



HEIDENHAIN

55 + 5/2012

Klartext

News from the World of HEIDENHAIN Controls

HEIDENHAIN iTNC 530

Entering the Race with Skilled Carbon- Fiber Machining

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Editorial

Dear Klartext Reader,

In modern metal-cutting manufacturing it is more important than ever to manage the balancing act between velocity and accuracy. New technologies demand very high precision during production. The challenge is to accomplish this economically as well. This issue of Klartext presents some innovative companies whose entrepreneurial spirit proves that this is possible. Motivated by the idea of creating something that was not available on the market, two of the companies dared to enter uncharted waters.

Our reports from the field tell how controls from HEIDENHAIN optimally assist the companies Carbomill and Tronical with their seminal technologies. These reports describe two common goals: attaining very high levels of precision, and successfully completing a project with the aid of an iTNC 530. This is the case with the start-up Carbomill AG from Switzerland: one of its jobs was the production of a satellite part using the powerful control from HEIDENHAIN (see page 6). Or the innovative instrument-tuning company Tronical GmbH from Hamburg, which uses the iTNC 530 to manufacture miniature parts for the world's first automatic tuning device—which "lives" inside the guitar (see page 18 for more).

Our readers already met the TNC 640 in the previous issue: it is the new, high-end control from HEIDENHAIN for full-surface machining. The first software release is imminent, and here in Klartext you can get an overview of the most important new features.

Another article deals with the imparting of knowledge all about the controls. On page 14 we present a new but already award-winning style of learning: HIT—the HEIDENHAIN Interactive Training system. This autodidactic learning system eases your way to gaining fundamental knowledge about TNC controls. Learn how quickly you become fit for everyday use of the TNC with the many animations, practical training examples and control simulations.

The Klartext staff also visited the "Training Workshop for Machinists" in Basel, Switzerland. On page 20 you can read about how modern HEIDENHAIN lathe controls give a marked edge in training!

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



In our report on Blum GmbH, learn about the benefits offered by the uniformity of HEIDENHAIN controls in production and training.



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Also, check out our interactive KLARTEXT e-magazine, with even more background information, animations, and expert knowledge. Take a look at

www.heidenhain.de/klartext

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Photo Credits

Carbomill AG: Page 6 top, 7 bottom

iStockphoto: Page 14 bottom, 18/19 background, 23 top

Lorenz Kunststoffgerätebau GmbH: Page 17

Tronical GmbH: Pages 17, 18

Gibson Guitar Corp.: Page 18 bottom

All other images

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TNC 640—the new HEIDENHAIN control for mill-turning

High End for Full-Surface Machining

Klartext readers have already known since the previous issue: at EMO 2011 in Hanover HEIDENHAIN presented the TNC 640, a new control whose strengths are evident in mill-turning. HEIDENHAIN remained true to its ambition of guaranteeing simple operation despite the numerous functions involved in the combined machining operations.

The initial software release is coming soon, and some machine manufacturers are already intensively working on interfacing the new TNC on machines with mill-turning functionality. Here is a compact overview of the most important new features.



Powerful cycle package

Operators of the new TNC 640 can now keep cool at all times, no matter how demanding the tasks are, because the TNC 640's package of cycles includes not only the familiar TNC milling and drilling cycles, but also many intelligent turning cycles. Even complicated turning operations are easily programmed at the machine—under conversational guidance and with support from expressive help graphics that clearly illustrate the input parameters. The cycles take the tool geometries from the turning tool table into account, providing even more relief by avoiding damage to the contour, such as when switching from external turning to internal turning operations.

Simple switchover

Switching from milling mode to turning mode is also very easy: it occurs in the NC program via standardized plain-language commands. There are almost no restrictions, since the switchover is completely independent of the momentary axis configuration.

The same techniques used when programming milling operations are used for turning operations: turning contours are defined in contour subroutines just like the milling contours. The designations of comparable cycles and parameters are matched to each other in the milling and turning modes. These standardizations make it easy for TNC programmers to uti-

lize their experience and rapidly find their way in the world of turning on a milling machine. This also simplifies the transition to the new HEIDENHAIN control.

Guaranteed balance

Unbalances often occur when asymmetric workpieces are machined. The new TNC 640 features powerful functions for the detection, continuous monitoring, and compensation of unbalances, and on most machines this is possible without additional sensors.



Optimal operability

Both the new hardware design and the new user interface play an important role in optimizing the operation. The 19" monitor and keyboard are embedded in an elegant stainless steel housing. The convex, slightly rounded keys are pleasant to the touch and type reliably. New LED status lights inform you "at a glance" about active functions.

The user interface has a new color scheme, and the structure of the dialogs has been optimized. Syntax highlighting makes it easier to distinguish between syntax elements, entered values and comments.

The various new features improve operability and increase the transparency and straightforwardness of both programming and operation.

Faster access to functions

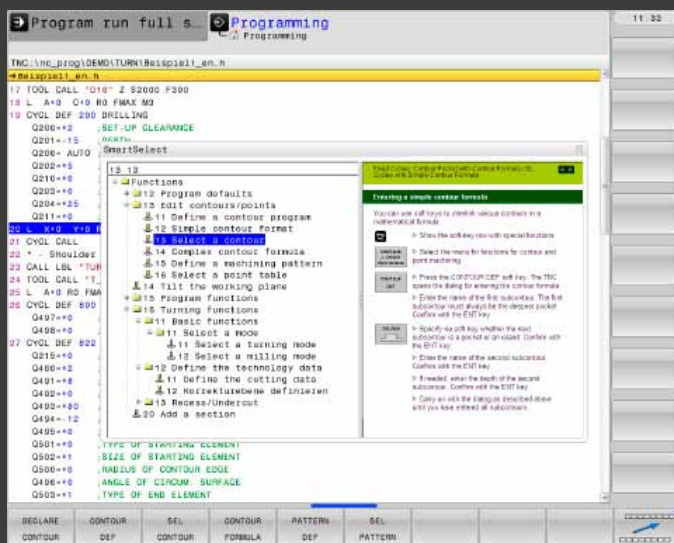
With smartSelect you enjoy dialog guidance for quick and easy selection of functions that up to now were accessible only through the soft-key structure. As soon as you open smartSelect, it displays a tree structure with all subordinate functions that can be defined in the control's current condition. Moreover, in the right part

of the smartSelect window, the TNC displays the online help. With the cursor or a mouse click, you immediately access detailed information on the respective function. smartSelect enables you to define fixed cycles, touch probe cycles, and special functions (SPEC FCT), and to quickly access the parameter programming.

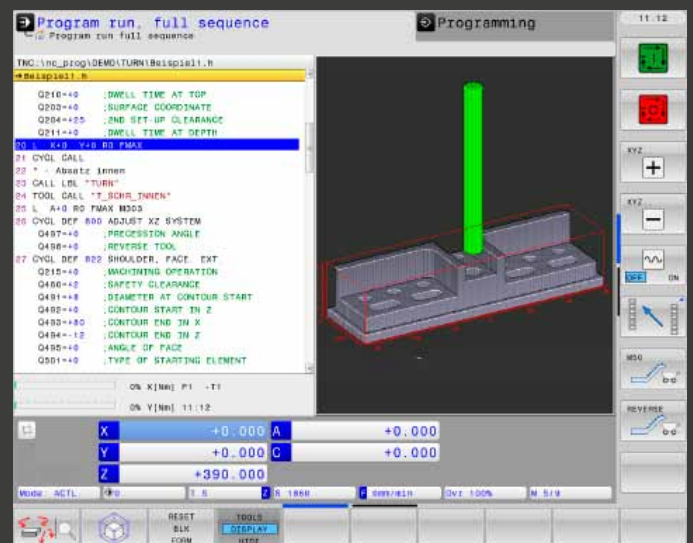
Technology for the future

Machine operators have come to expect and rely on a very high degree of quality from the TNC controls. It goes without saying that the TNC 640 also provides this quality. The new high-end control profits from powerful motion control, and also supports 5-axis functions for simultaneous milling (M128, FUNCTIONTCPM) and for machining in a tilted working plane (PLANE functions). Naturally the TNC 640 utilizes the benefits of the new HSCI hardware platform. Powerful processors, a fast block processing time of 0.5 ms, and a gigantic program memory (default: 138 gigabytes for NC programs) set new standards as well.

You can find more information, videos and animations about the TNC 640 at www.tnc640.de



Well organized and helpful: with smartSelect you can quickly select functions from a tree structure. The associated detail information is displayed as well.



Modern down to the last detail: the redesigned and homogeneous user interface with a new font and logical coloring.

HEIDENHAIN iTNC 530 being used on challenging materials

Swiss Startup: Entering the Race with Skilled Carbon-Fiber Machining

"Most people would be afraid to do this," says Patrick Meyer, founder of Carbomill AG. But he is not afraid of machining complex workpieces, including those made from carbon-fiber reinforced plastics. In order to deliver perfect results from the start, the young entrepreneur invested in a Fooke ENDURA 711 gantry-type milling machine, equipped with an iTNC 530 from HEIDENHAIN. His customers are very demanding, and come from motor-sports and the automobile and aerospace industries.

No compromises! The new company, located in Seon in the Swiss canton of Aargau, wanted to get off to a good start. Patrick Meyer wanted to persuade his first customers with a viable concept and the optimal equipment for skilled machining of carbon-fiber workpieces. Carbomill currently machines challenging workpieces made from carbon fiber or GRP, such as chassis components and other body parts for the automobile industry and motor-sports. There are also complex aluminum structural parts for aerospace projects or rail vehicles.

The expensive workpieces are machined with a gantry-type milling machine that takes up nearly the entire shop floor of the young company. An iTNC 530 from HEIDENHAIN controls the 30-ton ENDURA 711 with linear motors and five simultaneous axes. "We are highly satisfied with this control," says Patrick Meyer. "It is very precise, and of extreme importance for the speed." The control is supposed to fully utilize the machine's potential for high-speed machining, while at the same time remaining accurate down to the last hundredth.

The successful initial phase was the reward for entrepreneurial bravery and well-planned activities in an up-and-coming market segment. The trend toward lightweight design, together with the use of carbon-fiber reinforced plastics, has opened up new possibilities in many branches. A significant advantage of the material, along with its low weight, is the very high tensile strength in defined directions.

Competitive advantage with challenging materials

Good results not only require in-depth and specialized knowledge, but also lots of experience, because structured and molded parts made from composites are very difficult to machine. "You need a really fine touch here," emphasizes Meyer. Just setting up the workpiece already requires applicable experience, and of course the cutting conditions must also be correct. Even the slightest errors during machining can rupture the fiber structure and make the workpiece unusable. Sometimes these errors are not even visible. The workpiece has to be scanned ultrasonically or with X-rays in order to detect internal damage to the structure.

Optimal support when starting out

Patrick Meyer had already enjoyed working with controls from HEIDENHAIN during his time as department head of mechanical production at Sauber Motorsport. "HEIDENHAIN controls are very popular in Switzerland," he states. It was obvious that the Fooke ENDURA would be equipped with an iTNC 530.

The specialists from HEIDENHAIN came to his aid when it was time for interfacing the control. Patrick Meyer places a high value on the optimum interfacing of the control, in order to take full advantage of the powerful machine. Since a high de-

The relationship between the speed and the surface definition and accuracy can be directly influenced with Cycle 332.



gree of efficiency is extremely important to the small company, the speed, surface definition and accuracy must be optimally matched to each other, regardless of what the particular machining step is. This can be influenced via Cycle 332 of the iTNC 530, with which tolerance values and pre-defined filters can be selected.

Why is this important? Because the TNC automatically smoothes the contour between any contour elements. This function is particularly important for part programs generated in CAM systems. These

programs usually consist of many straight-line blocks, whose contour transitions are each affected by a chord error. Especially the surface definition would suffer without smoothing, but this smoothing of the contour leads to a deviation. Depending on the chord error set in the CAD/CAM system, the operator can specify a tolerance for the deviation at the control, and define whether higher contour accuracy or a higher feed rate is more important. Machine parameters for jerk and acceleration are also adjusted according to the respective operations.

“The control can do so much; you just need to choose the right thing!”

Patrick Meyer, managing director of Carbomill AG

Patrick Meyer (right) and Markus Schwarz (left) are enthusiastic about the perfectly matched tandem of machine and iTNC.



Delicate workpieces made from carbon fiber and reinforced plastics for motorsports.



Perfected procedures speed up machining preparation

Carbomill always has to deal with the machining of complicated workpieces. Every new job is a new challenge. But at the same time the young company has to be very cost-effective. The basic rule is: “Only the machining of workpieces generates earnings.” On the one hand this means that the part programs for machining the workpieces must be written very quickly, and on the other that even the first workpiece has to be machined perfectly. That is why Carbomill relies on a state-of-the-art CAD/CAM system and the corresponding expertise. “You already have to visualize the chips flying while you’re writing the programs,” says the director, and is convinced that you need a special mindset when working with carbon fiber. Other possible optimizations are also in sight: “We are always trying to figure out how to implement as many HEIDENHAIN cycles as possible, including those that don’t even exist in the CAD/CAM system.” You can feel his pleasure in continually looking for improvements and new solutions.

Carbomill also doesn’t want to lose any time when setting up workpieces, so an integrated fixture system is used for most operations. Whenever possible, the necessary studs remain on the workpiece, in order to perform later machining steps very quickly and accurately. This saves a large amount of time during serial production, since setting up the next workpiece then only takes a couple of minutes.

Efficient machining of very different workpieces

The iTNC 530 contributes its share in optimizing efficiency during setup and machining of workpieces. This is ensured by simple operation, practical functions for workpiece setup, and high-precision contour control during HSC milling. Carbomill considers the sum of these properties to be a significant advantage for economic manufacturing.

The 5-axis gantry-type milling machine and the control, which are optimally adapted to each other, make it possible to machine large and heavy workpieces as well as to economically produce small and delicate parts. As you

can expect, the variety of workpieces is quite large: the dimensions vary from dish-sized carbon components used on the race course to aluminum structural components several meters long for rail vehicles.

The workpieces used in aerospace projects are particularly demanding challenges. Carbomill manufactures highly complex components for satellite structures ordered by renowned aerospace companies. Errors or inaccuracies during machining cannot be accepted by the customers, since the failure of such a part could endanger the entire project.

TNC functions for accuracy and process reliability

Accuracy during workpiece machining is of exceptional importance at Carbomill. KinematicsOpt is therefore used to ensure the continuously high accuracy of rotary and swivel axes. Recalibration only takes several minutes, and corrects the kinematics model stored in the control.

Since Carbomill machines a large number of very different workpieces, reliable collision monitoring is a must. This is where the DCM option comes into play: in order to avoid collisions within the machine's work envelope, the control stops the machining process if a crash is imminent. This works reliably since the TNC takes all ac-

The Fooke ENDURA 711 fills the startup's hall.





Carbomill

Carbomill, based in Seon in the Swiss canton of Aargau, was founded by Patrick Meyer in 2011. The company specializes in machine cutting of fiber-composite materials. These materials can react sensitively to the machining process, and require specialized know-how. Patrick Meyer and his colleague Markus Schwarz are particularly competent in the high-quality cutting of structural parts and components with complex final forms.

A Fooke ENDURA 711 HSC gantry-type milling machine with five simultaneous axes is used for machining. It has highly dynamic linear motors, and the traverse paths in X, Y and Z are 2.8 m, 2.2 m and 1.2 m, respectively. A minimum dosage system handles cooling of the machine, since some of the materials are very sensitive to coolant.

The integrated fixture system dramatically reduces idle machine times.

tual values, including tool compensations and reference points, into account. DCM can also be used in the manual machine operating modes.

An increasing number of customers requests measuring logs as part of quality assurance. The search for a particularly efficient solution led Carbomill to the measuring cycles of the HEIDENHAIN control, since in many cases measurement of the workpieces in the fixture where they are machined suffices. This simple solution saves time and in most cases satisfies the customer's demands. Patrick Meyer summarizes the flexible and versatile iTNC 530 as follows: "The control can do so much; you just need to choose the right thing!"

Good support beyond the founding phase

Patrick Meyer praises HEIDENHAIN as a partner who "knows what is demanded in cutting manufacturing nowadays." There is always someone there to help you with a problem. Meyer and his colleague Markus Schwarz sometimes use the HEIDENHAIN service hotline, but they also check Internet forums occasionally for solutions to specific milling problems.

Looking back, the company founder considers the control to be ideally adapted to the Fooke ENDURA. He was impressed by the constructive collaboration between machine-tool builder and control manufacturer: no problems were blamed on the other party.

Patrick Meyer is more than satisfied with how business has developed. He can bring his expertise to play in his own company, with perfectly attuned machines. And the numerous new customers are pleased by the results. News of Carbomill's high level of competence with composites, as well as the unconditional dedication to deadlines, has made the rounds. In the meantime, the incoming orders have increased so much that the company is considering adding additional machinery. But one thing is already sure: any future machine tools will also be equipped with controls from HEIDENHAIN.



The large machine tool can also precisely manufacture very thin workpieces made from carbon fiber.

Carbon fiber

Carbon fiber is the jargon term for carbon-fiber reinforced plastic (CFRP). The production of carbon fibers is expensive and very demanding technically. The carbon fibers are typically layered (weaved) in different directions. They are then embedded as reinforcement in a plastic matrix that can consist of epoxy or thermoplastics.

CFRP has a particularly high tensile strength in the direction of the fibers, and is used if a high degree of rigidity and material strength is required while keeping the weight low. Along with advanced applications in aerospace projects and automotive design, CFRP is also frequently used in gymnastics equipment, and even in construction.

This cutting machining requires specialized knowledge, since the structures in the material can become damaged as the result of inappropriate handling. It must also be noted that the dust from the carbon fibers is electrically conductive, and can damage the electrical parts of a machine.

HEIDENHAIN controls in training, operating resource manufacture and vocational world championships

Well-Thought-Out Promotion of Young Talent

Establishing a company's core competence begins during training of its apprentices. The logical consequence: Passing one's own know-how on, and thus ensuring oneself a good number of qualified specialists. This is exactly what the Operating Resources Department does of Blum GmbH in Höchst, a town in Austria near Lake Constance. Good specialists are trained here who are capable of handling many challenging manufacturing tasks. HEIDENHAIN controls are in use here, both in the training workshop and in the actual production hall—from the "small" TNC 124 to the powerful iTNC 530. And it's exactly this uniformity that makes it easy for machine operators to deal with complex manufacturing tasks.

Motivation drives exceptional performance

Every year, Blum trains approx. 60 young people who, starting in the second year of their apprenticeships, are already doing preliminary work for the Operating Resources Department. It's important to Blum to effectively motivate the trainees, because high motivation drives exceptional performance, such as the participation in the biennial vocational world championships, the WorldSkills Competition. Last year Patrick Fröwis, a polymechnic in his fourth year of apprenticeship, achieved a sensational fifth place, winning a Medalion for Excellence.

WorldSkills successes: proof of the high level of training

It's become a tradition at Blum to participate in the WorldSkills vocational competitions. Only those apprentices who make it through the internal preliminaries can go on to the national competition. The best of them then travel to the world championship, which in 2011 took place in London. The task for the area of polymechnics and automation was to manufacture a small sheet-metal forming machine with all its parts. "We turned and milled," says Patrick Fröwis. "It took fifteen hours to cut the parts, another hour to assemble them, and then we had to connect all the circuits and program it." A KUNZMANN WF 400 M universal milling and drilling machine equipped with a HEIDENHAIN TNC 124 was used for milling. The machine-tool builder KUNZMANN, located in southern Germany, sponsored eleven machines for this competition, which is quite remarkable considering the company's small scale. HEIDENHAIN provided two controls for the machine tools. This was a stroke of luck for Patrick Fröwis, since he had already worked with a TNC 124 during his apprenticeship.

Entry into workshop programming with the small TNC 124 straight-cut control





The perfect entry to the world of TNC controls: Patrick Fröwis using a KUNZMANN WF 400 M with HEIDENHAIN TNC 124

Looking back: a clear decision in favor of HEIDENHAIN controls

In the middle of 1999, Blum made a fundamental decision to go with HEIDENHAIN. 5-axis machining was advancing in the manufacture of operating resources, so a control was needed that made it easy for machinists to handle the complexity of the cutting processes. Gerhard Gorbach, head of the Operating Resources Department, speaks of "likable advantages." The HEIDENHAIN TNC 426 used back then made it especially easy to set up and measure the workpiece within the machine's work envelope. Furthermore, the user-friendliness of the conversational programming language was very convincing, especially for training the apprentices. The desire for uniformity led to all of the company's milling machines, from the training department to the job shop, gradually being equipped with HEIDENHAIN controls. "That's the way we like it," emphasizes Gorbach. Today the HEIDENHAIN controls with their coordinated motion control tick-

Powerful and user friendly: the TNC in training



"HEIDENHAIN controls have advantages that we really like!"

Gerhard Gorbach, head of the Operating Resources Department at Blum GmbH

le every last bit out of the machining program. HEIDENHAIN controls are open to all NC programs created in CAM systems. But every so often the machine operators have to adjust the programs created with CAMWorks in order to optimize some technological aspects during machining. This makes it possible to ensure high-quality surfaces and the required dimensional accuracy of the workpieces, so the machinists are glad that the controls can be operated so quickly and easily.

The iTNC 530 can play out its strengths during sample production

Tricky machining tasks must be performed during the production of prototype operating resources. Specialists use dedicated functions of the iTNC 530 to simplify program creation, taking full advantage of the control's capabilities. The machinist Rupert Wilhelmi explains how easy it is to take contour sections generated by a CAM system and turn them into full-fledged programs directly on the iTNC 530 using

Q-parameter programming. For example, in order to manufacture a specific gearwheel, only a part of the CAM-generated machining program is needed, in this case just a single tooth. You just need to enter the geometry data and reference points, and the control then calculates the entire gearwheel, which saves you an enormous amount of time. Geometries constantly change in the production of samples, but this is not a problem either: a subroutine gets exchanged, and the control handles the rest. Wilhelmi is also pleased by the fixed cycles, such as the SL cycles, since they greatly simplify programming of complex contours in the workshop.

Conclusion

For companies like Blum GmbH it is a particular challenge to make technical apprenticeships attractive. The WorldSkills competitions are of great assistance here: young specialists can prove their skills and increase their motivation. The younger apprentices then get caught up in this enthusiasm, which pays out later in their jobs. The constellation of good performances and a user-friendly control from HEIDENHAIN leads to excellent results—with the apprentices and in production.



The iTNC 530 during sample production—simple conversational programming for complex operations

WorldSkills Competition

The international WorldSkills competition takes place every two years at a different location. Apprentices from many different vocations show their prowess at this vocational competition. The young people themselves are in the spotlight. The intention is to motivate them and get them excited about their jobs. They are also given the chance to meet apprentices from many different countries and cultures, and to gather competitive experience. The next WorldSkills competition will



be in July 2013 in Leipzig, Germany. It is likely that around 1000 apprentices from around the world will come to compete in various disciplines and find out who among them is the best.

+ www.worldskills.org

Julius Blum GmbH

The technology and training center in Höchst is one of seven sites in the Austrian state of Vorarlberg. Blum has approx. 4100 employees in the region, who develop and produce hinge, lift and drawer systems for a worldwide market. These fitting systems are used for furniture in kitchens and other rooms.

+ www.blum.com



AbouT.NC—Practical information for the world of HEIDENHAIN controls

The World of TNC is Just a Mouseclick Away

Anyone who's interested in the family of TNC products, who wants to learn new things about the controls, or is looking for practical tips to tricky tasks, should go to tnc.heidenhain.com for the right answers. It gets down to the nitty-gritty: there are programs for downloading, answers to FAQs, even screencasts about specific functions. This website for TNC users has plenty of good tips and other information about how to program TNC controls.

Get to know the TNC

This area provides detailed information about practical functions of the TNC controls, as well as their specifications. An interactive presentation familiarizes you with the powerful iTNC 530's range of functions. The videos and 3-D animations show you much about HEIDENHAIN's technology and functions, which stand for particularly high accuracy.

Find solutions

You need support with tricky tasks? HEIDENHAIN has set up an NC database on the TNC website for just this purpose. The pool of solutions to frequently occurring tasks is clearly sorted by control model, tool model and the number of machine axes necessary. Milling or contour machining operations, 3- and 5-axis machining, CAD/CAM examples, measuring and calculating are just some of the topics that are covered in detail by the NC database. You can simply download the NC program appropriate to your specific task from the database.

Visit the world of HEIDENHAIN controls at tnc.heidenhain.com

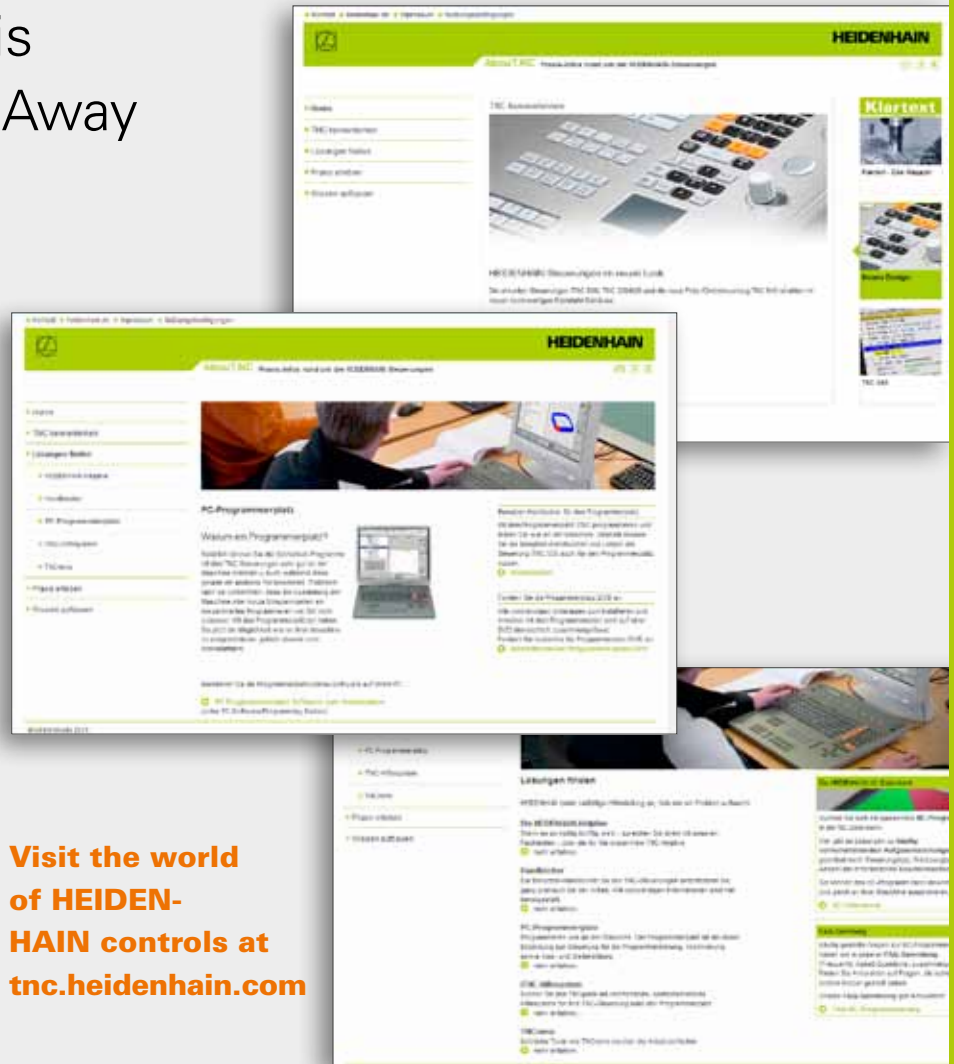
The collection of FAQs on the following topics is a valuable and useful supplement to the NC database

- Machine parameters
- Touch-probe cycles
- Programs created offline
- Programming
- smarT.NC
- File management
- Tools
- General information

Under "Find solutions" you also have access to the User's Manuals of HEIDENHAIN controls.

Experience the real world

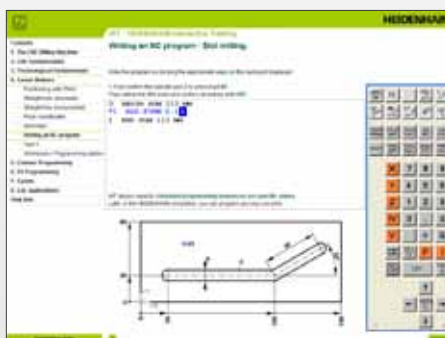
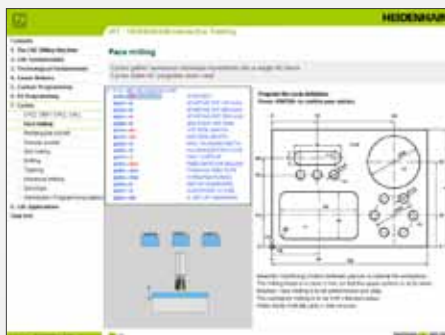
The "Experience the real world" area really holds what it claims. You can look over people's shoulders while they work! Read about how TNC controls are used in practice, or click the link to CNC Arena for discussions with other users in the HEIDENHAIN forum. Under "Experience the real world" you can also download Klartext, the modern and free user magazine with interesting stories, lively reports and valuable practical tips. There are links to the regular issues as well as to the industry specials: Automotive, Aerospace and Medical. In the interactive Klartext e-magazine you will also discover even more background information, 3-D animations, and screencasts.



New interactive training concept from HEIDENHAIN

HIT—HEIDENHAIN Interactive Training: The License to Learn Easily

HIT—HEIDENHAIN Interactive Training is the new concept for comprehensive and practice-oriented learning of how to program machine-tool controls. It consists of three modules that complement each other: an interactive training software, the programming station software, and the HIT Milling Workbook. The many animations, practical training examples and control simulations make you fit for everyday use of the TNC.



Anybody who wants to learn on his own needs to be highly motivated. In such cases an attractive system for learning can be of great assistance. Therefore, the intention is for HIT—HEIDENHAIN Interactive Training to vividly communicate the fundamental knowledge about HEIDENHAIN controls. The interactive HIT software offers the best conditions for this, with many animations and easily performed interactions. The user himself can jump between topics and learn at his own speed. This makes the learning environment suitable even for users with very different levels of knowledge.

Lively learning

The three-part system's goal is the simplest possible introduction to the programming of HEIDENHAIN controls. Using a workpiece as a guide, the HIT Milling



Workbook leads you through all modules of the learning system. It contains tasks to be solved both with the HIT training software as well as with the programming station.

Operation of the HIT software is intuitive, so that you quickly and easily find your way through the training environment. The contents are divided into defined learning sequences, which are clearly and understandably organized. There are interactive tests for each topic in order to check and improve your knowledge after each learning sequence.

The programming station—which is installed as a separate program on the computer—is used to create NC programs just like on a real HEIDENHAIN control. The programs can also be graphically simulated here, and then transferred to a machine tool and run there. This way the programs you've written yourself get tested in the real world.

Valuable fundamental knowledge

HIT first imparts the fundamentals of CNC machines, in order to establish important knowledge required for the creation of NC programs. Next comes the programming of linear paths, followed by training units

covering the programming of contours. Once this knowledge is attained you can learn how cycles are used to very easily realize frequently repeated workpiece operations. Finally, HIT teaches you how elaborate programs can be structured more efficiently with subroutines and program section repeats.

Conclusion

As a learning concept for HEIDENHAIN controls, HIT—HEIDENHAIN Interactive Training ideally combines theoretical learning with practical exercises into an autodidactic educational strategy. It is designed for qualified basic and advanced training. The comprehensive fundamental information imparted also makes it ideal for persons new to this technology, as well as for non-specialists without basic CNC knowledge.

Just a few clicks to the learning system

All modules of the learning concept are offered in an online shop. It can be reached from the "eLearning" section of our training portal at www.heidenhain.de/eLearning. Or go directly to <https://hit.heidenhain.de/800/purl-eng>.

The "HEIDENHAIN Interactive Training" link takes you directly to the online shop. Here you can purchase the HIT software as a cloud version, or with a single-station or multi-station license for moderate prices. For example, the network license for 20 workstations costs less than 400 euros. When you select the software, the programming station and a PDF of the workbook are automatically offered for downloading. The first two chapters can be tested in the free demo version.



Hannes Wechselberger (HEIDENHAIN, second from right) with the "Prize for Innovation in Continuing Education and Training" certificate for 2012, next to Siegfried Keller (CNC Keller GmbH, third from right)

Award-winning

Barely online and already winning awards: HIT—HEIDENHAIN Interactive Training was awarded the "Prize for Innovation in Continuing Education and Training" for 2012. The Federal Institute for Vocational Education and Training awards this prize to innovative concepts for continuing education in companies. The jury praised the successful combination of theory and practice, the mixture of multimedia and traditional learning elements, and the expressive and lively style of learning.

The HIT software was developed in close cooperation with CNC Keller GmbH, which has successfully been writing CNC software for productive and educational purposes for the past 30 years.



Compact HEIDENHAIN control in use on three-axis machining centers

Modern Manufacturer Bets on the TNC 620

It was an investment in the future for Lorenz Kunststoffgerätebau GmbH, a manufacturer of plastic products: this small business from Chieming on Lake Chiemsee in Germany's Upper Bavaria equipped two 3-axis machining centers with the modern and compact TNC 620 contouring control. The purpose was to procure an economical production environment for the growing market for simple machine parts.

Lorenz Kunststoffgerätebau was founded in 1946 as a precision mechanical workshop. Today, the manufacture of turned and milled parts is a mainstay at Lorenz, but deep-draw parts for packaging and shipping dominate the revenue of the 20-person company. The customers come from the semiconductor, electronics, optics and pharmaceutical industries. Lorenz possesses cutting-edge machining centers for the manufacture of high-precision machine components and molds for thermoplastic shaping. The spectrum goes from the formidable 5-axis machining center to the simple 3-axis milling machine.

Staying true to the TNC

Lorenz has been gaining experience with TNC controls for over 20 years. Almost all of their machines are equipped with the iTNC 530 or other TNC controls from HEIDENHAIN. When a short time ago the company decided to expand its machinery with 3-axis machining centers, it was clear that they, too, would be equipped with TNC controls. "We have many reasons from our practical experience that make HEIDENHAIN a must have on each machine," explained the two managing directors Ernst and Reinhard Erlacher: "The TNCs are convenient to program, the cy-



The intuitive operation of HEIDENHAIN controls permits uncomplicated and convenient programming.



With the HEIDENHAIN TNC 620, three-axis machining is realized simply and effectively.



Lorenz produces a large variety of highly precise machine components ...



... and also forms deep-draw parts for packaging, presenting and shipping.

“The TNCs are convenient to program, the cycles are well described and the programming safety is typical of HEIDENHAIN!”

Reinhard Erlacher, Managing Director of Lorenz Kunststoffgerätebau GmbH

cles are well described, and the programming safety is typical of HEIDENHAIN. None of our employees works on only one machine, so everyone can program every machine. And if we run into a programming problem, at least one of us has already solved a similar problem.”

Opening new markets

With the TNC 620, Lorenz has made the right decision for the special application, because the compact HEIDENHAIN control can be used for the economical manufacture of simple machine components as well. This target component group is growing at present, so the company decided to make significant new investments in its machinery. Its goal was to access this growing market segment. At the same time, with the new generation of controls from HEIDENHAIN, Lorenz is betting on modern technology and preparedness for the future.

Program compatibility makes it easier to get started

Lorenz was hoping for the same field-proven HEIDENHAIN quality as in the existing controls. For example the good program compatibility: “We’ve saved many programs of parts that are repeatedly manufactured either in identical form or as a modification. In part we use programs on the iTNC 530 or the new TNC 620 controls that were written on the TNC 150. In the old programs, for exam-

ple, the tool assignments and the fixture strategies are saved as well as all important program information and comments, which are still usable today. Show me any other family of controls that can do that with such problem-free upward compatibility!” says Ernst Erlacher.

Programming just like before

A further argument that spoke for HEIDENHAIN was the intuitive operation of the controls. “We are now in the process of transferring our 3-axis programs on the iTNC 530 for the Grob and DMG machines to TNC 620 controls of the other machines,” says Ernst Erlacher. “The programming is similar to that in all the previous HEIDENHAIN CNCs. Up to now I’ve never had to study the digital nor the printed control manual of the TNC 620. However,” states the managing director, “we have found a few constraints.” Because the TNC 620 presently still does not support some cycles that are available in the iTNC 530, we sometimes do have to use a small workaround. That isn’t really any great problem when, for example, we have to replace an older contour pocket cycle with an up-to-date SL cycle of the TNC 620.” Erlacher emphasizes: “Once you’ve taken care of that, it’s no problem at all. At any rate, we see the TNC 620 as an entry into a new HEIDENHAIN CNC generation with the seamless transfer of all the strong points characterizing HEIDENHAIN controls.”

Tronical uses the iTNC 530 to manufacture precision components for the music industry

Tronical and HEIDENHAIN Rock the World of Music

The guitar manufacturer Gibson landed a coup with the limited edition "Robot Guitar": it is the first guitar in the world that employs robotics technology. The unique technology is based on a mechatronic tuning package from the company Tronical, a Hermle machining center, and an iTNC 530 control from HEIDENHAIN.

"It's like guitar tuning from another planet"—that is what even expert guitarists like Carlos Santana might say when they hear that guitars can automatically tune themselves.



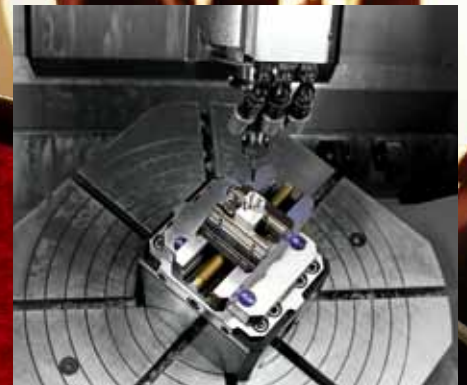
Necessity is the mother of invention

Hamburg has much more to offer than its internationally renowned harbor and the (in)famous Reeperbahn as a center for nightlife. Not only did the revolutionary "robotization" of the guitar tuning process begin in the Hanseatic city, but its technology is also produced there. But first things first: at some point in the more than 20 years that Chris Adams, the managing director of Tronical, has been playing the guitar, he got sick of the frustration shared by many musicians when they have to tune their instrument yet again. This is because the guitars have a life of their own. They don't just want to be handled nicely and cared for; they also want to be tuned before each session. Besides, each guitarist has his own "tuning profile." Motivated by the idea of creating something he always wanted to have himself, Adams dared to enter uncharted waters.

A huge challenge

Adams realized the potential in the groundbreaking idea of developing a fully-automated tuning device, and didn't hesitate a second to roll up his sleeves. But it was an ambitious project: there were no suitable components, such as mechanical parts, drives, or miniature electronic assemblies on the market for this revolutionary undertaking. They first needed to be developed, manufactured and assembled, which all turned out to be very demanding. The Tronical mechanics crew looked for a suitable machine at the Nortec trade fair in Hamburg, and soon found what they wanted. The company then purchased the necessary equipment: a CAD/CAM system, a C 30 U high-end 5-axis CNC machining center from Hermle for production of the prototypes, and a powerful iTNC 530 machine control from HEIDENHAIN.

Chris Adams, a professional guitarist and the managing director of Tronical, had the groundbreaking idea of a fully-automated tuning device, and the courage to develop it himself.



HEIDENHAIN sets the tone when it comes to controlling the machine. Thanks to the iTNC 530, Tronical achieves best results in 5-axis machining.

The multi-control knob on the Gibson Dark Fire guitar



Effective, and no stress

Tronical had a good reason for choosing the iTNC 530 from the control specialist in Traunreut: "The control from HEIDENHAIN lets itself be operated most intuitively," emphasizes Adams, stressing an important strength of the premium control. The musician and businessman praises the user-friendliness of the control, and describes the iTNC 530 as follows: "Compared with the other controls, working with it means effectiveness without stress." It was also the best way for Adams and his team to perform the complicated but necessary 5-axis machining operations. Erkan Saplak, CAD/CAM designer and responsible for CNC programming at Tronical, learned the most effective way of working with the control from HEIDENHAIN as part of a training course. "They showed me everything I needed to know in order to work with the machine," Saplak relates enthusiastically. The eight-day course covered the fundamentals as well as 5-axis machining. Was the investment worth it? Chris Adams answers, "Yes, definitely. The acquisition costs were more than justified by aspects such as speed, priority setting, and immediate testing of new ideas."

Right on the mark

The demands regarding precision, performance and quality were enormous for this revolutionary project. High-precision mechanical parts, drives, and miniature components—such as electronics assemblies—had to be developed. After all, the design, weight, acoustics, and especially the handling of a musical instrument should not be impaired by the tuning device. Complex 5-axis machining is essential here, as is the powerful iTNC 530, which ensures high levels of productivity and precision during production.

Rapid time-to-market

The northern Germans had to develop all the hardware and software for the product, and transform the idea into reality by way of engineering, design and production. "We've been working on the tuning of musical instruments as the Tronical GmbH since 2005, but this project was a brand new challenge for us," admits Adams. In order to concentrate the know-how and ensure a rapid time-to-market, the company decided that it would handle all mechatronical aspects of the guitar-tuning solution on its own. "We didn't want to rely on service providers with only a limited comprehension of what really matters, and who might dismiss us as freaks. Besides, we wanted to be highly flexible, and not have to wait for their shipments, which can be a real obstacle if there are modifications," explains the company founder. "We develop all of our products—nearly independently of mechatronics service providers—to the point where they and the processes are finalized," he continues. Only then is the series production put into the hands of specialists.

"Compared with the alternatives, working with the iTNC 530 is stressless and effective!"

Chris Adams, managing director of Tronical

Conclusion

Success followed quickly: the production technicians at Tronical—the company now has 40 employees, of which 20 are engineers—managed to successfully transform their revolutionary idea into reality, and they have already received numerous prestigious awards for it. In the end they made it possible for Gibson to advertise the first guitar in the world with robotics technology, using the fitting slogan "You play. We tune."



5-axis machining is the right choice when manufacturing components for guitar tuning. The iTNC 530 ensures highest precision.

Training Workshop for Machinists places its bets on HEIDENHAIN lathe controls

All A's for Productive Training

DMT Drehmaschinen GmbH & Co.KG from Lörrach, Germany, has equipped the Training Workshop for Machinists in nearby Basel, Switzerland, with KERN CD 282 machines. Their extensive stock of machinery consists mainly of HEIDENHAIN controls. The trainers are completely convinced: modern HEIDENHAIN lathe controls give them a marked edge in training!



In-company trainer Christoph Eicher explains the benefits of ICP programming for training



Frieder Spohn, Managing Director of DMT at a machine for fourth-year apprentices

Frieder Spohn, Managing Director of the lathe manufacturer DMT, accompanied the KLARTEXT team and presented the lathes that the company has provided for the Training Workshop for Machinists: six CD 282 lathes are accessible to the apprentices in their second year. The compact design, simple processes and the easily operated MANUALplus lathe controls from HEIDENHAIN offer virtually perfect features for training the future expert machinists.

Comprehensive and practically oriented, high-level training

The quality of the training can be measured in part by the number of students who pass a challenging test. Although the final examination is possible both on conventional as well as on NC-controlled machines, all of the apprentices took their tests with the NC-controlled machine. The high grade average of 5.5 (in Switzerland the best grade is 6!) speaks for an outstanding quality of training, built on motivated students and instructors with modern machine tools.

A relatively small period is provided for the learning units at the lathes during training. The apprentices have to learn within 9 weeks to be able to manufacture a relatively complex part. There are six NC-controlled lathes for 20 trainees, which further limits the available machine time per trainee. Theory and practice are taught right on the machine because program creation is learned not in the classroom, but directly while using the MANUALplus. The simple operation of the controls provides optimum conditions for learning.

The first workpiece operations are already realized with the cycle programming. Christoph Eicher, in-company trainer—an official title as per the Swiss education regulations—praised the operating interface of the HEIDENHAIN lathe controls: “Especially in training, the help graphics are just super! They make programming much simpler.” ICP programming is taught in the subsequent steps. With the ICP editor, the apprentices can graphically describe a turning contour. The individual contour elements are entered step-by-



“When it comes to working with lathes, I actually come from the era of CNC programming. At first I had to be convinced of the benefits of cycle programming. The bottom line is, a lot goes faster and simpler with HEIDENHAIN lathe controls;”

says in-house trainer Christoph Eicher.

step to display a complete contour. Defining a contour element usually requires only a few entries, which are taken directly from the workpiece drawing without conversions. The control automatically calculates missing coordinates, intersections and circle centers.

The apprentices generally have no problems with the dialog-guided programming. Not only can they manufacture complex workpieces with an NC-controlled lathe at a very early point in their training, but they also learn fundamental NC skills in a very short time. Of course there are a few important rules for the machining of a workpiece in training. Says the in-company trainer Christoph Eicher: “First the trainees have to prepare an operations plan (working plan), then create the part program directly on the machine, and finally present the finished part.” Certain fundamental prerequisites in working with the machine are made unequivocally clear: before every operation, the dimensions of the workpiece, the tool dimen-

sions, and with the tool in place the machine datum have to be checked. The best results come through the use of the “explain—demonstrate—imitate” principle. It’s necessary to absolutely sensitize the trainees in order to prevent damage and errors. The result? “Not a single apprentice has crashed any machine yet during any of our tests,” Eicher states.

Practical orientation with subcontracting

During apprenticeship training in a manufacturing company, parts are often manufactured directly for the company’s products. To enable the trainees to also gain such practical experience, the training workshop takes on job orders from commercial or industrial companies. Already at the end of the first year, the apprentices are allowed to operate the machines. And the first job order parts are already manufactured a week and a half later. Eicher says, “When I was an apprentice I would have had trouble trying to machine such

workpieces even in my fourth year.” For this reason, the modern machinery here is considered a valuable investment in educating tomorrow’s machinists: “A prerequisite for quick success is the outstanding tools and contemporary machines with their HEIDENHAIN controls.” Special value is placed on teaching the apprentices at a very early stage to act responsibly and independently in their work on the machine tools.

Future-proof training cooperation

In addition to their own teaching operations, the trade school offers third-party companies what are termed “training cooperations.” The Training Workshop for Machinists conducts a basic course in an agreed-upon period. HEIDENHAIN controls for lathes and milling machines are very widely used in the companies, so that the trainees are optimally prepared for their further training and practice in their companies.

The Training Workshop for Machinists traditionally places its bets on modern training

Urs Eichhorn regards their modern machinery to be one of the most important prerequisites for a valuable education. The use of KERN lathes from DMT with the HEIDENHAIN MANUALplus control are considered to be future-proof for the training workshops, because in his opinion the use of lathe controls from Traunreut is growing ever more important even in Central Europe. Particularly for training the compact DMT machines are proving themselves not least through their simple handling and sturdy design. That makes it possible to attain the goal of comprehensive training in a short time. The trainees can be introduced very early to actually machining parts with NC technology.

The Training Workshop for Machinists in Basel, Switzerland, is both a training institution and manufacturing company. Since its foundation in 1939, the training workshop, which belongs to the "General Vocational School," follows a special strat-

egy: instead of the typical apprenticeship training in a company, the multi-skilled mechanics undergo a basic course exclusively in the context of a public vocational training workshop. Here, the subcontracting of components for industrial customers makes an important contribution for the required connection with practice. The primary activity is vocational training that is to enable students to make the best possible career start thanks to cutting-edge equipment and motivated trainers. "Our model of providing an education as multi-skilled mechanic has proven itself

for over 70 years. Of course, in the past we used other occupational designations," Urs Eichhorn confirms.

The public vocational school procured its first NC-controlled lathes 25 years ago. NC-controlled machines have been in use since 2003 for the first and second year of the basic course. It wasn't until 2009 that Swiss educational regulations made NC-controlled lathes mandatory for use in training. Urs Eichhorn says, "We were decades ahead of our time, and now we're profiting from our years of experience."



Such workpieces can already be manufactured early in the apprenticeship on the KERN lathes from DMT.

MANUALplus 620 for lathes

The MANUALplus 620 is the HEIDENHAIN control for use on conventional lathes, cycle lathes or CNC lathes. The MANUALplus 620 particularly proves its versatility on cycle lathes.

With the MANUALplus 620, simple tasks or rework can be done in the same way as on a conventional lathe. The machine operator moves the axes with the handwheels and works as usual with the position display on the screen.

With rework or for small to medium-size production runs, the user profits from cycle programming. Fixed cycles can be saved right with the first workpiece.

The result is significant time saved during further production.

Regardless of whether you are producing simple turned parts or complex workpieces, the MANUALplus 620 provides you with the benefits of graphical contour input and convenient programming with smart.Turn. Help graphics and dialogs illustrate the few entries needed for the cycles. Moreover, the machine operator

can simulate machining to make sure that everything runs as planned before he begins the metal-cutting operation.

The MANUALplus 620 always offers the right support and—thanks to its user-friendliness—requires only a short time for familiarization.



The redesigned smart.Turn user interface makes programming easier and always gives you a good overview.

HEIDENHAIN Training Network: So Near, So Good

HEIDENHAIN's training partner network has been proving itself for over a decade now, and is growing continuously. The goal is to communicate to customers—close to home—knowledge of the control family and to show them how to work more efficiently with the TNC controls.

The course offerings extend far beyond the borders of Germany. In this way, HEIDENHAIN can be near to the customer at many locations within Germany, but also in Switzerland, Austria, Belgium, Denmark, Finland, Hungary and even Russia.

The courses are conducted exclusively by authorized HEIDENHAIN training partners. Advantage for the customer: the courses are of high quality, just as one is used to from the courses in Traunreut. By participating in annual advanced training measures, the training partners keep their knowledge up to date.

Course participants benefit from well equipped training rooms with original HEIDENHAIN PC programming stations. Many training partners are trained on CNC milling machines with HEIDENHAIN controls.

HEIDENHAIN training partners

New partners who were accepted last year into the circle of authorized HEIDENHAIN training partners include:

- Nagel Machine Tool GmbH in Ulm, Germany
- Milling Support Michael Weber in Frankfurt, Germany
- The Saarland Chamber of Commerce in Saarbrücken, Germany
- Metzler Competence Center in Rankweil, Austria
- WIFAG Vocational Training in Bern, Switzerland
- MSIU Moscow State Industrial University in Moscow, Russia

For the names of training partners in your vicinity, visit the training portal at www.heidenhain.de, and go to "Course search worldwide."

HEIDENHAIN Invests in Promoting Young Talent

Just as with the first COMENIUS project "Train for Europe," HEIDENHAIN is also participating in its successor project "Train for Europe—Reloaded." Comenius, the program for life-long learning is supported by HEIDENHAIN as an industry partner. This time, 24 schools from 23 different European countries are participating.

The goal of this project is to build a CNC network among trade schools. This project involves building a train to which every participating school, and naturally HEIDENHAIN, contributes a car. The chassis of the car is standardized and is built with CNC technology. The individual layout of the car goes under the motto, "What we have done to connect people."

www.cnc-network.eu

The concrete details of the "Train for Europe" were specified in Lisbon, the location of the second project conference. Parallel to the work phases, HEIDENHAIN offered programming support in the form of workshops and introduced HIT, the new interactive CNC learning concept from HEIDENHAIN. In addition, the project participants get the opportunity to participate in free courses in Traunreut.



HEIDENHAIN

The New High-End Control for Milling and Turning Operations



The new TNC 640: For the first time, milling and turning are combined in one TNC. Now users can switch as desired between milling and turning—both in the same NC program. Switchover is independent of the machine kinematics. It automatically takes the respective operating mode into account and without any additional action. This new simplicity is complemented by dialog-guided plain language programming, the optimized user interface, powerful programming aids as well as comprehensive cycle packets taken from amply field-proven HEIDENHAIN controls into the new TNC 640. **This is technological edge built-in.** DR. JOHANNES HEIDENHAIN GmbH, www.heidenhain.de