CNC4you

The Shopfloor Magazine

2nd Edition **2008**

SIEMENS

Manufacturing medical technology workpieces for the entire process chain

From Image to Implant

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CNC4you

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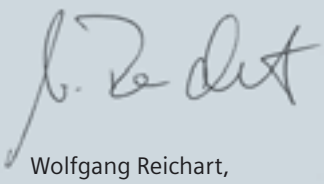
Dear readers,

The **tool and mold-making sector** is booming. However, there are also more and more challenges. Ever shorter product cycles and increasingly faster design changes demand greater flexibility from mold makers. Whether in the automotive or consumer goods industries, the energy or the medical technology sectors, workpiece surfaces must be perfect the first time, requiring virtually no finishing work whatsoever. There are equally high demands for absolute precision in machining production in order to succeed in an increasingly competitive market.

Our Sinumerik CNC offers you an ideal platform to gain a competitive edge. We have an appropriate solution for every requirement, from the Sinumerik 802D sl for simple three-axis cutting tasks to the 840D sl for complex five-axis machining, naturally, including special **tool and mold-making functions and applications.** With the Sinumerik 840D sl and the shopfloor-compatible **ShopMill** operating and programming software, we've put together a technology package for high speed cutting that provides optimum support for the entire production process, everything from machine setup to multiple-axis machining. In addition, with the acquisition of UGS, Siemens is now also able to provide integrated solutions for the entire **product lifecycle** from CAD/CAM processing to production – a new level of integration that holds enormous potential for increased productivity and efficiency. Optimized post processors for Sinumerik ensure perfect CAM data execution by the control system.

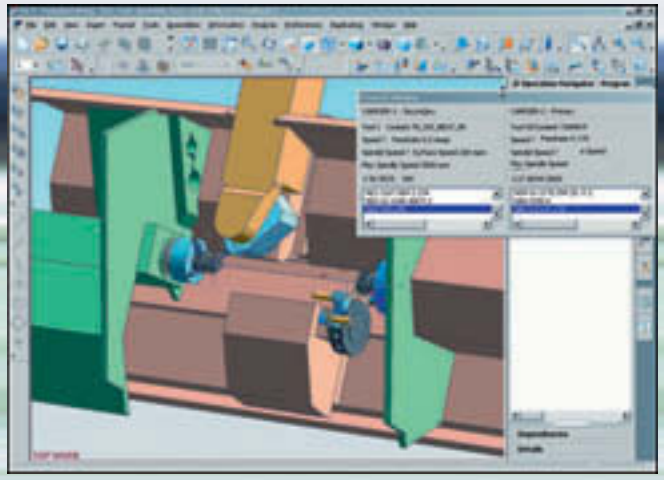
I invite you to discover our fascinating CNC solutions at this year's **EuroMold.**



Wolfgang Reichart,
Tool and Mold Making Project Manager
Siemens

Optimum technological solutions for tool and mold making

Getting a perfect workpiece faster



Perfect machining in the shortest possible time plays an increasingly important role in tool and mold making. The demand is much easier to fulfill with an integrated solution for the CAD/CAM/NC process chain.

Whether in the automotive, the consumer goods or the medical technology sector, time-to-market cycles for products are becoming shorter and shorter, while product quality demands are steadily increasing at the same time – particularly with complex parts. Frequently, there is simply no time for extensive testing and corrections. The workpiece coming off the machine must be perfect.

Optimized interface

No matter what the industry, molds must be manufactured with greater precision and complexity, and in the shortest possible time. Although three-axis machining has long dominated tool and mold making, an increasing trend toward high-performance five-axis machining is noticeable today. Particularly in milling, there is still a great deal of potential for more productivity and efficiency. That's why the CNC plays an important role. For example, the optimization of the interface between the CAx process chain and the control system still offers great opportunities. Integration of the CAD/CAM/NC process chain facilitates production, thereby making it more efficient. With the acquisition of UGS (Unigraphics, now Siemens PLM), Siemens opened completely new opportunities to seamlessly translate the CAM/CNC language into the NC code for the machine. A perfectly adapted post processor for the Sinumerik 840D sl and the NX-CAM system ensures that the CAD/CAM program responds directly to the control system functions, and that the machined product fully meets specifications the first time around.

Moreover, the virtual NC kernel (VNCK) of the Sinumerik 840D sl enables one-to-one integration of the control system's NC core into the CAM system, thus accurately simulating all machining steps in advance. As a result, production outcomes can be predicted with greater accuracy, collisions are avoided, and perfect machining quality is assured right from the start.

Consequently, a comprehensive system for the entire process chain emerges – from the CAD model to the finished tool. This enables quick and flexible response to production changes, including drives and motors. Siemens supplies an integrated solution which optimizes motion control and speeds up machining. Ultimately, this ensures higher productivity.

End-to-end technology package

Ideally, Cycle832, the "high-speed setting (HSS) cycle" of the Sinumerik 840D sl, which provides technological support for three- and five-axis high-speed machining of free-form contours (surfaces), would also be directly operated by the CAD/CAM system. The system

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Precisely simulating all machining steps in advance ensures perfect quality right from the start

Sinumerik 840D sl:

The highlights

- Highly functional and user-friendly for setup and measurements
- Flawless workpiece surfaces through excellent motion control and highly dynamic drives
- High-level precision through multi-axis kinematic scanning and optional correction functionality of the slightest errors during machine operation
- Fine-tuned process from the original idea to the finished workpiece through the perfectly tailored Siemens PLM post processors with NX CAM

compiles all of the necessary functions for HSC (high-speed cutting) in a single cycle, provides support in the creation of structured NC programs, and negotiates an ideal compromise between speed, precision and surface quality.

The Sinumerik 840D sl and ShopMill, the operating and programming software for the shopfloor, offer tool and mold makers an end-to-end technology package for high-speed cutting that provides optimum support for a wide range of requirements – everything from measuring and setup to programming, data transfer and program execution.

The ShopMill interface is extremely user-friendly and can be operated without in-depth CNC knowledge. User-friendliness is further enhanced with graphical function displays and intuitive input dialogs.

In the unlikely event that there are problems, help is always close at hand – anywhere in the world. That is a real competitive advantage because, in times where cycle times are becoming shorter and shorter, it is crucial that the machine never stands still and that no orders are delayed.

A look to the future

At this year's EuroMold, Siemens will look to the future and point out in which direction the road for efficient production methods such as high-speed cutting (HSC) is headed – not only for medical technology. It is becoming increasingly easier to machine harder materials even faster into precisely molded products with perfect surfaces the first time around. <

Manufacturing medical technology parts along the entire process chain

From image to implant


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CNC tool and mold making solutions from the Siemens Drive Technologies Business will be on display from December 3 – 6 at Euromold in Frankfurt. The centerpiece of the Siemens platform, the start of the High-Speed Cutting (HSC) Medical Roadshow, will showcase solutions for the for medical technology sector.

Together with DMG, Iscar, Renishaw and Siemens PLM, the Siemens booth (Hall 8, Booth H36) will highlight the significance of HSC solutions for prosthetic and implant production. The presentation targets machining companies, for example, from the medical technology or tool and mold making sectors, and will demonstrate an integrated CNC solution for everything from the design concept to the finished product.


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Expertise across the entire process chain – from the clinic to the finished implant

1.	Design, programming, simulation, post processor	Scanned CT data slices are processed by Siemens PLM via NX-CAM.
2.	Measuring functions, quality assurance	Renishaw measurement technology perfectly calibrated for the SINUMERIK 840D sl, utilization of measuring probes and OMV software.
3.	Workpiece machining – tools	Iscar supplies tools for maximum process stability, productivity and quality.
4.	Workpiece machining – machine tool + control system	Ultra-dynamic DMG HSC 20 machine tool with SINUMERIK 840D sl – the most powerful control system for milling.
5.	Implant production	Flexible, highly accurate machining of extremely hard materials.


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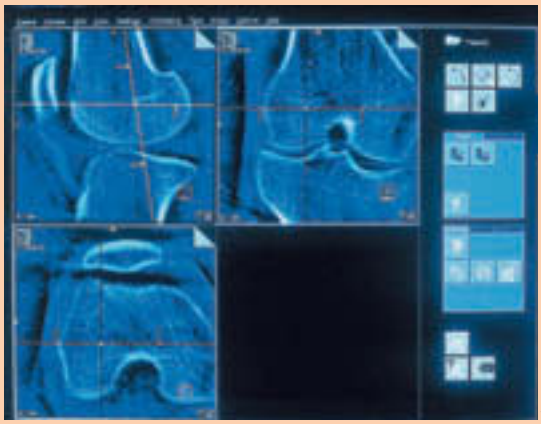
Using medical workpieces as an example, there will be a live presentation of the entire process chain, starting with the clinic and ending with the finished implant. Visitors can watch doctors use imaging data of a complex fracture acquired with a computed tomography (CT) scan to select an appropriate implant, and then position it in the fracture area of the patient on the computer. Of course, this is only possible if the implant geometries are stored in a database, and the clinic has implants in stock or can access them immediately from a manufacturer.

Simulation of machining sequences

In plastic surgery, however, where implants specifically manufactured for each individual patient are needed, a different process is employed. Instead of pre-machined parts, implants are tailor-made with the help of 3D imaging. In this case, the machine tools are controlled using the implant geometries. Calculated contours and shapes are acquired by the CT to produce implants that are a perfect fit. However, the feasibility of the planned production processes is first determined on a monitor using an NX graphic simulation from Siemens PLM to avoid potential collisions or damage to the workpiece contours.

Technology package for milling

High-speed cutting (HSC) is a machining process with high cutting speeds. HSC machines achieve high spindle speeds combined with feed rates that are much higher than those of conventional machining tools. Consequently, they require control systems and programs that equally fulfill these requirements. The Sinumerik 840D sl is specifically designed for the requirements of medical technology part-related HSC work. >>



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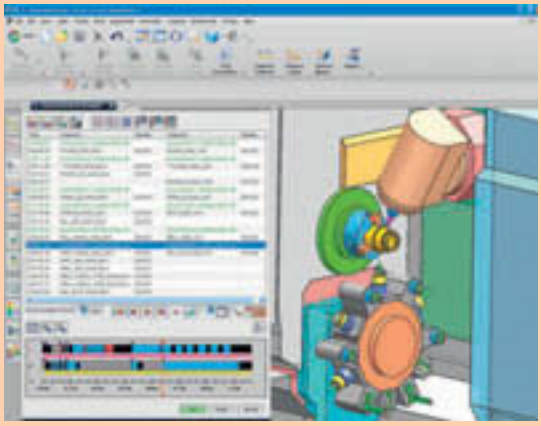
The process chain already begins in the clinic, where the doctor uses imaging data to select an appropriate implant



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NX from Siemens PLM enables realistic simulation of machine functions

P. Koerber

Implants for knee joints are precision machined with the HSC process of Sinumerik 840D sl

P. Koerber

The finished implant is a perfect fit

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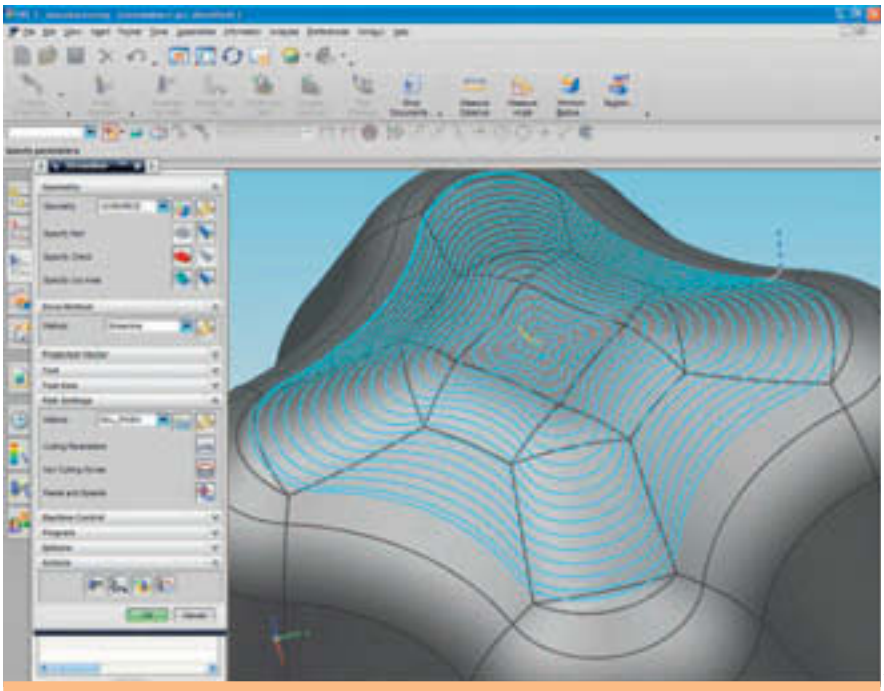

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The technological details

NX from Siemens PLM

NX is a Siemens PLM software solution that allows tool paths and functions to undergo virtual testing under machine conditions at the modeling and programming stage. The virtual NC kernel (VNCK) of the Sinumerik control systems, combined with the key parameters of the machining tools, ensures that the simulation precisely corresponds with the actual machine processes. This realistic simulation with NX means that the program testing process on the machine can be significantly reduced, or even eliminated.

>> Integrated functions assist users with setup and programming, thus allowing for fast and precise production sequences.

Together, the Sinumerik control system and ShopMill software form a milling technology package that allows machine operators rapid access to the functions they need. Thanks to graphic function display and input dialogs, cycles can be used quickly and effectively after a brief training period. Even the smallest errors can be corrected during operation using multi-axis kinematic analysis. The “Safety Integrated” safety solution provides protection for personnel and machinery. The software can be used to interlink emergency stop buttons and light barriers. In the event of an operating error, dangerous movements are immediately brought to a standstill and the power supply to the motor is quickly cut.

The use of measuring probes

During Euromold, the production of artificial knee joints on an HSC 20 linear milling center manufactured by DMG will be controlled and monitored by a Sinumerik control system. With its broad range of functions, the milling center is particularly well-suited for use in the medical technology sector. It is equipped with linear drives on all axes and achieves acceleration rates of over 2 g. The model can also generate a surface finish of up to 0.2 micrometers Ra. The liquid-cooled machining spindle operates at speeds of up to 42,000 rpm, thereby covering an extensive range of potential applications in the medical sector, where materials such as titanium, chromium-molybdenum, tantalum and niobium are milled.

In order to achieve maximum precision during implant production, while also maintaining a consistently high level of product quality, measurements are taken continuously from both the machine and the workpieces. At Euromold, Renishaw will demonstrate the fitting of HSC production machines with appropriate measuring probes, and the use of other solutions to measure tools, detect broken tools as well as set up and measure workpieces. Booth staff will provide demonstrations on the targeted use of measuring probes to reduce setup times by up to 90 percent as well as improve process control.

Cost-effective machining

Metal parts used in medical technology are often extremely complex. Thus, choosing the right tooling can have a great impact on the quality of the finished products. After all, cutting tools ensure that the parts leaving the machining center are absolutely precise and require no further finishing work. Although the materials used are difficult to machine, the tools must fulfill high demands with respect to the precision and surface quality of the implants. At the show, representatives from Iscar will demonstrate the use of precision tools for turning, drilling, milling and finishing jobs. They will also highlight the performance qualities of non-vibrating carbide milling cutters, which are well-suited for machining implant materials, as well as offer information on more cost-effective and efficient machining processes. <

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ISCAR

Precision machining tools for medical technology

Built tough

The production of medical components from titanium and other rustproof materials places high demands on machining tools. Ettlingen-based tool supplier Iscar offers a broad range of machining tools capable of handling such tasks – for turning, milling, drilling, countersinking and tapping of forged blanks and parts made from drawn solid materials, as well as tools for contour finishing and for rough and finish work.

Titanium is one of the key materials used in medical technology. Tools used for machining hard-to-cut titanium blanks are subject to high levels of continuous stress. This accelerates tool wear, potentially causing them to fail. For titanium machining, Iscar relies on materials such as very fine-grain and ultra-fine-grain substrates. For finish work, it also uses cutting inserts with polycrystalline diamond (PCD) particles.

Rustproof stainless steels contain varying amounts of chromium, nickel, molybdenum, manganese and niobium. Contrary to the obvious mechanical, hygienic and medical technological advantages of rustproof materials, they are difficult to machine. They are poor heat conductors, resulting in high temperatures and rapid wear on the tool blades. To machine rustproof metals, manufacturers use various combinations of cutter material substrate, coating, geometry and finish that are very similar to those used for tools in titanium machining.

More cutting edges – short machining times

Joint components for hips, shoulders, spinal columns, elbows and hands are generally milled from solid blanks, either as individual parts, or in very small volumes. Knee joints are also produced in larger volumes, whereby the workpieces are pre-fabricated through reshaping. The milling work is generally carried out on three- to five-axis machining centers.

Companies such as Iscar supply solid carbide milling tools specifically designed for tool and mold making. Solid carbide end cutters, spherical cutters and toroidal cutters made from ultra-fine-grain substrates typically have a large number of cutting edges. The higher the number of cutting edges, the shorter the machining time, and the longer the service life. <

Precise five-axis machining from model to finished workpiece

Perfect Elegance

Five-axis machining is, without a doubt, the most complex of all tasks within the turning and milling field. No other manufacturing process requires such expert knowledge, starting with the CAD system and continuing right through the machining and control functions. Using a manta ray as an example, the following article describes the development process from the model to the finished product.

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The manta ray is a sub-species of the devilfish family and renowned for its graceful elegance in the ocean. In order to capture this elegance, a model of a manta ray was first worked by hand until the transitions between the surfaces were completely seamless. Of course, creating NC mold making programs required CAD data for the workpiece. Therefore, as a first step, the model was digitized using a 3D laser scanner, where coordinates of several individual points on the manta ray were determined and used to generate a scatter plot.

The individual "jobs" of a perfect part

Next, the manta ray scatter plot had to be converted into CAD-compatible data (into a 3D model). Thereby, a grid model was developed from the coordinate points and, using a special software, optimized and polished to create free-form surfaces. The result was a manta ray CAD model, the quality of which formed the basis for the subsequent machining. With the help of a CAM system, NC programs were then created from the CAD data. The hyperMILL CAM system from Open Mind Technologies was used to define individual machining steps for the turning and milling jobs, including the surfaces to be machined, tool paths, remaining quantity, speed and feed rates, and much more. An entire project usually involves several integrated machining steps in sequence.

Optimum dimensional stability

The complex shape of a manta ray requires the definition of several machining steps involving roughing and finishing jobs from various angles along with

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both fixed and simultaneously moving rotary axes. When defining the jobs, tolerances for calculation accuracy are specified. These are usually 0.1 millimeters for rough machining and between 0.005 and 0.001 millimeters for smoothing operations. These tolerances must be subsequently factored in during the production phase.

Once collision-free calculations of all the jobs have been made in hyperMILL, the NC programs are generated using a control- and machine-specific post processor. The post processor converts the CAM data into the NC code for the machine. The data is generated specifically for the defined tools. Thus, the NC programs are also only valid for these tools. For instance, if an NC program is created for a 6-millimeter ball mill, however, a reground 5.8-millimeter milling cutter is used on the machine, the workpiece contour produced will not be not dimensionally correct.

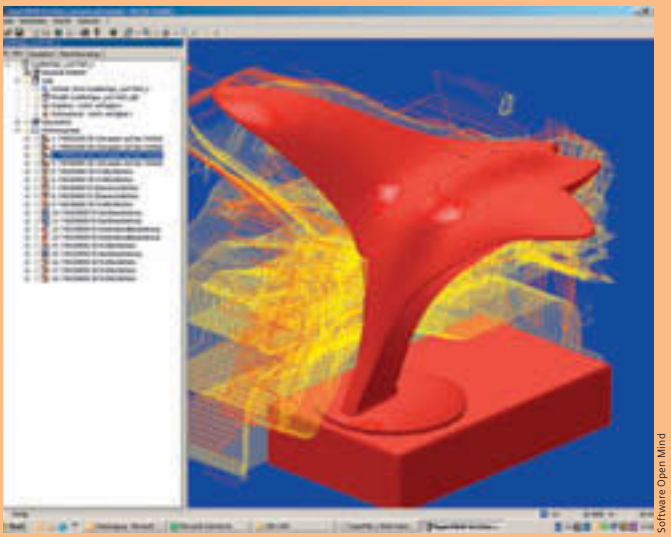
Optimum use of Sinumerik functionality

For the production, a five-axis milling machine with rotating table and Sinumerik 840D sl with ShopMill was used. Prior to setting up the tools and workpieces, the machine's accuracy was evaluated by measuring and correcting the rotary axes with the help of a Cycle996 kinematic measurement cycle. The NC programs generated by the CAM system were incorporated into a start program every time a program was called up. To ensure that machine parameters were ideally set for every machining task, a Cycle832 high-speed setting cycle was separately configured for roughing, prefinishing and smoothing. The Cycle832 sets all necessary parameters for HSC machining, thereby focusing on speed with respect to roughing tasks, and on surface quality and dimensional stability with respect to smoothing jobs.

The entire process chain – from the CAD model to the finished tool – directly impacted the quality of the manta ray. Achieving such optimal results requires extensive experience and knowledge particularly of the contextual relations between individual production steps. <

hyperMILL CAM system

When designing a job, the tool holder dimensions can be defined alongside tool data such as cutting values and dimensions. If available, a Finite Element Model of the machine can also be imported.
When calculating milling paths, hyperMILL automatically factors in the dimensions of the tool, the workpiece and the working area to ensure collision-free machining. As a result, errors can already be eliminated at the CAM system stage, thus preventing machine damage.



Even complex parts can be programmed with the hyperMILL CAM software

A perfectly milled workpiece, the product of precision NC programs and a highly sophisticated CNC, fully captures the elegance of a manta ray

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Weissenberger also manufactures complex molding tools for the automotive industry

Spotlight: employee certification and machine and control system quality

No Interruptions

The more complex and expensive a machine, the less often it should stand still. For this reason, the automotive supplier Weissenberger uses qualified technicians in its production processes and Sinumerik control systems in its milling machines.

In its production, the automotive supplier Weissenberger uses some 30 different machine tools. Some of them run completely "operator-free." The company's high-level expertise and professionalism is reflected in all production areas – from the design and development stage to the tool and mold making as well as the precision engineering.

In addition, air conditioned production rooms allow tolerances of less than one-thousandth of a millimeter to be achieved.

This is precisely what an automotive supplier needs to secure a competitive edge in the market, and Weissenberger certainly is. Almost all of its orders for tool and mold making come from the automotive industry.

Seamless interaction

Whenever new machining centers are purchased, they should be productive within a few days, according to production manager Matthias Floth. In addition, the Sinumerik 840D CNC system currently is the best solution for Weissenberger. The Huron KX20 milling center and the Kehren Ri 8-4 grinding machine are just some of the machines that were fitted with the CNC. The KX20 was the first machine Weissenberger equipped with a Sinumerik unit. "Since both the control system and the drives are from Siemens, the interaction between them worked smoothly right from the start, resulting in high surface quality and dimensional stability of the workpieces," as Matthias Floth reports.

He values the simple operation and logical control design, which are easy to learn for technicians with no previous CNC training, because they resemble a conventional PC keyboard. The optional ShopMill programming interface makes setup, programming and tool management of the Sinumerik 840D even easier.

To save energy, the control can be programmed to shut down systems automatically after filing an order, for example, or when orders are started during the late shift for the machines to process automatically overnight, or when no operators are on duty. Without the CNC shutdown function, they would remain on standby until the start of the early shift, consuming electricity needlessly. <

The technical details

HITACHI
Inspire the Next

A Technology Center partner

In the Technology and Applications Center (TAC), located in Erlangen, Germany, Siemens technicians work closely together with tool specialists from companies such as Hitachi to optimize surface quality, tool stability and machining processes. These developments also benefit Weissenberger's tool and mold making operations, where some 50 percent of all machines are fitted with Hitachi tools.

As one of the most innovative tool manufacturers, the Japanese Hitachi Tool company not only provides users with high-quality, high-tech machining tools. Its excellent consulting support can also help clients to save up to half of their overall production costs.

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German archery runner-up uses Sinumerik

Right on target

When you think of competitive archery, you immediately think of high-tech bows made from special materials. However, there are traditional archers who still prefer conventional wooden bows, but who are, by all means, open to modern milling technology.

A good bow fits perfectly the archer's hand, forming a single unit. This is exactly the type of bow Horst Bökesch, a passionate archer, was looking for. His aim was to develop a bow grip that could easily be adapted to suit the anatomy and preferences of the archer. Optimum weight distribution, balance and ergonomics were of key importance. Currently, the market only offers standard sizes to suit all, or expensive custom-made pieces requiring long manufacturing times. Horst Bökesch found the perfect partner with the technical resources and expert knowledge to create his ideal bow – Alzmetall in Altenmark, Germany.

Targeted modeling with Sinumerik

A CAD system was used to create a model of the bow grip according to Bökesch's requirements. Using a CAM system, Alzmetall then developed the model into a program for a five-axis milling machine with a Sinumerik CNC. Because the grip had to be milled as a single part, a specially manufactured holder was developed so that the raw part could be machined from all sides. Traditionally, bow grips are made by gluing together layers of tropical hardwoods that meet all of the requirements in terms of dynamics, durability and, of course, aesthetics. Production has now been optimized so that archers are able to precisely specify their personal requirements and preferences using model grips. Once the CAD data has been adapted, the new program is generated and a unique specimen of the bow grip is manufactured from the raw wooden part. Minimal adjustments are then manually performed.

Horst Bökesch was able to design a custom-made bow with the help of Alzmetall. The first masterpiece developed to emerge from the bow factory was a recurve bow. The bow is a further development of the classic long bow with tips that curve away from the archer, providing a softer draw back and improved efficiency. With his customized bow, Horst Bökesch placed second in the recurve category during his first trip to the German 3D Archery Championships in 2007. <

The bow grip, which was machined as a single part, meets all specifications in terms of dynamics, durability and aesthetics

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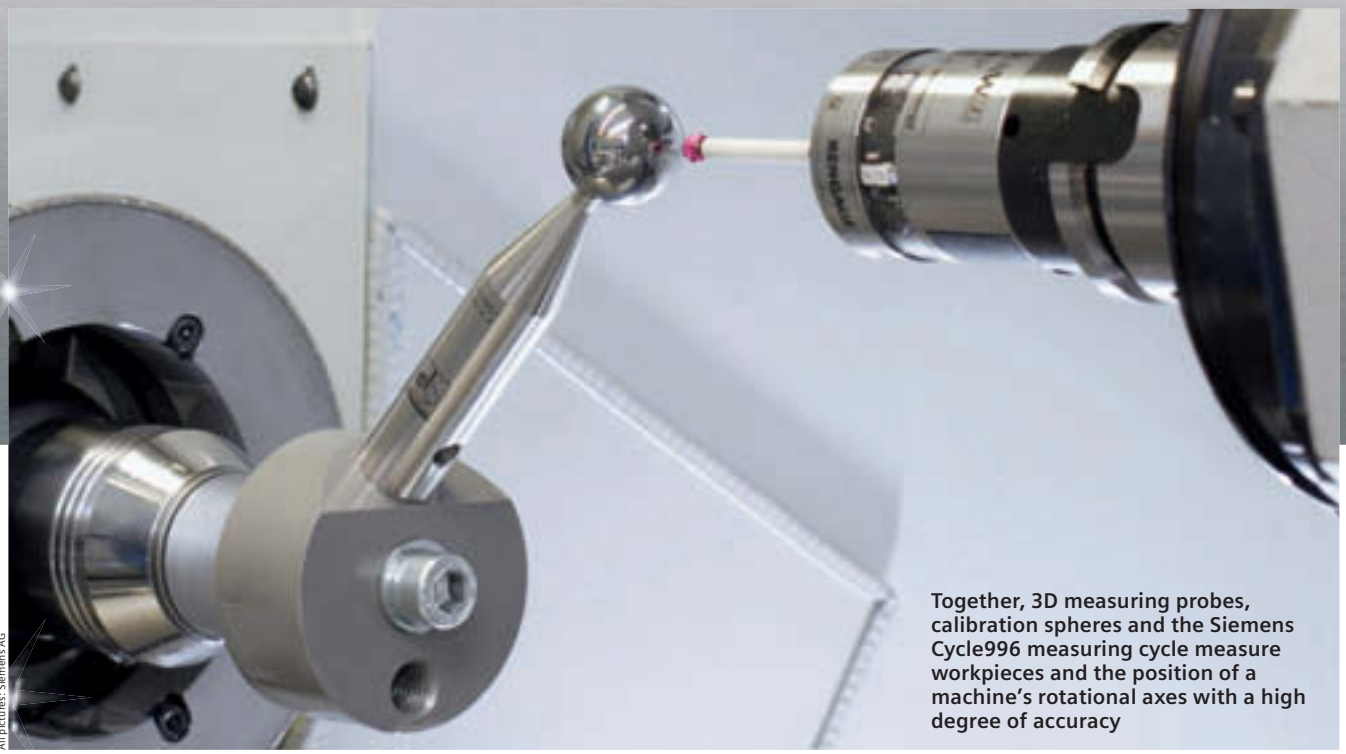
Profitable machines thanks to dimensionally stable workpieces

Precise positioning

Whether for recording a wide range of workpiece geometries during setup in JOG mode, or for automatic dimension control during the machining process, Sinumerik offers an ideal solution with its configurable measuring cycles.



All pictures: Siemens AG

Together, 3D measuring probes, calibration spheres and the Siemens Cycle996 measuring cycle measure workpieces and the position of a machine's rotational axes with a high degree of accuracy

Measuring cycle for the Sinumerik 840D sl

Cycle996

The Cycle996 measuring cycle was developed for multi-axis kinematic analysis and is well-suited for both initial setup as well as for subsequent calibration and control. The first step involves scanning the calibration sphere with a 3D measuring probe together with the measuring cycle in three rotational axis positions of the calibration sphere.

Three sphere positions are measured for each rotational axis. Once all measurements are completed, the machine operator starts the kinematic analysis. The respective data is then either stored in the control system or simply checked by the machine operator.

When tested on various milling and grinding machine kinematics, the cycle demonstrated a high level of measuring accuracy, even with high-precision demands. The time savings as compared to conventional methods is another clear benefit. With a customized measuring program, a work sequence, including calibration, only requires approximately ten minutes.

Despite its wide functions range, the new measuring method does not require expensive equipment. Sinumerik measuring cycles, a calibrated 3D measuring probe and a calibration sphere with a known diameter are all that are needed. The measuring cycle is also well-suited for handling systems as well as for water jet and laser cutting machines with kinematic transformations.

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In CNC production, it is still common to measure tools and workpieces by hand on the machine. The zero point is determined by scratching and the values obtained are entered manually into the CNC system. Not only is this method prone to error, it is often expensive and time-consuming, and requires a steady hand. The use of a measuring probe and Sinumerik measuring cycles makes life much easier.

Setup in JOG mode

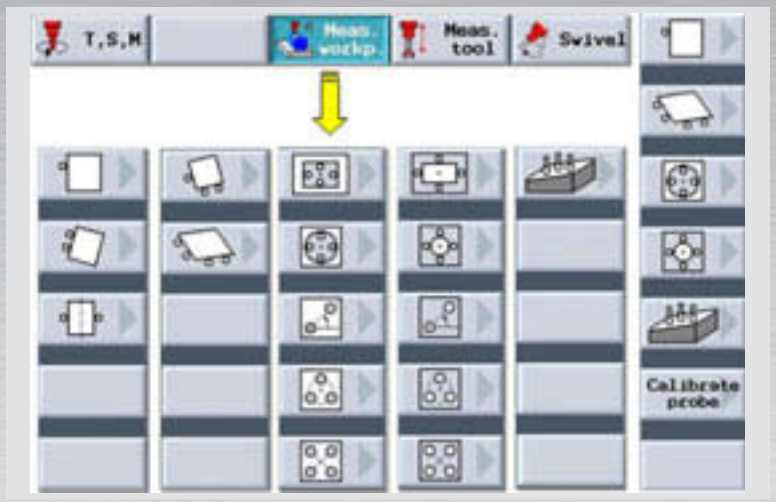
The probe measures the workpiece using an appropriate measuring cycle from the wide range offered by the Sinumerik 840D sl. The measured values are transferred automatically to the CNC to calculate the position and zero offset, thereby automatically calibrating the workpiece coordinate system with the machine coordinate system. In a linear process, for example, the machine moves parallel to the X-direction of the workpiece system, even if the workpiece is clamped at an angle to the table.

The Sinumerik 840D sl offers the following measuring cycles for the varying workpiece geometries:

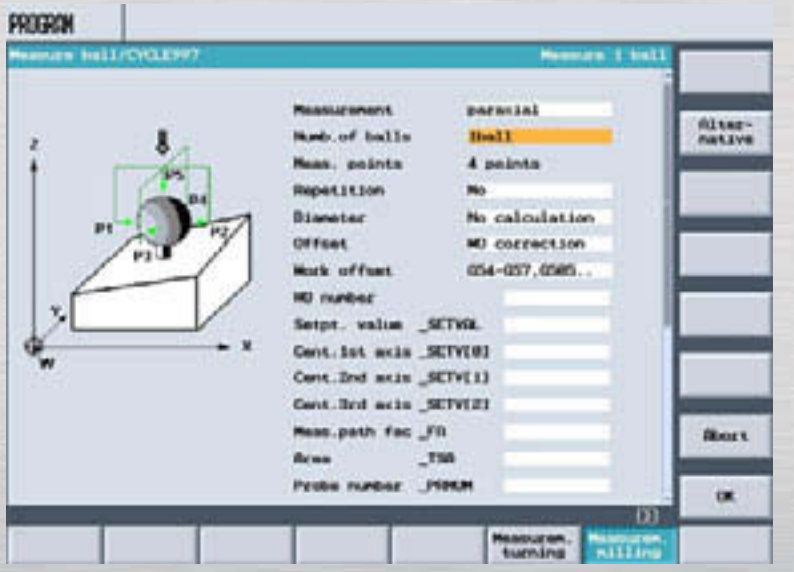
- Point/edge measurements
- Right-angled and other corner measurements
- Cavity/drill hole measurements
- Square/round spigot measurements
- Plane/surface alignments
- Probe calibrations

Calibration ...

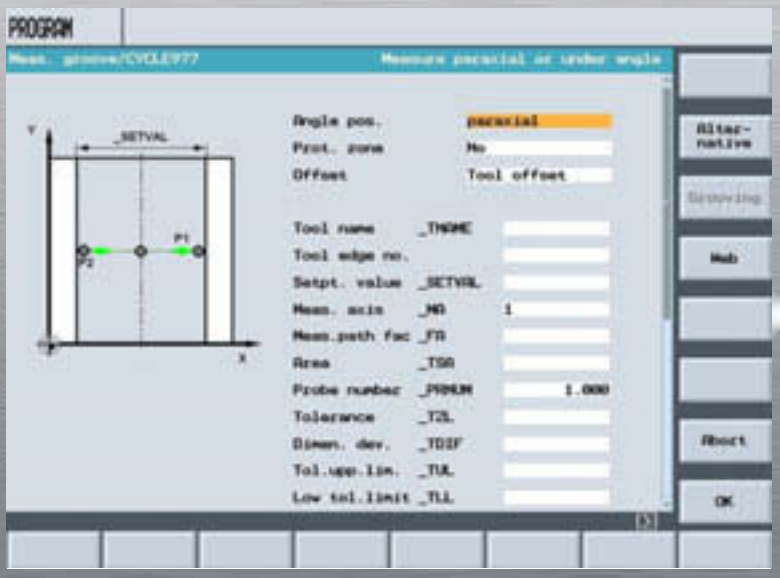
Prior to starting the measurement process, the measuring probe must be calibrated. This involves determining the switching points and the length correction. First, the measuring probe is set to run concentrically and then is positioned at the center of a known drill hole or special gauge ring. The “Calibrate Measuring Probe” command starts the measuring cycle. “Cycle Start” initiates the automatic calibration process. The center point of the drill hole is then determined and the switching points of the measuring probe is calculated relative to the center of the spindle. The center offset of the calibration sphere is also calculated automatically. By scanning a defined surface in the Z-direction, the control system calculates the length of >>



Measuring variants for measuring in JOG mode



Automatic process measuring cycle: sphere measurement with zero point correction



Automatic process measuring cycle: groove measurement with tool correction

>> the measuring probe and then enters it in the tool list.

... and quality control

Measuring probes can also be used in the machining process for quality control purposes. For repeated measurement processes or for checking the dimensional stability of workpieces in the machining process, measuring cycles similar to those used to set up the machine can be programmed in the NC program and used any number of times. Measurement values are simply stored in a measurement report, and can also be used for subsequent machining corrections.

An example of serial production

Let's take serial production with workpieces that require remachining. The key reference point for machining is a spigot on each workpiece. Normally, each workpiece would have to be set up by hand. The process can be significantly accelerated and simplified thanks to the cycle for measuring spigots, which is programmed in the NC program via the graphical user interface prior to the start of the standard machining. The reference position of the spigot is stored in the program and the configured measuring cycle is started. The latter measures the actual position of the spigot, compares it with the programmed reference position, and executes a new zero offset correction for each workpiece.

Convenient measurements with Sinumerik 802D sl

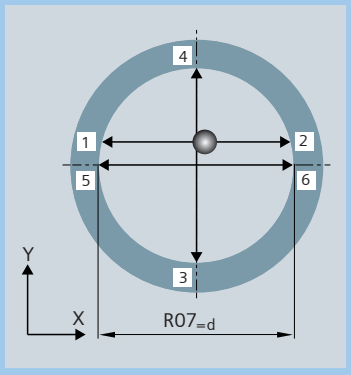
Small and mid-sized manufacturing companies frequently rely on milling machines with Sinumerik 802D sl-type control systems, the little brother of the Sinumerik 840D sl. The system is particularly valued for its high performance and flexibility, as well as for its ease-of-use and programming. The control system comes with a number of pre-programmed graphically supported measuring cycles for setup measurements – for example, for scratching the workpiece and for automatic tool analysis with a load cell. Apart from standard functions, Renishaw also offers an add-on package for more measurement convenience and functions.

Renishaw measuring probes, for example, can be used in combination with the EasyProbe measuring program. The measuring probe is moved to the appropriate start position in JOG or MDA mode, without needing to create an NC parts program. In MDA mode, the operator calls up the corresponding measuring cycles directly. EasyProbe allows the operator to program standard measuring cycles quickly and easily– without any expert knowledge. Basic programming skills are all that is needed. Software functions include calibration routines for probe length, X-Y offset and sphere diameter, tool alignment with zero point correction, storage of measured data and deviations in a macro-variables list as well as correction of the fourth axis and rotation function. <

Renishaw measuring cycles

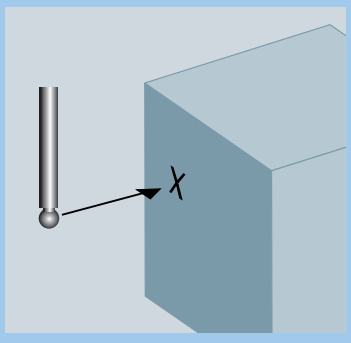
Calibration cycles

The calibration sphere is set to the measuring height in the gauge ring and the spindle axis is aligned with the center of the gauge. The cycle is run either in MDA mode or by creating a program.



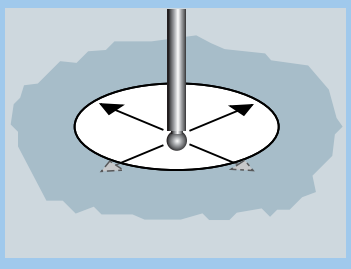
Surface point measurements

This cycle is used to measure an individual point of a surface. It can also be used to calibrate the length of the measuring probe. The measuring probe insert is thereby set to a starting point some 10 millimeters above the surface (step function or hand wheel mode). The cycle is run in MDA mode or by creating a simple parts program.



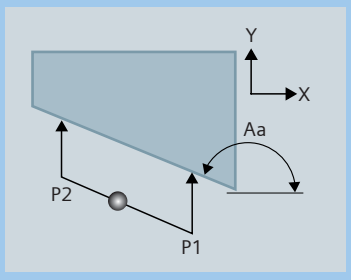
Drill hole/shaft measurements

This cycle is used to determine the dimensions and position of a drill hole or shaft by scanning positions parallel to the X and Y-axes. The calculated positioning or deviation can be used to update the zero point. This cycle is also used to calibrate the X-Y offset of measuring probes and the calibration sphere radius.



Angle measurements

The angle of a surface can be determined by means of two measuring cycles. The value can be used to correct the fourth axis or for rotation functions.



For more information > www.siemens.com/cnc4you Contact > manfred.buchner@siemens.com

Creating measurement reports with the Cycle100 and 101 functions

Automatic quality protocols

Measuring cycles, the little helpers of automatic measurement processes, control the dimensional stability of workpieces. In addition to measuring, however, they can also automatically generate and store a measurement protocol.

In automatic measurement, the dimensions of workpiece geometries are determined by means of preconfigured measuring cycles. The optionally enabled Cycle100 protocol function stores these measurement values as a table overview in a file. The data can be viewed directly on the control system, or read and edited as an ASCII file by any text editor or spreadsheet program. The protocol file comes particularly in handy with workpieces destined for further processing on another machine, such as a grinding machine or for documentation purposes.

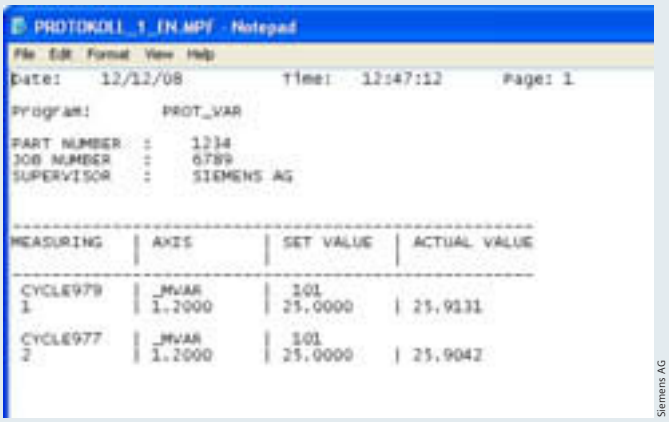
No special protocol specifications must be taken into consideration when programming the measuring cycles. Creating a program for the protocol format or adding the format to the parts program is all that is needed. The program is located in the same folder as the parts program for the measurement process. The protocol file containing the measurement values is also stored there. Exporting the protocol format to another program has also proven to be very useful. The protocol is defined in the program, and the parts program is activated after starting the Cycle100 protocol cycle. The protocol is ended following the Cycle101 mesurement.

The technical details

The protocol, for example, is defined in a “Report_Var.MPF” program. First, the protocol file format is defined, including number of lines, number of characters, page number and column width. The parameters for the protocol content describe the table headings, its content and the protocol header. Once the protocol format and content have been defined, the “Measuring program_1” parts program for the measurement is activated, run and switched off, when completed. The program then automatically creates a protocol file, “Protocol_1,” containing all measurement values. <

```
;=================== PROTOKOLL ======================
;---------PARAMETER FUER PROTOKOLLFORMAT-------------
_PROTFORM[0]=50      ;ZEILEN PRO SEITE
_PROTFORM[1]=100     ;ZEICHEN PRO ZEILE
_PROTFORM[2]=1       ;ERSTE SEITENNUMMER
_PROTFORM[3]=4       ;ANZAHL PROTOKOLL KOPFZEILEN
_PROTFORM[4]=1       ;ANZAHL WERTEZEILE IM PROTOKOLL
_PROTFORM[5]=12      ;SPALTENBREITE (ZEICHENANZAHL)
_PROTSYM[0]="|"      ;TRENNZEICHEN SPALTEN
_PROTSYM[1]="*"      ;TOLERANZ-UEBERSCHREITUNG
_DIGIT=4             ;NACHKOMMASTELLEN DER MESSWERTE
; ---------PARAMETER FUER PROTOKOLLINHALT-------------
_PROTNAME[0]="PROT_VAR"      ;NAME PROTOKOLLFORMAT
_PROTNAME[1]="PROTOKOLL_1"         ;NAME PROTOKOLLDATEI
;UEBERSCHRIFTEN DER TABELLE IM PROTOKOLL
_PROTVAL[0]="MESSUNG,ACHSE,SOLLWERT,ISTWERT"
_PROTVAL[1]=" , , , "
;WERTEZEILEN <=> _PROTFORM[4]
_PROTVAL[2]="_TXT[0],R2,_OVR[0],_OVR[4]"
_PROTVAL[3]=""
_PROTVAL[4]=""
_PROTVAL[5]=""
;ANWENDERZEILEN PROTOKOLLKOPF <=> _PROTFORM[3]
_HEADLINE[0]="TEILENUMMER :   1234"
_HEADLINE[1]="BESTELLNUMMER:   6789"
_HEADLINE[2]="BEARBEITER  :   SIEMENS AG"
_HEADLINE[3]=""
_TXT[0]=<<TRUNC(R10)    ;GANZZAHLIGE ANZEIGE DES MP
_CBIT[6]=0              ;MIT ZYKLUSNAME UND MESSVARIANTE
_CBIT[11]=0             ;STANDARD-PROTOKOLLKOPF
; --------- AUFRUF DES MESSPROGRAMM_1 ----------------
CYCLE100                ;PROTOKOLLIEREN EIN
MESSPROGRAMM_1
CYCLE101                ;PROTOKOLLIEREN AUS
M30
```

Sample protocol definition with comments



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Protocol file with protocol header and measurement values from two measuring cycles

SkillsGermany seeks best in class

Following an exciting and close contest, the winners of this year's SkillsGermany competition were announced at the AMB trade show in Stuttgart. The efforts of SkillsGermany are directed at promoting national vocational competitions, the European Championships (EuroSkills) and the World Championships (WorldSkills).

At the German-wide competition, each participant was required to program three workpieces using Mastercam, and then machine them. Chiron FZ 15 S milling machines with Sinumerik 840D and DMG CTX Alpha 300 lathes with Sinumerik 840D and ShopTurn were used in the competition.

At the awards ceremony, the winners were presented with tickets to the WorldSkills competition, scheduled for next year in the Canadian city of Calgary. Daniel Zelmer (Gildemeister, Bielefeld) was the winner of the "CNC turning" category. The "CNC milling" competition was won by Andreas Seeburger. <

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Dietmar Reker

Continuing in a winning groove

Sandra Kiriasis and her brake-woman Romy Logsch won the women's two-man bobsled championship in Germany on November 15, 2008. The Kiriasis bobsled team, which relies on ultra-fast runners milled with a Sinumerik 840D, won with a convincing lead of 0.6 seconds over the rest of the field – a successful start to the 2008/2009 World Cup season. <

2008/2009 World Cup tour dates

Altenberg (GER):	12/01 – 12/07/2008
IGLS (AUT):	12/08 – 12/14/2008
CESANA (ITA):	12/15 – 12/21/2008
Cortina (ITA):	01/05 – 01/11/2009
St. Moritz (SUI):	01/11 – 01/18/2009
Whistler (CAN):	02/01 – 02/07/2009
Park City (USA):	02/08 – 02/14/2009
Lake Placid (USA):	02/16 – 03/01/2009

More details are available over the Internet at
www.bsd-portal.de

A New Face in the TAC

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After completing a three-year training program as a turning and milling machinist at Siemens Professional Education in Berlin, Robert Schütze spent a year working in turbine construction at Siemens Power Generation.

He has since relocated from Berlin to Erlangen to assume a position as an applications engineer in the Technology and Application Center (TAC). In addition to classrooms equipped with Sinumerik control systems and Sinutrain training software, the center comprises of a production hall containing milling and turning machines operating with Sinumerik 840D sl and 802D sl.

Robert Schütze's responsibilities include training courses and workshops, as well as machine demonstrations. In addition, he will moderate presentations and panel discussions at trade shows.

Robert Schütze is 26 and particularly enjoys scuba diving in his spare time. Other interests include Linux and Web programming. He is looking forward to working with his new colleagues, especially with the Sinumerik users from around the world. <

For more information > www.siemens.com/cnc4you

Solution Partner
Automation
SIEMENS

First "MTT" partnership

In May 2008, Richard Glimpel, a member of the EMUGE Group, became the first tool maker to sign a Siemens Solution Partner contract for the "Machine Tools Technology" module, or MTT for short. The MTT module was developed to foster partnerships and to support cooperation in the areas of technology and promotion.

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Anton Heilmann, OEM manager for EMUGE Franken, and Karsten Schwarz, head of Application Engineering at Siemens Erlangen

The Siemens Solution Partner program aims to promote partnerships between system integrators, systems houses, leading technology providers and Siemens, for the mutual benefit of all parties. MTT is one of currently three modules within the Industry Sector's Solution Partner Program. Currently, the program comprises a total of 32 modules, with approximately 1,000 partners.

EMUGE, based in Lauf in the German region of Franconia, has a presence in 42 countries worldwide. As the leader in the field of thread-cutting technology, the company is an important Solution Partner for Siemens in the machining sector. <

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Medical High-Speed Cutting (HSC) Roadshow

At Euromold in Frankfurt, Siemens will kick off an international roadshow together with four strong partners on the topic of high-speed cutting in the field of medical technology. The various planning, development, simulation and production steps along the entire the process chain in medical part production will be demonstrated live – from the clinic to the finished implant. <

Event	Location	Dates
EUROMOLD	Frankfurt (GER)	12/03 – 12/06/2008
DMG Open House	Pfronten (GER)	02/09 – 02/14/2009
MEDTEC	Stuttgart (GER)	03/03 – 03/05/2009
Medical show	Warsaw (USA)	03/12 – 03/13/2009
Siemens Seminar	Erlangen (GER)	03/19 – 03/20/2009
CIMT	Beijing (CHN)	04/06 – 04/11/2009
ISCAR Seminar	Ettlingen (GER)	05/06 – 05/07/2009
Medical show	Memphis (USA)	05/07 – 05/08/2009
mediSIAMS	Moutier (SUI)	05/10 – 05/13/2009
Medical show	Boston (USA)	06/11 – 06/12/2009
DMG Seminar	Geretsried (GER)	07/09 – 07/10/2009

The new strength in high-speed-cutting

Precision meets power

SINUMERIK

Medical workpiece manufacturing requires the utmost precision along with highly dynamic performance. Together with these strong partners for high-speed-cutting – DMG, Iscar and Renishaw – Siemens will show you how such demands can be met. We will present the entire process chain, live during our road show, from the clinic through to the final implant.
For more information, visit www.siemens.com/high-speed-cutting

Answers for industry.

SIEMENS