that have experience in these areas and can help you navigate the waters.

Worth pursuing market

So, it has been established that the medical market is worth pursuing! But what special considerations does the medical market hold for those who wish to use their existing equipment – or purchase new machines – to make medical parts or devices? At a recent Tornos TechDays open house, the Tornos Applications Engineering team gave an Advanced Applications presentation focused on the special machining processes used to make Swiss turned parts and devices for the medical market. Here are some excerpts.

Machining PEEK

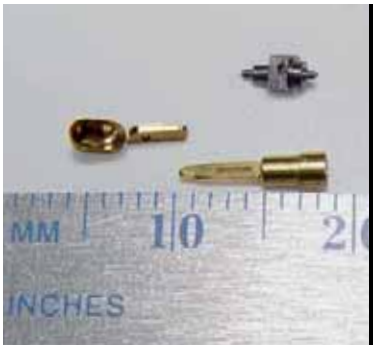
PEEK (polytheretherketone) is not your traditional bar stock material: PEEK is a strong thermoplastic material with potential for a vast variety of different applications in the medical parts market. Here are some of the advantages of PEEK for the medical parts and devices market.

PEEK:

1. retains its mechanical properties even at elevated temperatures,
2. is flame retardant,
3. is abrasion resistant,
4. has high impact strength,
5. has a low friction coefficient,
6. is biocompatible with several sterilization methods (including conventional steam, ethylene oxide, gamma irradiation and others)
7. doesn't interfere with x-rays, MRIs or CT scans,
8. and, one particular type of PEEK called CFR for carbon-fiber-reinforced, offers high wear resistance for components such as articulating joints.

Machining conventional medical grade PEEK requires carbide cutting tools; but carbon-fiber-reinforced PEEK takes diamond tools. For this special application Tornos has developed various solutions according to customer specific needs.

Tornos, who's customers include the biggest names in the medical market, including Metronic, Smith & Nephew, and others, has performed several test cuts with lots of different brands of PEEK material. One type they have tested is PEEK-Optima® from Invibio®. This particular type of PEEK is available in unfilled grades, image contrast grades (for controlled visibility through x-ray, CT and MRIs for easier post-operative device placement verification by surgeons), and reinforced grades (which provide a variety of benefits including increased strength and stiffness, a modulus similar to that of cortical bone, and excellent wear performance in articulating joints and bearing surfaces).



Micro machining

Micro machining, another type of Swiss turning useful for medical parts, requires a proper mindset in terms of part and tool handling, inspection, and secondary operations. When micro machining medical parts, there are a few musts:

1. Machine accuracy: even with the best tooling, if your position locations are not accurate, you are fighting a losing battle. It is important to re-qualify your tool positions and update the database.
2. Run-out: run-out that might seem fine for a standard size part could likely spell disaster in micro machining Main/pickoff collets and guidebush need to be "XP" – extra precision. And ER style collets need "UP" – ultra precision.
3. High frequency spindles: essential for drilling or milling tiny features into parts and achieving the desired finishes, accuracy and tool life. For example, drilling a 0.2 mm hole in stainless, you will need 11,500 rpm. But if the tool is TiN coated (Titanium nitride – a hard ceramic material often used as a non-toxic exterior for medical implants), you need 19,000 rpm. Some spindles (such as those from IBAG, NSK, Meyrat and others) can reach speeds in excess of 150K. Spindles can be mounted various ways in the machine to meet specific needs.

These parts include features created with high frequency spindles and spindles that are mounted in holders.

Internal Broaching

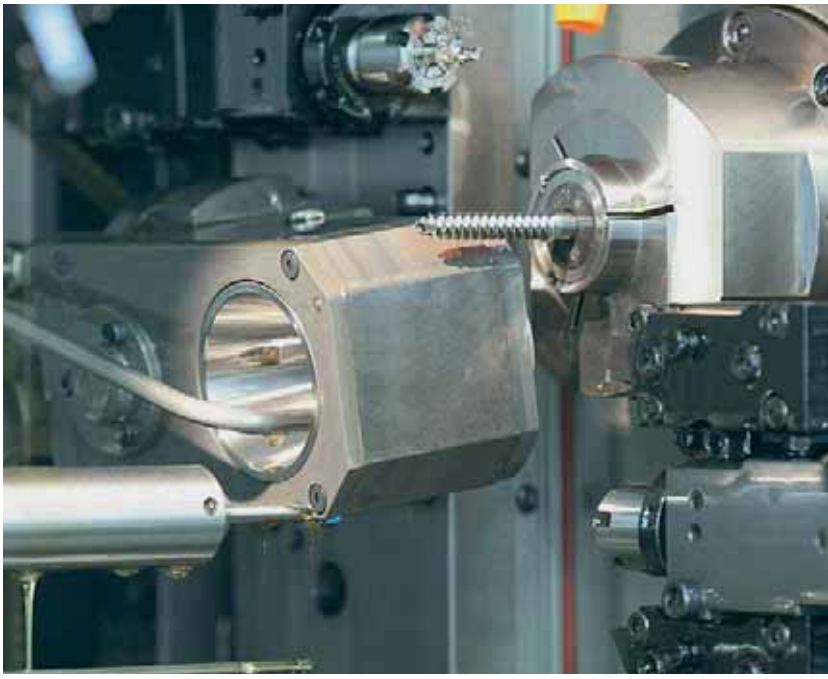
Another key machining process for medical parts manufacture is internal broaching. It's important to purchase the proper broaching tools. But how is the actual broaching process completed?

1. In preparation for the broaching process, it is necessary to make a pilot hole.
2. Depending on the configuration, it may be necessary to remove material for the corners with a small endmill.
3. A 90º chamfer on the hole is also necessary. This prevents the points from chipping upon entering the cut. It also allows the broach to follow the centerline.
4. Depending on the chip size, deburring passes may be required.

Rotary Broaching

Wobble (or rotary) broaching uses a tool with a similar shape to the final shape except that it is ground with clearance. The tool axis is typically inclined 1º from the work axis. As the broach rotates, it is pressed against the work. Due to the 1º incline, the leading edge of the tool "wobbles" with respect to the work. Tornos offers these guidelines:

1. If the tool is inclined 1º, the sides of the tool must have a clearance angle of at least 1º.
2. Ideally, the tool advances at the same rate it cuts. For example, a ½" diameter tool should advance at 0.022 per rev. (1/2 x sin (1º) = feed;
3. In general, wobble broaches does not cut as accurately as the punch broach so its use should be determined by the application.



Thread Whirling

Thread whirling, a technique pioneered by Tornos, is generally used for cutting special form threads in difficult-to-machine materials with far fewer limitations than other thread cutting options. Thread whirling is often used for bone screws due to their typical challenges: long length to diameter ratio; deep, high helix buttress thread forms; and extreme differences between major and minor diameters. ID thread whirling is great for producing clean, burr-free thread contours. No residual chips are created. And it's possible to thread right to the bottom of a hole. Thread whirling can produce threads as small as M1.4.

Alternatives to thread whirling include: die head (which doesn't work with materials like titanium; thread milling (which requires pre-turning, special cutters, and in some cases, special supports; single point turning (good for short screws – but long screws need support), thread rolling (which requires accurate pre-turning and doesn't work on "buttress" style threads of hard materials), and grinding (which can't be done on a Swiss turning machine).

Some special considerations with thread whirling:

1. the circular inserts used in a thread whirler are custom ground. If a customer does not have the means or desire to re-sharpen the circular inserts, they can opt for a cutter head that uses indexable inserts.
2. the setting gauge locates inserts at the proper angle prior to locking them into the head.
3. the cutter head is mounted into the thread whirling unit.
4. the thread whirling unit is mounted in the machine at the proper helix angle by means of a graduated scale.
5. tools rotate at very high speeds.
6. part rotation depends on left hand or right hand threads.

Special work holding

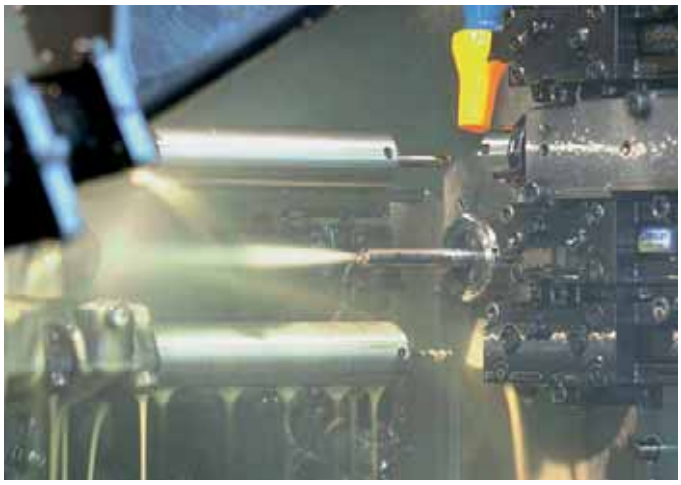
As more and more work is sent overseas, the remaining work takes experienced and knowledgeable people to process jobs in ways that are efficient and reliable. Specially designed work holding is a key component to success in the medical market. Step collets can be bored in the Tornos machine – resulting in superior concentricity and huge time savings.

This collet allowed a Tornos customer to balance work between main and counter operations improving productivity and profit.

Gun drilling

Cannulated (or hollow) bone screws contain a space that allows bone marrow to grow and facilitates the insertion of guide pins for bone screws used in fracture fixation. With increases in cannulated bone screw orders, many shops are purchasing cannulated material. This represents a large expense for the company due to the limited use of the hollow bar stock and the need to carry larger inventory. An alternative is gun drilling which allows these types of medical screws to be made efficiently from solid bar stock with:

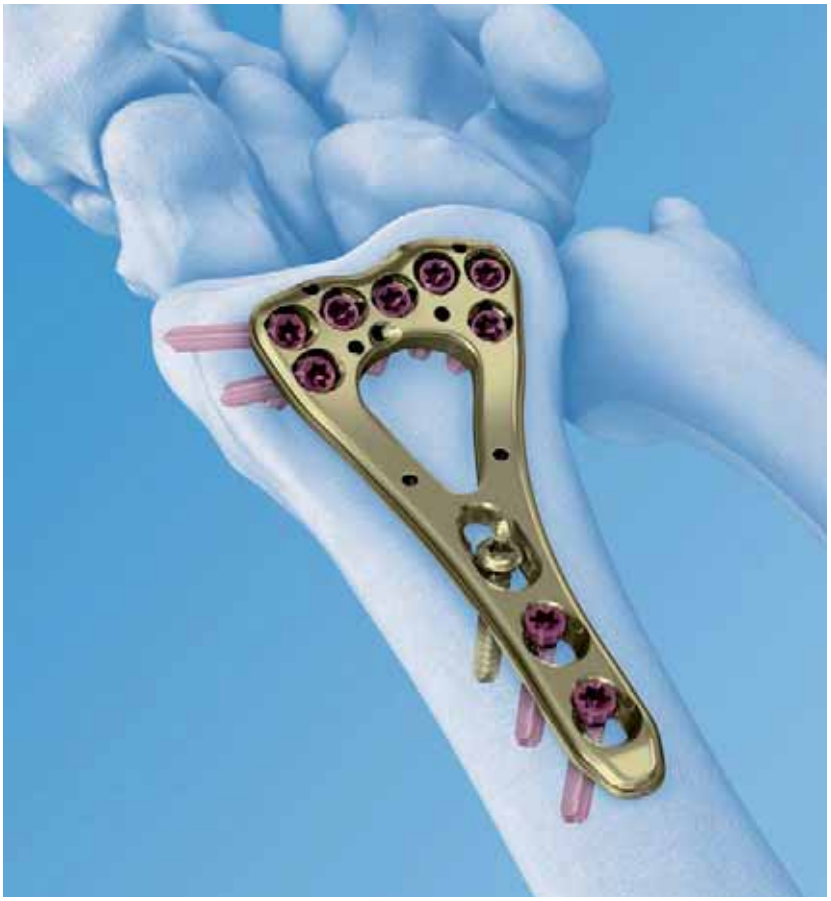
1. high drilling quality
2. great chip removal
3. high process reliability
4. minimum run out
5. great length to diameter ratio
6. reduced need for cannulated material inventory



For more information about using Swiss turning to produce medical parts and devices, please contact your Tornos representative or visit www.tornos.com

FIRST HAND KNOWLEDGE: THE MOTOREX MEDICAL TECHNOLOGY SEMINAR 2009

Approximately 150 participants attended two extremely interesting medical technology seminars to bring themselves up-to-date with all the latest technology. The seminars were organised by the Carpenter Technology Corp., a leading manufacturer of special steels, L. Klein SA, high-grade steels and metals and Motorex AG Langenthal, the industrial lubrication technology specialist.



Variable Angle LCP Two Column Distal Radius Plate, © by Synthes

The 2009 Medical Technology Seminars, which were again conducted under the organisational leadership of Motorex aroused great interest among participants. The first seminar took place at the BBT (Berufliche Bildungsstätte Tuttlingen[1]) in Tuttlingen, Germany and the second at Motorex's headquarters in Langenthal, Switzerland. The seminars dealt with a whole range of themes from the production of implants and

[1] Tuttlingen professional education establishment

Filip Van Weereld, Regional Metallurgist Europe, from Carpenter Technology Corp. provides information about cobalt-chromium alloys. CoCr was used for an implant for the first time back in 1936.

A lubrication technology expert from Motorex describes the successful Swisscut Ortho cutting oil used with Vmax technology as a "fluid tool". Nowadays process optimisation is an interdisciplinary challenge.

instruments to cleaning and sterilisation. In addition to the companies Carpenter, L. Klein SA and Motorex, representatives of Chiron, Tornos, Seco Tools, Dow Europe, Borer Chemie, Amsonic and the Fraunhofer Institut provided information on the latest medical technology innovations during the seminars.

Sophisticated cobalt-chromium alloys

Carpenter Technology (www.cartech.com) is a leading manufacturer of special steels and metals and is a reputed worldwide supplier of top-quality products for a wide range of applications. L. Klein SA (www.klein-metals.ch) is a distributor and stockist for these high-value materials produced by Carpenter Technology. A considerable proportion of the products used in medical technology are cobalt-chromium alloys (CoCr), which are used for a wide range of medical parts. These feature excellent mechanical characteristics in terms of corrosion resistance and bio-compatibility. We distinguish between conventional molten cobalt-chromium alloys and those produced using powder metallurgy. Both types make high demands on companies who process them using machines, tooling, lubricants and cleaning specialists.

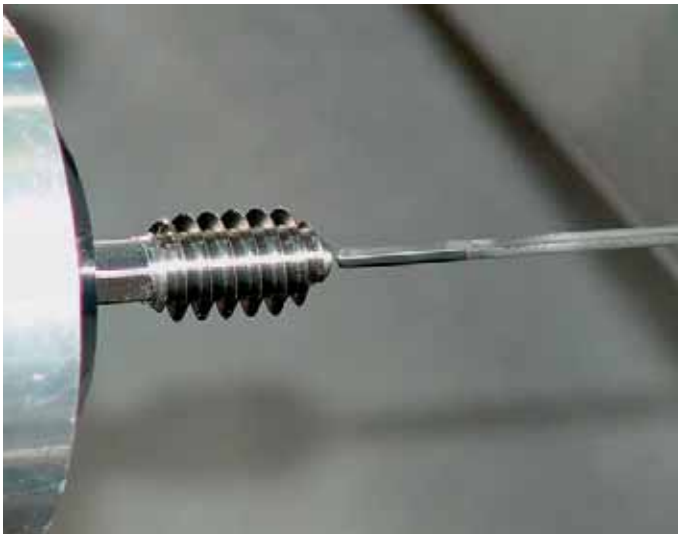
Machining fluids as fluid tools

In the machining of medical technology materials, the supplier needs to provide top-notch cooling, lubricating and flushing characteristics. A Flushing pressure of up to 120 bar is no longer rare in this day and age! Extreme pressure characteristics are also required. The lubricating film must be exceptionally temperature and high-pressure stable, so that the fluid's EP characteristics can absorb the extreme pressure levels. With the continuous development of high-performance cutting oil Swisscut Ortho NF-X and Motorex Vmax Technology, Motorex has made a considerable contribution in the field of industrial medical-technology component production. The cutting oil is completely free of chlorine and heavy-metals and can be easily cleaned off.

Meshing together of all processes

Continuous development and adjustment of the production process is therefore indispensable. The economical machining of this "extremely hard material" is a real challenge. Criteria such as the surface quality, tool life, washability and compatibility of the machining fluids and cleaning agents used are also of

A significant part of the seminar was devoted to the theme of cleaning and sterilisation of manufactured parts. Mrs Christiane Wetzel from the Fraunhofer Institute gives a lecture on electron-beam sterilisation.



There are no greater extremes in part production than thread whirling and deep-hole boring: equipped with the right tools and Motorex Swisscut Ortho NF-X cutting oil, this is now a reality.

the utmost importance. For this reason perfect meshing of all the specialities and processes is absolutely essential in the medical sector.

If you have any questions on this subject, the specialists at L. Klein SA are on hand to help regarding high-grade steels or at Motorex for machining fluids. The technical experts would be delighted to answer any questions and will forward any interdisciplinary enquiries to the specialists concerned, i.e. seminar partners.

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ENTERPRISE NOT INACTIVITY

The success story of a medium-sized manufacturer of turned parts is an inspiration.

Katja Geigle, Sven Martin (Tornos) and Manfred Geigle talking shop.

It's nice in these times to come across a company that doesn't immediately join in with all the moaning about the economic crisis, but instead looks to the future with confidence and assurance. In just under 40 years, Manfred Geigle, founder and managing director of Manfred Geigle GmbH, has turned a small garage operation into a solid, medium-sized business that manufactures precision turned parts and continues to grow steadily. Closely linked to this success story is the Swiss machine tool manufacturer Tornos, which not only laid the foundations of the company with the first machine but still today supplies most of its state-of-the-art machinery.

Manfred Geigle is a "Swabian" thoroughbred businessman who despite his success; has kept his feet on the ground. Growing up with five brothers and one sister, he quickly learnt what it was to "achieve". He still lives by this virtue today. He began his career path as a toolmaker's apprentice in a precision optics company. Manfred Geigle subsequently took his master craftsman's diploma in the evenings alongside work, and his personal manner as well as several suggestions for improvement and his own developments quickly earned him the trust of his superiors. By the age of 24 he had already become head of department and he would certainly have had an impressive career ahead of him in that company. However, even then, Manfred Geigle dreamt of independence and in 1970, at the age of 26, he and his wife realised this vision. For 56,000 DM they purchased a new Tornos R 10 and set it up in the garage. At the beginning of January they spent a fortnight in Moutier for training. The knowledge gained in Switzerland was then put into practice for a week. However, Manfred Geigle felt that he could get even more out of the machine and therefore went back to Moutier for another fortnight, where he extracted every last piece of information from the Tornos technologists. This cooperation and Tornos' desire to provide excellent support even to smaller customers has characterised the relationship between the two companies to this day.

Growth in waltz time

The company's very first customers included not only Siemens and Alfred Teves, but also the typewriter manufacturer Triumph und Adler. This allowed Manfred Geigle to make full use of his experience in precision engineering and in June 1970 the second machine, a Tornos M7, was purchased. From here on, the company went from strength to strength. In June 1975 Geigle, which by now included three employees and five machines, moved into the buildings it still occupies today. Even here, Manfred Geigle's foresight is impressive. Although the company had by now expanded nine-fold, the whole facility is a compact unit, in which all the individual operations overlap functionally. This company has long since developed from a simple turning shop into an efficient system partner.

The company draws on the whole range of state-of-the-art turning technology and has a total of more than 28 CNC sliding headstock automatic lathes with up to eleven axes in a diameter range of 2.0 to 25,0 mm, 15 six-spindle automatic lathes, 2 centreless grinding machines, 4 cylindrical grinding machines and 3 honing machines. This means that Geigle is able to offer the customer an exceptional vertical range of manufacturing¬ with numerous further processing options, such as centerless grinding, surface grinding, lapping, honing, blasting and smaller assemblies. The service is rounded off by co-operation with selected partners for heat and surface treatments such as thermal and electrochemical deburring.
For the automotive industry, the company manufactures (for example) heavy duty turned parts from materials with low machinability for fuel injection systems, valves in air conditioning systems, safety components in ABS and ESP systems as well as precision parts in exhaust gas recirculation systems. For the jewellery industry, a further main pillar of the company, it manufactures high-quality necklace components and ear studs from precious metals. Other customers come from the furniture and fittings industries and a great deal of medical operating equipment also owes its precision to the use of turned components made by Geigle. The customer spectrum is completed by sophisticated parts for exclusive writing implements and small parts for the electrical industry, component parts for display cabinets or household appliances and gardening tools.

Always at the cutting edge

"If you don't move with the times, you'll get left behind". Manfred Geigle has taken this saying to heart more than anyone. He is always on the look out for new technological improvements. Thus he was one of the first SPC users in Germany and was

Quality assurance is of great importance at Geigle. Several temperature-controlled inspection rooms contain the latest measuring equipment in order that all customer requirements can be assessed in-house.

among the pioneers in data telecommunications. Again, when entering into CNC technology, he relied on Tornos - thus sparing himself all kinds of disappointment. Together with Tornos he gained his initial experience in this area and fostered development. But Manfred Geigle wanted even more and so he continued to grow in his role as development partner to his customers. He designs the turned parts together with his customers, in order to make the manufacturing process more cost-effective and as efficient as possible. The parts are then processed in-house at Geigle right up to complete component assembly. During the whole process, any challenges are solved in a creative and unbureaucratic manner. Despite the size that the company has now become, it has remained a family concern in its thinking. Frau Suse Geigle and daughter Katja run the business side while Herr Manfred Geigle and son Jörg are responsible for the technology. Unbureaucratic structures and short communication channels are the foundations of an extraordinary capacity for flexibility. Operating procedures are constantly being improved and the company is always looking for new solutions. Word of this kind of aspirational thinking gets about and the company now often receives enquiries which other suppliers have already given up on. Turned parts that even Tornos had to pass on and the customer had lost hope of finding a solution for, such as pens with a silver core and stainless steel casing, are one of the current challenges that Manfred Geigle GmbH has bravely taken on. A fundamental prerequisite for this precision for Manfred Geigle is of course the quality of the Tornos turning machines, which he equates to that of a large and well known Swabian car manufacturer. *"This is where you see that Tornos comes from the field of precision engineering; the machining is perfect and flawless down to the last detail. Even on our older machines we still achieve accuracies below 6 µm."* Manfred Geigle gets really enthusiastic when he talks about the new MultiDeco CNC multispindle automatic lathes with 6 and 8 spindles. For him they are the ne plus ultra of engineering. He is also full of praise when it comes to working with Tornos. The machine manufacturer is a very customer-oriented company which responds to the needs of the user and is a highly competent and committed organisation to work with.

Experts together: Manfred Geigle (left) and Sven Martin from Tornos.

A passion for quality

On a tour of the company, it is immediately apparent that Manfred Geigle is a perfectionist and doesn't leave quality to chance. *"Only when we are able to assess all customer requirements ourselves can we also pass our quality standards on to the customer by supplying perfect products."* Therefore, Geigle has put huge resources into building and expanding his quality assurance system. In a temperature-controlled micro-inspection room, testing equipment is used that is able to display even the smallest tolerances reproducibly. For example, computerised measuring systems for contours, surface as well as form and position are used. State-of-the-art light measuring technology for optical measurements or a 3D multi-sensor measuring machine that completes every measurement task fully automatically is also employed. This means that you can choose between tactile, optical and laser measurement technologies depending on the job in hand. The process capability is monitored by an efficient CAQ system. As a competent partner in the automotive industry, Geigle is certified according to DIN EN ISO 9001:2000 and ISO/TS 16949:2002.

However, the manufacturing process at Geigle is not only economically efficient but also environmentally friendly. For this reason, the company places particular importance on sustainable production and this is

Jörg Geigle (left), here with Sven Martin from Tornos, will further develop the company with his sister, continuing in the philosophy of his father.

monitored by strict standards. Geigle was also one of the first companies in its sector to introduce its own alkaline-based cleaning circuit with subsequent water recycling through a complex filter system. The proper disposal of other materials, the use of machine-generated heat for heating and a separate swarf storage system are further measures that help to protect raw materials, soil and water for future generations.

This responsible attitude of Manfred Geigle can also be seen in his dealings with employees and suppliers. The 50 or so employees have excellent qualifications and a vast wealth of cross-industry knowledge and experience. By providing regular training and education, the company furthers this know-how and ensures that it is always up to speed on the latest scientific and technical expertise. The satisfaction of the employees at Geigle can be seen not only in their exceptional performance and customer focus, but also in the above-average length of employee service, of which the family business is very proud. The course has been set for continued success, as Katja and Jörg Geigle will further develop the company, following their father's philosophy. In doing so they will continue the partnership with Tornos and, together with this machine manufacturer, write several more chapters to this success story.

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SERVING THE INDUSTRY

During these turbulent economic times, one factor that allows companies to compete effectively is having skilled, creative staff. Training is therefore a keystone in the success of a business, both today and tomorrow. Tornos has recently installed a Micro 8 machine at CNIP in the Val-de-Travers (Switzerland) and we wanted to know more about this training institution serving the local, regional, and national economies. To find out more, Tornos met with Ms Gosteli, Marketing and communications manager for the institution.

Presentation of the logo in 3d during the open day last October.

An established centre in its region…

CNIP is a training centre for adults who have few or no qualifications. It has provided continuing education for the past 15 years, specialising in traditional and CNC mechanics, electrical engineering, polishing, welding, watchmaking and logistics. The training consists of a combination of theoretical and practical modules and focuses on getting people who are specifically qualified to meet certain labour market needs. It can be adapted for people who want to get back into the workforce, those who wish to learn new skills or those who wish to bring their existing skills up to date.

… serving businesses

It is not uncommon to provide targeted training for businesses in the Neuchâtel, Vaud and Jura regions and also in neighbouring France. Another service offered by the institution is to provide an assessment of technical competences. It is possible to take a test module that will determine an individual's skills and the training modules they would be best suited to. The purpose of this is to offer training that not only meets the needs of the market but also the goals of the employees themselves.

View of the unit dedicated to the "small and precise". This unit integrates programming, production and testing.

Mr Yersin (left) and Mr Tüller in front of their new Micro 8. *"This type of machine has been taken up on a large scale in our region so there was a real need for training support".*

Working with the machines

The training is carried out using actual projects; therefore the results achieved are very similar to those achieved in real working conditions. Sometimes CNIP is sub-contracted to create workpieces for local companies. Ms Gosteli tells us: *"We do not wish to compete with our clients and partners, but actually doing small production runs can sometimes be helpful to them."*

Why Micro 8 machines?

As we have seen above, the institution wishes to offer the types of training that meet the needs of the market. Ms Gosteli says: *"This type of machine is used on a large scale across our region; therefore there is already quite a significant need at this level."* Mr Yersin and Mr Tüller, managers of the workshop, add: *"The machine is easy to program, to use and to explain. It is also very precise and trustworthy. Our industrial partners in the region have been very satisfied with this acquisition that allows us to gear our training towards NC bar turning."* They continue: *"In*

A NEW IMAGE AFTER 15 YEARS

On 23 & 24 October, CNIP unveiled its new image during an open day. At this event, the employees presented work they had created to the large number of people present. It represented the institution's new logo. Ms Gosteli explains: *"We really wanted to add value to CNIP, we are known and recognised as a quality provider and our image was slightly old-fashioned and had not developed at the same rate as the company. When the project to create a new logo began in the company, a strong sense of teamwork developed among the staff. This project allowed us to reinforce motivation and team spirit within our institution."*

bar turning, we have been training specialists on cam-operated machines for a long time, but today demand is clearly shifting toward CNC. There are still markets for the cam, but trainees are also opting for CNC." In addition, a larger diameter machine (20 mm) from the Tornos range will soon complete their collection of machinery.

A desire for higher quality

CNIP, an Eduqua and ISO-certified company, is recognised by the industries as a provider of quality training. Its 25 trainers are competent professionals with industrial experience. Ms Gosteli tells us: *"Our main goal is to provide the best for our student; our trainers are professionals in their fields and have also undergone intensive educational training, usually the Swiss federal adult trainer's diploma. This ideal is the same for our production/training tools: we want to have the best."*

The training covers all aspects of the machinery, starting with the basics such as drilling or simple turning.

Training on Tornos and Almac machines

On the 3,500 square metres we have available, a small section for the "small and precise" and includes Tornos machines in the Almac CU 1007 and Almac FB 1007 ranges, as well as a single-spindle Micro 8 and an Alphacam programming workstation. This mini workshop is managed by production managers, former employees of Tornos Fleurier. They said: *"Our machines are well equipped and we can carry out training that closely corresponds to the needs of the markets. Usually we receive a list of specifications and use it to develop customised training."* Carlos Almeida, Tornos sales manager for French-speaking Switzerland, adds: *"We have received a large amount of positive feedback from our clients. Being able to conduct our training locally is definitely a plus."*

As a prominent player in the medical and watchmaking markets, Tornos should be active in training areas that reflect its clients' industries. Also, through CNIP, a range of the latest generation of machines is available to the regional economy.

"Our machines are well equipped and we can carry out training that meets exactly the needs of the markets" - Mr Tüller and Mr Yersin, workshop managers.

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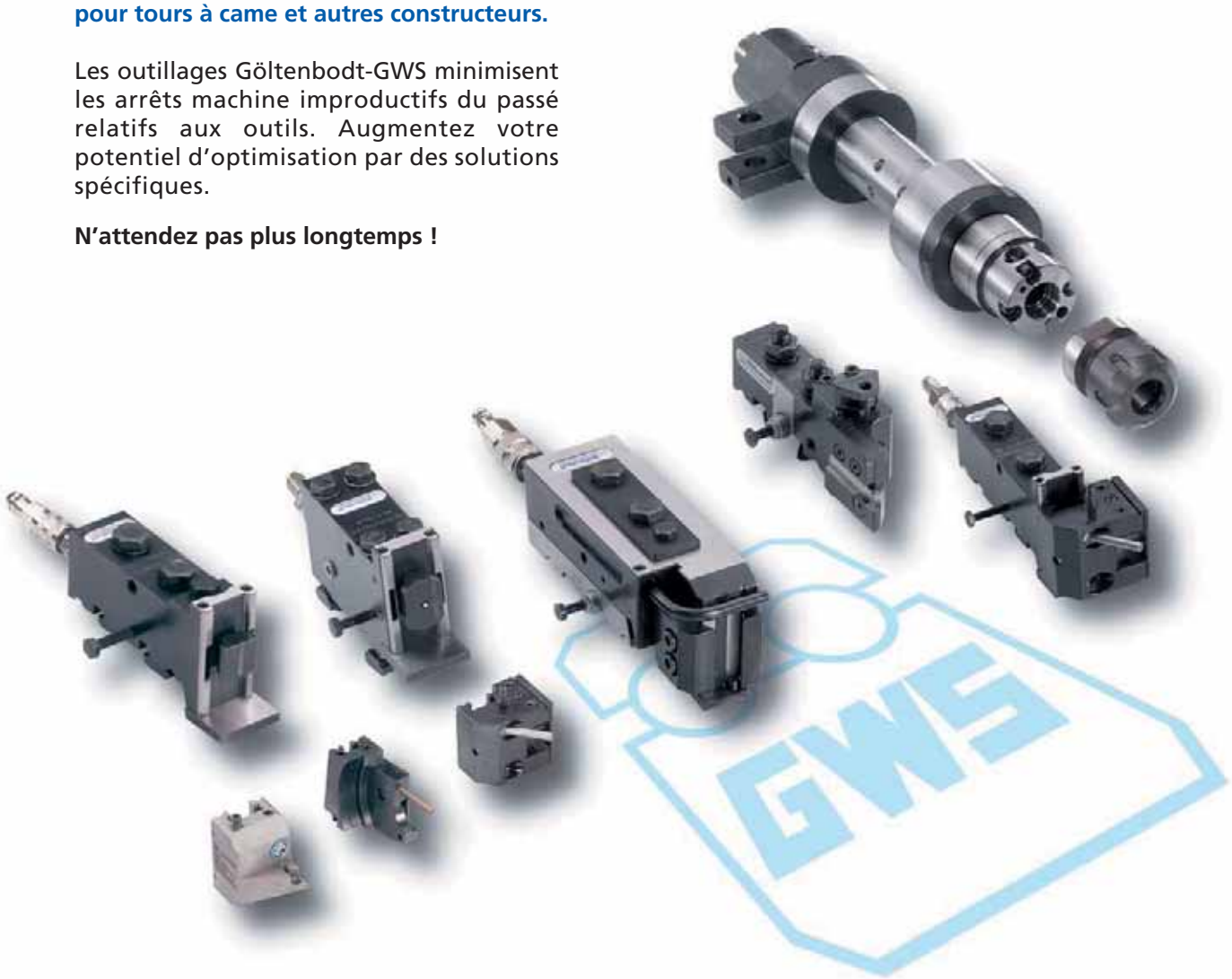

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THE NEXT GENERATION…

Interest in the mechanical professions is cyclical in nature and is closely linked to the ups and downs that the industry experiences. Even though the bar turning profession has evolved significantly through the introduction of numerical control and the efforts of manufacturers to offer increasingly pleasant working conditions, it still does not have a good image among young people. And yet, bar turning is ubiquitous and is of benefit to all sectors of industry. For the third year running, Tornos Deutschland has made a donation towards training instead of sending out the traditional customer gifts.

United

Numerous institutions are springing up around the world to encourage training, but unfortunately communities cannot always bear the costs for such operations and action from industry is very welcome. This year, the German branch of Tornos decided to support two institutions: the vocational training centre (BSZT) in Pirna (Osterzgebirge) and the Behinderten-Werk Main-Kinzig e.V. (BWMK) in Gelnhausen. Through these acts, the machinery manufacturer intends to demonstrate its support for training and for the regional economy as it prepares for the future.

1st beneficiary:
Berufsschulzentrum für Technik, Pirna

Situated in the Eastern Ore Mountains, the Osterzgebirge administrative district is certainly not one of Germany's largest industrial centres; rather it is an area of impressive natural beauty. However, this region does have a tradition of being an industrial location with its remarkably diverse range of business activity. Major sectors include machine and plant engineering, metal processing, vehicle subcontracting, chemical industry/plastics processing, timber and paper industry, tourism and services. The Glashütte

watch manufacturer is world-famous and the area is also home to many efficient and innovative bar turners. This is also the reason why this region has developed into a genuine Tornos stronghold, because Tornos automatic turning machines are unmatched in terms of precision engineering productivity and efficiency. That is why, last year (2008-2009), Tornos

From left to right: Hubert Sperlich – CEO of Telegärtner Gerätebau GmbH Höckendorf, Chairman of the IMPRO trade association, Egon Herbrig – CEO of Herbrig & Co. GmbH Bärenstein, Jan Lippert – Production Director at Herbrig & Co. GmbH Bärenstein, Dr. Willi Nef, Vice President and Head of Sales and Marketing Tornos Moutier Frank Mortag, Sales Director for Tornos Germany/East.

supported an initiative of the regional council, the vocational training centre (BSZT) in Pirna and the IMPRO e.V. federation and offered the BSZT attractive conditions for acquiring a Deco 10e CNC automatic turning machine (see decomagazine number 49). This year (2009-2010), the manufacturer renewed its support by making a donation.

Having a large well-trained and highly motivated workforce in reserve gives a solid basis for strong economic development and a functional community. For this reason, in 1995 the district administration decided to invest in vocational training and lay the foundation for Germany's most state-of-the-art vocational training centre. Over 1000 young people are currently being trained in a wide range of technical and industrial trades. Manfred Weiß, a head teacher for over five years in Pirna, has been promoting the development of the centre: *"Job descriptions and requirements are changing continuously. By providing young people with the right resources, we can give them the tools they need for their future careers."*

From left to right: Presentation of the donation cheque to Thomas Weichler (BWMK workshop manager) and Wilhelm Kramer (BWMK workshop specialist) by Sascha Schmidt (Tornos Sales Engineer).

2nd beneficiary: Behinderten-Werk Main Kinzig e.V., Gelnhausen

Technical expertise and attention to detail are an essential foundation for the quality of the work in the metal workshop. With modern machinery and professional expertise, everything to do with turning, milling, sawing and drilling is provided in precision – from batch production to mass production. What is so special about the workshop? People with disabilities find work here and gain additional qualifications - with the aim of sending them into the job market. In order to best adapt working processes to the abilities of the workers, the fields of activity are analysed. Following many years of experience in the care and support of people with disabilities in the workplace, a team has been formed to deal with fixture construction. Tools and machines are specially developed and built to enable people with disabilities to carry out specific tasks. This makes it possible to meet the customers' requirements precisely and promptly.

The Steinheim metal workshop belongs to Behinderten-Werk Main-Kinzig e.V. (BWMK). The BWMK is a not-for-profit organisation that currently offers support, education and care for people with disabilities in 44 establishments in Main-Kinzig district. Established in 1974 as an amalgamation of regional counselling associations, the former disability society of Hanau and Main-Kinzig district, the BMWK has since developed into a medium-sized organisation with about 600 employees. The social enterprise regards itself as a body that assists and provides services to people with a specific need for support. This means supporting these people in such a way that they can go about their daily lives as self-determinedly and independently as possible. The BWMK ensures that people with disabilities can draw on individually tailored services in the fields of work, housing, education, consulting and leisure activities. The aim is to integrate people with disabilities into the social community, taking into account their right to autonomy.

A bet on the future…

To conclude, Herr Jens Kuettner, Director of Tornos Technologies Deutschland, told us: *"It's true that we didn't send gifts directly to our customers at the end of the year, but we are convinced that they will benefit directly or indirectly from the consequences of our action. Support for training and employment is a priority."*

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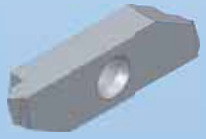

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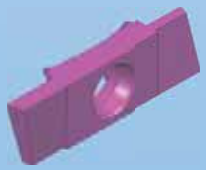
Gamme idéale pour le développement de plaquettes à profil complexe.



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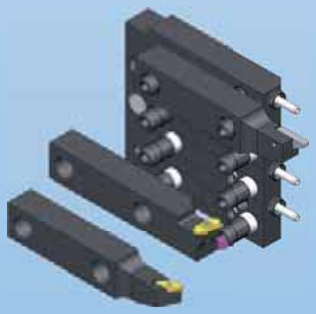
Gamme économique.



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