

# CNC4you

The Shopfloor Magazine



## Looking at the whole

Complete solutions for training

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### Sinumerik Operate made easy

Visually impaired young people at a vocational training center become metalworking professionals

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### Handle with care

Mold making for the glass industry



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Cover photo: Siemens AG

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# Dear readers,

The **AMB** trade fair — the International Exhibition for Metal Working — is one of the most important industry trade fairs. Once again in 2014, Siemens will be present with a booth at this fair in Stuttgart. Baden-Württemberg is regarded as one of Germany's leading regions for the machine tool industry. The Swabians are renowned for being hardworking and thrifty, but the drive to constantly keep improving and developing skills is just as important in this key region for machine tool production. At AMB, Siemens is presenting itself as a partner for **CNC training** and demonstrates a comprehensive range of solutions at AMB — from the PC-based **SinuTrain** training software to **professional training documents** and **curricula**. What's more, Siemens is also supporting this year's German CNC turning and milling championships. These act as a preliminary round of the WorldSkills competition 2015 in São Paulo. Experience this competition for yourself, and visit the VDW-Nachwuchsstiftung (the training foundation of the German Machine Tool Builders' Association) booth at AMB. As you can see, AMB has a lot of interesting things to offer in terms of CNC training, and you can also find out more about the technological developments of our **Sinumerik CNC systems**.

I look forward to seeing you at our booth at the AMB trade fair in hall 4. If you would like to discuss any technical aspects of Sinumerik applications, our **Sinumerik User Support Team** will be more than happy to help.

**Jürgen Klingler**  
CNC User Support Southwest Region  
Sinumerik User Support





Complete solutions for training

# Looking at the whole

Urgently seeking the next generation of qualified specialists!  
But where can you find them? To get High School graduates  
interested in the metalworking industry, training must include  
CNC machine tools and, most importantly, must be didactically  
well designed.



There could be many more machine tools in use. The industry cannot invest in new CNC machine tools because there is a lack of well-trained specialists, and this has long been a serious problem. The VDMA (Verband Deutscher Maschinen- und Anlagenbau, the German Engineering Federation) analyzed industry-specific figures from the German Federal Employment Agency and, for most mechanical engineering occupations analyzed, found more trainee positions than applicants. For that to change, training programs must be made more attractive to High School graduates.

### CNC and more

It is no longer enough just to bring machine tools into the training centers. Complete system solutions that incorporate everything needed for good CNC training are required: video tutorials that show operation and programming, didactically designed teaching materials, and, of course, the machine itself, with a camera and monitor for demonstrations during class.

It has been a long time since the focus has been on CNC training alone. For a training to be complete it must include automation technology with its robots and automation systems, such as loading and unloading devices for workpieces and raw material. The operative skills the trainees learn must encompass the big picture. The complex processes involved in the realization of an idea, from the design process to production and the integration of all production processes into a company's IT system. It will shape the future of training.

For this reason, Siemens, together with machine manufacturers and training providers, is developing integrated solutions and putting together training packages that address everything from protective equipment for the operators to machines and teaching material to robots. Working closely with training providers, partners can order complete sets of classroom equipment and equipment for CNC training. In this way, industry requirements for the specialists of tomorrow can be met today.

### Individual training programs

For all control types — whether Sinumerik 808D, Sinumerik 828D or Sinumerik 840D sl with Sinumerik Operate — Siemens offers training programs that consist of training documents, video tutorials and web-based training modules. Whether they are for an introduction to CNC technology or high-end applications, the training documents and media are perfectly geared to the relevant control systems and requirements and are incorporated into the partner's overall programs. Successful results are as good as guaranteed. Furthermore, as a global player present almost everywhere in the world, Siemens can provide training support to its partners at any time.

In addition to training solutions for education partners, Siemens offers certification programs for vocational schools and universities worldwide via the Werner-von-Siemens vocational school and the Siemens Technology Academy (STA) in Berlin. These programs train professors and teachers in the area of operative skills — a central pillar of the dual German vocational education and training.

### Mechatronics certification program

Under the Siemens Mechatronic Systems Certification Program (SMSCP), STA trainers teach trainers from partner schools worldwide in teaching methodology and show them how they can apply this methodology to their mechatronics classes. After the partners have successfully completed the train-



Siemens supports aspiring specialists through all phases of their training

the-trainer program, they implement the mechatronics certification program in their home institution. They impart their system and process-oriented thinking and their technical knowledge of mechatronics to their students and teach them the operative skills of future engineers. In addition, students can earn an STA-developed industry-recognized certificate — an important element in the qualification of each individual. Regardless of the training pathway the aspiring specialists take, Siemens will support them. <



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**HBZ Münster: Successful cooperation with the KvG High School**

# CAD/CAM mastered — race points won!

**Race cars! Designed in the CAD system, optimized in the virtual wind tunnel, wheels manufactured on precision turning machines, and all this realized in a continuous process chain — students at the KvG High School in Münster did everything they could to improve their placement in the “F1 in Schools.” They gained their expertise through Sinumerik training partner HBZ Münster and its contacts to the manufacturing industry.**

**F**1 in Schools” is a competition that takes place all over the world. Just as in the “real” Formula 1, strict rules govern the construction of the cars — as well, of course, as the regional, national and international championships. The Kardinal-von-Galen (KvG) High School has been participating for several years now, as part of a project course of two hours per week. Here the students of each year develop and build cars that are compliant with the rules — along with project, cost and time plans.

Analysis of the weaknesses of last year’s car showed that construction improvements were needed, especially where the wheels were concerned. Until now they had been purchased; this time they were developed by the students themselves. Furthermore, the implementation of the CAD-designed parts had to be improved. For both of these issues, the students picked the brains of experienced manufacturing experts: the training partner of the CNC machine shop in the Handwerkskammer Bildungszentrum (HBZ) Münster (Münster Chamber of Crafts) is Siemens.

## Door opener to industry contacts

Klaus Schemken, the HBZ contact partner at Siemens, explained to the students how construction data entered into a CAD system are then used to cause tools — for example, milling machines — to move. Using a simple example in which a basic contour is transferred to the CNC via DXF file, Schemken developed the fundamental principle of a continuous CAD/CAM chain in front of the students. Peter Claussnitzer, a CAD/CAM expert from the Alphacam company, then taught the students the specific application of the process chain under NX CAM and Teamcenter — from 3-D design in Solid Edge to a tested parts program for Sinumerik CNCs. “This included tips about how one can ensure efficient production and high-quality components even during construction — for example, which edge contours must be rounded and to what extent,” remembers supervising teacher Roland Kesselmann.



Siemens AG/W. Marschner



Siemens AG/W. Marschner



F1 in Schools — the most valuable type of sponsoring is not sold advertising space but the expertise of manufacturing professionals in 3-D construction and CAD/CAM chains



Everyone — staff of HBZ Münster, Spinner, Alphacam and Siemens — became infected by the young people's enthusiasm and provided crucial expertise on CNC and production technology and the process chain

The ultralight construction of the wheels was a decisive factor in reducing weight. The wheels were made on a Sinumerik-controlled precision turning machine from HBZ machinery partner Spinner



Siemens AG/W. Marschner

### Tricky design despite virtual wind tunnel

Thus prepared, the students redesigned their model car. The cars, which must weigh at least 54 g, are catapulted forward by recoil-fired CO<sub>2</sub> cartridges and race along the guide wire to the finish line. The students were able to optimize the aerodynamics of their models in the virtual wind tunnel of the CAD system. The difficulty was in coordinating the tremendous kick of the full cartridge and the relatively heavy weight of the empty cartridge. Otherwise the front spoiler would drag on the ground when starting, and the rear end would drag on the ground when coming to a stop.

### HBZ's machinery partner makes precision-turned ultralight wheels possible

The basic elements of the bodywork were prepared on the CNC milling machine of a partner machine shop. Most of the weight loss was thanks to the new wheels. For this purpose the KvG team used an ultralight construction made of thin-walled turned plastic parts. Thanks to a partnership with turning machine manufacturer Spinner, HBZ Münster was able to make use of suitable precision turning machines to manufacture the wheels: an MVC 610 H with Sinumerik 840D sl and a TC600-53 SMC Y with Sinumerik 840D sl using Sinumerik Operate.

The Sinumerik CNCs are integrated into a continuous CAD/CAM process

chain (NX) via SinuTrain networked workstations.

The SinuTrain 6.3 Edition 2 installation used in the HBZ can be used for CNCs with software up to Version 4.4. Machine adjustments for the Spinner turning machines are available to download at Sinupedia, as are the machine data for all the machine tools installed at HBZ Münster.

The result: even in the maximum acceleration and speed phases, the wheels run perfectly round — no fluttering or rattling!

### Notably improved cars score at the regional championships

Supervising teacher Kesselmann praised the performance of this year's KvG team: "We fought our way from one of the back rows up to fourth place despite the strong competition. That alone was a terrific effort. This success in particular showed the students how much further one can go with a professional engineering approach." That's also how the members of the jury of the Telekom Foundation's Junior Engineer Academy saw it: they rewarded the professional approach of the KvG team with a prize of €10,000. <



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Programming assistance at the Spinner Technology and Demonstration Center  
in Flieden, Germany

# CNC trainers with practical knowledge



Siemens AG

The result of a successful five-axis training session: the programmed workpieces are produced on the Spinner machining centers at the Technology and Demonstration Center in Flieden

**The best teachers align their teaching with practical requirements. In keeping with this dictum, Guido Heinze, Arnd Görtz and Manuel Sinzia, independent contract manufacturers and Siemens-trained CNC instructors, regularly pass on their expertise. The location of the programming training courses is the Spinner Technology and Demonstration Center at the German company Siniza.**

Complex machine tools only increase productivity in manufacturing companies if they are programmed by qualified staff who know what is important for each specific machine. The German machine-tool manufacturer Spinner establishes innovative demonstration centers in various sales regions for precisely this purpose.

For example, Bernhard Glassl, managing director of the Spinner agency BG Werkzeugmaschinen, equipped a facility provided by the Siniza Zerspantungstechnik company in the municipality of Flieden with modern machines. In addition to various turning centers, the five-axis U5-1520 milling center is a particular highlight at the demonstration center. All the machines are controlled by high-quality Sinumerik







**Siemens instructor workshop**

# A meeting with tradition

Training and training partners have a long tradition at Siemens. In Germany alone there are more than 50 Siemens training partners teaching apprentices to use Sinumerik systems. Partners also include institutions such as chambers of crafts and vocational training centers involved in adult education. Siemens and its partners recently met up for the annual workshop.

**T**raining centers for Siemens partners cover the entire spectrum from traditional advanced training to occupational retraining. Their importance is growing, as training is the only way to sustainably combat the shortage of skilled workers. The core objective is to provide training in the latest technologies with a focus on practical real-world applications. Annual advanced training events help ensure that this goal is achieved, as do other activities such as technology workshops organized by Siemens. The topics cover everything from hard machining to the process chain, always in cooperation with Siemens and the training centers.

## **2014 Instructor Workshop in Bad Griesbach**

In addition to the activities carried out locally on-site, Siemens also invites its partners to an instructor

workshop once a year. The 2014 instructor workshop was held in Bad Griesbach, near Passau, Germany. It was the seventh meeting of its kind. "Coming to this event is like meeting up with friends," sums up a participant who attended the event for the seventh time. Partners from Germany, the Czech Republic and Austria were accompanied by the Siemens contacts who provide them with on-site support in their companies.

The meeting gives attendees the opportunity to find out about the latest and upcoming innovations, such as new products, technological developments and training documents. The partners also get the chance to introduce themselves and their training methods, and to talk about their experiences and challenges. In short, the three workshop days offer the perfect opportunity to learn about training topics involving Sinumerik.





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They have known each other well for a long time: participants at this year's Instructor Workshop in Bad Griesbach updated their expertise with advanced training topics involving Sinumerik and familiarized themselves with the training methods on-site at the Austrian WIFI institute

## Training in Austria

Austria took center stage at the event this year. On the second morning of the event, all the participants set out to gain more firsthand knowledge about training and training methods just across the border. The destination: the Wirtschaftsförderungs-Institut (WIFI, Business Development Institute) for Upper Austria in Linz. WIFI is the largest and most state-of-the-art institution of its kind in Austria.

It offers everything from language courses and welding technology programs to five-axis simultaneous CNC training. Erich Döberl, host and head trainer for CNC technology, introduced his colleagues to the different areas. The subject of training documents and their practical implementation in the field of CNC — also in combination with automation technology — proved very interesting for all the instructors.

They were as impressed by the machinery at WIFI as they were by the practical implementation of the training material. Training is offered across the board in Linz, from basic training in the classroom, in which SinuTrain simulation software identical to real control systems is used, to standard CNC machines and CAD/CAM applications with five-axis simultaneous machining. The entire machine shop process chain is illustrated here — everything from the idea to the workpiece — while maintaining a focus on practical application. This highly targeted

and extensive training produces the qualified specialist workers that the industry desperately needs.

Robot technology for automated solutions can also be found at WIFI, with several types of robots available for hands-on training. After all, one thing is certain: automation technology and CNC technology are moving ever closer together as time progresses. The proof: working in cooperation with the KUKA company, Siemens has made it possible to control robots connected to a CNC machine using Sinumerik.

## Outlook for 2015

During a dinner together, the instructors engaged in long and heated discussions about how training is carried out in the different regions using different measures. They returned to Bad Griesbach with a great deal of new information and numerous suggestions to consider. Many of the attendees are already looking forward to the Siemens 2015 Instructor Workshop — and to hearing more news about Sinumerik and training.



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**T**rainees in the metal sector of the Nikolauspflge Foundation, also known as “Niko,” have poorer vision than most other apprentices in Germany, but that does not stop them from becoming metalworking professionals. At the Stuttgart Vocational Training Center, the young people are taught to work with metal as well as modern CNC machine tools. “Of course, we are faced with particular challenges here,” explains Herbert Greschner, head of the metal sector, “but that depends only partly on the type and intensity of the visual impairment. It is primarily the commitment of the individuals that is key.”

Albert Moser is a perfect example of this: he has the use of only one eye, in which he has just 10% vision. More than 25 years ago, he started an apprenticeship to become a cutting machine operator at Niko and then completed further training as a foreman at the Stuttgart Chamber of Commerce and Industry. Today, he is an instructor at Niko and currently passes on his knowledge and experience to 24 trainees in the metal sector.

A key factor in the successful development of the visually impaired trainees, and in giving them a chance in the labor market, is that the apprenticeship

is oriented as closely as possible to the actual needs of the industry. This is why Moser puts great emphasis on training his future cutting machine operators on the CNC that is used most frequently in the industry: Sinumerik from Siemens. Thus, a TC 600 MCY turning center from Spinner, which is equipped with Sinumerik 840D sl, is used on the training shopfloor.

### Practicing programming and virtual cutting

The machining master is also happy to have SinuTrain training software, which is installed on two separate PCs. “Our apprentices can write programs on the computer screens without blocking the machines,” confirms Moser. “What’s more, the size and color of the display can be adjusted easily. That is a great feature, especially for visually impaired trainees.”

With SinuTrain, the PCs are equipped with the latest user interface. This keeps various programming modes on hand, of which primarily the graphically supported ShopTurn (turning) and ShopMill (milling) programming software are used during training. Training is also given in cycle-supported DIN programming with programGuide.

## The Stuttgart Vocational Training Center of the Nikolauspflge Foundation...

...specializes in the training of visually impaired and blind young people in various professional fields. The program includes practical training, close cooperation with the associated technical college, different housing options and various leisure activities. Special integration consultations and specialist services support the trainees’ successful transition into working life.

[nikolauspflge.de](http://nikolauspflge.de)

The menu navigation in ShopTurn/ShopMill is structured particularly intuitively. The Niko metalworkers can thus create functional programs after just a short training period. With the integrated simulation, they then cut the workpiece virtually and correct any errors themselves.

**Visually impaired young people at a vocational training center become metalworking professionals**

# Sinumerik Operate made easy

**The Stuttgart Vocational Training Center BBW of the Nikolauspflge Foundation for blind and visually impaired people trains machining specialists and places them on the labor market. In doing so, the Vocational Training Center staff members are guided strictly by the needs of the metal industry and provide training on modern CNC machining centers with Sinumerik controls. The SinuTrain training software is used for trainees to practice on.**

### Practical experience

To allow the visually impaired trainees to experience their trade in the real world, the Nikolauspflge Foundation currently partners with around 20 specialist companies. Moser explains: “The companies make internships available to us and issue various machining jobs that our trainees can complete.” For example, they turned a variety of wheel nuts that students at the Baden-Württemberg Cooperative State University Stuttgart needed for high-performance competition cars.

The most important partner company of the Niko metalworking training center is OKIN GmbH — an integration company in which visually impaired, hearing-impaired and nondisabled people work side by side. The Nikolauspflge Foundation is a partner, and



Siemens AG/P. Klingauf

Among other things, the Stuttgart Vocational Training Center of the Nikolauspfllege Foundation trains young people with visual impairments in metalworking professions — as cutting machine operators, specialist turners, metalworkers and, as of recently, specialists in metal engineering

“The size and color of the display can be adjusted easily. That is a great feature, especially for visually impaired trainees.”

Albert Moser, Industrial Foreman,  
Nikolauspfllege Foundation



Siemens AG/P. Klingauf

The Sinumerik 840D sl controlled TC 600 MCY turning center from Spinner is used in the training machine shop of the Stuttgart Vocational Training Center

Greschner also runs the metalworking and assembly departments there. As a limited liability company, the integration company must nevertheless be managed in a results-oriented manner. The head of metal working thus needs qualified employees, some of whom were trained by the Nikolauspfllege Foundation, as well as high-quality machinery.

There are seven CNC centers in total at OKIN. Recently, two Spinner machines were purchased, both of which are equipped with Sinumerik 840D sl and Sinumerik Operate user interfaces — a four-axis MVC 1000 machining center and a TC 800 turning machine with driven tools. According to Greschner, the price/performance ratio of these machines is particularly good. <

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Establishing a zero point with cameras

# Quicker series production

To ascertain the zero point of a workpiece with a high degree of accuracy, touch-trigger probes combined with Sinumerik measuring cycles are the first choice. For smooth, efficient series production, cameras offer a quicker, albeit slightly less precise, alternative.

A Simatic MV440 1-D/2-D code-reader system in the machine space of a three-axis milling machine

The digital processing of camera data has been successfully applied to many areas of automation technology. In machine tools, too, cameras can have a multitude of uses. They can monitor and analyze manufacturing processes in areas otherwise difficult to see, or digitally document the production process for training or quality assurance purposes. However, new high-resolution cameras are now being used for measuring tasks in time-optimized series production.

## Object and pattern recognition

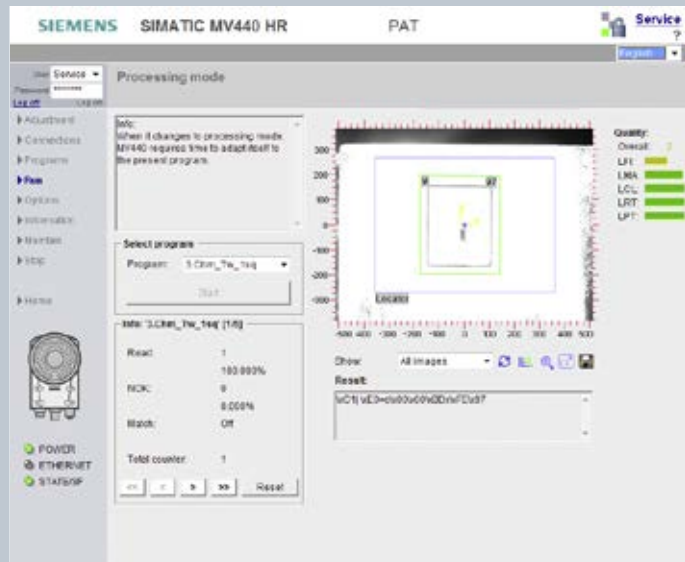
A typical example of the new generation of cameras is the Simatic MV440 1-D/2-D code-reading system. Specially developed for industry, it can be used in even difficult machine spaces thanks to its compact design, its flexible lighting options, and its many communication and connectivity alternatives. Combined



## TECHNOLOGY IN DETAIL

### Smoother operation with Run MyScreens

With the Run MyScreens tool, operator interfaces can be customized for Sinumerik Operate that contain machine manufacturer or user-specific function extensions or that allow a user-specific layout to be implemented. The operator can both create and customize dialogs from his or her control system, thereby allowing the integration of context-sensitive help images and alerts. The defined dialogs are then accessed through integrated soft keys. Run MyScreens is configured using ASCII files. These configuration files contain the description of the operator interface.



with a range of software options, the code-reading system can also be used for text and object recognition.

To determine a zero point, the camera records as an image the contours of the blank or workpiece before analyzing the information. By comparing the state of the blank with the predefined size of the reference object, the offset and rotation can be ascertained in two dimensions. The automatic correction of the zero point is carried out using ATRANS and AROT in the NC program.

#### Precalibrating the camera

To calibrate the camera for automated measuring using a reference part, the operator must first connect the camera via Profinet to the Sinumerik 828D CNC, mounting it parallel to the axis over the machine table. Then a predefined z distance from the camera to the reference part is approached and the x and y position as well as the zero offsets are saved as user data (GUD). The calibration process can be made easier for the operator with the help of menu images rendered in the Run MyScreens tool.

The operator then captures images of the reference object with the camera and defines distinctive features in the images to aid measurement using the camera's software. The coordinates of the distinctive features are recorded as pixel values in x and y and then transferred to the Sinumerik CNC. Using a

predefined scaling factor, the pixel values can be converted into a traversing path.

#### Measurements in automatic mode

In automatic mode the camera moves into the pre-calibrated reference position and creates an image of the blank. The analysis software compares this image with the reference image and determines the offset and rotation of the blank compared to the reference object using the distinctive features. The zero offset is then automatically corrected in the program via ATRANS and AROT.

This saves time compared to measuring the position with a touch-trigger probe. Deviations must be taken into account in determining repeat accuracy. This is dependent on lighting, contrast and surface quality. The accuracy of position measurement is  $\pm 0.02$  mm, and that of rotation measurement  $\pm 0.2^\circ$ . For many applications in series production, however, the time gained is sufficient compensation for this loss of accuracy.



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**Bold design** — ultimately, the fragile glass needs to be removed without damaging it

## Mold making for the glass industry

# Handle with care

**Zwiesel in the Bavarian Forest is well known for its glass industry. The handcrafting of glass products, which is still practiced here in part, is today considered to be a national treasure. A glance into the machine shop of a glass mold maker reveals that the latest machine tools are used here.**

**P**eter Olinger Formenbau e. K. specializes in molds for high-quality domestic glass in the crystal and lead crystal sector. The company has constantly adapted its production methods to the latest technological standards. While in the past molds were usually eroded and polished by hand, milling has now become prevalent. "We have always milled molds for large vases because the electrodes required would have been too large, too heavy and too expensive," explains managing director Peter Olinger. "Now, we mill almost everything — with excellent results in terms of quality and surface finish."

### Inconsistent material, high requirements

Engravers have very high standards for their machining centers. They need to be just as suitable for high-speed roughing as they are for the finest engraving work. This requires not only a certain torque on the spindle but also high speeds for the precision work. The stainless steel used as a mold material is also very demanding: "It is an inconsistent material, because chromium makes it harder and nickel makes it softer," explains Olinger.

The latest milling machine was put into operation in January 2013. The Microcut MC 800LL was modified spe-

cifically to meet Olinger's requirements: it has higher-quality bearings and a more powerful motor to ensure the required high speed and torque. For him, a prerequisite in purchasing the machine was that it be equipped with a Siemens CNC. The more powerful control version of Sinumerik 828D (PPU 281) brings faster block processing times and 5 MB of internal memory for user data.

### The faster way to finished molds

To create the required surface finish quickly and without any additional optimization, the Microcut control system is equipped with the Sinumerik MDynamics milling technology package. This includes the High-Speed Setting Cycle (Cycle832). This provides all the important functions and G-code commands for High-Speed Cutting (HSC). After the machining strategy (roughing, prefinishing or finishing) and the tolerances have been entered, the respective dynamic parameters are automatically activated in the background. With the Advanced Surface option, which is part of the milling package, the control system calculates the speed profile in advance for short track sections and simultaneous fast feed rates. The more uniform speed profile achieved

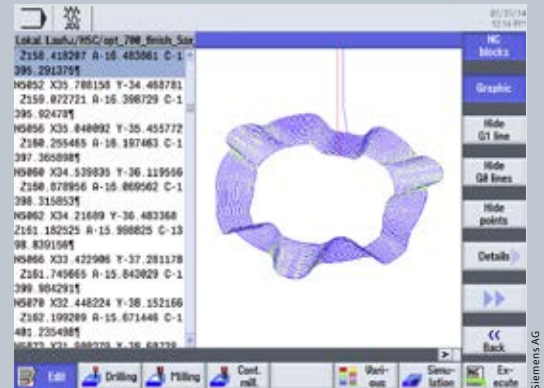
## TECHNOLOGY IN DETAIL

### Mold making Quick Viewer

The mold making Quick Viewer allows the visualization of the processing paths of large parts programs, for example, from CAM systems. The Quick Viewer gives a quick overview of the program and, for example, allows the user to check the workpiece shape or traversing errors or approach and exit paths. The mold making viewer supports such blocks as those with G0, G1, G2 and G3; polynomials and b-splines; and vector and rotary axis programming. Uninterpretable NC blocks are skipped and not displayed in the graphic.

#### Opening the mold making viewer:

- > Open the NC program in the program editor.
- > Press the soft keys >> and then the mold making viewer.  
The NC program and the graphic are displayed side by side.
- > You can fade the views in or out by pressing the NC blocks or graphic soft keys.



“Now, we mill almost everything — with excellent results in terms of quality and surface finish.”

Peter Olinger, Managing Director,  
Peter Olinger Formenbau e. K.

as a result optimizes the machining of free-form surfaces in the HSC area with regard to accuracy, speed and surface quality.

The Microcut machining center comes from Tusch & Richter GmbH & Co. KG of Obertraubling, Germany, which predominantly distributes cutting machines from Taiwan. Robert Pickl, managing director at Tusch & Richter, is confident: “The applications at Peter Olinger show that a Sinumerik-controlled standard machine from Taiwan meets the high demands of a mold maker.”

#### Fragile part removal

The orders received by Peter Olinger vary greatly. The construction of the mold must always align design requirements with part removal possibilities. After all, it must be possible to remove the fragile glass product from the mold without damaging it. Olinger draws the expertise required for this from years of experience with material and manufacturing processes. And even though glass producers are increasingly trying to save on molds and therefore reduce

costs, there are many products for which they cannot avoid mold makers. It is therefore an advantage if a mold maker has efficient equipment in order to produce good-quality molds cost-effectively. <



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Drive elements with a milling component manufactured on CNC-controlled turning machines

# Ready to fly

When 250 km/h high-speed model helicopters take to the air, all the drive elements need to be perfectly coordinated with one another. This is ensured by high-precision components, as produced by Grenzemann Präzisionstechnik GmbH on a new Sinumerik-controlled Hyundai turning machine.



High-speed model helicopters from the Minicopter company reach speeds of up to 250 km/h. To ensure that they can lift off, fly and land safely, the aluminum drive elements need to be produced to a high standard of precision

The high-speed model helicopters from the Minicopter company based in Vellmar, Germany, are fast and flexible and offer superb control. The Sinumerik 828D controlled Hyundai L210LM turning machine, on which various aluminum parts are manufactured for these high-speed helicopters, demonstrates similar qualities.

The modern L210LM turning machine with a bar loader — made in South Korea and distributed in Germany by NCT Reber Maschinen GmbH — has been in place at the Grenzemann Präzisionstechnik contract manufacturing company in Eisenbach since the start of the year. Harald Müller, technical managing

director at Grenzemann, had made plenty of positive experiences with dealers and manufacturers and therefore invested in the Hyundai turning machine: “The machine is ideally suited to the drive components of various helicopter models. But ultimately, that is only a small part of what we manufacture with the turning machine.”

The company, which was founded around 35 years ago, has a workforce of 18, has 15 CNC milling and turning machines in production, works in double-shift operation, and serves many different industries. “When we started out, focusing on one customer group almost led to disaster for us. We learned from

this, and today no single industry or customer has more than a 15% share of sales," explains Müller.

### Shorter retooling times possible

The qualified engineer and trained industrial mechanic identifies the good price/performance ratio as an important reason for purchasing the L210LM turning machine with bar loader and driven tools. He adds: "The technical data were also suitable, and all the trial workpieces were manufactured in the required quality and with the desired surface qualities." For Müller, however, there are also other key factors: "NCT Reber offers very good service and was able to deliver quickly. In addition, the machine can be retooled incredibly quickly." As the Eisenbach-based company primarily produces medium-sized quantities of 50 to 5,000 units, this is a key factor.

"That's precisely what the L210LM is ideal for," says Angela Reber, who is responsible for corporate development at NCT Reber. From the clamping system to the electrically adjustable bar loader and the calibration of the tool, everything functions largely automatically. This means that it takes just a few steps, and in less than an hour on average a new product can be started.

### Fifty percent faster with ShopTurn

Before the machine can be set up, the CNC programs need to be written. The basis for these is usually construction drawings, which are received as PDF files. Experienced specialists at Grenzmann then handle the programming. With the new Hyundai turning machine, this task can be completed particularly easily and quickly. Crucial to this is the compact Sinumerik 828D CNC with its Windows-oriented Sinumerik Operate user interface and ShopTurn work-step programming.

Cutting machine operator Gerhard Hettich had previously only programmed G-code. But even though ShopTurn was new to him, it was not a problem, as he explains enthusiastically: "All I needed was a quick briefing, and a few days later I was quicker with ShopTurn than I was with DIN programming." This is confirmed by his boss, Müller, who adds: "As we are not a large-volume manufacturer, it is not as important to us to squeeze out every last second of production time. It is much more important to generate a stable program in a short period of time. ShopTurn enables us to do this superbly. On average, it makes us around 50% faster, and, thanks to the integrated 3-D simulation, we are 100% fault-free to date."

Grenzmann specialists create their programs with the help of a menu and various cycles. Particularly helpful here are the integrated drilling and turning cycles, which Hettich can access at any time via soft key: "The driven tools of the L210LM make it possible for us to turn and subsequently drill, create threads

## TECHNOLOGY IN DETAIL

### New retract function in Sinumerik 828D

This function supports manual retraction of the tool from the workpiece after a stoppage, for example, due to power failure. The tool can be retracted in jog mode in the direction of the tool, and machining can be continued from the point of stoppage. A typical application would be machining with the Cycle800 swivel cycle and interpolatory tapping with G331/G3.

The retract function also works if tapping is aborted, as the spindle interpolates with the z axis when being retracted from the thread, even in jog mode.



The new Hyundai L210LM turning center at Grenzmann can be retooled quickly thanks to the automatic clamping system, the automated calibration of the tools and the easy-to-use Sinumerik 828D CNC

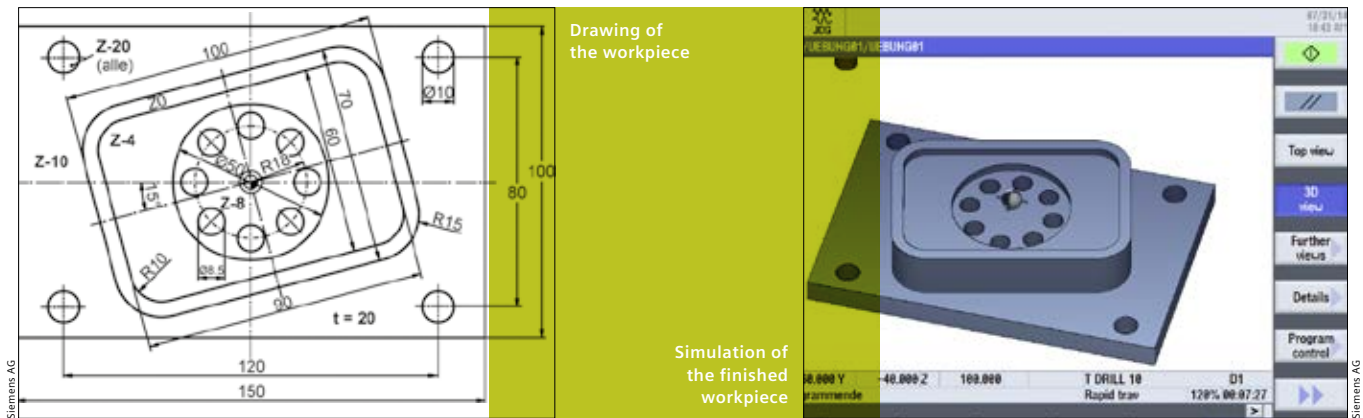
and mill various contours in a single clamping, as is necessary for the drive components for the high-speed model helicopters, for example. Thanks to ShopTurn, even the programs required for this are generated in just a few keystrokes." <

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# SinuTrain practice example



When creating NC programs it is advisable to divide up the programming task into separate, technologically sensible work steps. This is precisely the approach of the work-step-based programming of Sinumerik with ShopMill for milling and ShopTurn for turning. In the following example, you can use SinuTrain to test for yourself how quick and easy programming is.

The complete ShopMill program with a more detailed description can be downloaded from the CNC4you website at [sie.ag/1qn3RFa](http://sie.ag/1qn3RFa).

To learn how to use ShopMill independently, see the "Easy milling with ShopMill" documentation that is available for download from the Service & Support portal at [sie.ag/1qn3RFa](http://sie.ag/1qn3RFa).

## 1

### Programming

In the preliminary work steps, the blank and the zero offset are defined, and the workpiece is then face milled. The drill holes are rapidly programmed with the help of drill cycles and the position pattern. Creating the central circular pocket also presents little challenge to the programmer, thanks to the milling cycle. Programming becomes more demanding when milling a rectangular stud turned 15° and the related rectangular pocket. It is possible to turn the coordinate system 15° and to program in x and y directions as usual, or else to convert the coordinates of the key points for the unchanged coordinate system. However, ShopMill provides other possibilities that can lead to quicker success.







## 2

### Programming with the contour editor

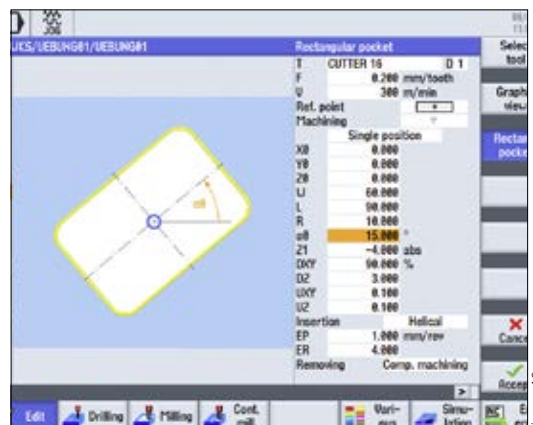
With the help of a guideline, the contour starting point of the rectangular pocket turned 15° can be determined in the contour editor. An x/y line under 195° with a length of 50 mm is created on the pole (0/0). The coordinates of the line's endpoint are the starting point of the contour and are registered as such after the guideline has been deleted. From this starting point, the contour is described using the angle data and the length of the line segments.



## 3

### Programming with the milling cycle

When programming, the simplest option is to use the cycle for milling rectangular pockets and studs. In the cycle, the programming of the pocket or stud is carried out simply by specifying the center point as well as the length and width. By providing the starting angle  $\alpha_0=15^\circ$ , the pocket or stud can be turned about the center point.



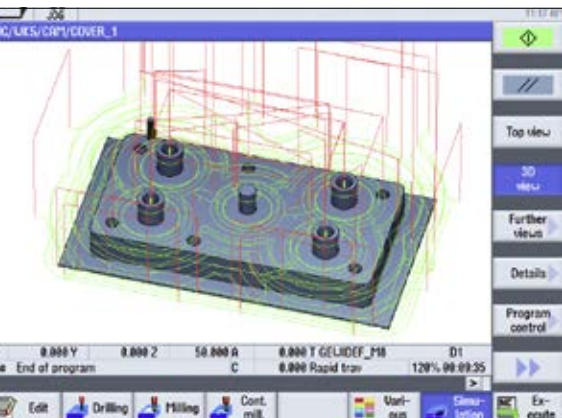
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New CNC4you workpiece for use in training

# Splash-proof camera housing

Action camcorders enjoy great popularity and provide very good video recordings even under difficult conditions. Their compactness, wide-angle lenses and various mounting options mean these types of camcorders are also useful in the work area of CNC machines.



3-D simulation of the rear plate (above) and the finished milled camera housing (below)

When being used in the machining area, a splash-proof housing, with an external power supply and direct connection for live transmission, is an essential requirement. Since the solutions available on the market did not meet all the necessary specifications, the CNC4you team developed a new camera-housing workpiece. The main criteria were simple construction and quick reproduction. The workpiece was programmed directly on the CNC machine with ShopMill and ShopTurn. The housing is designed for GoPro camcorders.

## Programming with ShopMill

The housing is composed of the shell, the rear plate and a flange for mounting the lens cover. The housing parts are programmed in ShopMill and the flange is programmed in ShopTurn.

The cover and rear plate are made in two clamping operations using the milling machine. Using the point measuring cycle, the zero offset is first set in the z direction and, using the measuring cycle for rectangular studs, the zero offset is set in the x/y direction. The upper side is face milled using the face milling cycle.

When milling the underside of the rear plate, a helpful feature from ShopMill for contour milling is used. This applica-

tion first defines the outside contour, in our example the blank contour. All other contours within the first contour will be automatically recognized as islands by ShopMill and will be roughed and finish machined with the stud milling cycle. In this way, the five mounting studs can be programmed very efficiently.

## Assembly

The GoPro camcorder is placed in a perfectly sized cutout in the housing case. On the left side of the camera, the terminals for video output and power supply are freely accessible and can be used accordingly. The cables lead out of the housing via secured and sealed cable bushing. The rear plate of the housing is affixed using flat-head or Allen screws. A sealing ring between the two halves of the housing ensures that it is splash-proof.

Detailed manufacturing descriptions, with programs and drawings, can be found at [siemens.com/cnc4you](http://siemens.com/cnc4you) under the heading "CNC Workpieces."

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## Certified Sinumerik trainer

After completing a train-the-trainer program in Erlangen, Wolfgang Odemer is certified to provide Sinumerik training and workshops on behalf of Siemens as a freelance trainer. Odemer received his basic training in his parents' company and was then further trained as a CNC technician. Between 1984 and 1993, he worked at a large German machine tool manufacturing company as a CNC technician and technician trainer. Since 1994 he has provided freelance training and instruction to machine manufacturers, retailers and users for machine tools from different manufacturers, both in Germany and abroad. This has allowed him to gain extensive experience. From turning and milling to Sinumerik Operate to ShopTurn and ShopMill, this Sinumerik trainer, located in Mühlhausen an der Ruhr, Germany, provides a broad spectrum of training courses.



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Wolfgang Odemer

Siemens AG

## Easy CNC app for iOS — now also for Android

You asked and we listened. The popular Easy CNC app is now available for Android devices. Easy CNC contains all the current training manuals for Sinumerik CNCs and will ensure that you always have the latest updates. With no more heavy manuals to carry, you have access to over 4,000 pages of vital CNC instruction and content. In addition, a handy G-code compatibility tool lets you quickly find compatible codes for Siemens and ISO G-codes. The glossary feature is your reference guide to CNC terminology, and weblinks to service, support and CNC social media feeds open the door to our online user community. Don't wait — download the Easy CNC app for iPhone, iPad and Android devices for free. To download Easy CNC to your mobile device, visit:

[siemens.com/cnc4you-app](http://siemens.com/cnc4you-app)



Siemens AG

## Events

Below you will find an overview of upcoming fairs related to turning and milling with Sinumerik. Find out more about these and further events at [siemens.com/cnc4you](http://siemens.com/cnc4you) —> Events.

Event	Location	Date
SPS/IPC/Drives	Nuremberg, Germany	November 25 – 27, 2014
EuroMold	Frankfurt, Germany	November 25 – 28, 2014



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The only address for cool CNC workpieces and useful tips

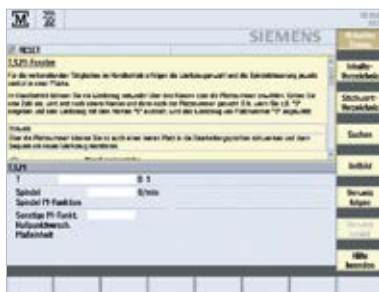
The SINUMERIK® Operate user interface makes programming quite simple, every step of the way.

#### Many new and useful functions:

SINUMERIK Operate provides you with a wide range of functions and makes machine operation even more efficient. As a result, programming and operator control clear and easy-to-understand thanks to the tool list and animated help elements. Simple tips and tricks make SINUMERIK Operate easy-to-use.

## SINUMERIK Operate — programming and operator control made simple

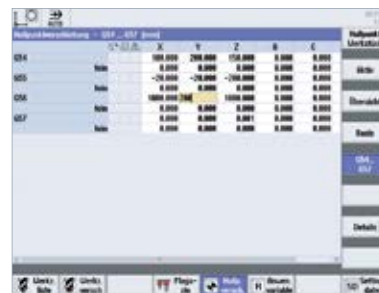
#### Tips and tricks:



The language-independent help key, tooltips, as well as improved search functionality with CTRL+F, are available in all screen forms.



HELP



The undo function using the "Insert" key — as long as an Input key has not been pressed or data already transferred into the fields.



INSERT



Recompiling, commenting out or processing cycles with just one or two keys.



SHIFT



INSERT

#### Download useful tips and tricks free-of-cost:

There are many additional functions and softkeys for fast programming and operator control. All this and more can be found online — visit [www.siemens.com/cnc4you](http://www.siemens.com/cnc4you).

Answers for industry.