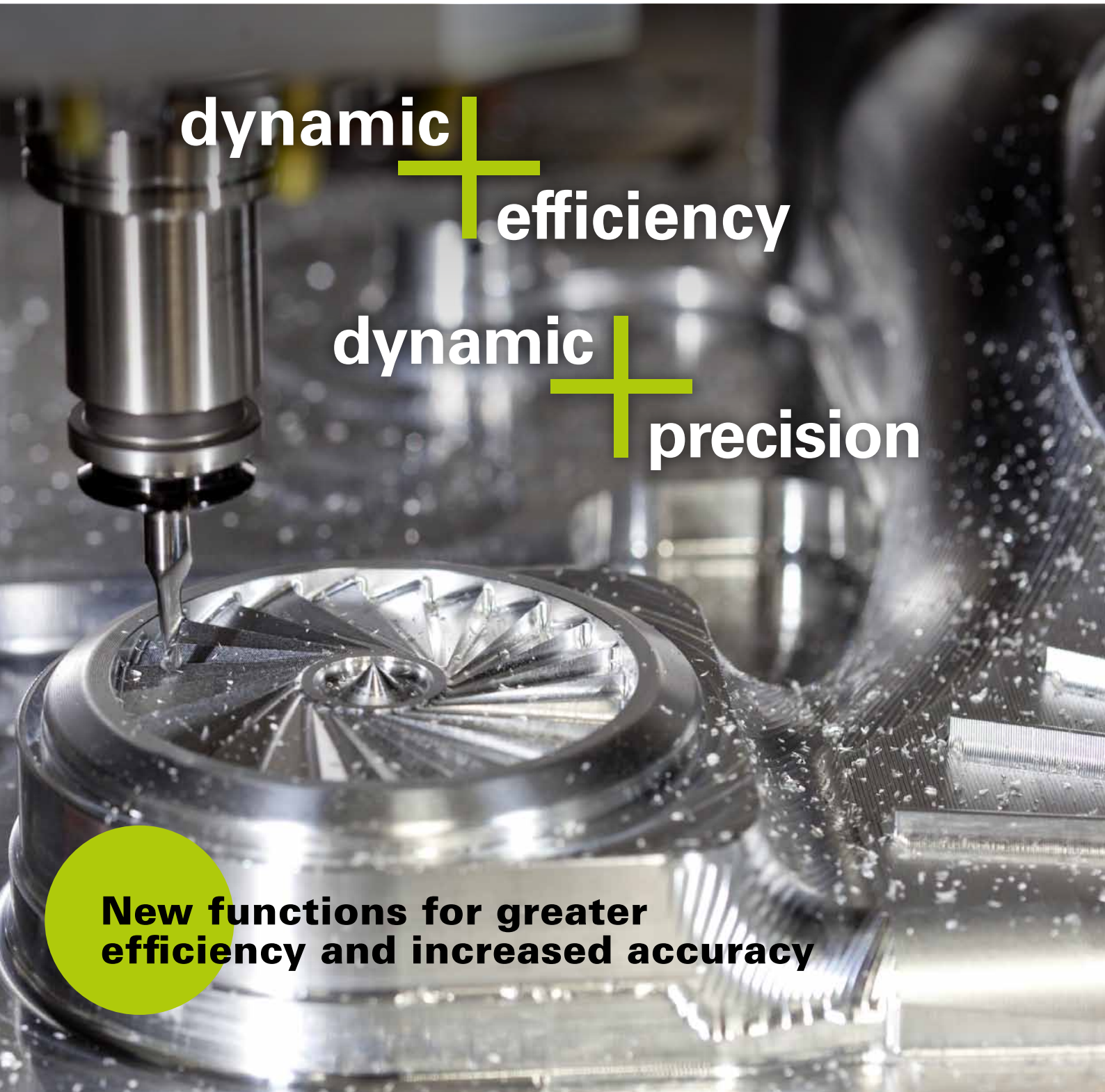
HEIDENHAIN

58 + 9/2013

Klartext

News from the World of HEIDENHAIN Controls



New functions for greater efficiency and increased accuracy

Klartext

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Editorial

Dear Klartext Reader,

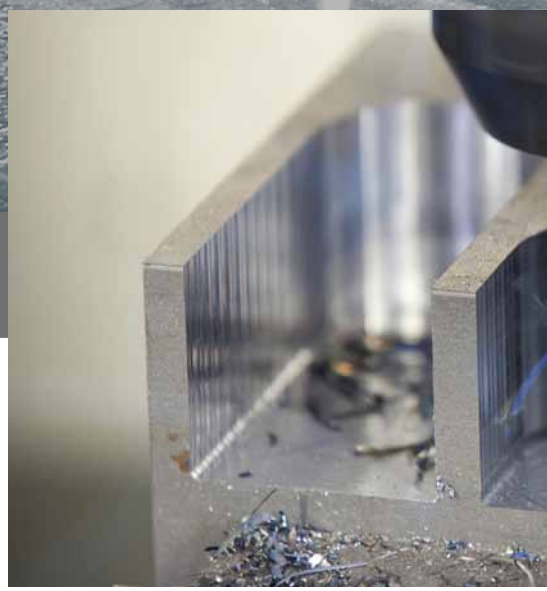
In interviews with HEIDENHAIN's customers, the Klartext staff learns quite a bit about the hurdles that companies must overcome in practice. One significant challenge is the pressure of having to lower costs while simultaneously having less time to complete each customer order. And of course the finished quality must not suffer under these constraints. Appropriately enough, in this issue we report on the new packages of features for TNC controls that HEIDENHAIN will present at EMO 2013: "Dynamic Efficiency" and "Dynamic Precision" exploit the potential of machine tools and result in more efficient and precise machining operations.

"Dynamic Efficiency" combines functions that help the machine operator achieve his heavy machining goals more quickly. "Dynamic Precision" stands for a whole slew of software options that palpably make machined workpieces more exact, even at high feed rates. Our titles stories reveal how these functions work, and how you can profit from them.

Earlier this year the Klartext staff visited a start-up entrepreneur in the Austrian town of Attnang-Puchheim, who turned his hobby of flying model airplanes into a flourishing business. A TNC 620 helps him to produce parts for model airplane motors efficiently and precisely. Experience for yourself how simply and quickly typical machining operations can be realized directly on the control.

In order to introduce greater efficiency on the shop floor, Klartext in this issue presents new functions for the TNC 640, TNC 620 and TNC 320. There are also tips on how you can manufacture entire series of fits over a long period of time, efficiently and precisely.

Read and enjoy, with best wishes from the Klartext staff!



Solutions for efficient heavy machining with Dynamic Efficiency

Achieve the required accuracy quicker with Dynamic Precision

Visit HEIDENHAIN at EMO 2013!

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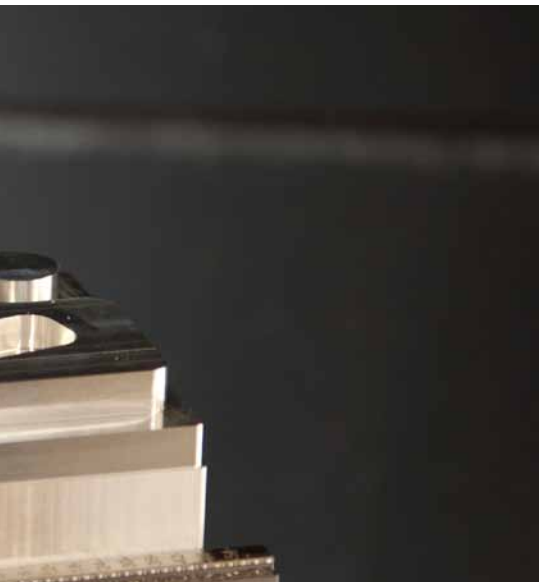

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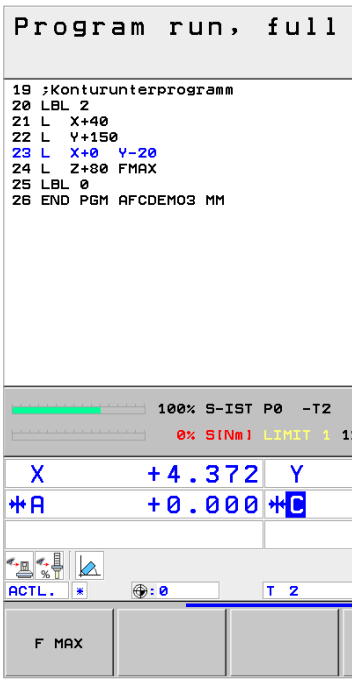
Dynamic Efficiency: More chips in less time

The HEIDENHAIN solution for efficient heavy machining

With Dynamic Efficiency, HEIDENHAIN exploits the potential of the machine and tool, in order to make heavy machining even more efficient. At the same time, the mechanical load is limited in order to reduce wear on machines and keep tools in use as long as possible. Dynamic Efficiency supports all processes where high cutting forces and high metal removal rates occur, such as roughing operations, and also assists in the machining of materials that are difficult to cut.

Dynamic Efficiency combines performance-enhancing controller functions with time-saving machining strategies: For example, Active Chatter Control (ACC) suppresses the inclination of a machine to chatter, whereas Adaptive Feed Control (AFC) always ensures the best possible machining feed rate. The "trochoidal milling" machining strategy serves to reduce wear on the tool while roughing slots and pockets, and can very easily be used as a cycle.

The effort is worth it. Metal removal rates 20% to 25% greater are possible, which significantly increases the cost efficiency.



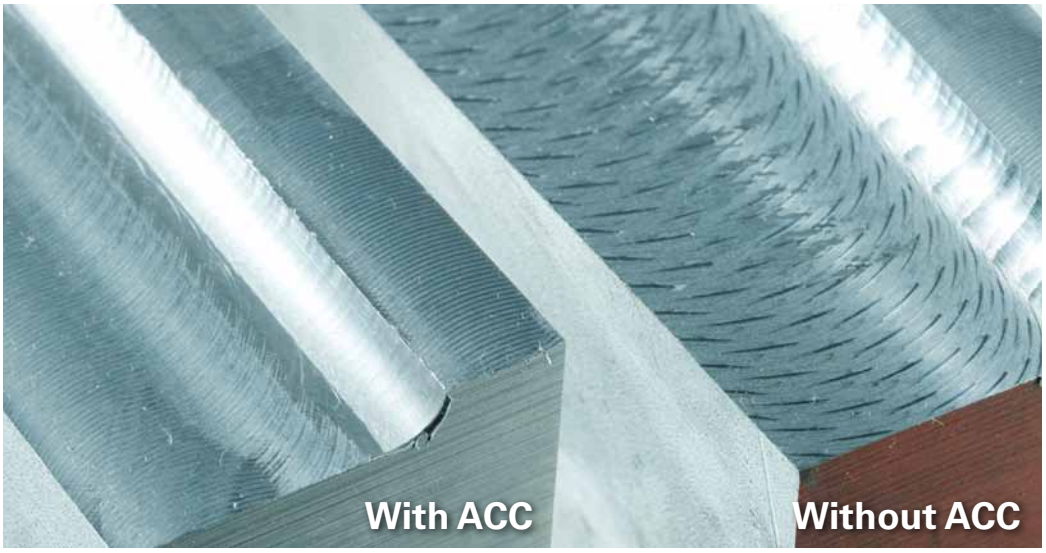
Everything at a glance: In a line diagram the TNC displays the current spindle power and the adapted feed rate.

ACC—active reduction of chatter vibrations

High cutting forces are involved in roughing, particularly during machining of hard-to-cut materials. This can result in chatter vibrations. Active Chatter Control (ACC) is a powerful controller function that reduces the tendency toward tool chatter.

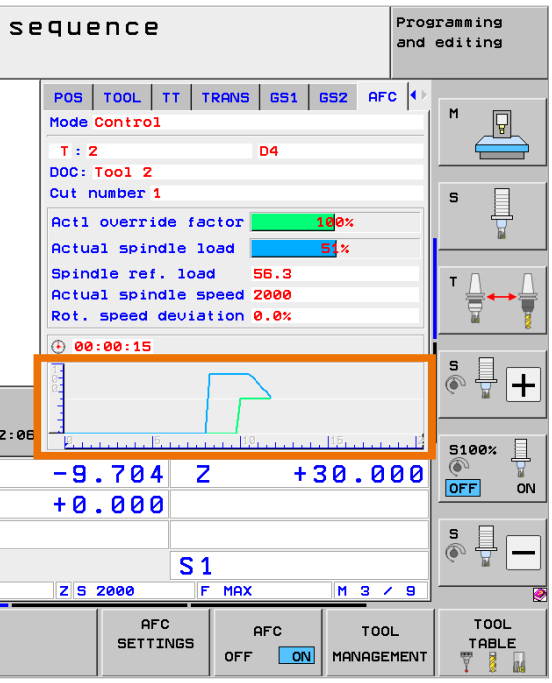
Chatter vibrations leave blemishes on the workpiece surface. At the same time, the tool is subject to heavy and irregular wear. In unfavorable situations the tool can even break. This chatter also places a heavy mechanical load on the machine tool.

ACC protects the machine tool against the effects of chatter vibrations, and at the same time increases its performance: The ACC algorithm actively counters the disturbing vibrations. This permits greater infeeds, leading to higher metal removal rates. For certain machining tasks the increase is easily more than 20%.



The comparison shows that the blemishes are avoided on the surface machined with ACC.

AFC—profiting from the best feed rate possible

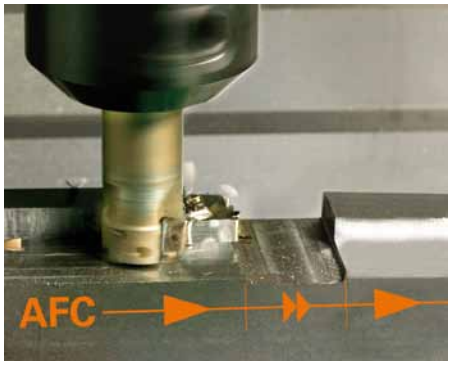


Adaptive Feed Control (AFC) shortens the machining time by automatically increasing the feed rate in machining zones with less material removal. This depends primarily on the spindle power and further process data.

AFC therefore always ensures the best possible feed rate when there are fluctuations in the cutting depths or material hardness. This increases the efficiency.

The application is simple: Before machining, you specify the maximum and minimum limit values for spindle power in a table. The values are determined by having the TNC record the maximum spindle power consumed during a teach-in cut. The adaptive feed control then continuously compares the spindle power with the feed rate, and attempts to maintain the maximum spindle power during the entire machining period.

AFC also offers another advantage: As a tool becomes blunt, the spindle power is increased and the control reduces the feed rate. AFC can initiate an automatic tool change if the maximum spindle power is reached. This reduces the mechanical load on the machine and effectively protects the spindle from becoming overloaded.



Trochoidal milling—using the tool's potential

The control supports the trochoidal milling machining strategy with an easily programmable cycle. This significantly accelerates roughing of any contour slots.

The cycle superimposes a circular tool movement over a linear feed movement. For this you need an end mill that can remove material over its entire cutting edge. "Scraping out" the material in this manner lets the machine work with large cutting depths and high cutting speeds.

Circular plunging into the material places less radial force on the tool. This reduces the mechanical load on the machine and prevents vibration.

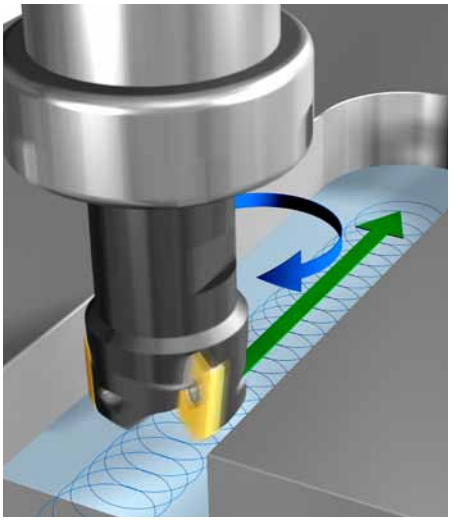
Much time is won by combining trochoidal milling with AFC

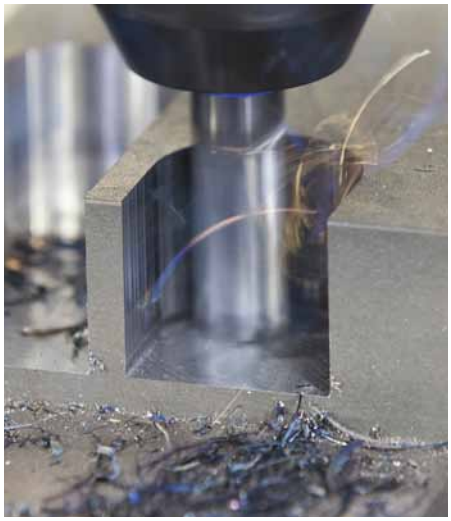
A significant gain in efficiency can be expected if trochoidal milling is combined with adaptive feed control. Since the tool moves on a circular arc, a part of this movement is in the air. In this situation, AFC moves the tool at a much higher feed rate. These features add up during machining with the HEIDENHAIN cycle to enormous time savings.

Conclusion: The software combination for efficient heavy machining

A high metal removal rate in the least amount of time possible is the measure for efficient roughing operations. It can particularly be increased with Dynamic Efficiency from HEIDENHAIN.

How to get rid of material quickly: Trochoidal milling superimposes a circular motion on the infeed.





Dynamic and efficient: Increased metal removal rates during roughing.

The functions for heavy machining place great importance on ensuring that the machine's dynamic behavior is not impaired, while at the same time maintaining high accuracy—regardless of whether the functions are used separately or in combination.

By combining the simple handling of the functions with the reduced load on the machine and the tool, HEIDENHAIN TNC controls demonstrate their power and capabilities with particularly economic and efficient heavy machining.

+ For more information, visit dynamic.heidenhain.de

The Dynamic Efficiency software package includes the following features

	Type	Control
ACC – Active Chatter Control Control function to reduce a machine's inclination to chatter	Option	TNC 640, TNC 620 and iTNC 530
AFC – Adaptive Feed Control Option 45 Function for optimizing the machining conditions	Option	TNC 640 and iTNC 530
Trochoidal milling Cycle 275 TROCHOIDAL SLOT In conjunction with Cycle 14 CONTOUR GEOMETRY, this cycle facilitates the complete machining of open and closed slots or contour slots using trochoidal milling.	Standard	TNC 640, TNC 620 and iTNC 530

Dynamic Precision: Exact machining in the least amount of time

The HEIDENHAIN solution for high production rates of precisely machined workpieces

With Dynamic Precision, HEIDENHAIN exploits the accuracy potential of the machine tool. Dynamic Precision makes it possible to compensate for dynamic deviations of the machine tool, and ensures that workpieces with increased contour accuracy and even better surfaces are produced—while also increasing the machining velocity.

The machining of a workpiece is often a conflict of interest: If the workpiece is to have exact contours, the milling operations can't be too fast. But if higher feed rates are required, the contour accuracy and surface definition usually suffer.

So what's to be done? Modern manufacturing enterprises are always faced with the challenge of simultaneously achieving higher accuracies and shorter machining times. Increased production rates and cost pressure force parts manufacturers to reduce their door-to-door times. Stringent demands on the accuracy and the surface definition should be met without time-consuming touch-up work.

It would appear that this conflict cannot be resolved. But this is exactly where Dynamic Precision comes into play. Dynamic Precision makes exact machining operations even faster, and increases production rates. Machine operators don't waste time or money on unnecessary scrap.

Dynamic Precision for TNC controls is a package of optional functions that ideally complement each other. These controller functions improve the dynamic accuracy of machine tools. Milling operations on a machine with Dynamic Precision can be performed faster and more accurately.

Dynamic deviations are the cause

Dynamic deviations are transient position/angular deviations or vibrations at the tool center point (TCP). They increase when the speed of NC program execution increases. The drive control usually cannot compensate the dynamic deviations completely. This leads to a following error between the nominal position and the actual position of the feed axes. The following error is a measure of the quality of the feedback control, i.e. how well the control traces a nominal contour. The dynamic deviations change over the lifetime of a machine, since the frictional forces in the guideways change due to wear, for example. Dynamic deviations usually also increase in machines with table kinematics when heavy workpieces are clamped on.

How do dynamic deviations arise?

Dynamic deviations are the direct result of machining operations. Machining forces, i.e. high moving forces and torques, briefly deform parts of the machine. The tool is continuously accelerated and decelerated again. Due to the inertia of the masses, the nominal and actual positions of the tool then no longer match. But even the drive train itself is not completely rigid. Due to a certain elasticity of the components, vibrations can arise.

In order to accomplish a change in direction while machining complex path contours, the axes must be braked and accelerated. The more rapidly this occurs, the greater is the jerk. Jerk is the measure for the duration of a change in acceleration. The greater the jerk, the more the machine begins to vibrate. This leads to dynamic deviations, and especially on slightly curved surfaces to visible shading. Until now this could only be prevented by slower feed rates. But now the time has come for Dynamic Precision.

What does Dynamic Precision do?

Dynamic Precision reduces the dynamic deviations of a machine tool. Dynamic Precision can particularly show its strength at high feed rates and rapid accelerations, by compensating for the deviations that arise. This enables machinists to fully utilize the potential of their machine tools. Test operations have shown that the accuracy can be improved, even if the jerk increases by a factor of 2. At the same time, the milling time can be reduced by up to 15%.

How does Dynamic Precision work?

The HEIDENHAIN controller functions compensate for deviations, dampen vibrations, and regulate machine parameters in dependency of the current position, inertia and velocity. This is done without modification of the machine's mechanics. Dynamic Precision ensures the accuracy, subject to the current motion and load.

Conclusion

Dynamic Precision significantly speeds machining operations, while at the same time improving accuracy. This means that machinists much less frequently need to turn the feed-rate potentiometer to the left in order to reduce the feed rate. High precision is possible together with fast machining, no matter how heavy the workpiece is. Dynamic Precision—contour accuracy and surface definition in the least amount of time!

Highly dynamic motions as part of 5-axis machining: Dynamic Precision compensates for the deviations that result.

Dynamic Precision includes:

Cross Talk Compensation (CTC)
CTC compensates for position deviations that result from the compliance between two axes. With it, the jerk can increase by a factor of 2, and machining times can be reduced by up to 15%.

Active Vibration Damping (AVD)
AVD actively dampens vibrations. It suppresses dominant low-frequency vibration (machine setup vibrations or elasticity in the power train). To attain comparable surfaces without AVD it would be necessary to reduce the jerk values by up to a factor of 3.

Position Adaptive Control (PAC)
PAC regulates the feed rate depending on the position. PAC changes machine parameters depending on the axis positions. This achieves improved contour accuracy within the entire range of traverse of the feed axes.

Load Adaptive Control (LAC)
LAC regulates the feed rate depending on the machine load. For linear axes LAC determines the current mass, and for rotary axes it determines the inertia. LAC continuously adapts parameters of the adaptive velocity feedforward control to the current mass or inertia of the workpiece. The machine operator no longer needs to determine the load situation on his own, which rules out operator error.

Motion Adaptive Control (MAC)
MAC regulates the feed rate depending on the machine motions. MAC changes parameters depending on the speed or acceleration of a drive. This enables a greater maximum acceleration during rapid traverse movements.

+ For more information, visit dynamic.heidenhain.de

KinematicsOpt

Thermal errors of machine tools can become apparent on the workpiece in periods of from a few minutes to several hours. With the software option KinematicsOpt, users of five-axis machines can quickly and effectively compensate the effects of thermal errors.

Fascinated by 4-stroke motors and TNC 620 controls

Precise production of motors for model airplanes

Passionate model airplane pilots put great emphasis on attention to detail and authenticity. You can feel the tension when the aircraft finally takes off for the first time, after so much work has been put into it. A small but steadily growing number of model pilots already gets goosebumps as soon as the engine is started: The sonorous motor charges the atmosphere—in a four-stroke rhythm. And with each push the orchestra of up to four cylinders gains in strength and volume. The crescendo is reached when the model plane takes off at full force. With the production of these high-precision motors, the new TNC 620 from HEIDENHAIN shows how efficient it can be to write programs directly at the control.

Johann Kolm fulfilled a dream by starting his own company. With an engineering degree in his pocket, the passionate model airplane pilot began developing the compact 4-stroke engines himself several years ago. The time-consuming work was spent on unique motors for other model pilots, who weren't satisfied with off-the-shelf products. Up to 10,000 hours of R&D were put into the current product range. Seven highly motivated production specialists, each and every one also a model builder, are instructed to unlock the potential of the machine tools in order for the young company to operate efficiently and economically. The team is particularly fond of the TNC 620 from HEIDENHAIN, which runs a new E600 milling machine from the Austrian EMCO group.

Knowledge leads to efficiency

Even a one-cylinder motor consists of approximately 70 parts, all of which are produced at Kolm. Nearly all types of machining are involved in this, including milling, turning, drilling, reaming, line boring and tapping. The machine shop is used not only to produce current parts, but also to develop new and optimized components. This leads to a variety of applications for the machine tools, and challenges the efficiency on the shop floor: Each piece must be programmed and machined as quickly and simply as possible.

So the start-up entrepreneur places his bets on knowledge being the key to success: The team must be capable of taking complete advantage of the flexible production strategies of the machine tools and their controls. The TNC 620 is of great support in situations such as this. The comprehensive scope of functions is not

just intended to be useful for complex tasks. Quite the opposite is true: The team uses many functions and cycles to quickly and directly program simple and typical machining operations at the control.

Generating powerful machining programs with the DXF converter

Motors cannot be developed without a CAD system. As an experienced user of HEIDENHAIN controls, Johann Kolm uses the DXF converter of the TNC 620 to enter the data for complex 2½-D applications. In the user-friendly DXF editor he hides layers, selects contour elements, and sets datums. This information is then converted into plain-language subprograms. The company owner is convinced that this procedure very quickly leads to reliable machining programs. "For us it is essential that we can modify cutting data such as the spindle speed, feed rate and cutting depth directly on the machine," says Kolm. Additionally he takes advantage of the numerous cycles offered by the TNC 620. They help to ensure that even complicated machining programs can be programmed particularly efficiently on the control.

Kolm estimates that 80% of the machining operations are programmed directly on the control.

Measuring while machining

The idea of performing workpiece setup or measurement and testing of workpieces or tools without using touch probes has become inconceivable.

Kolm and his team also use HEIDENHAIN touch probes to perform measurements in the middle of the manufacturing process. The TNC 620 has numerous convenient measuring cycles that make it easier to measure workpieces. When the narrower tolerances inherent in motor manufacture result in reworking being necessary, the workpiece remains clamped during measurement and also the subsequent work stages. This saves setup times, and is beneficial for the accuracy.

"There are no alternatives to HEIDENHAIN controls for my high-precision motor components."

Johann Kolm, company owner

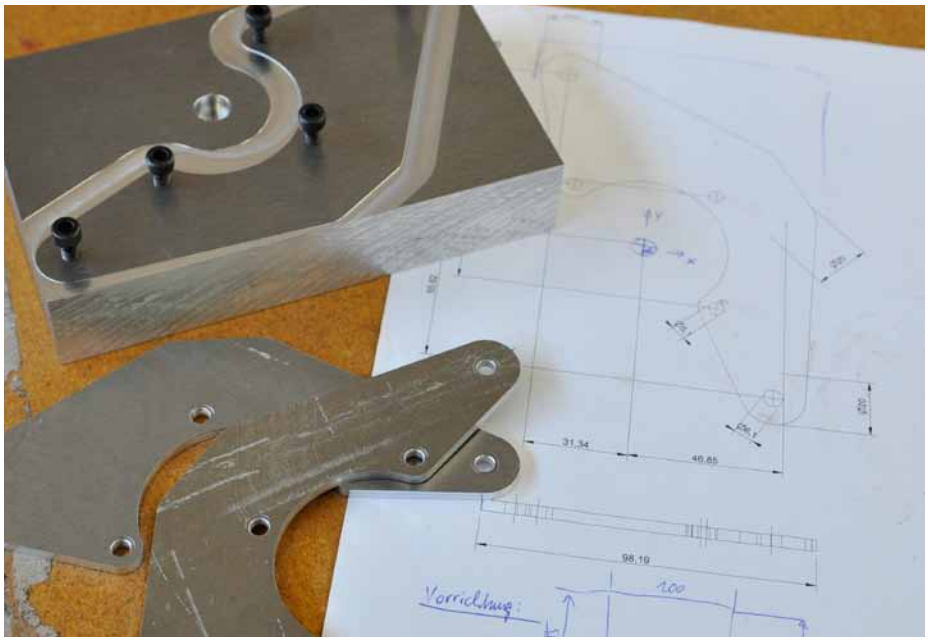
Programming of tilting operations on the control

Simple tilting operations can easily be programmed with the TNC 620 using conversational programming. Kolm confirms that the PLANE functions are very practical. They are used to program inclined contours as if they were in a level plane. Using the appropriate PLANE function—depending on how the dimensions are indicated—the coordinate system can be rotated in the required plane and then tilted. Particularly 2½-D operations can quickly be programmed in this manner.

Utmost precision with very small dimensions: The motor components are produced very economically with the TNC 620.

In this context Johann Kolm is also convinced of how well the TCPM function (Tool Center Point Management) works: This feature of the HEIDENHAIN control leads the tool tip exactly along the programmed path, taking into account the compensating movements of the machine. This avoids contour damage during tilted operations.

Kolm recommends taking a special training course for tilted machining, given by HEIDENHAIN or an authorized training partner, before working with tilted planes in conversational programming. The knowledge gained is of great use in quickly attaining practical results.

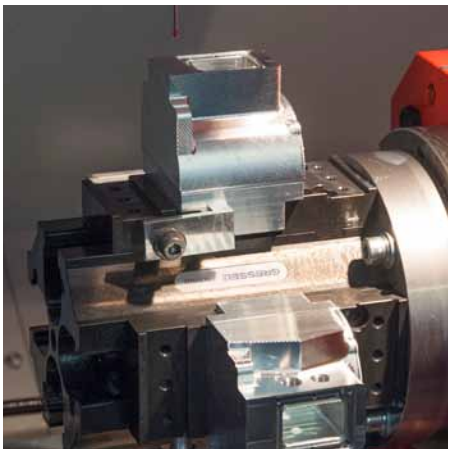


Simple solutions for efficient production: Generating hole patterns with DXF converter and a datum table.

Greatest accuracy without unclamping: Johann Kolm uses a HEIDENHAIN touch probe to test the dimensional accuracy while machining.

Saving time with repeated worksteps

Sometimes solutions are so simple that it is hard to see them. Using a simple workpiece, Johann Kolm demonstrates how quickly repeated worksteps can be performed—if you select the suitable function: In this case, threaded holes are to be set along a contour. Instead of replicating the contour in the program editor, Kolm simply uses a datum table, storing the coordinates of the individual holes there. First he had quickly used the DXF editor to determine the coordinates. In order to machine the hole pattern, the datum is repeatedly shifted on the workpiece, and the machining cycle is run again.



In some cases the fourth axis is used for multiple fixtures.

Unusual services with a new control

Johann Kolm meanwhile sells his high-quality motors throughout the world. Insiders appreciate the powerful four-stroke motors with the nice sound.

Johann Kolm's passion for his work gives him the energy needed to establish his young company. In order to achieve his vision within economical bounds, the motor components must not only be machined very exactly, but also very efficiently. That is why a control from HEIDENHAIN was an absolute requirement for the company owner. The TNC 620 provides many practical functions and features, as well as a wide range of cycles, which are all very easy to program directly on the control.

+ For more information, visit tnc.heidenhain.de

Many different materials and machining procedures are involved in the production of motors.

HEIDENHAIN TNC 620: The compact contouring control for milling, drilling and boring machines

The TNC 620 is a compact but versatile contouring control for up to five controlled axes. Programs are either written directly on the control—in plain-language conversational programming, the workshop-oriented programming language from HEIDENHAIN—or externally. Even long programs are transmitted very quickly over the Fast Ethernet interface. It's so simple to use: The operator is assisted by practical dialogs and help graphics, numerous fixed cycles, and coordinate transformations.

Kolm Engines

Kolm Engines develops and builds four-stroke gasoline engines for model airplanes. Johann Kolm sells motors with one cylinder as well as with more cylinders. He develops all components himself, and manufactures them with his team on CNC machines. As a HEIDENHAIN training partner, he gladly passes on his TNC knowhow to ambitious machinists who want to take complete advantage of the potential of their user-friendly controls.

Time-saving and practical functions for the TNC 640

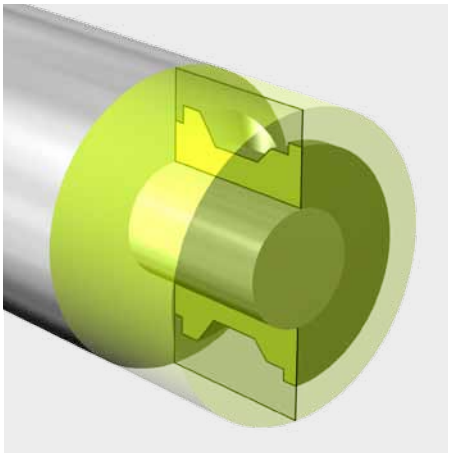
New features in software version 34059x-02

The newest version of the software for the TNC 640 control from HEIDENHAIN for milling and turning provides the machinist with even more practical functions. This time the focus is on turning applications: New cycles for blank form updating and for recess turning cycles help to shorten machining times. Also, the DXF converter supports entry of workpiece data, and the 3-D simulation graphics now show milling/turning operations in as much detail as "simple" milling operations.

Using the blank form update for more efficient turning operations

When machining with turning cycles, the current contour of the workpiece blank is taken into account for the calculation of infeed and machining paths. Updating of the workpiece blank considers completed machining steps, and detects areas that have already been removed. This avoids non-productive motions and optimizes approach paths. This enables you to significantly reduce the machining time, especially for complex turned parts.

This function is activated with the TURNDATA BLANK command. It links to a program or subprogram which defines a zone in which monitoring of the workpiece blank is in effect.

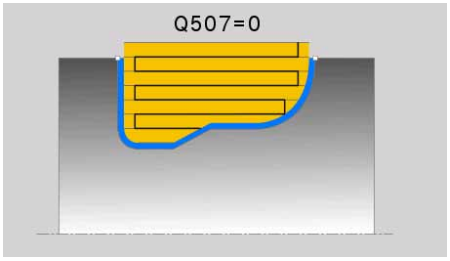


TURNDATA BLANK activates updating of the workpiece blank and links to the description of the blank contour.

Repeatedly saving time with efficient recess turning cycles

Recess turning speeds the machining of slots or contours with undercuts. A recessing traverse to plunging depth and then a roughing traverse are alternatively machined. This sequence is repeated in opposite directions until the slot depth is reached. This avoids the tool retraction and approach movements that are typical of recessing, thereby reducing the machining time.

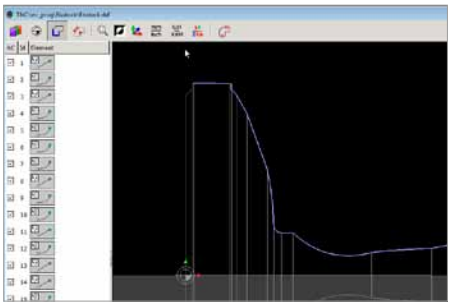
In conventional turning, due to the tool shape, repeated tool exchanges would usually be necessary, for example between left and right tools. With recess turning such contours can be machined with just one tool, which reduces nonproductive times.



The recess turning cycle reduces machining time.

Loading turning contours from DXF files

The DXF converter can now also process turning contours. In addition to milling contours, it can now also extract turning contours and copy them into the NC program. When selecting the contour in the DXF converter, simply switch the coordinate output from XY to ZXØ, and the coordinates will be interpreted as ZX coordinates. The X coordinates are then automatically treated as diameter dimensions.



The DXF converter runs as a separate application on the third desktop of the TNC.

Preview of SW version 04

Unique 3-D simulation graphics in full detail

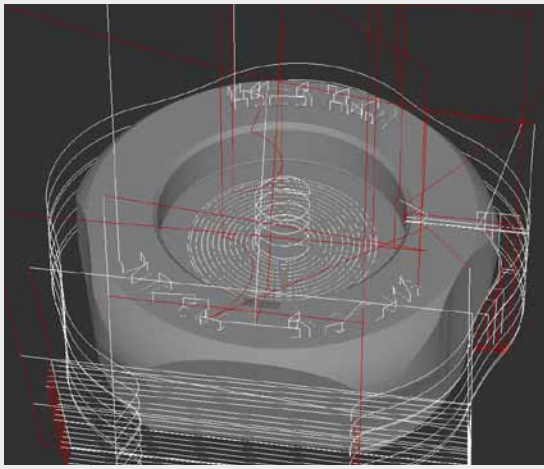
Starting a program requires some courage, so it helps to simulate the program first. Wrong or missing information in the program can then be found before machining begins. The revised 3-D simulation graphics of the TNC provide a very realistic view, in which the workpiece can be rotated in any dimensions. The TNC 640 can simulate milling and turning tasks in the same graphic.

For this test run you define the blank, i.e. the unmachined workpiece. For milling this is normally a simple cuboid. Now parts for turning can also be shown: cylinders, pipes and rotationally symmetric workpiece blanks. Now the turning operation can be simulated in the program, very easily in the same 3-D view as for milling.

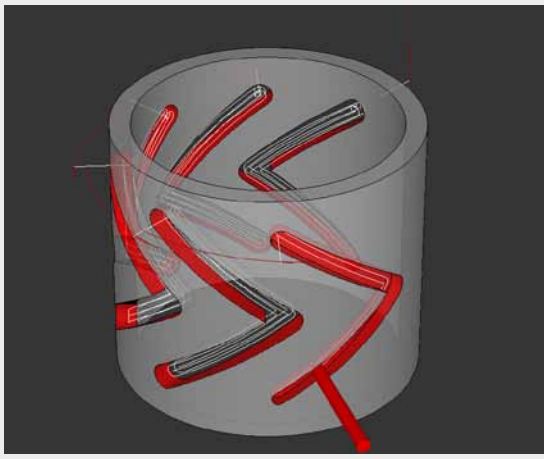
Depending on the requirements, you can adjust the graphics to your needs. The tool and tool path can also be shown. Displaying the frame of the blank can provide useful information. To assist you in visualizing the spatial details, the TNC 640 can show the workpiece edges as lines. You can also make the workpiece and/or the tool transparent, or show machined surfaces in color.

The mouse and soft keys control the graphics, just as you are accustomed to from familiar CAD systems. You can rotate, shift or zoom the image, in order to view highly detailed sections.

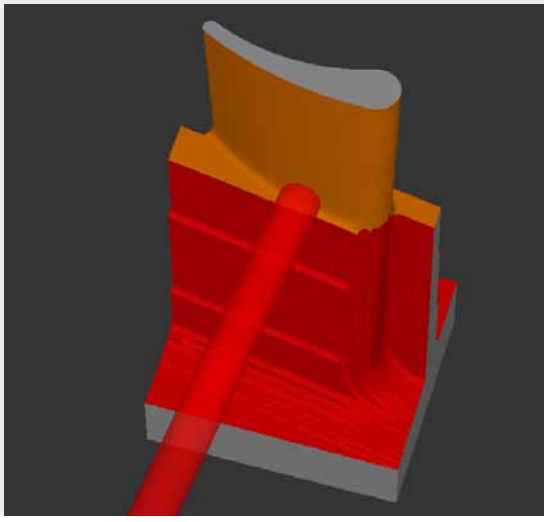
SW 03 is mainly concerned with integrated functional safety. The improved simulation graphics of software version 04, planned as a feature for 2014, will be unveiled at EMO 2013.



3-D representation for detailed views—now also for turning operations



Colors for lateral-surface machining of a cylindrical component

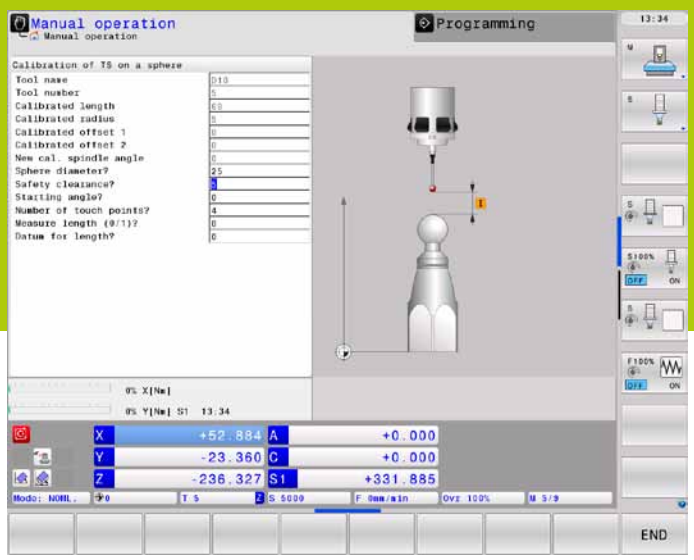


Different colors for machining operations with different tools

New calibration and touch-probe cycles

Precise manufacturing with TNC controls

HEIDENHAIN touch probes are used to set exact datums in the TNC, and for precise measurement of workpieces. New cycles and enhancements simplify and speed the use of touch probes in manual and automatic operation of the TNC 640, TNC 620 and TNC 320 controls.



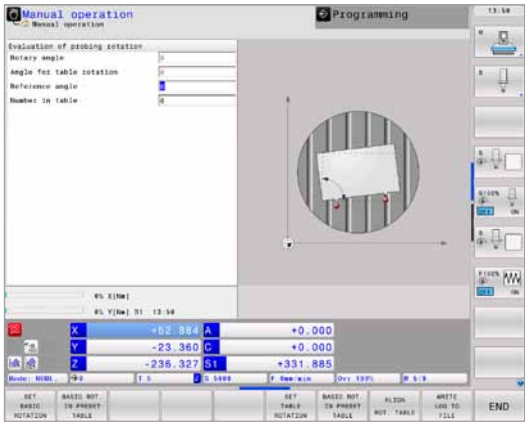
Calibrating a touch probe using a calibration sphere

New calibration cycles

In order to achieve exact measurements, the workpiece touch probe must be calibrated on a regular basis. The TNC uses various cycles to determine the effective length, the effective radius and the center offset of the touch probe:

- Measure the effective length
- Measure the radius and the center offset using a calibration ring
- Measure the radius and the center offset using a stud or a calibration pin
- Measure the radius and the center offset using a calibration sphere

What is new is that all four cycles are now available in manual as well as automatic operation.



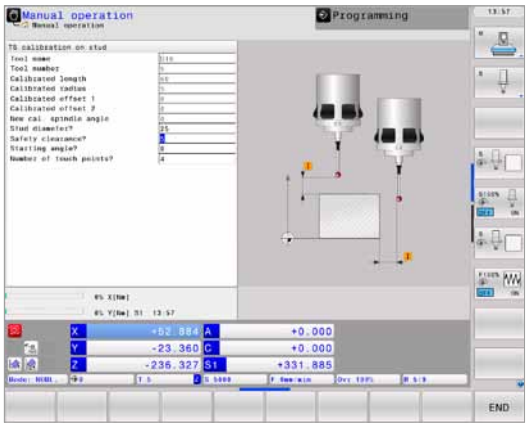
The clearly arranged help graphics help you orient yourself, and operation becomes even easier.

Expansion of the Basic Rotation cycle

The TNC has various cycles for detection of workpiece misalignment. The control then compensates for this mathematically. With the new ALIGN ROTARY TABLE function the TNC determines the misalignment, and automatically aligns the rotary table correctly.

New probing routines for holes and studs in manual mode

There are new soft keys for manual touch-probe cycles for automatic probing of holes (inside diameter) or studs (outside diameter). You simply enter a few values in a form, and the TNC generates an automatic probing routine. You position the touch probe in the center of the hole or near the first touch point on the stud, and start the probing cycle. The determined measured values can be logged.



The TNC generates an automatic probing routine from the entries in the form.

“There’s nothing else like it nowadays!”

What customers have to say about the HEIDENHAIN Service department

Maintenance and service technicians need rapid assistance when technical problems occur. The qualified employees of the HEIDENHAIN helpline are here for you. Additionally, the fast delivery of exchange units, a very large stock of spare parts, and on-site service support for HEIDENHAIN customers are other aspects of professional support at the highest level. Here are three examples.

MBM provides mechanical and electrical services as well as modernization measures for machine tools from SHW. Mr. Stefan Legner at MBM is responsible for the electrical design and commissioning of the SHW milling machines. He has had experiences with the service departments of numerous different manufactures of components.

Stefan Legner
MBM Maschinenbau GmbH, Ellwangen, southern Germany

Stefan Legner believes in the HEIDENHAIN Service department: “The service employees at HEIDENHAIN go to efforts far beyond what is usual. When you call the service hotline, you immediately get a technical contact partner. If he can’t solve the problem himself on the spot, he doesn’t just pass you on, but rather stays with you until the problem is solved. They call you back quickly, too. Usually within half an hour, instead of waiting two or three days.”

As a service specialist, he is responsible for the maintenance and repair of approximately 300 CNC machines. What does he like about the HEIDENHAIN Service department?

Franz Sieberer
D. Swarovski KG, Wattens, Austria

For Franz Sieberer, working with HEIDENHAIN is a “true pleasure.” The hotline is staffed solely be experts who know what they’re talking about. Due to the proximity to HEIDENHAIN, an assistant can simply hop in a car with the defective part: Either the driver waits one or two hours while the part is repaired, or the Service department gives him an exchange unit. It works just as well over the phone: If he calls this afternoon, HEIDENHAIN delivers the exchange unit the next morning.

But Mr. Sieberer appreciates not only the service and flexibility, but also HEIDENHAIN as a company, with its social responsibility toward its employees. The fact that all HEIDENHAIN products are produced in Germany at the Traunreut site, with the utmost precision? “I really like that.”

Assertive GmbH provides maintenance and repair services for mid-sized companies throughout the country. Its expertise ranges from 30-year-old, simple straight-cut controls to the most modern 5-axis contouring controls.

Jürgen Schneider
Assertive GmbH, Dortmund, northern Germany

“You need interdisciplinary knowledge and experience in order to act quickly and effectively when a machine is down. The HEIDENHAIN Service department provides ideal support when looking for errors.

Just recently HEIDENHAIN sent a replacement unit at 15:00 on Friday afternoon, and it arrived on-time Saturday morning for us to continue working.

The people at HEIDENHAIN go at it heart and soul, even Friday afternoon shortly before quitting time. You rarely have experiences like that anymore. That is why we—in the best tradition of the Ruhr Area—sent a yellow-and-black thank you to the service department, and treated them to a hearty Westphalian breakfast.”

Have you already used the HEIDENHAIN helpline?
Go to service.heidenhain.de for more information

Do you know this function?

A reliable process for the milling of fits

Reliably manufacturing fits in series production

Klartext presents a method for the precise and reliable manufacture of fits—particularly in mid-size and large series runs. The challenge is the fact that cutting conditions change continuously. Particularly the cutting pressure changes during milling as the result of increasing tool wear. The values for the tool dimensions must continuously be adapted because of this. Along with the usual tool measurement, the method presented here also takes into account the current cutting conditions, since the actual dimensions of the workpiece are measured. This is done automatically, without repeatedly needing to manually adapt the tool's compensation values.

The recommendation is to use touch-probe cycles 421 through 430. This is very convenient, since tool monitoring can be activated in these cycles. The control then performs continuous tool compensation automatically. How often should the measurement be repeated? You decide this individually, depending on the machining task.

Details about the method

First the milled fit is measured with a touch probe. It is important that the fit is roughed and pre-finished (same finishing allowance as for actual finishing). Based on the values measured, the control corrects the tool compensation values in the tool table—meaning the oversize DR for the tool radius or DL for the length. The cutting pressure has already been accounted for in this compensation, since the actually machined workpiece was measured.

Now you call the tool again and the fit is completed. The control takes the compensation values previously determined into account.

How is it ensured that this compensation is reliable? The recommendation here is to find an appropriate number of workpieces after which the touch-probe cycle is called again, e.g. after every fifth workpiece. The program section with the touch-probe cycle is simply controlled by a counter, for example by incrementing in QR parameters.

With each new measuring process the tool compensation values are adapted to the current situation.

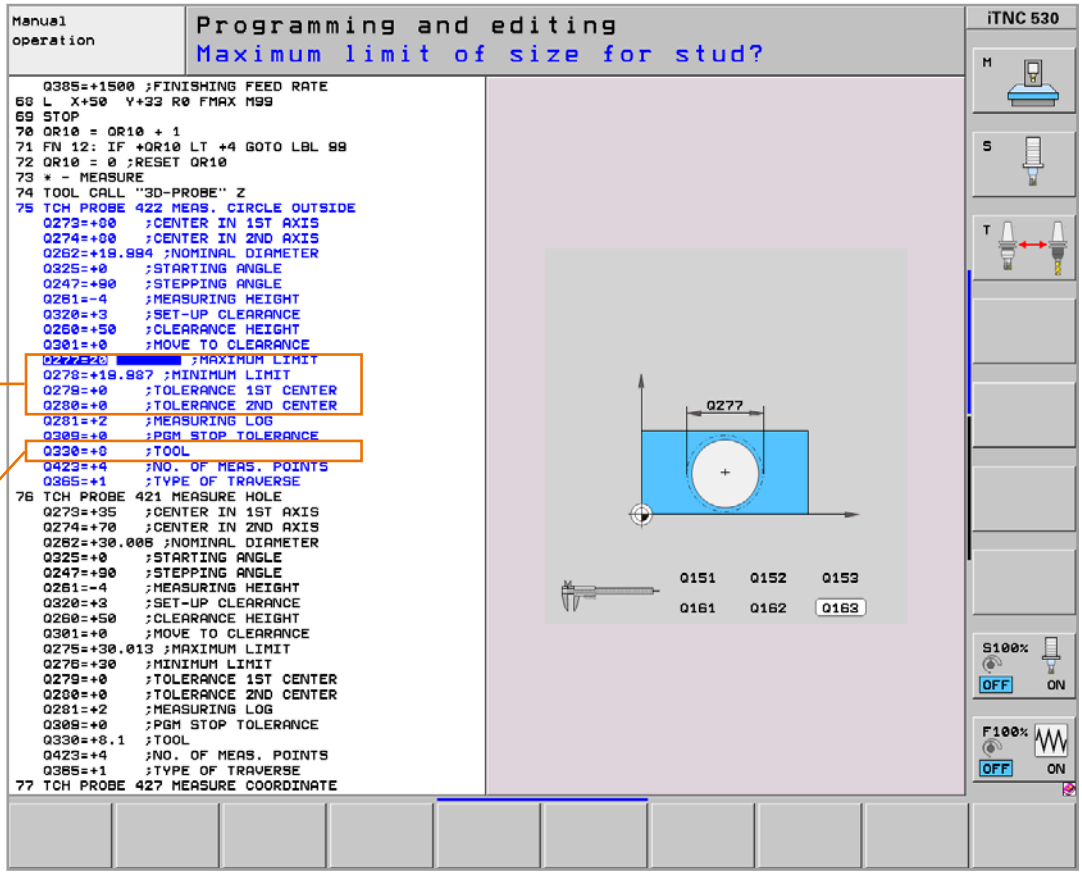
Reliably producing the first workpiece

This strategy also includes the first fit, so that the first workpiece doesn't end up as scrap. For the first measuring cut you simply enter a greater oversize for the milling tool: Choose such a large value that the next finishing cut encounters similar cutting conditions.

Avoiding tool breakage

By the way, this method also monitors the tool. The cutting pressure continuously increases, theoretically until the tool breaks. Here the control lets you enter maximum delta values. When this value is reached, the control locks the tool and activates a replacement tool, if desired.

+ You can find example programs and other information in our NC database at http://applications.heidenhain.de/ncdb



It doesn't get any more exact than this: In the probe cycle you define the maximum and minimum limits as well as the tolerance values for the fit (Q277 through Q280). If tool monitoring is activated (Q330), the TNC corrects the tool radius in the tool table, depending on the deviation from the nominal value.

TNC 128 – The new convenient straight-cut control

The compact TNC 128 sparkles with new technology and numerous functions

The external modifications are already clear at a glance, but there is no reason to hide the inner beauty: Numerous improvements to the hardware and software of the smallest HEIDENHAIN TNC control have brought it back to the newest state of technology.

Less complex operations continue to be performed on simple CNC milling machines, and it is exactly these applications for which the TNC 128 straight-cut control is designed. The smallest control of HEIDENHAIN's TNC family is specially designed for universal milling, drilling and boring machines. Its strengths lie in series and single-part production, in training and education facilities, and in the production of prototypes.

Compact control

The basic version of the TNC 128 controls up to three axes and one spindle. Two additional axes can be activated as options. As a result, the TNC 128 offers more features than its predecessor, the TNC 124. The innovative software platform has the same basis as that of the "large" HEIDENHAIN controls: the TNC 640, 620 and 320. This is a solid foundation for future demands.

Convenient programming

The TNC 128 presents itself in a modern, stainless steel design, with a newly designed keyboard. The proven TNC operation and plain-language program entry are the basis for the user-friendly programming. New NC conversational keys that have been added to the TNC operating panel make program entry more convenient—the complex navigation through the soft-key structure is no longer needed.

Enlarged screen

The easy-to-read 12.1" TFT color screen offers a split-screen view: one half of the screen shows the NC blocks, while the other can show graphics or status information. Additionally, the TNC assists you during program creation with help graphics and practical prompts, and offers more cycles for machining and coordinate transformation.

More interfaces and more memory

The TNC 128 has greatly improved its data transmission, and is much more powerful compared to the TNC 124. This is in part due to the Ethernet interface, integrated as a standard feature, which makes it possible to connect the TNC 128 to a company network with very little effort. Programs created offline, even larger ones, can be transferred directly to the machine. The integrated web browser of the HEROS 5 operating system provides Internet access.

The TNC 128 straight-cut control presents itself in a new design—but the simple operation of the control is still the same.

New: Tool and workpiece measurement

The TNC 128 can do things the TNC 124 couldn't do. Connecting touch probes with signal transmission by cable to the new control is not a problem. Workpiece and tool touch probes help you to reduce costs, because setup, measurement and monitoring functions can run automatically.

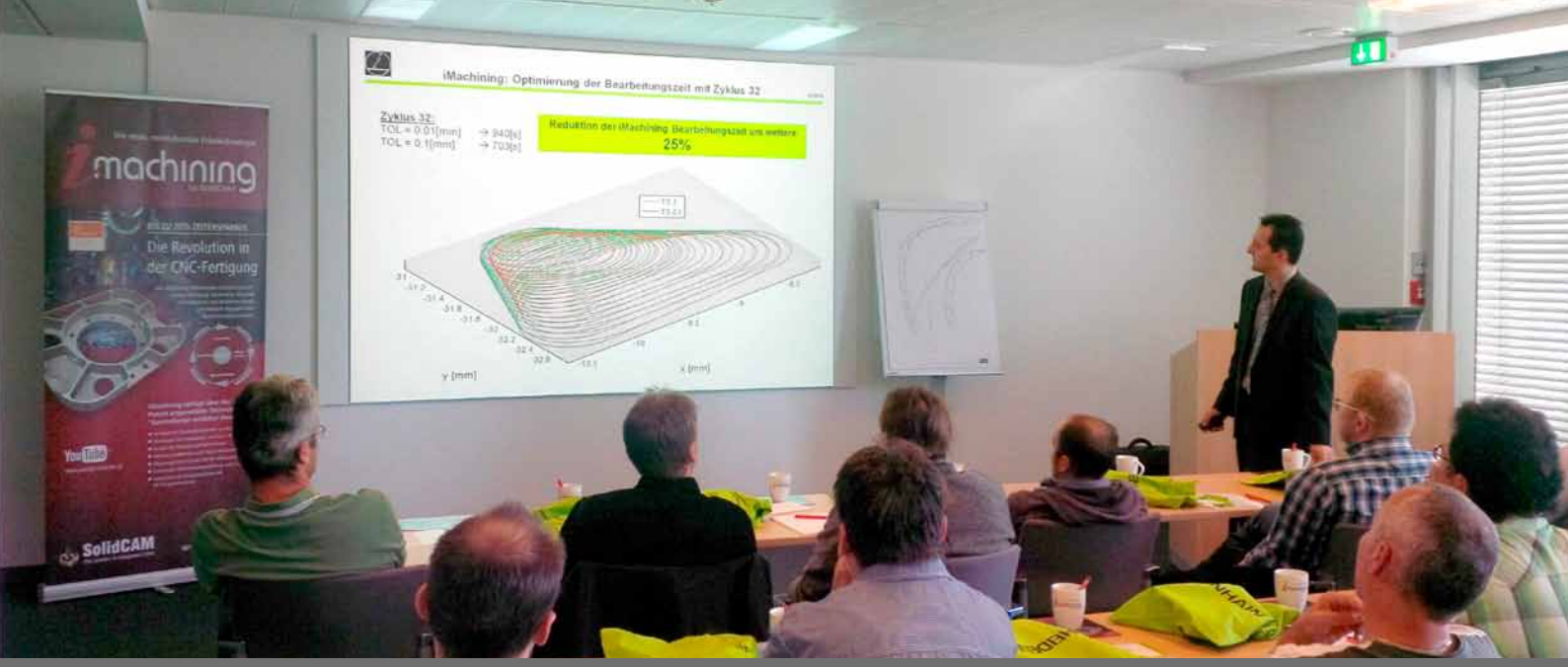
Conclusion

The elegant appearance and new power of the TNC 128 leave quite an impression. Throughout, HEIDENHAIN's basic operational concept for TNC controls has remained the same despite their continued development and improvement, making it easy to upgrade to a new control.

+ For more information, visit www.heidenhain.de

Comparison of TNC 128 / TNC 124 – The most important changes at a glance

	TNC 128	TNC 124
Display	12.1-inch TFT color flat-panel display (1024 x 768 pixels)	Monochrome flat-panel display (640 x 400 pixels)
Axes	3 closed-loop axes plus closed-loop spindle 1st and 2nd additional axes as options	3 closed-loop axes plus closed-loop spindle 1 open-loop axis for position display
Data interfaces	Gigabit Ethernet 2 x USB 3.0 (rear side) 1 x USB 2.0 (front) V.24/RS-232-C	RS-232-C/V.24
Integrated PLC	PLC memory: 350 MB Symbolic operands 31 PLC outputs 56 PLC inputs (expandable via PL 510, max. 4)	PLC memory: 128 KB Numbered markers and words 15 PLC inputs 15 PLC outputs (not expandable)
Machine parameters	Tree structure with symbolic names	Numerical structure
Touch probes	TS 220, KT 130, TT 140	



Important topics for specialists

HEIDENHAIN training center hosts user workshops

HEIDENHAIN is known for its comprehensive training program. Now targeted user workshops are being added to the program, where the emphasis is placed on acquiring practical knowledge and putting it to use. The participants are presented with current solutions on the market that play a role in efficient turning and milling operations.

To this end, partners from various sectors are invited to show how the various applications come together in the machining process. The workshops are held in HEIDENHAIN's new training center. After discussing the theory, the practical applications are demonstrated immediately on the powerful machines in the center's own machine shop. The first workshop took place in early June, under the motto "The perfect interplay of CAM software and TNC controls."

iMachining from SolidCAM

Alfred Kefer from the company SolidCAM presented the innovative iMachining milling strategy. The intelligent CAM software calculates the optimum cutting data for the machining process. It takes into account the CNC machine being used, the material to be cut, and the tool. Enormous increases in productivity can be achieved in this manner, while at the same time reducing wear on the machine.

The training center's machine shop lets machinists convince themselves of how practical the new milling strategies are.

The participants in the user workshops discussed the potentials for saving time in milling operations.

TNC and iMachining

Marco Hayler from HEIDENHAIN explained how iMachining is used directly on the TNC control. He specifically talked about the output of points by iMachining, and showed how setting the appropriate tolerances on the TNC—easily done with Cycle 32—significantly reduced the machining time even more. You adjust the tolerance value T in accordance with the application, thereby controlling the permissible contour deviation. If the HSC mode is set to roughing, the control can really step on the gas!

Practical demonstration convinces the participants

Things that sound great in theory must first prove themselves in the real world. Various materials were milled in the live demonstration using programs created with iMachining. Using the brand-new TPC cutters (Trochoidal Performance Cutting) from Hoffmann-Garant and torus end mills, the participants were given a demonstration of the perfect symbiosis of milling strategy and milling cutter.

The highlight was using an iMachining program for dry machining of a V4A workpiece (1.4572) with infeeds of up to three times the tool diameter. The result convinced the participants, and showed vividly how much potential there is for saving time in milling operations if the individual links in the process chain are optimally adapted to one another.

Implementing new solutions in your own company

The workshop was a complete success, replete with eye-openers for the participants. So if any of the attendees implements the new solution in his company, the workshop will have achieved its goal. Other events with well-known partners are already planned, and in the future will be an integral component of the training center's course offerings.

+ Information about HEIDENHAIN training courses: http://training.heidenhain.de

+ Information on workshop partners: www.solidcam.de www.hoffmann-group.com

User workshop: Manufacturing more productively

The next user workshop will be held in the training center in Traunreut on October 29, 2013. The companies OPEN MIND with the CAM software hyperMILL, CGTech with its simulation software VERICUT, and HEIDENHAIN with its TNC controls will show you how to quickly and reliably go from a 3-D model to the finished part.

+ For more details on the user workshop and for the online registration form, go to training.heidenhain.de/schulungsprogramm


HEIDENHAIN
dynamic + efficiency
Sometimes you have to bundle all your forces to achieve your goal. This truth is no more valid in sports than it is in chip making on milling machines. Here the TNC control from HEIDENHAIN provides "Dynamic Efficiency" to find the potential hiding in your machine: for example higher metal removal rates with Active Chatter Control (ACC) combined with Adaptive Feed Control (AFC). With "Dynamic Efficiency" you become more productive, spare your machine, and attain longer tool service life.
DR. JOHANNES HEIDENHAIN GmbH, 83292 Traunreut, Germany, phone +49 8669 31-0, www.heidenhain.de
angle encoders + linear encoders + contouring controls + position displays + length gauges + rotary encoders