

CNC4you

The Shopfloor Magazine

Four competitions – 100 % Sinumerik

CNC competitions at
WorldSkills Leipzig 2013

Tuning for CNC manufacturing
Sinumerik highlights at EMO

Strong start

Shopfloor programming: a factor for success





Siemens AG / E. Nürnbarger

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Cover photo: Siemens AG / A. Kradisch



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Dear readers,



The Sinumerik product line is now broader and more aligned with demand than ever before. There is an optimum solution for every machine concept: for entry-level machines, the **Sinumerik 808D**; for standard machines, the **Sinumerik 828D and 828D Basic** compact CNC; and for high-end machines, the **Sinumerik 840D sl** modular premium CNC. We will be giving live demonstrations at EMO in Hannover to show just what the various types of CNC can accomplish, and we will be focusing on current topics such as the **trend toward multitasking**. Sinumerik now offers even more functions that are perfectly tailored to multitasking machines. In addition, with **Collision Avoidance** Siemens has developed a pioneering approach to preventing collisions within the machine. And in order to make manufacturing plants more efficient through IT integration, the new **Sinumerik Integrate for Production** software suite enables the integrated use of data from the corporate level right through to the CNC. You can read more about the EMO highlights in the cover story.

In addition to exciting application examples, this issue of CNC4you also gives you the opportunity to read up about the CNC competitions at **WorldSkills Leipzig 2013**, where the best up-and-coming young turners and millers showed their expertise on DMG / MORI SEIKI machines with Sinumerik CNCs. You can learn more about Sinumerik innovations and the **new Sinumerik Operate functions** in the first issue of SINUMERIK InSight, which is enclosed with this magazine. See for yourself – visit us at EMO Hannover or at Euromold in Frankfurt!

Best wishes and enjoy the read,



Sinumerik highlights at EMO

Tuning for CNC manufacturing

Tuning means power as well as precision and quality, attention to detail, specialization, and commitment. So at our EMO trade show booth, we are not only presenting a tuned-up motorcycle to catch everyone's eye – the stars of the show will be Sinumerik CNCs demonstrating real tuning for CNC manufacturing by means of numerous large and small innovations, from optimized operation to multitasking functionality. Sinumerik is the leading family of CNCs – used consistently across the range from entry-level machines to cutting-edge multitasking machining centers.

Three machines from three different performance classes, three different workpieces and machining technologies – but just one control concept. At EMO 2013, Sinumerik CNC controls impress again with their standardized programming and operation. The result is technologically advanced CNCs for the widest variety of machine classes, production types, and machining technologies. More proof of the quality and innovation that characterize Sinumerik CNCs: their constant enhancement in line with trends in machine construction.

Multitasking – the combination of various machining technologies in one machine – is establishing itself as a strong trend in CNC manufacturing. The arguments are convincing: greater efficiency and precision due to combined machining in a single clamping fixture (more information about multitasking is presented in our Tips and Tricks article on p. 20).

Multitasking on a mill-turning center by DMG / MORI SEIKI

Many manufacturing companies are looking to multitasking as an answer to the constantly increasing demands of customers and growing competitive pressures. At the same time, the combination of complex technologies such as milling, turning, and grinding presents huge challenges during operation. This is where Sinumerik offers the operator optimum support.

One reason for this: Sinumerik CNCs are already leaders in each individual technology. So although combining them in one machine is new territory, each technology in itself is already supported down to the last detail. The nonstandard coordinate systems, different tools, and altered kinematics of the technologies to be combined – all are mapped in Sinumerik in the established manner. The standardized operating concept also makes it easier for a

milling specialist to program turning processes and for a turner to program milling processes.

Skeptics can see for themselves at the trade show: a motorcycle wheel rim will be manufactured live on a DMG / MORI SEIKI mill-turning center with Sinumerik 840D sl. Thanks to the machine's multitasking capabilities, milling and turning operations can be combined in a single clamping fixture. While the spindle revolves at up to 18,000 rpm and the rotating tools machine the fixed blank, both the worktable and the workpiece are turned at up to 1,000 rpm, with the workpiece remaining fixed. This opens up a range of completely new opportunities that can be utilized precisely and efficiently via Sinumerik 840D sl. The secret: intelligent transformations make it possible to switch between the individual technologies with just a few parameter inputs, turning the milling machine into a turning machine.



Siemens offers a suitable control for every application with the Sinumerik portfolio

Siemens AG | Nürnberg

The entire process chain from CAD design and data management to data transfer to the machine and multitasking machining can be witnessed by trade show visitors.

Standardization across all machine classes

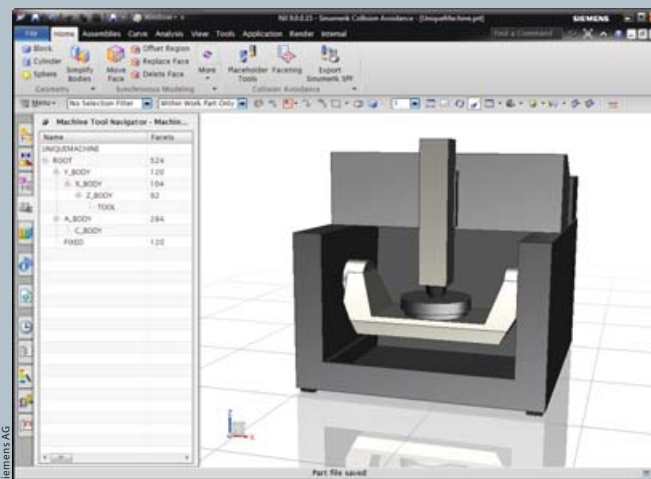
The advantages of the standardized system architecture and operation of Sinumerik CNCs will be highlighted by two other live manufacturing demonstrations at our booth. The air filter housing for the trade show motorcycle will be produced on a Hyundai WIA compact machine. The CNC of the F500 three-axis milling center, used worldwide by many contract manufacturers, is Sinumerik 828D. Special features during the demonstration: working with multiple clamping fixtures on four holders and mounting a dividing head – options that can easily be accessed and used to increase efficiency with Sinumerik.

TECHNOLOGY IN DETAIL

Improved and simplified: Collision Avoidance

Not least because of multitasking, the issue of collision avoidance remains a hot topic in CNC manufacturing. The latest version of the Sinumerik software now offers optimum protection

against collisions – and thanks to real-time 3-D monitoring, this even holds true for complex machining operations such as five-axis simultaneous milling or turning with a B axis.



With Collision Avoidance, machine manufacturers can derive the machine model from existing construction data on the PC

TECHNOLOGY IN DETAIL

Monitoring with Sinumerik Integrate: further optimization requires measurement

The networking of CNC machines continues to move forward in manufacturing; the stand-alone machine as an isolated island has become a thing of the past. For years Sinumerik has enabled the exchange of programs between central upstream production-planning servers or programming and the machines.

Networking, however, offers even more opportunities. Sinumerik Integrate provides a comprehensive package of software modules for integration with other IT systems and machine monitoring. The advantage for companies: machine status and work progress are transparent, independent of location and device. As a result, work progress can be automatically reported to higher-level IT systems. In this way, production planners can receive information about the order status without having to make numerous inquiries, and process optimizers can generate and use key performance indicators from the production processes. Employees on the shopfloor also benefit: fault alarms on the machines can be communicated directly to mobile devices – this means that an operator can reliably keep an eye on several machines during time-intensive machining processes.



Example of a plant overview for a cylinder head and cylinder block line

The idea behind Sinumerik Integrate: the ability to respond faster, more flexibly, and more purposefully to changes in a transparent manufacturing environment. Networking and comprehensive monitoring enable the optimization of processes in the medium term. Overall, the manufacturing company's competitiveness is increased.

TRADE SHOW NOTE



Sinumerik at EMO 2013

We will be presenting all our Sinumerik innovations at **Booth D33 in Hall 25**.

We will also be represented at the VDW Sonderschau Jugend (special exhibition for young people) in **Hall 24**.

And if you'd like to find out more online, just visit siemens.com/emo.

Those wishing to see the variety of functions and the precision of Sinumerik in use on basic machines for the lower performance range can do so on the Knuth NUMTURN. Starting with a drawing, workshop programming on Sinumerik 808D will be used to produce an indicator light mount for the motorcycle. Here the machine operator benefits from Sinumerik functions that go far beyond the usual standard of CNCs for this class of machine.

Interesting details and new functions

The trade show presentations will demonstrate the fundamental advantages of Sinumerik. In shopfloor manufacturing, however, equal importance is attached to the many specific advantages in operation and the range of functions. EMO offers insight into the numerous new Sinumerik CNC functionalities.

One example is the new version of the Sinumerik Operate user interface.

Workpiece programming simulation and program management have now been further optimized. The result: even greater clarity and more efficient operation. The definition of blanks has been expanded as well as the "manual machine" function. The ability to display Sinumerik Operate content on tablets and mobile phones is a pioneering addition as well.

Our tip: talk to our experts about your work processes and requirements, and learn more about the opportunities that the new improvements in Sinumerik CNCs offer when it comes to programming, operation, and more efficient machining.



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Retrofit of Geiss milling centers

Retrofit as tuning for production



MS Design

MS Design produces tuning components for all well-known automotive manufacturers in Europe

At MS Design in Austria, 3+2-axis Geiss milling centers had proven their worth for years in the manufacture of high-quality automotive tuning components. The automation technology, however, was no longer state of the art and was reducing manufacturing performance. The smart solution: a retrofit with an upgrade of the control and drive technology. The tried and tested milling centers can still be used and are now faster and more flexible, while a new CAD/CAM connection creates more time for actual production.

MS Design, based in Tirol, Austria, is well known among automotive manufacturers and private car enthusiasts for its high-quality design tuning. At its base in Roppen, around 50 km west of Innsbruck, the company manufactures tuning parts for many European car brands: front and rear aprons, door sills, spoilers, and special fenders. These aftermarket parts are often designed by the car manufacturers themselves,

but MS Design is also developing components in-house with growing success.

Design tuning: function and quality

The tuning components are mostly realized as deep-drawn plastic parts. Finish machining ensures the correct final contours and the necessary cutouts. The ►►



Siemens equips recoverable machines with the newest control and drive technology according to customer requirements



After the retrofit, the number of components in the control cabinet is reduced considerably

- » high manufacturing quality can be seen in the precision and clean surface of the tuning components that are immediately ready for spray painting.

For many years, MS Design has been using three 3+2-axis milling centers from Georg Geiss for the final machining process: two FZ 2250x1500s and one FZ 1000x600 (the figures refer to the work top size in millimeters).

The preformed blanks are mounted on workpiece-specific holders inside the center's machining space. Because the workpieces are flexible, during the machining process a vacuum holder, in addition to the mechanical clamping fixture, maintains the exact position – both around the target contour and around all the cutouts. This ensures the ability to comply with the gap measurements and tolerances specified by the car manufacturer.

Florian Larcher, head of the repair and maintenance section, explains: "We really appreciate the Georg Geiss machines because of their rigid construction with fully welded frames. They are low-vibration, even with the relatively high portals, long traverse paths, and long tools that we need. This means we can mill shapes that have a high surface quality that is ready for spray painting without any further finish machining." Although they had been in use for 15 years, the machines were still performing their quality-critical tasks perfectly, so it was understandable that the company and its employees were unwilling to give up such reliable machines.

15-year-old automation

The machines' original automation was no longer state of the art, however, and was preventing them from being integrated more efficiently and flexibly into the well-organized production processes on-site. This meant that parts programs that were created on one of the three machines would work on the other two machines only if time-consuming adjustments were made. The parts programs had to be created or modified directly on the CNCs of the machines them-

selves. This resulted in idle times that reduced productivity and yield. Back when the machines first went into production, network or USB connections for importing or exporting parts programs or tool data were still exotic functions.

Impending large-scale order

The pressure to make a decision increased with the prospect of winning a major order, and MS Design decided on a retrofit with an extensive upgrade of the drive and control technology. On the recommendation of a business partner, MS Design turned to Siemens AG's branch office in Vienna. The service team based there had already carried out a large number of successful retrofits on a wide variety of machines, as a full-service provider or in collaboration with the operator, machine manufacturer, or other partner companies.

The upgrade process quickly gained momentum. MS Design sent Siemens Vienna machine descriptions, drawings, circuit diagrams, some photos, and a catalog of requirements as the basis for the bid. The tuning parts manufacturer had prepared the documentation in great detail, so the automation specialists at Siemens were able to draw up not only the quotes but also all the project plans at the same time. The car parts supplier awarded the contract and shortly afterward received the project planning documents together with circuit diagrams and the control cabinet layout.

Standardized CNC

These documents provided for a standardized Sinumerik 840D sl CNC for each of the three machines, with an OP 012 operator panel, Sinamics S120 drives (including feedback-capable Smart Line Modules for energy-saving feed-in/feed-back), and standard Simotics S-1FT6 feed motors. Each machine was additionally given an HT2 mobile handheld terminal. The safety engineering was also updated.

The company made a general switch to the Safety Integrated functions integrated into the Siemens products for improved protection of people, machinery, and the environment. Safety-related communication would take place via Profibus using the Profisafe protocol.

Only a short break

The upgrading work, that is, the dismantling of the previous motors and control cabinets and the reinstallation and wiring of the new components, was carried out by technicians commissioned by the car parts supplier. A retrofit specialist from Siemens was on-site to answer questions while programming the PLC functions required by the machines in parallel with the installation work. The close cooperation paid off. The first completely upgraded machine was able to resume operation in just over a week, and all three machines were in shakedown operation two weeks after the upgrade started. Optimizations were complete just one week later, and the Geiss milling centers were once again available for production.

Result: significantly greater efficiency

The positive effects of the retrofit can be seen in operation. The machines now acquire their programs via the network straight from the drawing office or the production planning department. The new Sinumerik 840D sl CNCs are directly and comprehensively supported by the NX-CAM CAD/CAM system used at MS Design. The parts programs are freely interchangeable among the machines. As a result, the Geiss milling centers can be used far more flexibly. Another plus for productivity: there is now more cutting time available on each machine because programming work is no longer carried out on the machine itself – the parts programs tested and optimized via simulation are created in the office away from the shopfloor. The intelligent set-up functions of the Sinumerik Operate user interface noticeably shorten nonproductive times. The bottom line: a vast improvement in overall productivity, and the machines are second to none.

Retrofit enables rapid response to market opportunities

Larcher says: "Unlike with a new purchase, the retrofit enabled us to respond very quickly to the altered order situation. We saved a lot of time and money in comparison to a new investment. We can not only

continue to use the durable machine mechanics but also the foundations and the workpiece holders – and we didn't have to make any changes to our company's infrastructure either. Siemens' experience with retrofits like this and the fact that all the hardware and software components were coordinated with each other and came from a single source gave us the confidence in the project and scheduling that we needed at this stage of the business."

The upgrade work at the Roppen site is complete, and the machining facilities and manufacturing organization are ready to meet upcoming challenges. Although no further retrofits are needed at MS Design for the foreseeable future, Larcher adds, "But we can certainly pass on with confidence the recommendation that led us to Siemens as a retrofit partner!" <

TECHNOLOGY IN DETAIL

Machine tools retrofits


Time leaves its mark even on the most modern machine tools. Whether decreasing productivity, newly available functions or an increasing energy consumption: CNC Retrofit, the modernization of machine tools effectively counteracts the impact of time, especially when the mechanical system is still in good shape, but the control or drive technology is no longer state-of-the-art, CNC Retrofit measures are an economical alternative as compared to a new purchase.

Find out more about Retrofit:
[siemens.com/sinumerik/retrofit](https://www.siemens.com/sinumerik/retrofit)



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Shopfloor programming: a factor for success

Strong start

It took Ullrich Peter only three years to develop his company, Peter Präzisionstechnik (Precision Engineering), from virtually nothing into an efficient, medium-sized parts producer. To achieve this success, he relied consistently on machine tools from DMG / MORI SEIKI and Sinumerik CNCs.

In the beginning there was ... Ullrich Peter. He reminisces: "I used my last penny to buy my first machine from a bankruptcy sale, and then I began to produce parts using six tool holders." Bit by bit, with total commitment as well as technical knowledge and a craftsman's skills, Peter gained a foothold among the region's parts producers. His specialty: individual items and very small series.

The commitment paid off. Peter Präzisionstechnik now has four employees and a range of machines that enable the milling of parts from 5 mm to 1,000 mm long – right up to five-axis machining. "And the number of tool holders has risen to several hundred," says the young entrepreneur with a grin.

A wide range of products

For the Nuremberg machining specialists, it was important from the outset to produce individual parts and very small series. This allows them to make full use of their expertise in accurately translating drawing details into parts programs.

DMG / MORI SEIKI milling machine
with Sinumerik 840D and
Sinumerik Operate user interface

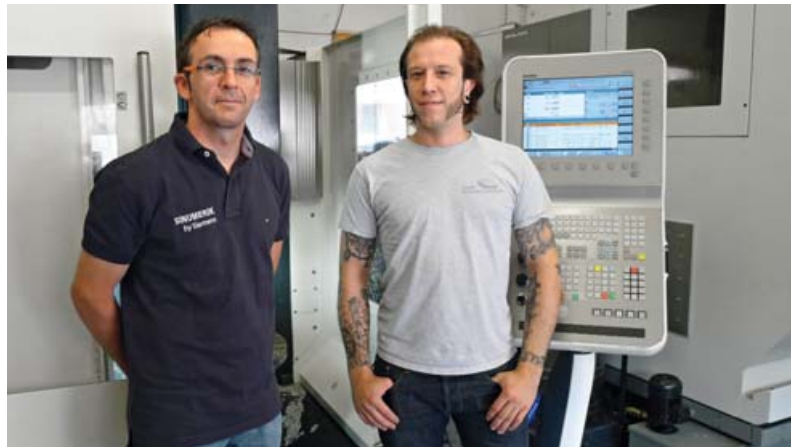
Their customers are special machine producers and prototype builders within a radius of 100 km. Peter says: "Ninety percent of the orders we receive are for milled parts, but we also offer the complete processing of assemblies." Parts that cannot be produced in the company's own machine shop are purchased so that customers have only one point of contact. Steel, nonferrous metals, and plastics can all be machined.

When it comes to the machines, Ullrich Peter always relies on milling machines from DMG / MORI SEIKI with Sinumerik CNCs – ranging from older models to Sinumerik 840D sl with the Sinumerik Operate user interface. There were a number of reasons for this choice: positive experience from the past, the familiar user interface that allows a new machine to be operated immediately without any further training, the standard programming and operation of all the machines, and the possibility of using tools and tool holders on any machine.

NC programs easily created

At Peter Präzisionstechnik, the geometry of the parts to be manufactured is entered into the CNC directly from the drawing and then augmented with the required technological and tool information. For this, the CNC provides a type of CAM system via Sinumerik Operate, which facilitates the easy and safe creation of NC programs. Sinumerik Operate combines the familiar ShopMill and ShopTurn tools into one user and programming interface in such a way that even users of older tools can find their way around easily.

This interface is used at Peter Präzisionstechnik to program 95% of all parts, although there is also an external CAM system available. Peter says: "Programming with Sinumerik Operate is easy, safe, and sometimes faster than on the external CAM system. That's why we use this tool so much." The integrated work-step programming is particularly useful: the operator simply calls up the desi-red cycle, inputs the required details, and completes the cycle. Then the next cycle comes up, and so on until the tool part has been described completely.



Gerd Müller from Siemens and managing director Ullrich Peter (right) are pleased with Peter Präzisionstechnik's successful launch

TECHNOLOGY IN DETAIL

The contour calculator

The contour calculator's complete range of functions is available in ShopMill/ShopTurn and programGuide.

After entering the starting point and machining plane, linear and circular paths are other entry options.

In general, the following applies: if mathematically possible, the contour calculator will use auto-complete. Details determined by the system are highlighted in light blue.

You can find more information about this topic in the CNC4you portal at Tips and Tricks.

siemens.com/cnc4you

Machining can be simulated after the program has been inputted. Gerd Müller, applications engineer at Siemens, explains: "When just the simulation of the tool paths is activated, the machine can continue running – programming and tool path simulation therefore take place parallel to machining." At Peter Präzisionstechnik, however, simulations are performed only for more complex workpieces.

The machining specialists also use Sinumerik Operate's tool management. All the tools are preset and recorded in the tool drawer and can then be used on all the machines.

The Nuremberg engineers find the measuring cycles stored in the system very helpful, as they can easily be used to perform measurements in the

machine. Peter says: "We are able to achieve consistent top-class results thanks to the ability to plan, control, and check all the activities throughout the whole production process."

Peter's experience with his chosen machine/CNC combination has been very positive, so it is no wonder that the next machine has already been planned. Someone with such a strong start will never stand still. <



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Horticultural specialist Pöppelmann standardizes its CNC concept

Manufacturing small tool series more efficiently



André Roggenkamp, team leader for turning, and his employee Philipp Hoping at the new Puma 2600 SY, which is fitted with Sinumerik 828D

Injection-molding tool construction at Pöppelmann GmbH & Co. KG makes special demands on the CNC with small batch sizes and a wide range of tool molds. The horticultural specialist is now standardizing its CNC concept in the turning shop – and benefiting from increased flexibility.

Pöppelmann GmbH & Co. KG processes approximately 50,000 tons of plastic at its site in Lohne, Germany, alone. Across its locations, the company produces products for professional horticulture on more than 450 automated injection-molding machines. The company has an in-house mold construction department; however, this department, with a total of 130 employees, must compete with

external suppliers. It is up to the business divisions whether they procure the injection-molding tools they require in-house or from third parties.

A huge variety of molds, small batch sizes

Small batch sizes are typical in tool construction. Batch sizes at Pöppelmann fluctuate between single items and

quantities of around 70. At the same time, the individual business divisions require very different tools, ranging from simple tools with very few parts, weighing a few kilograms, to highly complex injection-molded stack molds with 500 individual parts, weighing several tons.

In order to meet these demands more efficiently than external competitors, the in-house tool construction depart-

ment has developed the concept of a standardized CNC. Hermann Winner, head of tool construction at Pöppelmann, explains: "Only about 10 percent of the shapes we manufacture are recurring; the remaining 90 percent are completely new each time. To produce these many small and very small series efficiently, we need easy, flexible, and practical programming options on the machine. This is why we are switching

the turning shop over to a standardized control concept."

Uniformity creates flexibility

In the future, all the machines at Pöppelmann will be fitted with Sinumerik. First in line was a Doosan turning and milling center of the Puma 2600 SY type, which went into operation with Sinumerik 828D at the beginning of 2013.

This CNC was the key criterion for Winner when deciding on the purchase of the machine tool. The state-of-the-art CNC is available on machines from various manufacturers and is perfect for tool construction, as it demonstrates all the advantages of the integrated ShopTurn work-step programming when manufacturing single parts and small series.

The Sinumerik Operate user interface is part of the equipment. André Roggenkamp, team leader for turning, reports: "Our expectations have been met: programming is very fast – sometimes we need only half the time we used to on the new Doosan."

As a result, even complex components can be programmed quickly and effortlessly. The machining operations stored as cycles in ShopTurn can be adapted to the data of the current workpiece. There are specific cycles for milling and drilling operations on the face and lateral surfaces that can easily generate all kinds of grooves, pockets, and other shapes on cylindrical bodies and the face area. The key is that modifications of all types can be implemented directly on the machine, making it considerably easier to program similar parts flexibly.

In demand across all sectors: easy handling

A few months were enough to demonstrate the success of the concept. Head of tool construction Winner estimates that productivity has increased by approximately 20% thanks to the new machine tool with Sinumerik 828D – a huge leap in efficiency that he credits to the CNC and the resulting time saved when programming. Equipped in this way, Winner and his team are now much more confident in facing external competition for "their" in-house Pöppelmann customers.

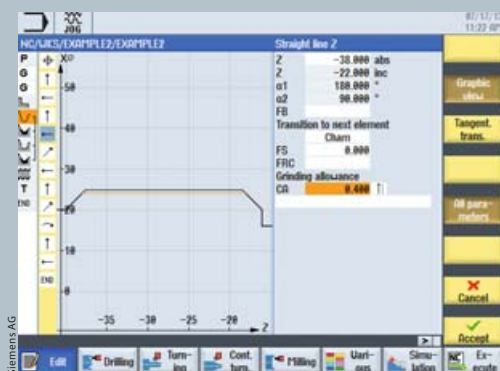
TECHNOLOGY IN DETAIL

Specifying grinding allowance in Contour Editor

In tool making, individual parts and very small series that require subsequent heat treatment often are produced. After hardening, these workpieces have to be ground or brought to the appropriate fit size or surface quality by hard turning. For this reason, a grinding allowance must be calculated and produced on the relevant elements during preliminary machining of the turned part. This sounds relatively simple at first. In most cases, however, the transition elements – such as chamfers, radii, and undercuts – are not reworked. This means that they have to be turned or extended, so that the dimension of the chamfer or undercut and also of the subsequent element corresponds exactly to the drawing after grinding. For the complex workpieces often found in tool making, this can be a time-consuming task when programming.

The Sinumerik Contour Editor, however, offers the perfect function for this situation. The editor allows specification of each element's grinding allowance while actually creating the contour.

The transition element is also simultaneously converted so that everything is completed correctly. This function can be found in the editor with elements active under the soft key "All Parameters."



The figure is entered in the "Grinding Allowance" box. The symbol adjacent to it is responsible for selecting internal or external contours



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How toll manufacturer MBS
achieves short delivery times

Flexibility required

Short-notice orders, rigorous demands regarding quality and delivery times – the pressure on toll manufacturers is steadily increasing.

MBS CNC-Technologie GmbH, based in Freigericht, Germany, demonstrates how to cope with these challenges. Everything at the company's production facility is aimed at achieving flexibility and short delivery times.

Urgent order in the middle of the night? Spare parts or series production? Nothing daunts Thomas Amberg, technical manager at MBS: "We are very fast and in many respects extremely flexible, which distinguishes us from many of our competitors." This strategy of flexibility is implemented by optimizing a combination of many factors. Amberg explains: "We use our large pool of machines as the foundation. We are able to manufacture simple milled and turned parts just as cost-effectively as complex products with free-form surfaces." Classic tool steel and stainless steel, light metals, plastics, molybdenum, and tungsten – MBS works with all of them. Whether spare parts or small or large series are needed, the customer determines what is produced.

Machines alone, however, are not enough. MBS managing director Pasqual Schunk adds: "We can only meet the extremely short delivery deadlines because our employees are prepared to work a three-shift pattern around the clock to keep production running."

About 40 CNC milling and turning machines are available in the production facility in Freigericht. On average, nine qualified skilled workers who write CNC programs on the operator terminals and set up machining centers are on-site to keep the machines running. Six semiskilled workers insert blanks and remove finished workpieces.



Small, complex workpieces are no problem at all for toll manufacturer MBS



You can't get something for nothing: investment in new machines

Managing director Schunk invests constantly in new technology. In one year he ordered four MTCut V110 vertical three-axis milling machines from MTRent – all of which were fitted with the Sinumerik 828D CNC. The most recent acquisition was a five-axis center of the same make. Technical manager Amberg is pleased to report: "A proper traverse path in the x-direction is important, as we machine large and small components.

The MTCut V110 with a traverse path of 1,100 mm is well within target.” Regarding performance data he says: “We achieve axis speeds of 32 m/min and the spindle rotates at up to 10,000 min⁻¹ at a maximum torque of 332 Nm – with a positioning accuracy of $\pm 5 \mu\text{m}$ and repeat accuracies in the range of $\pm 3 \mu\text{m}$.”

Amberg lists the advantages based on the example of a stainless steel component: “We used to not be able to manufacture this product cost-effectively. It’s a completely different matter with the new machining center. We are now more than twice as fast as we used to be.”

Robust CNC with maximum accuracy

The state-of-the-art CNC makes a significant contribution to the company’s high productivity. Sinumerik 828D, with its 80-bit nano accuracy, offers maximum precision integrated into the CNC and the Sinamics drives. Rounding errors in the software are eliminated and precise path guidance creates the greatest possible accuracy.



MBS skilled worker Benjamin Seim thinks there are many advantages when operating the unit. He praises the robust aluminum die-cast housing and the mechanical plastic-coated keys of Sinumerik: “The keys respond remarkably well, whether I’m programming or setting up.”



Also popular at MBS: the Sinumerik Operate user interface with typical PC functions; “highlight all” using Ctrl+A functions as well as copy and paste. ShopMill (graphical machining step-programming), programGuide (cycle-supported G-code), and the




TECHNOLOGY IN DETAIL

Sinumerik Operate: functions – soft keys – key combinations

Sinumerik Operate offers many useful key combinations. A few examples are shown below:

 +  Screenshots – file location: commissioning – system data – HMI data – protocols – screenshots

 +  Go to end of program

 +  +  Backup of protocol files to USB or CF card

A list of all key combinations can be found in the CNC4You portal at Tips and Tricks.
siemens.com/cnc4you

pure DIN/ISO language provide three different programming modes. Seim uses ShopMill for spare parts and very small series: “I’m just quicker at programming them with this.” He prefers programGuide for larger series, as it allows him to input an exact program sequence in classic G-code and reduce the machining time even further – a decisive factor for cost-efficiency when manufacturing series.

Cycles are displayed via animated sequences. Seim is full of praise: “These animations help me with cycles that I’m not yet very familiar with.” He personally appreciates the machining cycle for open grooves in particular: “I can use it to input programs for grooves of different depths directly on the machine by entering only a few parameters. I just push a button to choose whether the machine should use the trochoidal or plunge-milling method.”



Siemens AG

MBS skilled worker Benjamin Seim appreciates the robust construction of Sinumerik 828D as well as the clearly laid-out Sinumerik Operate user interface



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The right CNC leads to new opportunities for Task Force Tips

As fast as the fire department

Does higher efficiency really make premium machines more profitable?

“Yes, of course” was the answer given by the team at the US company Task Force Tips Inc. after investing in a high-quality Index turning machine with the Sinumerik 840D sl CNC.

Stewart McMillan, CEO of Task Force Tips (TFT), speaks freely about his former reservations: “I’d never made the link between Index machines and the idea of profitability. Why? Because I thought the Index brand was too expensive and virtually unaffordable.”

Practical experience with an Index C100, however, led to a change of mind for this fire department supplier, although his reservations still seemed to be justified when the project started. The Index machine planned for use in the 15,600 m² production facility in Valparaiso, Indiana, did not initially meet TFT’s expectations. McMillan says: “As a result, we had the machine retrofitted with Sinumerik 840D sl. And after starting parts production, we discovered that production time was around 30 percent. Note that by this I don’t mean an improvement of 30

percent but a reduction to 30 percent of the time we originally needed.”

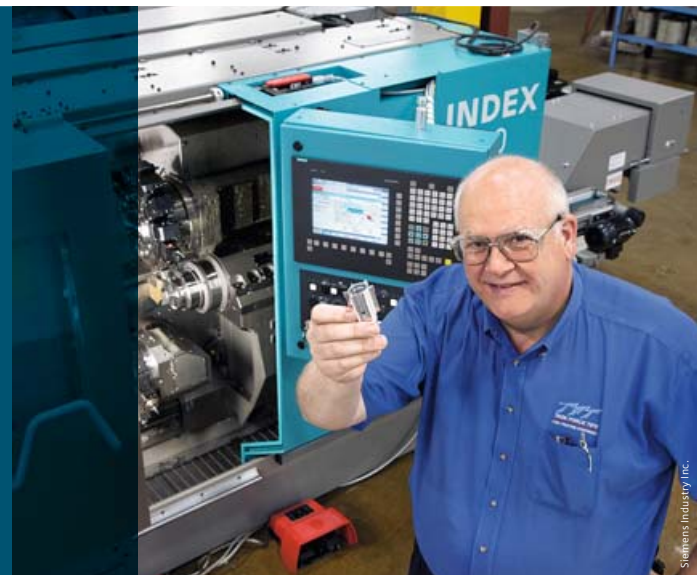
From 0 to a steady 5,000 rpm in one second

The machine’s high-speed design is the reason for this achievement. TFT began to carry out production jobs at 5,000 to 6,000 rpm. The fascinating thing was that the spindles were run up to the set speed and were steady within one second. McMillan reports: “We had never noticed before how much time other machines needed for stabilization at a new set speed. It also turns out that turret indexing is extremely fast. In this case, the various tools are used overlapping on both spindles so as to cut at the same time.”

The automatic remnant recovery function is yet another plus point. McMillan explains: “With other

“With the Index C100 production turning machine and Sinumerik 840D sl, we have reduced our machining time for a workpiece to 30 percent of the time previously required.”

Stewart McMillan, President and CEO, Task Force Tips Inc.





TFT is able to produce small parts with precise surfaces on the Index C100

Siemens Industry Inc.

machines we have to take the remnant out and feed in new bar material. This step only takes five minutes. In practice, however, a machine can easily be empty for several minutes before anyone notices. These are delays that add up and that used to reduce productivity and efficiency."

New opportunities in programming

Nate Price, head programmer at TFT, sees an improved approach to programming, setting up, and operating the machine with the Sinumerik 840D sl interface: "The Sinumerik CNC makes all the difference, in my opinion. It makes creation of programs and postprocessing faster and easier, which significantly accelerates the set-up of special routines."

The operators are also very satisfied. "The CNC offers a wide range of keyboard commands and a process for displaying messages for the machine operator that was not available with the other CNC. Sinumerik helps keep all the processes under control," says Price. "For example, the machine wants conditions to be fulfilled before it will start a cycle. The previous CNC was not particularly good at telling the operator this. With the Sinumerik CNC, by comparison, if you press the 'Cycle Start' button and the conditions are not fulfilled, the CNC guides you specifically through the required changes and the cycle can be started quickly."

Price mentions tool allocation as a second example: "We tell the CNC via a mini-program which tools are necessary for the job to be set up. The CNC then presents the relevant stations on the turrets and informs the operator which tools have to be loaded.

The operator is guided, which means a huge gain in speed and reliability." Set-up times decreased by 80% overall.

Improved performance per unit area

And finally, the crucial question of profitability. McMillan says: "Now I look at machine investments from an entirely different perspective. I calculate all the acquisition and running costs for setting up a production facility, for constructing the building, for heating and air-conditioning. This results in a certain sum per hour. Then I purchase a machine that costs \$600,000 instead of \$300,000 over 10 years. Our production runs almost 24 hours a day, seven days a week. Bottom line: the difference for us if we buy the \$600,000 machine is approximately \$8 per hour. And for \$8 more per hour, we get three times the production output with the same footprint." So the investment pays for itself. <

You can watch a video accompanying the article at bit.ly/14CsUFg.



Scan the QR code to go directly to the video via smartphone.



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The clearly structured Sinumerik Operate user interface simplifies the work for the participants

CNC competitions at WorldSkills Leipzig 2013

Four competitions – 100 percent Sinumerik

Only the best was good enough for the best young CNC turners and millers from all over the world. In July this year at the WorldSkills Leipzig 2013 professional world championships, Sinumerik CNCs spurred the national champions of their disciplines to peak performances on more than 30 machine tools by DMG / MORI SEIKI.

The atmosphere in Hall 2 of Leipzig's trade show site was electric. Those visiting the stands were immediately aware of the intense levels of concentration along with the general hustle and bustle. While young hairdressers from all over the world were bending over heads, and up-and-coming confectioners were producing the finest chocolates in record-breaking time, 22 CNC millers and as many CNC turners were sharing 11 machines next door. One was using the Mastercam CAM system to convert the geometric contours of a highly complex imaginary part drawn on paper into a program. Another was already setting up "his" machine tool in order to manufacture the workpiece he had been tasked with.

In three heats on three competition days, the national champions of their disciplines – all no more than 22 years old – machined their parts once in aluminum and twice in steel. Particularly challenged were the millers who had to manufacture a complex three-sided machining task in the third heat. For all participants it was important to select the best tools for fast and effective machining and finishing within the time specified – and getting an impressive result. "That would be pretty challenging even for an experienced skilled worker," stresses Bernd Barthelmann, turning expert at the Technology and Applications Center (TAC) of "Skills Presenter" Siemens in Erlangen, Germany, who, together with his TAC colleagues,

provided the participants with intensive coaching before and during the competition.

Intensive preparation with Sinutrain

Each of the machines by DMG / MORI SEIKI was fitted with Sinumerik 840D sl and the Sinumerik Operate user interface. In the run-up to the competition,

The champions had to give their all for the demanding tasks (here the Finnish CNC miller)





WorldSkills International

The winners in the CNC milling competition are proud of their success

participants could take part in two-and-a-half-day trainings held at various locations by the DMG / MORI SEIKI Academy with the support of TAC Erlangen. Training courses at the TACs in Taiwan, Korea, and China also provided preparation for the big task ahead. And all “athletes” were given access to a version of the Sinutrain training software, adapted specifically to the competition machines.

Robert Wolbers, a participant from the Netherlands, explains, “I had never had anything to do with a Sinumerik CNC before, but with Sinutrain I was able to prepare myself perfectly at home. In the end, the real Sinumerik behaved in exactly the same way during operation and programming as the training software.” Johannes Rudolf, German champion in CNC milling, had already familiarized himself in the training workshop with the Sinumerik Operate software. “I think the familiar Windows style of the interface is very user-friendly, with all its diagrams and colored graphics,” he says. This experience was a great help to him at WorldSkills, and he was extremely pleased with his experience there, even if he didn’t quite manage to get into the top group, being pitted against some strong Asian contenders.

From lone wolf to team member

For the first time, the CNC turning and milling competitions at WorldSkills were complemented by the demonstration skill Plastic Die Engineering, as well as the team competition Manufacturing Team Challenge – also equipped and supervised by DMG/MORI SEIKI and Siemens. The plastic die engineers had to construct an injection mold within a certain time frame, set up the respective programs in the CAM system, and mill the molded part with the MILLTAP 700 CNC milling machine. The production engineers had to show teamwork: a team of three had to manufacture a box for shredding cans. Also in this competition, the

participants were impressed by of the high quality and easy handling of the CNC equipment.

Brazil in sight

The first thing anyone thinks of upon hearing “Brazil” and “world championship” is probably football. After all, the biggest and most popular of all sporting events has already been marked on the 2014 calendar by most people. Not so the ambitious up-and-coming CNC operators and young skilled workers from other industrial skilled trades and services – because Brazil will also host the next WorldSkills competition just one year later (more precisely, in São Paulo, from August 11 to 16, 2015). More than a thousand competitors from more than 60 countries are expected to take part after the national qualifiers and EuroSkills in the French city of Lille in 2014. The reigning German champions in CNC milling and CNC milling encourage people to take part. Rudolf, a participant in the CNC turning competition, says: “The excellent preparation by Siemens and the intuitive Sinumerik CNC equipment gave me an enormous sense of security during the competition.” Tobias Brockfel confirms: “Despite the huge time pressure and the hustle and bustle, I thoroughly enjoyed WorldSkills, and it has helped me grow both personally and professionally.”



MORE INFORMATION

Have we piqued your interest? You’ll find a photo gallery and infos on the winners and the free Sinutrain test version download at
siemens.com/cnc4you
siemens.com/worldskills



Multitasking with Sinumerik

The right control system is a key factor for successful multitasking. Sinumerik 840D sl, with its consistent system architecture and standardized system platform, offers maximum CNC

performance and operator-friendliness in multitasking applications for turning and milling.

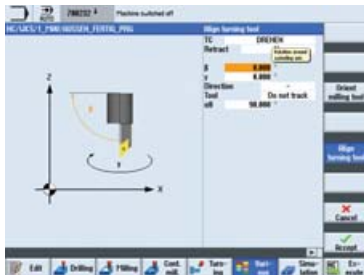
The uniform look and feel of Sinumerik Operate for all the individual technolog-

ies enables multiple technologies to be combined in one machine – with maximum consistency in operation and programming, of course. <

Sinumerik multitasking – just a few parameter inputs make a multitasking talent

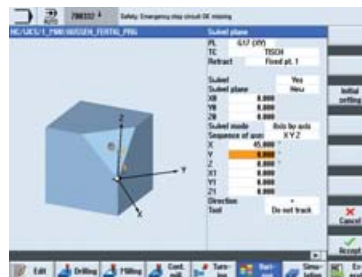
Thanks to intelligent transformations, only a few parameter inputs are required to turn milling machines into turning specialists and turning machines into experts for demanding milling tasks.

- > The B axis of a turn-milling center is fully supported by pivoting the milling plane or aligning the turning tool. Automatic activation of the turning plane and orientation of the turning tool in mill-turning centers are the key functions of multitasking.
- > The gamma and beta angles play a decisive role in the "Align Turning Tool" cycle.



- > With the gamma angle, it is possible to change the basic cutting-edge position of the turning tool by rotating the spindle through 180°. The setting angle of the cutting insert can also be adjusted for special applications by making small changes of a few degrees.
- > The tool is aligned in the G18 plane with the beta angle. This facilitates changes in the pitch and tool clearance angles. Beta works directly on rotation of the cutting insert, independently of the machine kinematics.

- > The "Pivoting Level" cycle is used mainly for milling and drilling on inclined surfaces in 2-D and 3-D. In this case, the x, y, and z linear axes move while the rotary axes are only positioned, in order to create a pivoted machining plane (3+2-axis positioning).

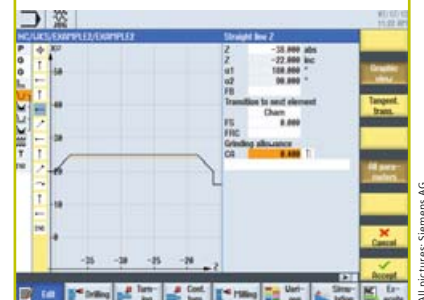


- > The X0, Y0, and Z0 parameters are used to specify the reference point prior to the rotation.
- > The X, Y, and Z parameters are used to specify the angle of the geometric axes around which is pivoted.
- > Using the X1, Y1, and Z1 parameters, the WCS can be displaced again additively after the rotation.
- > When the coordinate system is rotated into the inclined plane, the workpiece is always perpendicular to the machining plane. It is then possible to program drilling, for example, simply by calling up a drilling cycle.

Sinumerik multitasking – all tools on board

With their efficient tool management system, Sinumerik CNCs provide all the tool types necessary for mill-turning and turn-milling centers, including multitools, with maximum uniformity and simplicity.

- > Maximum choice:
All tools for mill-turning and turn-milling on board
- > Optimum visibility:
Consistent operation and visualization of all tool types
- > Maximum productivity:
Support for high-productivity multitools

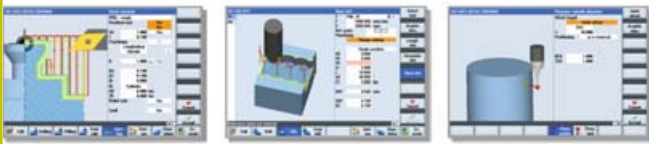




Sinumerik multitasking – uniform technology for all multitasking activities

Uniform Sinumerik technology cycles for drilling, milling, turning, and measuring tasks adapt perfectly to any multitasking machine. This creates unrivalled standardization for technological work steps.

Mill-turning centers



Turn-milling centers



Turning

Drilling/milling

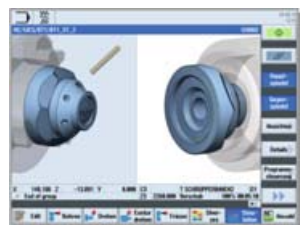
Measuring

Sinumerik multitasking – maximum multitasking process reliability

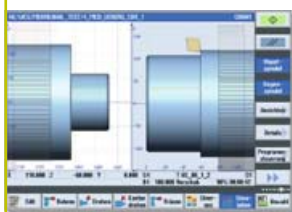
The unique Sinumerik CNC simulation guarantees maximum process reliability – from turning on milling machines to multichannel machining operations on turn-milling centers.



Mill-turning



Turn-milling

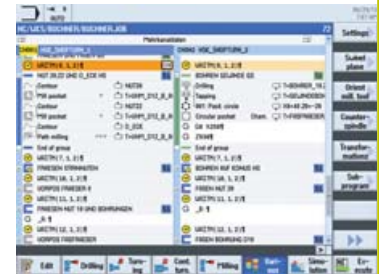


Multichannel application

Sinumerik multitasking – multitasking programming for all manufacturing jobs

Thanks to uniform CNC programming tools beyond turning and milling technology, Sinumerik CNCs offer the best possible basis for efficient CNC programming of multitasking machines – from individual parts to large series production.

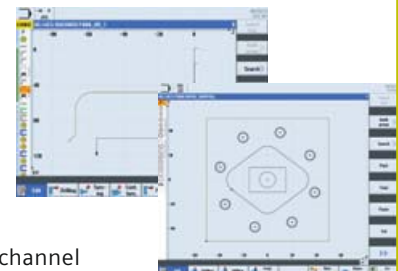
- > Sinumerik CNC programming language: CNC programming with high-level language elements for any technology



- > programGuide cycle support: turning, milling, and measuring cycles for all multitasking kinematics



- > ShopMill / ShopTurn: work-step editor for turning, milling, and multitasking machines



- > programSync multichannel programming: multichannel programming for demanding turn-milling centers



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The right tool for every machining task

High productivity and process reliability

Flexible milling and turning machines are especially suited to the manufacture of complex, delicate components in a single clamping fixture. These machines significantly reduce tolerance errors and nonproductive times. At relatively high machine-hour rates, the right balance must be found between commercial efficiency and high machining outputs – without sacrificing process reliability. Unstable clamping caused by component characteristics and materials with low thermal diffusivity often complicate the machining result. The machine operator is therefore faced with a difficult task in choosing the right tool if he or she must manage the temperature via a controlled supply of coolant and, using a positive cutting-edge geometry, keep the machining forces as low as possible.

Reliable and cost-effective milling processes

The Iscar IQ845 is a good example of a machine for face milling. It is extremely soft cutting due to the positive axial embedding of the indexable insert in the milling body and thus counteracts increases in temperature. The two-sided design also means reasonably priced inserts. This machining process generates less undesirable heat than comparable milling tools, due to the soft cut and the internal supply of coolant right up to the cutting edge.

Sumocham modular drilling system

With this innovative interchangeable head drilling system, Iscar offers an efficient solution for drilling operations at the highest performance level. The



IQ845 face-milling cutter with extra-soft cut

self-clamping and self-centering drill-head clamping system guarantees excellent stability, plus safe and easy handling – even when changing the drill heads in the machine. The optimized drill head geometries (ICP, ICM, ICK, ICN) are available in increments of 0.1 mm in a diameter range of 6 to 32.9 mm. An extensive selection of drill bodies for drilling depths of 1.5, 3, 5, 8, and 12XD in Weldon or round shaft design completes the Sumocham line.

Steel machining with high-pressure cooling

Using high-pressure cooling when machining stainless steel prevents the all-too-familiar phenomenon of edge buildup, with its associated overheating, tool failure, and poor surface quality. Therefore, for standard turning Iscar has tools for high-pressure machining: in the Isoturn and Heliturn product lines and many variations of the Camfix line, as well as tool holders and insert holders for grooving, parting, and plunge-turning from the Pentacut, Tang-Grip, Cut-Grip, and Sumo-Grip lines.

High-pressure tools with a controlled supply of coolant



i INFO

iscar.de

Certified Sinumerik trainer Benedikt Bole

Benedikt Bole (right)
during a Sinumerik
practical training at a
customer's machine



Sandra Sanchez

Prior to entering self-employment as a technology trainer and consultant, Benedikt Bole spent 10 years working for Germany's largest machine tool manufacturer. He spent four and a half of these years in China, where he was responsible for implementing specific technology solutions at end clients' facilities and for delivering training courses and machine demonstrations at local trade fairs. Shortly after establishing his consulting business, he took part in the "train the trainer" program in Erlangen, Germany, which enables him

to deliver training courses and workshops on Sinumerik as a freelance trainer at Siemens' request.

Bole's particular specialties are consulting on and delivering Sinumerik programming courses and – due to his many years of experience – the practical implementation of solutions on the machine. He also works for the VDW-Nachwuchsstiftung (the training foundation of the German Machine Tool Builders' Association), which is involved in the recruitment and development of young talent and also in the transfer of computer-aided

manufacturing technology to vocational education programs. This technology transfer is ensured by the guidance of the teachers at the vocational schools as well as by specific training measures. Promoting the necessary technology transfer and training are Bole's main tasks as a project manager for the VDW-Nachwuchsstiftung.

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Events

Below is a summary of upcoming events addressing turning and milling with Sinumerik. These and other events can be found at siemens.com/cnc4you —> Events.

Event	Location	Date
Euromold	Frankfurt	December 3 – 6, 2013
Nortec	Hamburg	January 22 – 25, 2014
Metav	Düsseldorf	March 11 – 15, 2014

SIEMENS



siemens.com/cnc4you

The only address for cool CNC workpieces and useful tips

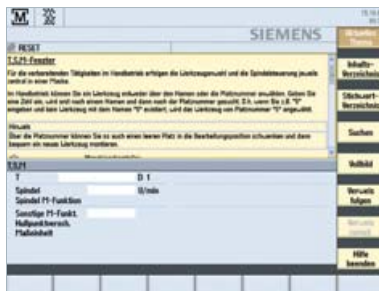
The SINUMERIK® Operate user interface makes programming quite simple, every step of the way.

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

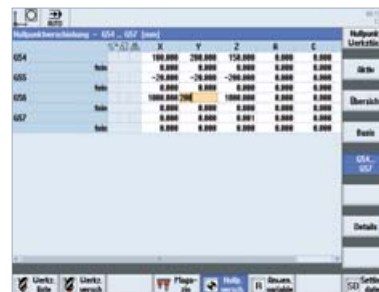
Tips and tricks:



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



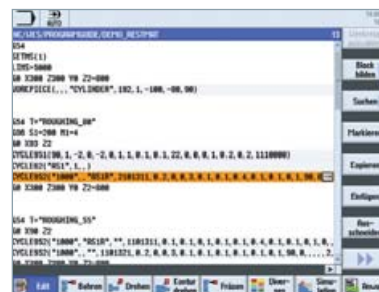
HELP



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.

Answers for industry.