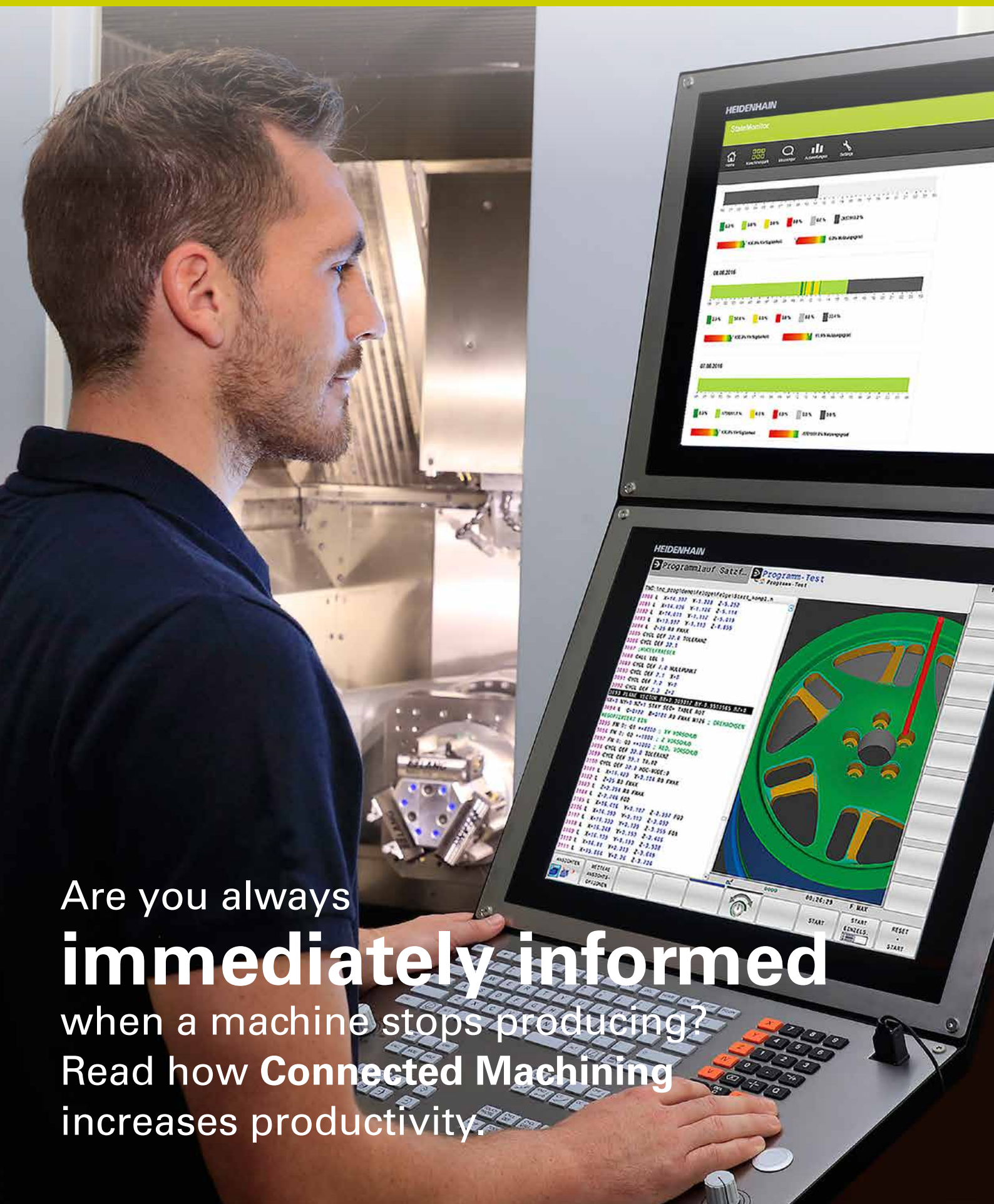
Klartext

HEIDENHAIN



Are you always

immediately informed

when a machine stops producing?
Read how **Connected Machining**
increases productivity.

Editorial

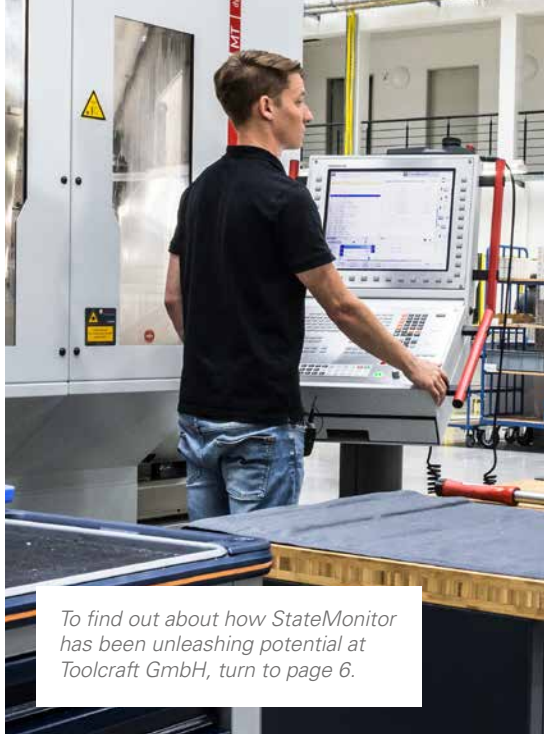
Dear Klartext Reader,

"Connecting systems for intelligent production" is the motto of this year's EMO trade show. We have summed up our fascinating innovations in this field under the rubric of Connected Machining, a term you will encounter both at the trade show and in this edition of Klartext, where we'll be showing you how you can network your machines in a highly customized way in order to achieve even greater efficiency. Our report on MBFZ Toolcraft GmbH will showcase the field testing of a machine network by an end user, where our StateMonitor software has been revealing and unlocking new potential.

The company ulrich medical®, a family-owned business in Ulm, Germany, is also achieving efficiency as it tackles the unique challenges of manufacturing high-grade medical products. Meanwhile, the Dortmund-based firm GIF will astound you with its unconventional solutions for manufacturing high-precision gear technology.

So that you too can develop such extraordinary solutions for your machining tasks, you must be able to master your equipment down to the very last detail. This is why we offer comprehensive opportunities for initial and further training. These opportunities include our international training network and, more recently, our TNC Club.

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



To find out about how StateMonitor has been unleashing potential at Toolcraft GmbH, turn to page 6.

Everything meshes here—to discover how GIF produces high-precision gear technology, go to page 14.

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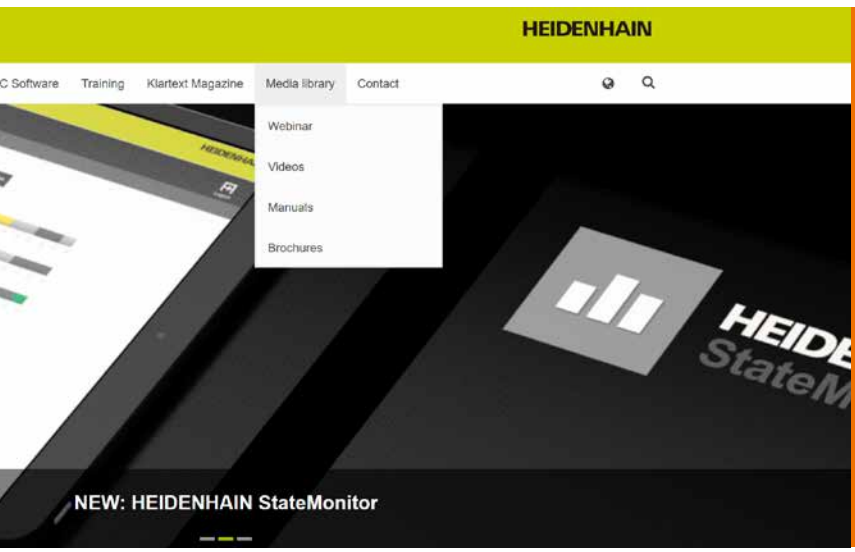


Discover the new Klartext Portal!

Our new website features a modern layout with fresh, interactive content allowing you to experience Klartext multimedia reports and receive the latest information and tips. This is also where you will now find our training program.

www.klartext-portal.com

Machine shops take center stage

Connected Machining connects the production strengths of the shop floor with the entire company

Imagine a production process in which all of the work steps from design to finished product are networked—Connected Machining makes this possible. Connected Machining gives you, the TNC operator, access to all job-related information from the company network and allows you to project your shop-floor expertise back into the process chain—all via the control.

The TNC 640, combined with Extended Workspace and StateMonitor, allows you to maintain a clear overview of all the data.

Connecting expertise

Core production expertise is located at the place where the workpiece actually takes shape—on the shop floor. This is where you perform your job as a highly qualified specialist and TNC user. You bear responsibility for component quality, dependable lead times, and much more. You also program machining processes directly at the control.

To do your job well, you need access to crucial data, including information from designers, the CAM system, and from the people involved in tool preparation. Your colleagues, in turn, also require information from you in order to do their jobs. The shipping department, for example, needs to know the current status of an order so that they can plan shipments. Those involved in tool preparation can set up new tools on time if they've been informed about an approaching tool change. The quality assurance department requires data for documentation purposes.

What could be more fitting than making the shop floor the center of the company's flow of information and digital order management—and doing so outside the constraints of a company's existing or future IT systems? This is the approach taken by Connected Machining.

Customized yet simple networking

The core elements of Connected Machining are the HEIDENHAIN DNC interface, the Remote Desktop Manager, and the StateMonitor software. HEIDENHAIN DNC establishes the link to merchandise management and control systems and integrates the StateMonitor software into the company network. The Remote Desktop Manager enables access to all Windows applications. In addition, TNC controls from HEIDENHAIN provide a large number of useful standard functions for data presentation, such as viewers for PDFs, graphic files, and CAD files in STEP or IGES file formats. TNC controls even feature a browser. In order to connect the control to the company network, all you need is an Ethernet connection.

These building blocks allow you to design your process chain in accordance with your own individual preferences and requirements. Connected Machining solutions can be universally adapted to the specific elements of your production environment and can connect elements from multiple providers into a process chain featuring a uniformly digital flow of information. At the same time, you benefit from maximum versatility due to the fact that you can modify, configure, and implement the Connected Machining software entirely on your own.

Networked production demonstrated live at the EMO

As part of the "industrie 4.0 area" at the 2017 EMO, HEIDENHAIN will be demonstrating Connected Machining in real production situations in cooperation with partners from the fields of CAD/CAM, machine tools, tool measurement, and tool management. Here you will find a typical small company operation equipped with a machine tool, a CAM system, a tool presetter (with tool database), and, of course, a TNC 640 control.

All stations will be networked using HEIDENHAIN DNC and the Remote Desktop Manager. The StateMonitor software will generate a real-time view of the machine status and be able to send messages to defined recipients—for example, when the NC program recognizes that tool life has reached a critical value. The result is a uniformly digital, paperless production environment in which all members in the process chain, from design to finished product, have access to the data they need, thereby allowing every step in the process to be optimized.

HEIDENHAIN TNC controls with Connected Machining provide you with a number of solutions for networking and data exchange, such as accessing e-mail accounts right at the control.

REPORT ON MBFZ TOOLCRAFT GMBH

Rapid capture of machine data using StateMonitor

New HEIDENHAIN software helps identify and utilize potential

As Project Manager for Industry 4.0 at MBFZ Toolcraft GmbH, Jonas Billmeyer is forging ahead with the digitalization of Toolcraft's production process. In Billmeyer's search for a hassle-free machine data acquisition solution, an offer from HEIDENHAIN proved to be just the ticket: Toolcraft was given the opportunity to participate in a StateMonitor field test. The new software from HEIDENHAIN records and visualizes the operating status of machine tools.

Toolcraft sees its own strengths in its complete range of production services covering precision parts, assemblies, tools, and injection molded parts. Its customers hail from the semiconductor, aerospace, medical technology, and optical industries, as well as from the machine building, motor sport, and automotive sectors. This highly specialized parts manufacturer invests in groundbreaking technologies such as metal 3-D printing and the construction of customized robotic solutions. Its digitalization of production processes is intended to unlock potential for further expanding the company's range of services.

Getting off to an easy start

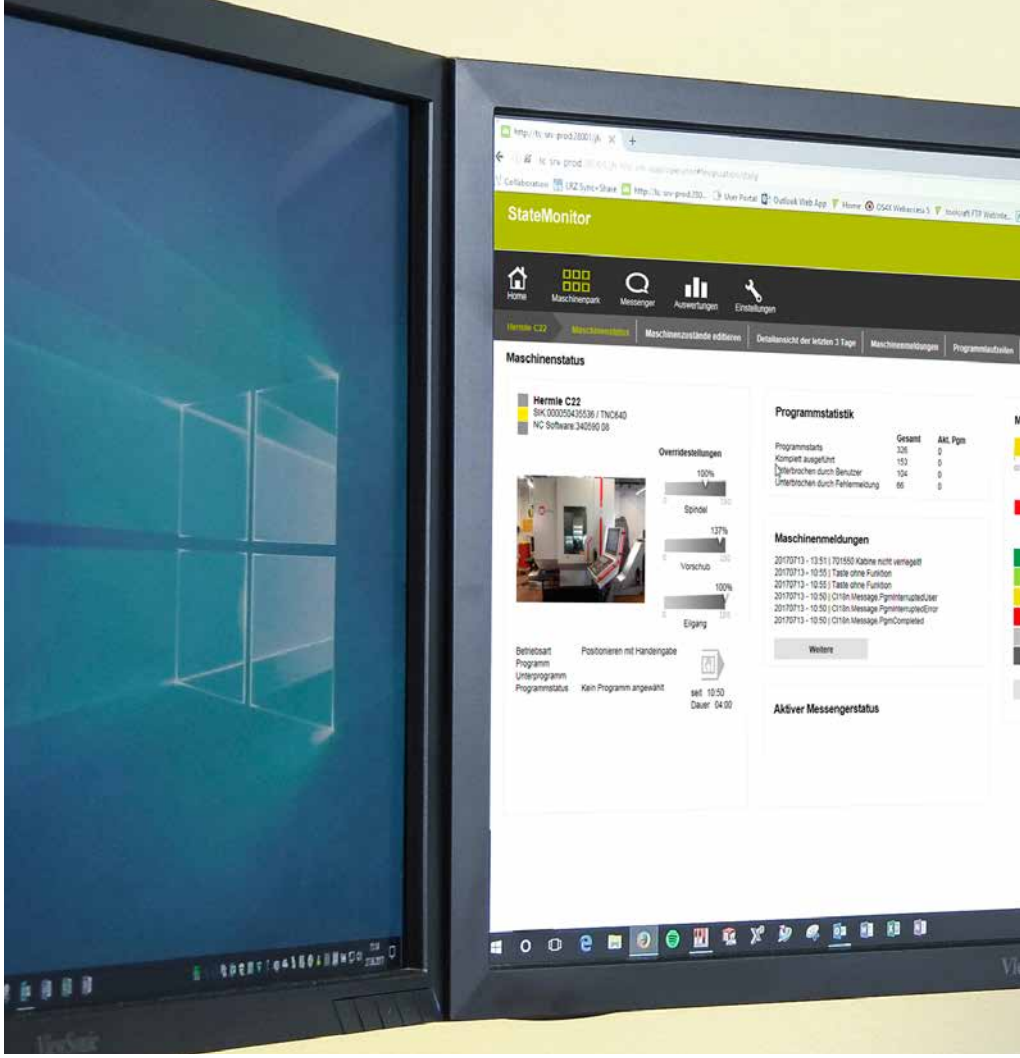
Machine data provide facts about production situations and processes. By being able to easily access this data, Jonas Billmeyer hopes to gain insights into how Toolcraft can further optimize its internal processes. This places him at the beginning of an exciting task, with future plans for an ERP system that can directly access both current and past machine states and enable the uniformly digital organization of the production process.

Initially, this means getting off to a hassle-free start with machine data capture. Until now, Jonas Billmeyer hadn't found the right offer. This was partly due to the fact that machine tool builders tend to favor solutions for their own brands, and partly because software solutions from specialized companies typically involve a high level of initial complexity. By contrast, the universal approach of HEIDENHAIN's StateMonitor software was very straightforward. As part of a field test, HEIDENHAIN provided Jonas Billmeyer with two test licenses. The licenses were easily installed on the company's server and then linked to five machine tools via the DNC interfaces. "External support from HEIDENHAIN wasn't required," and "the administrative burden is extremely low," says Billmeyer approvingly.

Jonas Billmeyer, Industry 4.0 Project Manager at MBFZ Toolcraft, is thrilled by StateMonitor because it makes monitoring and analyzing production processes so simple.

> “The information is helping us analyze whether we need to purchase another machine tool or whether there are other options for resolving bottlenecks.”
>
> Jonas Billmeyer, Project Manager for Industry 4.0

Over a single web browser, StateMonitor displays the networked machines, as well as information about current states, workload diagrams, and notifications. Jonas Billmeyer found the software's interface to be intuitive: "Everything is clearly structured, informative, and easy to use," he says.



Immediate benefits

Processes at Toolcraft usually call for a single employee to oversee an entire production order, including production planning, CAD/CAM program generation, and machine operation. On the one hand, this level of task diversity and responsibility makes the position particularly attractive. On the other hand, the job requires being able to concentrate for long periods of time. This is precisely what StateMonitor makes possible: instead of employees having to interrupt their current tasks to "run back and forth between machines, all that they have to do now is just take a look at their PC," enthuses Billmeyer. This holds true regardless of whether the employees are currently working at their desks or standing at their machines because, with the help a compact PC, they can access their workstation and keep an eye on other production systems while working at any machine.

This makes things much easier for employees who are responsible for the time-intensive machining of workpieces during unmanned shifts. Instead of having to come to work on the weekend, a single glance at StateMonitor is often all that is needed in order to stay informed about the current state of the machining processes. But what happens if the machine indicates a problem? In this case, StateMonitor sends notifications in the form of e-mails or text messages, enabling employees to respond promptly.

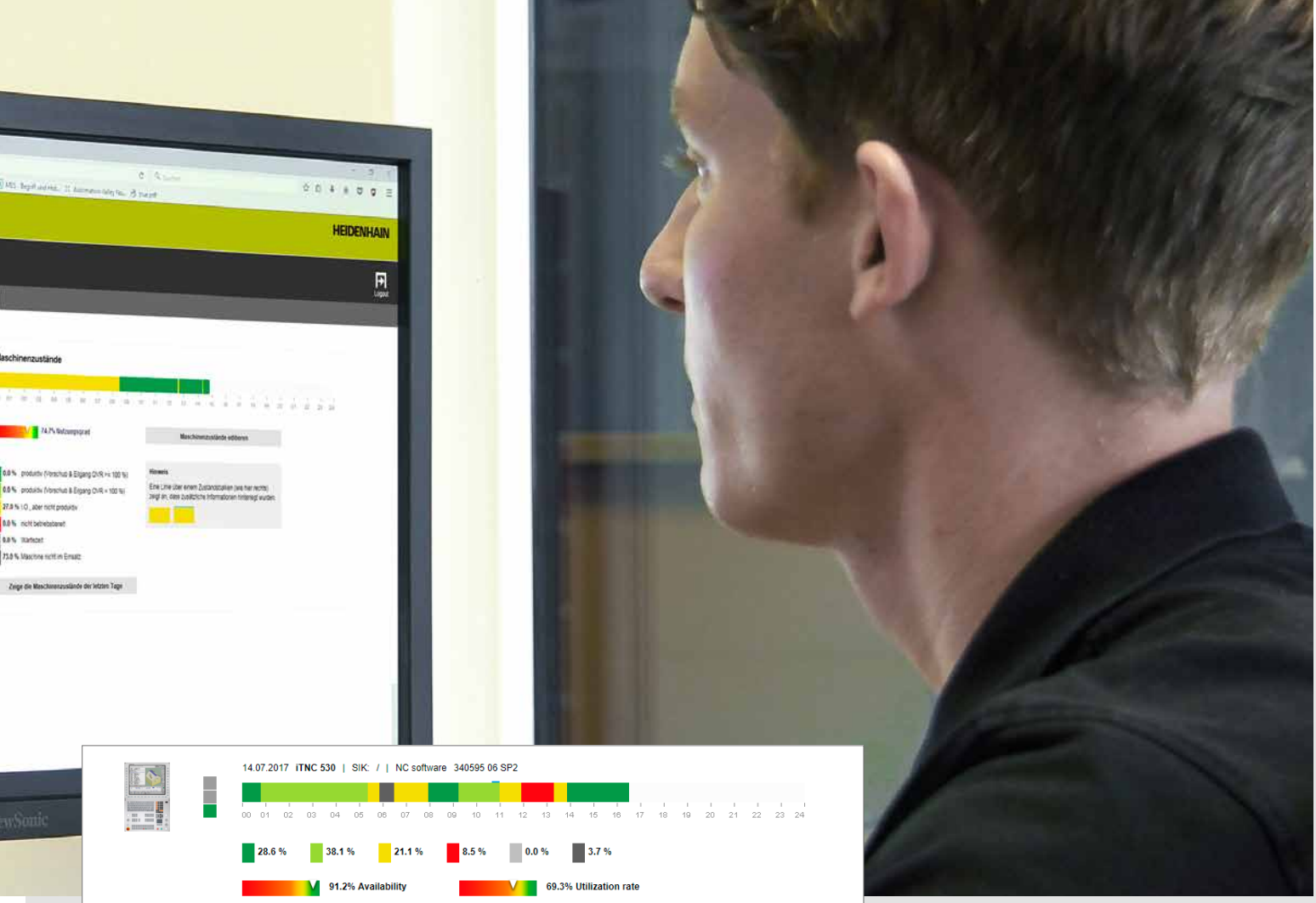
Analyze and plan more effectively

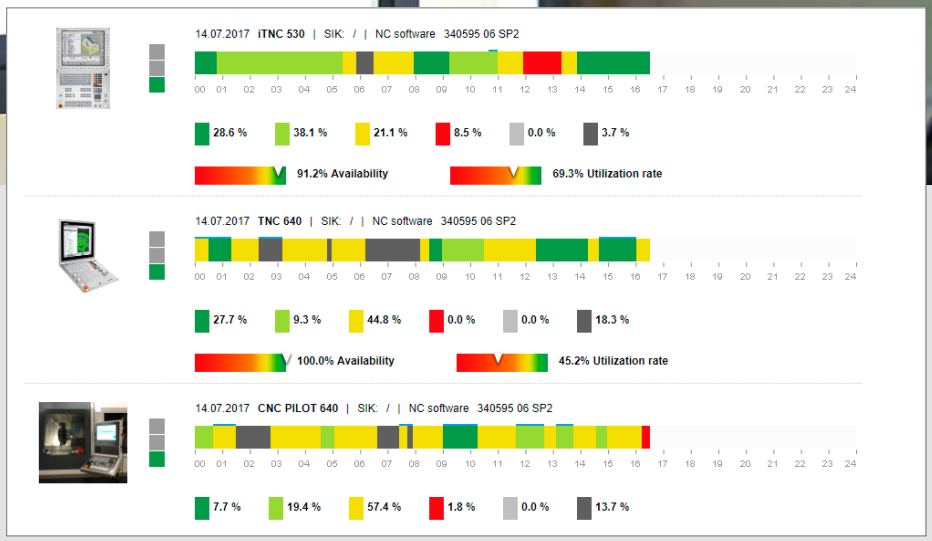
StateMonitor records the operating states and notifications of the machining centers over any desired period of time. These detailed data and notifications then make it easier for Jonas Billmeyer to conduct a meaningful analysis of the machining processes. Being able to export selected data to Excel helps the project manager preform further evaluations and visualizations. "We want to find out how we can keep optimizing our processes, where we need to provide more support to our employees, and whether further resources are required," says Billmeyer.

A strong future in view

During the field test, StateMonitor proved itself by delivering meaningful information that has benefited the company's staff. As a result, they have been able to cut down on unproductive inspections and devote more time to value-creating activities. The easy-to-use software from HEIDENHAIN has provided Jonas Billmeyer with all the important information he needs in order to identify hidden potential in the planning and implementation of machining processes and in the allocation of resources. This experience has served as an important foundation for Billmeyer's further goal of improving flexibility, efficiency, and performance by seamlessly linking all of the company's processes.

Toolcraft, a family-owned company, produces high-end precision parts and places its focus on complete solutions. Its in-house engineering department also develops robotic systems.





All the machine states at a glance:
The status monitor displays the availability and utilization rate of the entire machine park.

The meaningful evaluations from StateMonitor allow an assessment of workflow, utilization, capacities, and potential improvements.

StateMonitor

StateMonitor is installed on a server in the company network and collects machine data over the HEIDENHAIN DNC interface. The web-based user interface can be operated on any device featuring a web browser, including on mobile devices.

StateMonitor records and visualizes the following information:

- Operating modes
- Override settings for spindles, rapid traverse, and feed rate
- Program status, program name, and subprogram name
- Program run time
- SIK number and software number
- Machine notifications

This HEIDENHAIN software features a configurable messenger service and can automatically send notifications per e-mail. Users can specify which machine notifications they would like to receive.

A healthful interplay

Three success factors for high-end medical products

The family-owned ulrich GmbH & Co. KG in Ulm, Germany, has mastered the diverse challenges associated with manufacturing Class III spinal implants. These challenges include the regulatory standards for medical products, the need for flexible delivery capacities, and the high level of precision and exact fit required for vertebral replacement systems. Thanks to its expertise in these areas, ulrich medical® has even managed to outstrip foreign competitors. The company's highly qualified specialists manage a modern production environment based on HERMLE machining centers equipped with HEIDENHAIN iTNC 530 and TNC 640 controls.

1. The machine tool

When it came time for ulrich medical® to expand its production by investing in new machines, "the HERMLE was the clear favorite among our employees," says Head of Production Dieter Münz. In his opinion, the sturdy gantry design of the two HERMLE C 22U PW dynamic machining centers, featuring 18 pallets and 150 tools, makes them ideal for producing implants with exceptionally tight accuracy requirements. That these systems are up to the task has been confirmed by the extensive measurements performed by ulrich medical® for every batch on every shift.

Here, production takes place almost around the clock. This machine runs unattended at night and on Saturdays after employees have prepared the pallets for the HERMLE C 22U PW dynamic featuring 18 pallets.

2. The control

Among the factors that contribute to being able to meet the required accuracy is the Dynamic Precision package of functions implemented on the machine. These functions compensate for dynamic deviations that arise during machining, thereby ensuring exceptionally fine surfaces and a high level of contour fidelity. At ulrich medical®, temperature influences during machining are handled using the KinematicsOpt option. This option doesn't just perform recalibrations; it also saves all of the data from changes made to the kinematic configuration, thereby allowing previous configurations to be easily restored at a later date. This also gives ulrich medical® a hassle-free way to meet its industry documentation and validation requirements for complex processes.

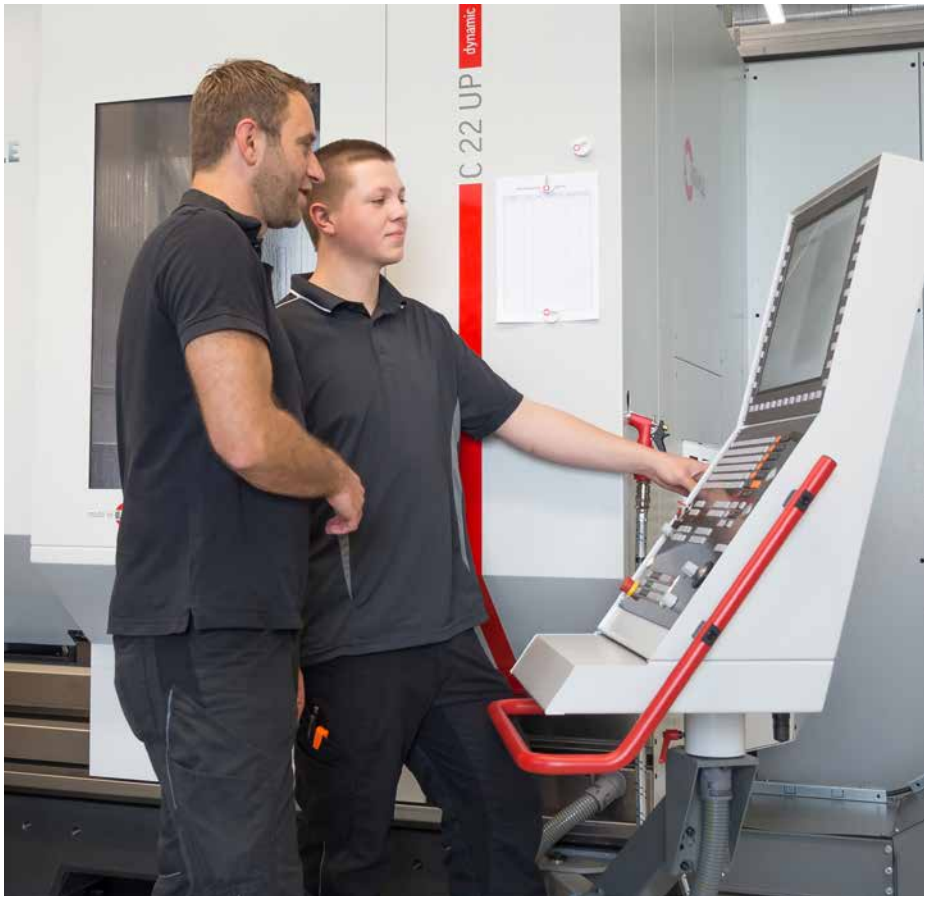
Numerous machining operations are programmed by the company's specialists right at the HEIDENHAIN control, while a CAM system is used only for generating very complex NC programs. Klartext is ideal for programming vertebral replacement systems involving assemblies with various lengths and an-

gles. "Each length is a subprogram that we can call using CALL LBL, depending on the variant required—it's very clearly structured," says the foreman Florian Laupheimer.

The HEIDENHAIN controls integrate perfectly into the company's production environment. Performing data exchange using the CAM system and the programming station works flawlessly thanks to TNCremo, and the TNC also communicates directly with the HERMLE Automation Control System (HACS). Thanks to the HACS production planning system, ulrich medical® enjoys complete control of everything from work scheduling to pallet utilization and tool management.

The company plans to improve communication even further by using the HEIDENHAIN Remote Desktop Manager. Because programming frequently takes place right at the machine, operators would like to be able to access design files in the company network from their control. This would save both time and legwork.

Foreman Florian Laupheimer with the young operator Marc Engelhardt on the iTNC 530.



"I like the fact that HEIDENHAIN controls are easy to use. It doesn't require much experience to get really fast with them."

Florian Laupheimer, Milling Foreman

3. The employee

For ulrich medical®, the expertise of its employees is a crucial factor in its success. They bring out the full potential of the machines and the controls and improve processes with new ideas. One of their tasks is preparing pallets for unattended night shifts or for Saturdays: "We are continually optimizing our solutions for clamping delicate parts," says Laupheimer. He and his team also plan the cutting strategies for hard-to-machine materials such as titanium. On every shift, the machine operators also very carefully and skillfully perform the measurements required for assessing the statistical process capability. For all of these tasks, the operators prize the simple and consistent user friendliness of the HEIDENHAIN controls.

The uNion plate system for cervical vertebrae after initial clamping (above) and following final machining (below).

Conclusion

The success and continuous growth seen at ulrich medical® are a vindication of the company's way of doing things. Its interplay between a modern machine park, TNC controls, and committed staff has made the company highly competitive—with the result that its high-quality medical products contribute to the health of people all around the world.

Programming expertise on a course of expansion

The HEIDENHAIN training network is expanding to support you locally

HEIDENHAIN has been teaching TNC programming skills for 34 years, and its authorized partners have been training TNC operators worldwide for the last 18 years. HEIDENHAIN has been continually expanding its network of training partners so that customers can enjoy local access to further training, either in our partners' training facilities or on-site at their own company.

A consistently high level of training quality is vital for knowledge transfer at HEIDENHAIN. This applies both to its headquarters in Traunreut, Germany, and to all of its partners. Regular examinations conducted at the HEIDENHAIN training partners certify the technical and didactic competence of the trainers. All of the partners' training facilities are equipped with modern media technology and programming station keyboards.

Moreover, all of the network partners comply with defined quality standards ensured by audits regularly performed by HEIDENHAIN. In countries outside of Germany, the local training partners are supported intensively by the HEIDENHAIN regional agencies. The goal is to impart control know-how to customers in the form of high-quality courses conducted locally and in the customer's native language.

+ You can find all of our training partners in the Klartext Portal under the "Training" menu item.

HEIDENHAIN extends a warm welcome to its twelve newly authorized training partners.

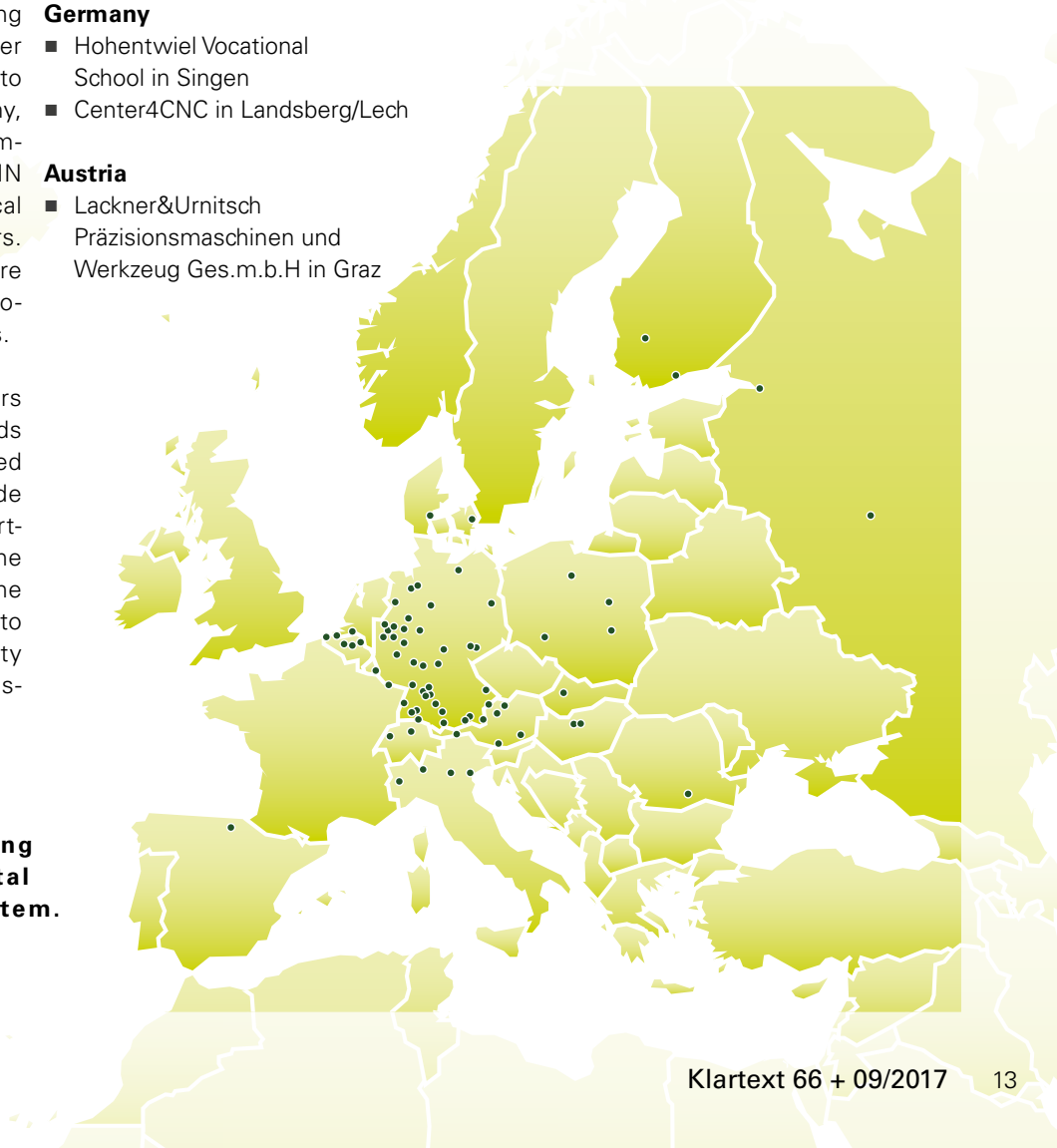
Belgium
- VDAB in Herentals
- VSBA in Heverlle
- VSBA in Hasselt
- VSBA in Bruges
- VSBA in Wondelgem
- VSBA in Ypres

Germany
- Hohentwiel Vocational School in Singen
- Center4CNC in Landsberg/Lech

Austria
- Lackner&Urnitsch Präzisionsmaschinen und Werkzeug Ges.m.b.H in Graz

Russian Federation
- Pacific National University in Khabarovsk
- Reshetnev Siberian State University in Krasnojarsk

Slovakia
- KOPRETINA TN s.r.o. in Trencin



REPORT ON GIF MBH & CO. KG

High-precision gears – the supreme discipline of 5-axis machining

LAC – Load Adaptive Control: Mastering dynamic accuracy

GIF MBH & CO. KG, a company based in Dortmund, Germany, operates according to the motto "making the impossible possible." It's a principle that Dr. Bieker and his team put into practice in the 5-axis machining of gears with complex, custom toothing. This production method is still relatively new in the gear technology sector, and its unique strengths lie in the nearly unlimited possibilities available for the geometric design of high-performance, innovative gears and in the ability to work with almost any material. A prerequisite for successfully implementing this potential is a production process that has been optimized down to the very last detail. The goal is to minimize inaccuracies and compensate for residual deviations. The company's key to meeting such highly stringent accuracy and tolerance requirements is its combination of an ALZMETALL GS1400/5FDT machining center and a HEIDENHAIN TNC 640 featuring the enabled LAC (Load Adaptive Control) option.

Everything here meshes: The TNC 640 with LAC ensures dynamic accuracy on rotary axes.

"Absolute quality assurance defines the production process, which is economical starting with a batch size of one."

Dr. Rafael Bieker and his team don't see the 5-axis machining of spur and bevel gears as competition to the established production methods. Instead, he and his team seek to overcome the boundaries of the current methods. A striking example of this is their production of case-hardened, highly compact double helical and herringbone gears on the universal ALZMETALL 5-axis machining center.

The 5-axis milling of gears within a thoroughly optimized production process also enables the hard machining of gear contours, and it renders any follow-up steps superfluous, such as grinding. In conventional gear grinding, a multi-stage optimization process is required before the required gear quality and contact profile can be achieved. This involves grinding, measuring, and compensation grinding. By contrast, GIF achieves the required accuracy in a single step using 5-axis machining—starting with the very first gear.

First the process, then the compensation functions

Under certain conditions, machining processes at GIF are currently able to achieve deviations of less than 10 µm along the tooth flank. This meets even the most stringent quality standards in gear technology.

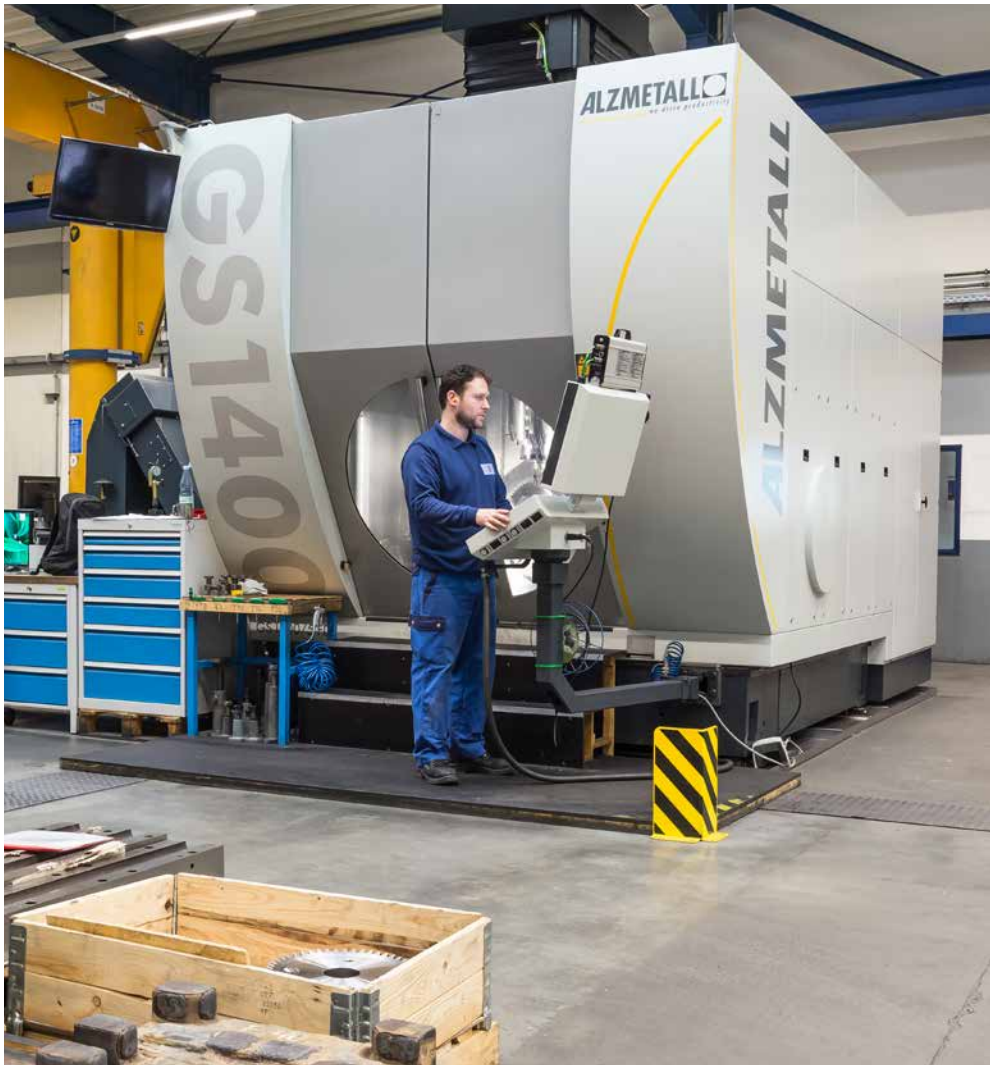
However, a lot of work had to be done before these results could be achieved with process reliability: “When optimizing a process for greater accuracy, the first measures you take yield sizable leaps in quality," says the company’s managing director, adding that "the subsequent optimization steps pose the biggest challenges and yield only very small improvements in accuracy, which are nevertheless indispensable."

The task of manufacturing precision gears with high process reliability led to a joint project with the WZL machine tool laboratory at RWTH Aachen University, a project supported as part of the Central Innovation Program for SMEs by the German Federal Ministry for Economic Affairs and Energy (BMWi). The goal was to develop a production system for the 5-axis milling of high-precision bevel gear sets. GIF used the resulting process analysis and the newly developed compensation models by applying them specifically to the company’s production process.

But first, it was necessary to optimize all the steps of the machining process required for accurate production—for example, by choosing the machining strategies and the appropriate process parameters. Only when these options were exhausted could the compensation functions of the control come into play.

“Nowadays, it only takes us 10 minutes to generate a finished program for machining a gear.”

Dr. Rafael Bieker, Managing Director of GIF MBH & CO. KG



Getting off to a strong start in milling-turning: GIF invested in an ALZMETALL GS1400/5FDT.

LAC: Meeting dynamic accuracy requirements

The team at GIF considered it important that their new gear production machine both feature a high level of baseline static accuracy and comply with the specific requirements of dynamic precision. The team decided in favor of an ALZMETALL GS1400/5FDT milling-turning center equipped with a HEIDENHAIN TNC 640 and an enabled LAC option for load-dependent adaptation of control parameters.

The machine's direct drives for the C and A rotary axes are highly dynamic; however, they are also very sensitive to differing loads and moments of inertia. This can lead to reduced dynamic performance and lower contour accuracy. The LAC option from HEIDENHAIN optimizes the control parameters of the machine in accordance with the load. This adaptive control benefits the dynamic performance and, as was crucial at GIF, the high dynamic accuracy of the rotary axes.

Accounting for deviations in tool shape using 3-D tool radius compensation

If the targeted accuracy for tooth flanks reaches a tolerance class of at least 5 out of 12 (as is the case at GIF), then "functions such as 3-D tool radius compensation are extremely important," says Bieker.

This HEIDENHAIN function compensates for production-related variations in radius that are contingent on the contact point, and it can also be applied to 5-axis hobbing operations for curved tooth flanks. Prerequisites for this involve making precise measurements of the cutter (GIF uses a BLUM laser tool measurement system for this) and transferring the normal vector at the contact point using the postprocessor of the GearCAM system supplied by Euklid CADCAM AG.

Accurate rotary axes: KinematicsOpt reduces temperature influences

GIF uses KinematicsOpt in milling-turning applications in order to compensate for temperature-related drifts at the machine's rotary axes—Rafael Bieker thinks this is crucial. With a loaded HEIDENHAIN touch probe, a touch probe cycle automatically measures the rotary axes on a calibration sphere. This function determines the spacial errors of the tilting axis and the rotary table in various positions. Then it calculates an optimum kinematic machine description and saves it directly as the machine kinematics, thereby allowing spacial errors to be minimized for subsequent 5-axis machining operations.

Strategy: Proprietary tool classifications reduce the effects of wear

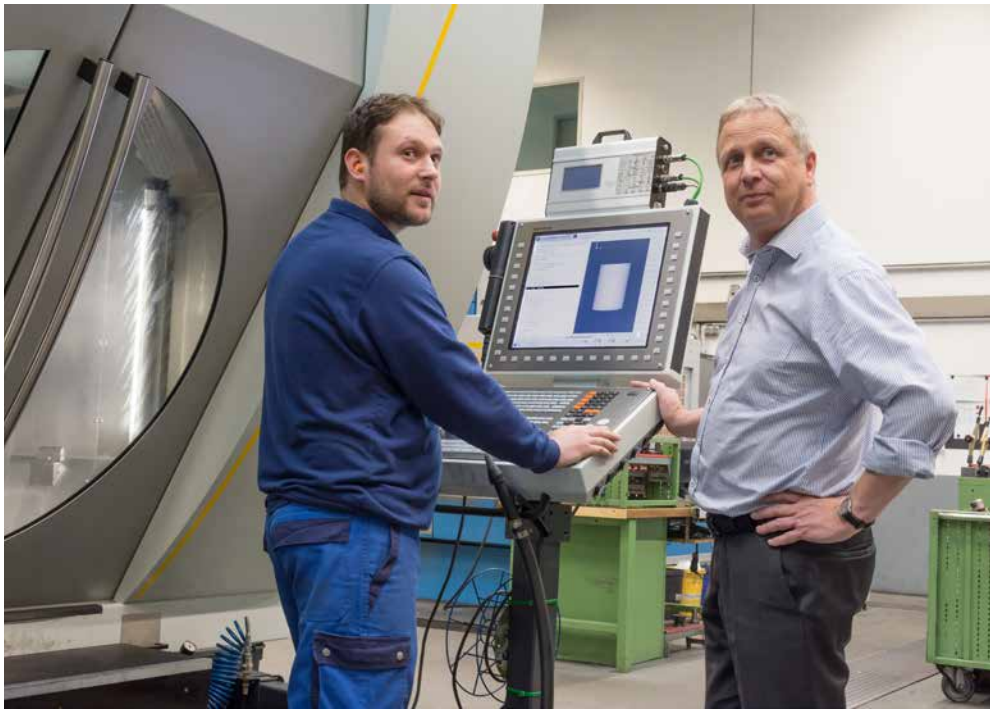
Knowledge gained about the wear behavior of one's tools can be used for developing special tool utilization strategies. First, it is necessary to determine to what extent specific tool usage parameters influence characteristic wear behavior—for example, the radius of a tool's cutting edge changes in accordance with how long the tool is used. This causes increased tool deflection and has a noticeable influence on accuracy.

GIF logs and classifies its tool characteristics and gathers its tool-specific technology data in a database.

This technology database enables quality-assured process design in combination with special milling strategies that take optimum advantage of cutter service life. The NC programmer decides on the number of finishing cutters to be used and on the appropriate cutting parameters so that the gear leaves the machine with the required quality. If the wear behavior of the cutters is known, then GearCAM, in conjunction with the HEIDENHAIN TNC 640, offers the ability to compensate for the increase in cutter deflection along the milling path.

New potential

The ALZMETALL machining center and the LAC-equipped TNC 640 make for a high-performance platform used by GIF to implement its deeply optimized process for manufacturing gears with reliable results. The use of 5-axis machining enables new degrees of freedom in the production of gears that meet the highest quality standards.



Managing Director Dr. Rafael Bieker and his team are pioneers in 5-axis gear machining.

GearCAM for innovative gear solutions

When it first entered the field of 5-axis gear machining, GIF relied on committed partners. One of the them was the swiss-based company Euklid CADCAM AG, which possessed long-time expertise in the 5-axis milling of complex components. At the suggestion of GIF, Euklid began developing a high-performance Euklid GearCAM system specifically designed for 5-axis gear milling.

From the very start, Euklid focused on achieving absolute mathematical precision and on combining this with the requirements of a practical solution in "the language of gear specialists" with an intuitive user interface. Today, GearCAM offers a wide variety of options for the NC programming of spur gears (including double helical and herringbone gears, as well as functions for all commonly occurring flank compensations, etc.). Its spectrum of capabilities includes DIN, Gleason, and Klingelnberg bevel gears, as well as bevel gears with custom teeth.

GearCAM already includes numerous functions that support users in the area of milling technology (quality-oriented milling strategies, tool databases, managing user-specific process data).

The practical advantage in all of this is that "nowadays, it only takes us 10 minutes to generate a finished NC program for machining any type of gear with process reliability," says Dr. Rafael Bieker.

Five-axis machining enables almost any gear geometry.

LAC – Load Adaptive Control

The HEIDENHAIN TNC function determines the load, automatically sets the optimum control parameters, and then continuously adapts them during machining. This results in higher dynamic accuracy and shorter machining times.

+ Learn more about LAC in this video: youtu.be/E5e_pwR_AWg

GIF relied on ALZMETALL's recommendation of a HEIDENHAIN TNC 640: "We haven't regretted it!"

Creating and adapting NC programs has become even easier

The next software version 08 for the TNC 640 features new and enhanced functions – a sneak peak

Facing slide (expansion for Option 50)

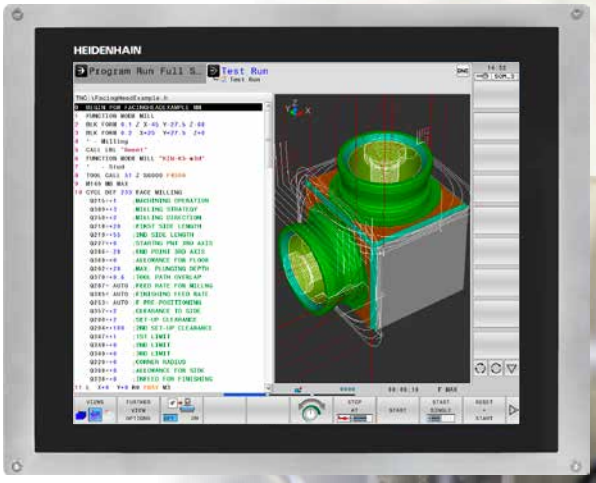
Facing slides with a controllable U axis system make it possible to machine nearly any turning contour, particularly on non-rotationally symmetrical workpieces. The spectrum of applications ranges from simple recessing and boring to back chamfers, as well as the pre-machining and finishing of complex turning contours. During these applications, relatively high cutting speeds are possible in combination with moderate spindle speeds, thereby allowing for efficient machining of the desired turning contour.

In order to program the facing slide and its associated U axis, you can use the comprehensive turning cycles of the TNC 640 and then conveniently simulate them in the Test Run operating mode. The only prerequisite for this is the implementation of a facing slide by the machine manufacturer.

You can add the facing slide as a turning tool and, after activation, program it with the X and Z axes as you usually would for turning operations. The programmed X coordinates are then implemented via the U axis of the facing slide being used. Two new functions will help you do this:

- FACING HEAD POS activates the calculation of the facing slide and prepositions it as needed at a defined height. After this, you can proceed as usual by starting the turning cycle being used.
- FACING HEAD OFF deactivates the execution of the X coordinates via the U axis. After this, you can once again use the machine's original X axis to preposition the next machining position.

To create turning contours in different planes, just shift the datum and tilt to the desired plane using the PLANE command.

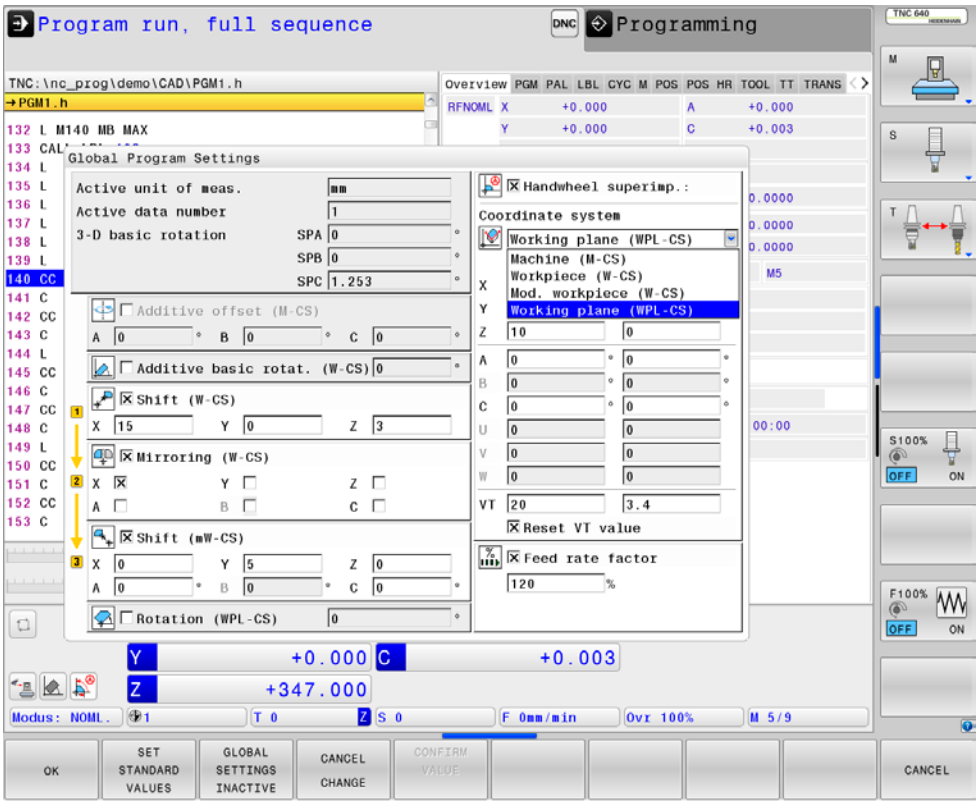


Simulation of a turning operation using a facing slide in a tilted plane

Global Program Settings (Option 44)

Do you need to re-mill the restored surfaces of a press tool that you are repairing? Or do you have to fabricate the mirror image of a design model? With the help of Global Program Settings (GPS), you can quickly and easily adapt the execution of an existing NC program to new circumstances without having to alter the NC program itself.

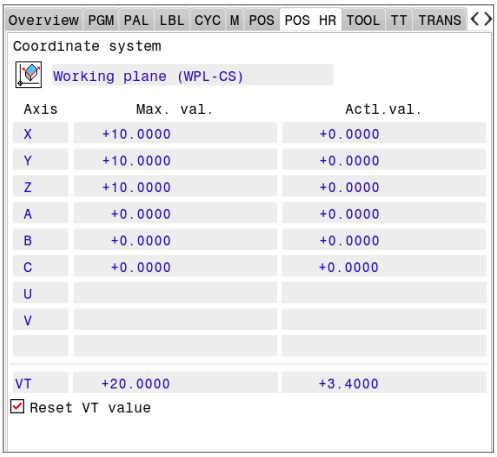
To make such an adaptation, simply go to the Global Program Settings dialog window via a soft key in the PROGRAM RUN, SINGLE BLOCK, or FULL SEQUENCE modes. Once in the dialog window, you have the option of shifting, mirroring, or rotating a machining operation. Combinations of these individual functions are also possible. For the sake of improved clarity, combined individual functions in the dialog window are dynamically numbered in accordance with the selected order.



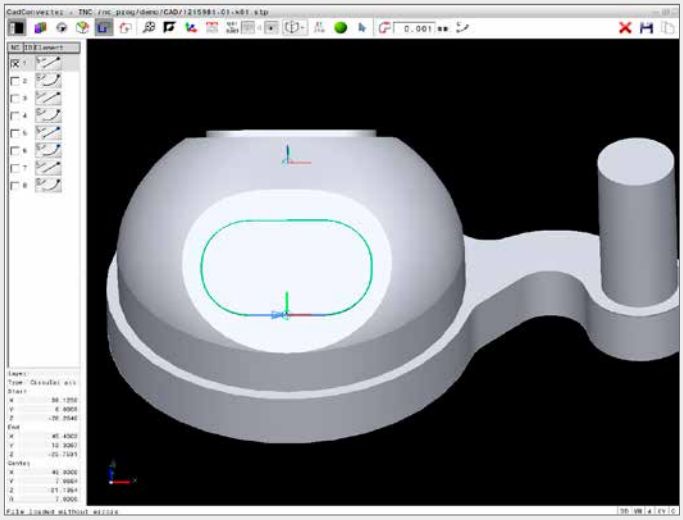
The GPS dialog window allows you to conveniently make changes to your machining operation without having to alter the NC program itself.

Using Global Program Settings, you can also activate handwheel superimpositioning for machine axes or activate the virtual tool axis VT and define the permissible ranges. In addition to superimposing axis values by positioning with the handwheel, you can also define superimpositioning values directly in the dialog window. You can also activate the selected handwheel superimpositioning for a particular coordinate system as needed and can choose between coordinate systems belonging to the machine, the workpiece, or even the previously modified workpiece. If, for example, you are machining in a tilted working plane, you can use the handwheel superimpositioning function for this tilted coordinate system as well.

The Global Program Settings status display continually indicates the currently active selection. In addition, in the POS HW status display, you can continually monitor the handwheel superimpositioning values.



CAD Import (expansion for Option 42)



Contour extracted from a previously defined working plane

The new CAD Import option expands your abilities to extract contours and machining positions from CAD files and incorporate them into an NC program. In addition to DXF files, it is now easy to perform error-free imports of CAD models in STEP or IGES file formats.

Being able to extract machining information directly from CAD files provides additional possibilities, particularly when creating NC programs with tilted working planes. You can now set the preset along with a 3-D basic rotation in the 3-D model. In addition, you can define a datum together with a corresponding 3-D rotation in the desired working plane.

You can then conveniently save the newly defined working plane in the clipboard and incorporate it into the NC program with the corresponding transformations and PLANE command. As was previously possible with the DXF Converter, you can now extract contours and machining positions from the newly defined working plane and include them in the NC program.

Not only does this save you programming and testing work, it also provides certainty that the contour or machining position exactly corresponds to the designer's specifications.

```
TNC:\nc_prog\demo\CAD\CAD_Import.H
→CAD_Import.H
0  BEGIN PGM CAD_IMPORT MM
1  BLK FORM CYLINDER Z R40 L30 DIST-30
2  * origin_file = "1215981-01-k01.stp"
3  * origin = X+0.0000 Y+0.0000 Z+0.0000
4  PLANE RESET STAY
5  TRANS DATUM AXIS  X+0  Y-19.2838  Z-10.8285
6  PLANE VECTOR BX+1 BY+0 BZ+0 NX+0 NY-0.6616216
   NZ+0.7498379 TURN MB MAX FMAX
7  END PGM CAD_IMPORT MM
```

Transformations with corresponding PLANE tilting command from CAD Import via the clipboard

Getting a new angle on machining

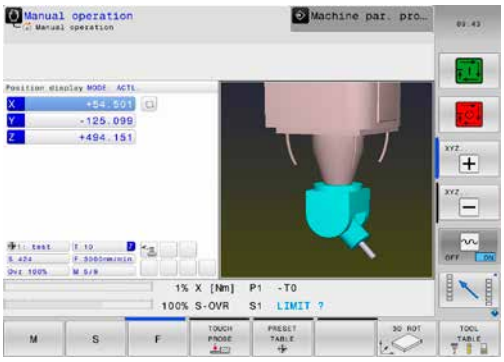
Using an angle head requires making a number of modifications to the machine, control, and the NC program. The service technicians of the HEIDENHAIN Customer Service Department can help you with this.

Sometimes there are machining tasks that simply cannot be performed using conventional machine configurations. One such task is inside machining. An angle head can get the job done, but there are several things to be considered when using one. When it comes to angle heads, our customer service technicians are extremely knowledgeable.

Actually, using angle heads isn't very difficult. The machine must have the appropriate kinematics, and the TNC control needs to be equipped with the tilting option and PLANE function. Modern 5-axis machines and the current versions of the iTNC 530 and the TNC 640 meet these requirements. Of course, as an experienced operator, you are also very familiar with tilting.

However, creating a definition of an angle head can be tricky. This is due to the wide selection of angle heads; they come in a variety of sizes with fixed or adjustable angles and various approaches to machine mounting and tool holding, and they can be either single- or double-sided. Indeed, the market offers a solution to meet every customer's unique requirements. Angle heads even vary in their appearance, with each model having its own unique dimensions and design.

This is where the HEIDENHAIN Customer Service Department comes into play. Our specialists for NC programming will provide you with tailor-made templates for defining your angle head and, if needed, can support you on-site during setup. For this service, we require technical drawings with the most detailed dimensions available for the angle heads in question. Based on these drawings, our specialists will create one or more templates that you can store in the ToolholderWizard and call as needed—just as you would a tool holder



Once installed, an angle head opens the door to a number of new machining possibilities.

Regardless of whether you need a single template for defining a single angle head or several templates for entering the dimensions of multiple angle heads, the NC programming helpline staff will be happy to advise you on the specific options available for setting up your TNC control to handle these devices and are happy to help you on-site during installation:

NC programming helpline: **Tel. +49 8669 31-3103**
Service.nc-pgm@heidenhain.de

Versatility is key

What helps ensure the future of a company? The Spanish company GOIMEK decided to invest in a new SORALUCE machine featuring a HEIDEHAIN TNC 640 control.

From its location in Itziar between San Sebastián and Bilbao, GOIMEK has specialized in the production of very large components. With its high versatility, their new machine is expected to help the company expand its range of services to include, for example, parts for wind turbines, and to improve its competitive edge in existing business areas.

GOIMEK chose the SORALUCE FP-16000 traveling column milling and boring center, equipped with a TNC 640 control from HEIDENHAIN. Aitor Alkorta, General Manager at GOIMEK, was impressed by the versatility of both the machine and its control: "With our new milling and boring machine, we can perform a wide variety of machining processes with high performance and accuracy—all on a single machine. This includes turning, milling, drilling, boring, and tapping operations for numerous components in a variety of shapes and sizes." One source of the machine's versatility is, for example, Option 50 from the TNC 640 control. This option unlocks a sizable range of turning operations and converts the milling and boring center into a versatile milling-turning machine.

As versatile as it is big: Thanks to the TNC 640, the FP-16000 can perform both milling and turning operations

> “With its versatile functions such as facing slide support, milling-turning functions, KinematicsOpt, etc., the TNC 640 is the right choice for carrying out multitask projects.”
>
> Aitor Alkorta, Managing Director of GOIMEK

Aitor Alkorta, General Manager at GOIMEK is thrilled by the versatility of his investment.

Various machine heads for milling and turning

For milling-turning operations, the machine is equipped with the SORALUCE H100 milling-turning head, a 5-axis head for machining complex surfaces. Machining with 5-axis interpolation is supported by the TNC 640 through Function M128 and its expansion, Option TCPM (Tool Center Point Management). These functions improve tool guidance and avoid contour damage. Option DCM (Dynamic Collision Monitoring) reliably prevents collisions during complex 5-axis movements.

The SORALUCE machine also features two additional heads: a SORALUCE H62 horizontal milling attachment and a SORALUCE TH02 head for inside turning. Switching between milling and turning is easy to do using FUNCTION MODE MILL and FUNCTION MODE TURN. Depending on the selected mode, the rotary table either acts as a C axis for milling operations or as a turning spindle for turning operations.

Very long traversing paths and two tables

The machine’s versatility not only comes from its milling and turning capabilities but also from its enormous traversing paths, its two work stations, and its two tables. The machine can traverse 16 000 mm horizontally, 3600 mm vertically, and 1500 mm diagonally. When it come to tables, the machine features a quadratic rotary/sliding table measuring 3000 mm by 2500 mm, as well as a round rotary/sliding table with a diameter of 3000 mm. Both rotary/sliding tables have their own traversing paths of an additional 2000 mm, and they can each carry a workpiece weighing up to 40 tons. The tables’ movements are controlled by the TNC 640 by means of its master-slave function.

The machine’s enormous potential, arising from the combination of its large working space, long traversing paths, various milling and turning heads, two rotary/sliding tables, etc., is unlocked by the TNC 640 through the control’s kinematic options and workspaces, which in this case allow for more than 80 different possible defined combinations.

The TNC 640 also plays a key role in the management of parallel axes through its PARAXCOMP and PARAXMODE functions. “With the PARAXCOMP function, we carry out a relative compensation between the Y axis and the translation axis of the rotary/sliding table (i.e., the V axis), which allows the datum to remain unchanged. Using the PARAXMODE function, we perform the

machining operation by traversing with the Y or the V axis, and we don't have to make any changes to the machining program," says Aitor Alkorta as he explains the advantages of these functions.

Simultaneous machining and job setup

Workers at GOIMEK are also excited by the new machine's possibilities when it comes to workpiece setup. The machine's traveling column design makes it possible to simultaneously machine and prepare workpieces, which gives a significant boost to productivity. The TNC 640 helps make this possible by assigning asynchronous axes to various workspaces.

Along these lines, another much-used function at GIOMEK is the tool management of the TNC 640. "We have installed an additional ITC 755 operating station for simple and fast tool management," explains Aitor Alkorta, adding that "tool identification occurs automatically through RFID components managed by the TNC 640. This gives us complete control of the 80 tools in the magazine."

For GOIMEK, being able to network the company's machines was also an important consideration. With the HEIDENHAIN DNC function, information can be transfered between the TNC control and various external parties. This includes being able to see the machine status in real time along with important information regarding the state of the current machining program. The DNC function also makes it possible to send e-mails during standstill. To help GOIMEK continue to get the most out of its new machine, reports are generated on important information from the production process (e.g., energy consumption, machining cycles, and diagnostics).

The TNC 640 can handle complex 5-axis machining tasks.

HEIDENHAIN

Drive it, don’t just let it go

The speed and direction of a balloon is determined by the wind. For balloonists, going with the flow is an experience, a challenge, and a delight. In your production, of course, you don’t want to leave anything to chance. Everything has to be perfectly coordinated and precisely intertwined. You can ensure this with linear and angle encoders from HEIDENHAIN. They stand for highly accurate position and speed control and are an important part of your system’s reliability. With our extensive experience and know-how in the development and manufacture of measuring devices and numerical controls, we create the groundwork for the automation of tomorrow’s plants and production machines. This experience ensures and will continue to ensure the safety and reliability you need on your way to the top.

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