hyperMILL®

VIRTUAL Machining

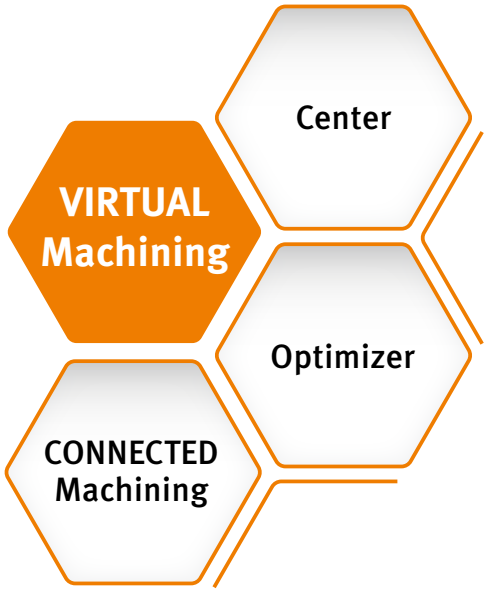
Safely Generate, Optimize, and Simulate NC Code

OPEN MIND
THE CAM FORCE

Perfect Synergy of the Virtual and Real Worlds

Rely on *hyper*MILL® VIRTUAL Machining to safely generate, optimize, and simulate your NC programs. Our innovative post-processor and simulation technology consists of three modules: Center, Optimizer, and CONNECTED Machining. This way, we offer you a solution for the simulation and optimization of your NC programs as well as in-depth connectivity with your machines. This allows you to close the gap between CAM system and real machine environment – providing an unprecedented level of process control and optimization. This is Industry 4.0!

***hyper*MILL® VIRTUAL Machining areas**



More than just a simulation solution

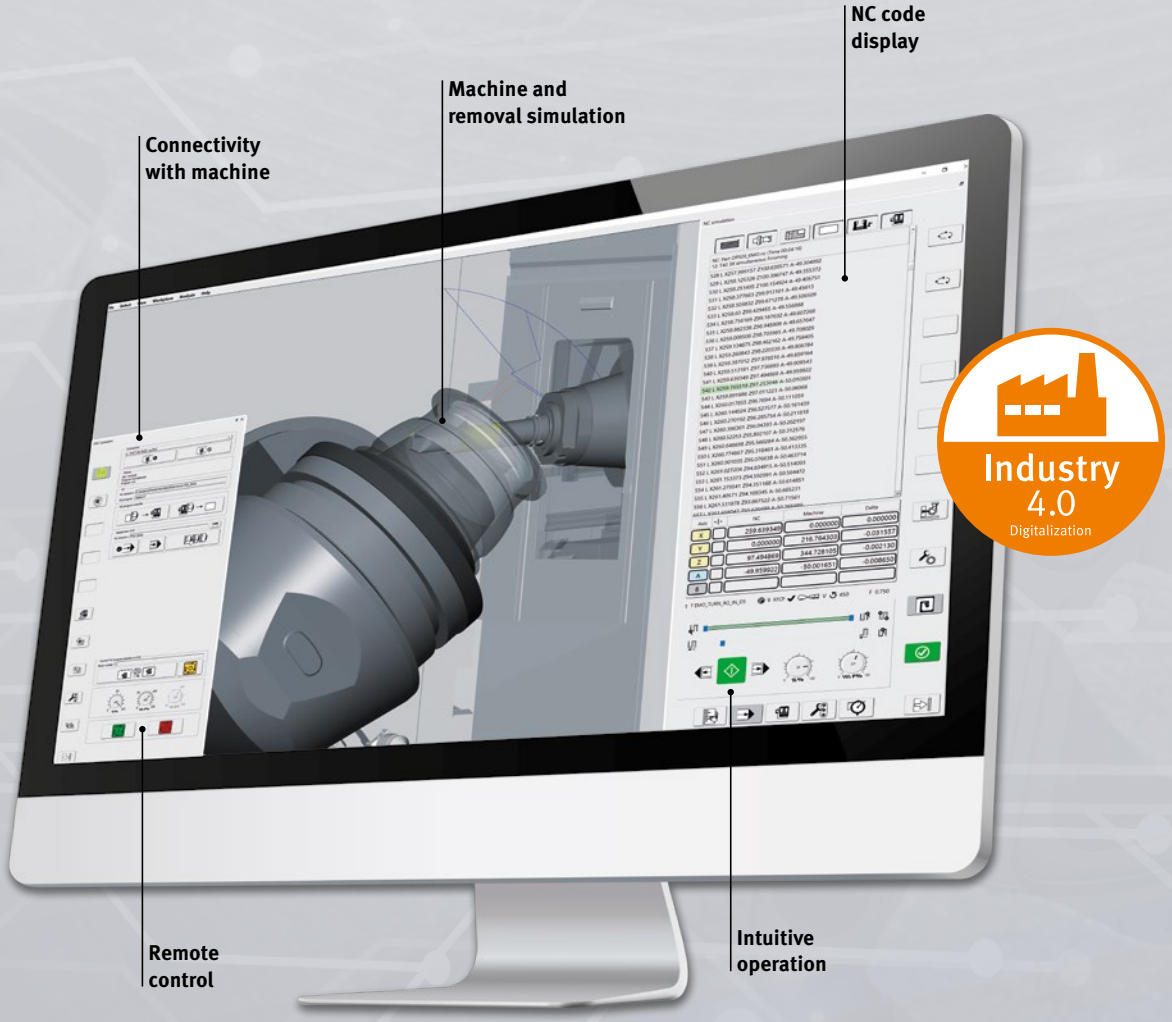
With *hyper*MILL® VIRTUAL Machining, we offer a technology that goes far beyond a classic simulation solution. It is the core of our NC code generation and simulation and at the same time provides the basis for further functions. Powerful optimization algorithms ensure that the NC code is perfectly adapted to the machine kinematics. Our Optimizer automatically finds the technically best tool position and also generates the linking movements and necessary clearance movements. *hyper*MILL® CONNECTED Machining enables bidirectional connectivity and synchronization with the machine. The integration of our *hyper*MILL® BEST FIT automatic component alignment completes the process chain from the CAM system to the machine.

Increased safety in simulations

Thanks to your machine's digital twin, that is, the virtual representation of your machine including controller and PLC, we can simulate the machining processes in detail and realistically based on the NC code. All processes are transparent for you and can be analyzed in depth. Real-world machine collisions, causing costly machine damage, production downtime, and therefore critical delays, are prevented.

Application areas

- Creation and optimization of NC programs
- Machining checking and analysis
- Connectivity and interaction with your machines
- Component alignment at the touch of a button with *hyper*MILL® BEST FIT
- Job preparation: Help with machine selection and planning



”*hyper*MILL® VIRTUAL Machining allows us to map all the process steps in CNC manufacturing within our software in order to offer you the greatest degree of safety and consistency – without compromise.”

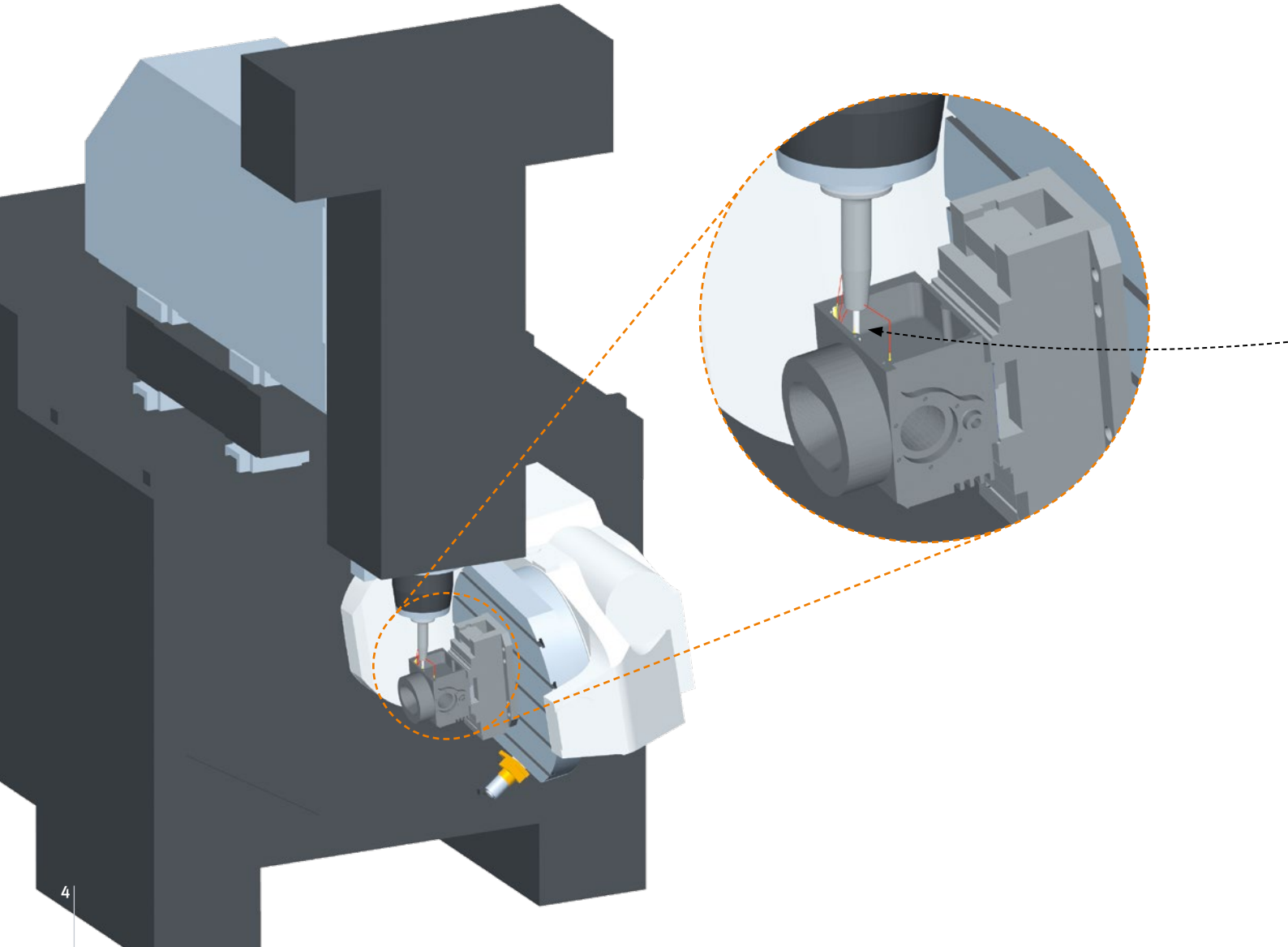
Peter Brambs, Director Product Management & Innovation

NC Code Simulation with All Key CAM Information

The *hyper*MILL® VIRTUAL Machining Center combines the advantages of a CAM data-based simulation with those of an NC code simulation. What you get in the end is an NC code simulation that includes all the process information you need from the *hyper*MILL® CAM system, such as negative allowances, broken edges, and hole parameters. In this way, you avoid incorrectly identified collision areas and save yourself a time-consuming evaluation afterwards.

Simulation with maximum safety

Our *hyper*MILL® VIRTUAL Machining Center offers you all the classic options for simulation, embedded in a highly intuitive user interface. The machine simulation is carried out on a digital twin of your machine, taking into account the workpiece, stock, and tool as well as the tool holder, fixtures, and clamps. Our NC code-based machine simulation guarantees reliable collision detection and far safer and efficient set-up processes.

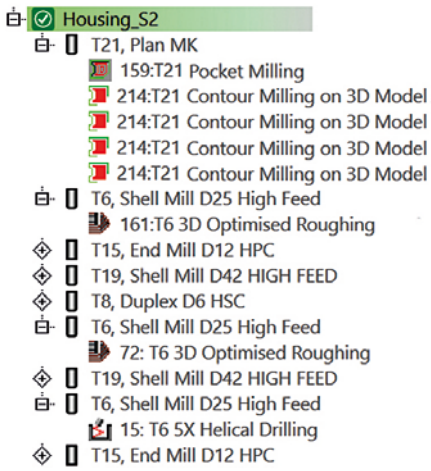


Features

- Based on NC code
- Based on digital twin of the machine
- Visual inspection independent of collision check
- Simulation of all tool and connecting paths
- Limit switch check
- Stock removal simulation
- Comprehensive analysis functions
- Checking of machine, holder, tool, model, and stock
- Clamping check

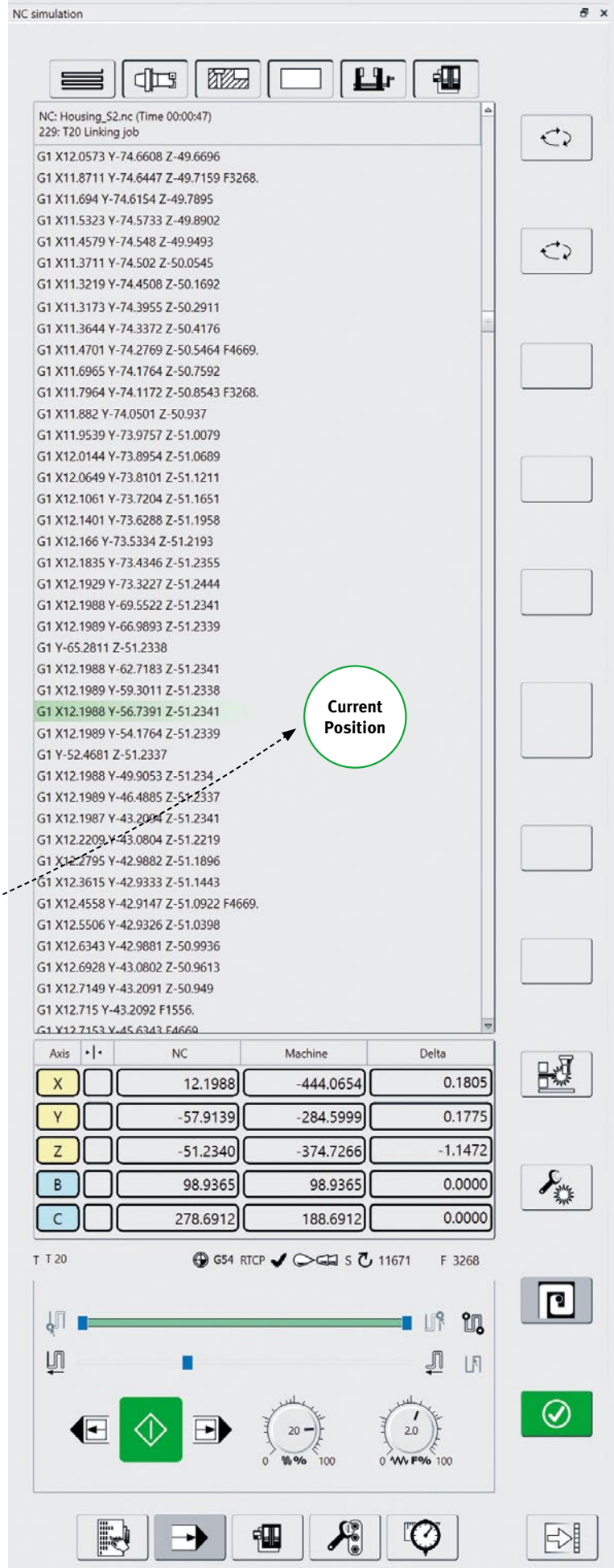
Clear program management

All programs are mapped in a clear structure. Individual operations can be simulated separately, or used as a starting point for the simulation.



Intuitive user interface

The design of the user interface is based on an actual controller. Machine operators, CAM programmers, and manufacturing planners benefit from the intuitive operation. The time required to become acquainted with the simulation technology is therefore reduced to a minimum.

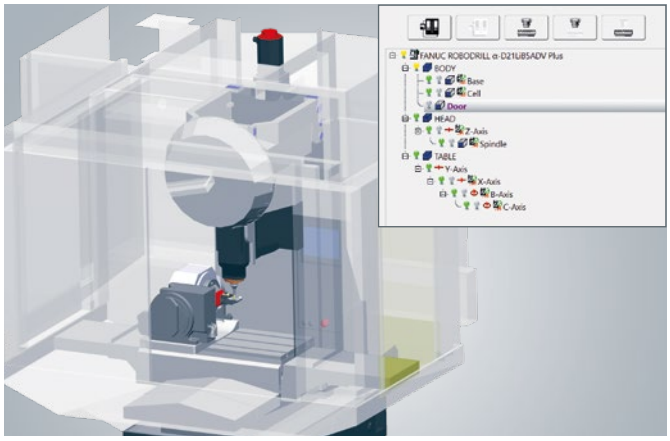


In-depth analysis of the NC program

Extensive analysis functions allow you to check every machining situation in detail. Various technical charts provide valuable information about the quality of the machine run. All traverse movements of the different axes, feedrates, and spindle speed are visible to the CNC programmer at all times to avoid errors and inefficient operations.

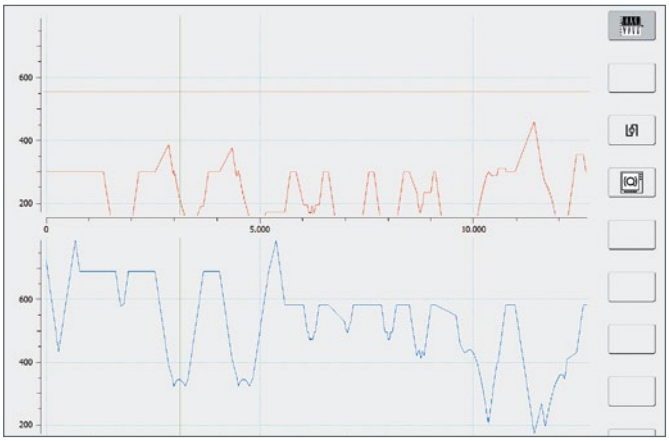
Workspace monitoring

A stored machine model is used to check whether any limit switches are traversed during 2.5D, 3D, 3+2, and 5-axis simultaneous machining. The movements of both the linear axes (X, Y, and Z) and the rotary axes (A, B, and C) are checked.



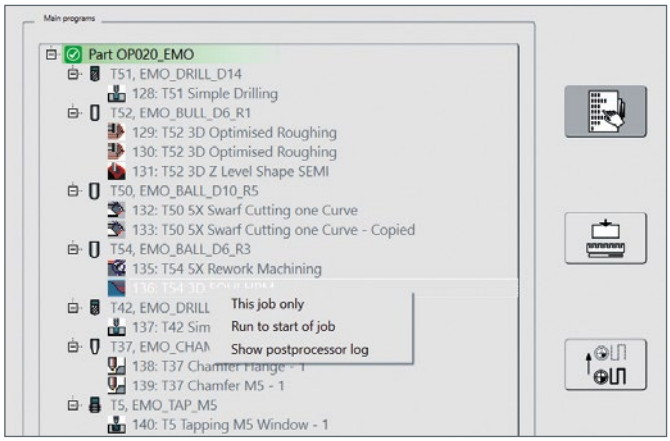
Adjusting visibility

The visibility of the individual machine components can be adjusted individually in order to enable optimal visualization of the simulation. Preset machine views, such as “Head and Table,” can be called up at the push of a button.



Axis diagrams

Movement diagrams of the individual axes provide valuable information about the quality of the machine run. Abrupt changes in direction or large traverse movements are easy to see and can be analyzed in more detail.



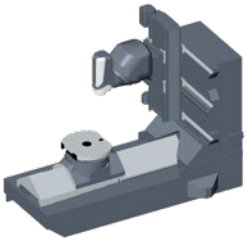
Jumping to simulation locations

Jumping forwards or backwards to specific points in the NC code is possible at any time. The stock is automatically updated for the selected simulation point. The points can be selected either via automatic breakpoints, the program management, or any position in the NC code.

Extensive machine portfolio

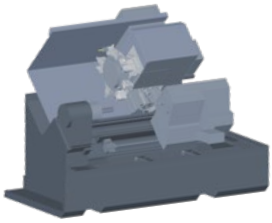
*hyper*MILL® VIRTUAL Machining supports a wide range of machines. This includes various types of milling machines as well as lathes and special machines, such as additive machining centers. Whether it is 3-axis, 5-axis, or multi-axis milling machines or lathes of different designs, our VIRTUAL Machining is designed to meet the specific requirements of all machine types. This versatility allows you to use our software for a wide range of applications while achieving the greatest possible safety and efficiency.

Milling



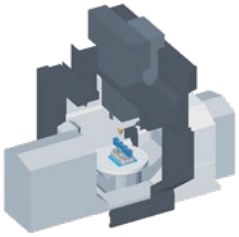
- 3-axis milling machines
- 4-axis milling machines
- 5-axis milling machines
- 6-axis milling machines
- Multi-axis milling machines

Turning



- Mill-turn machines
- Lathes

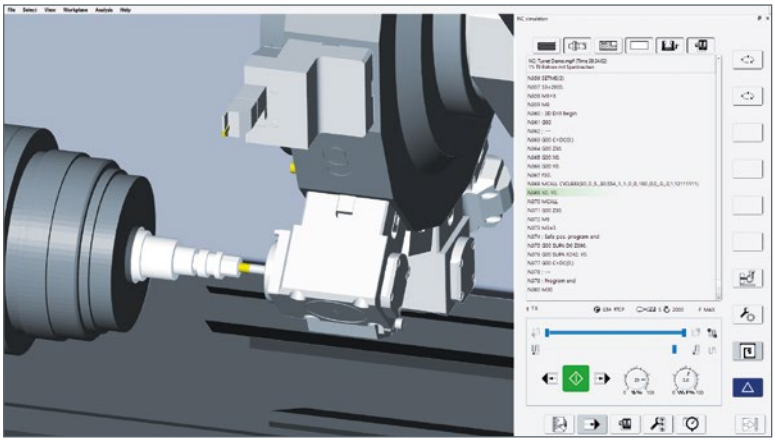
Special machines



- Additive machining centers
- Knife-cutting machining centers

CNC controls

The wide range of machines is also reflected in the large number of different control system manufacturers. The challenges posed by different control systems are many and various – ranging from special control cycles to individual parameters and functions. *hyper*MILL® VIRTUAL Machining is designed to cope with this diversity and enable seamless integration into the various control systems.

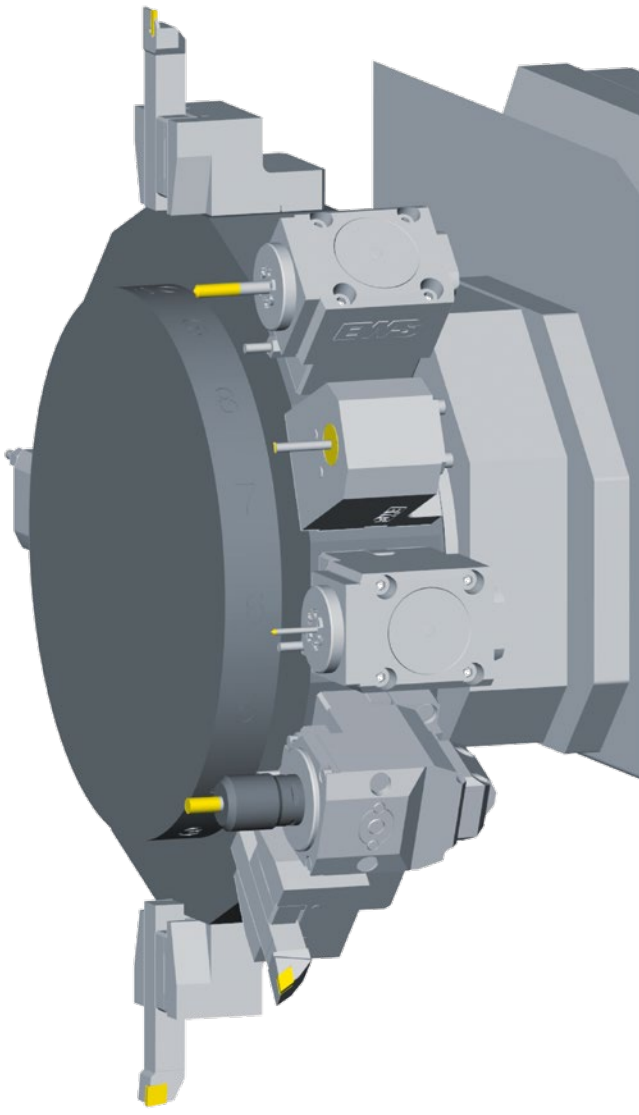


Turning operations safely under control

Trust in our VIRTUAL Machining technology, and make no compromises when it comes to your NC code generation and simulation. Precise checking is essential, especially in view of the sometimes very complex tools and holders in use as well as machining with a turret.

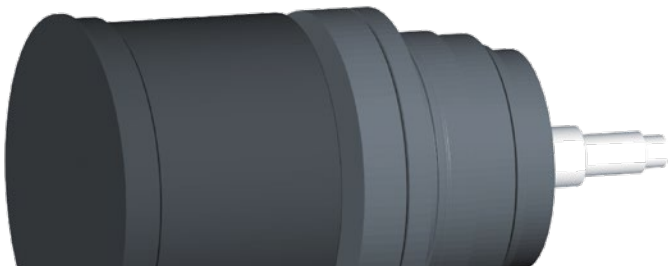
Features

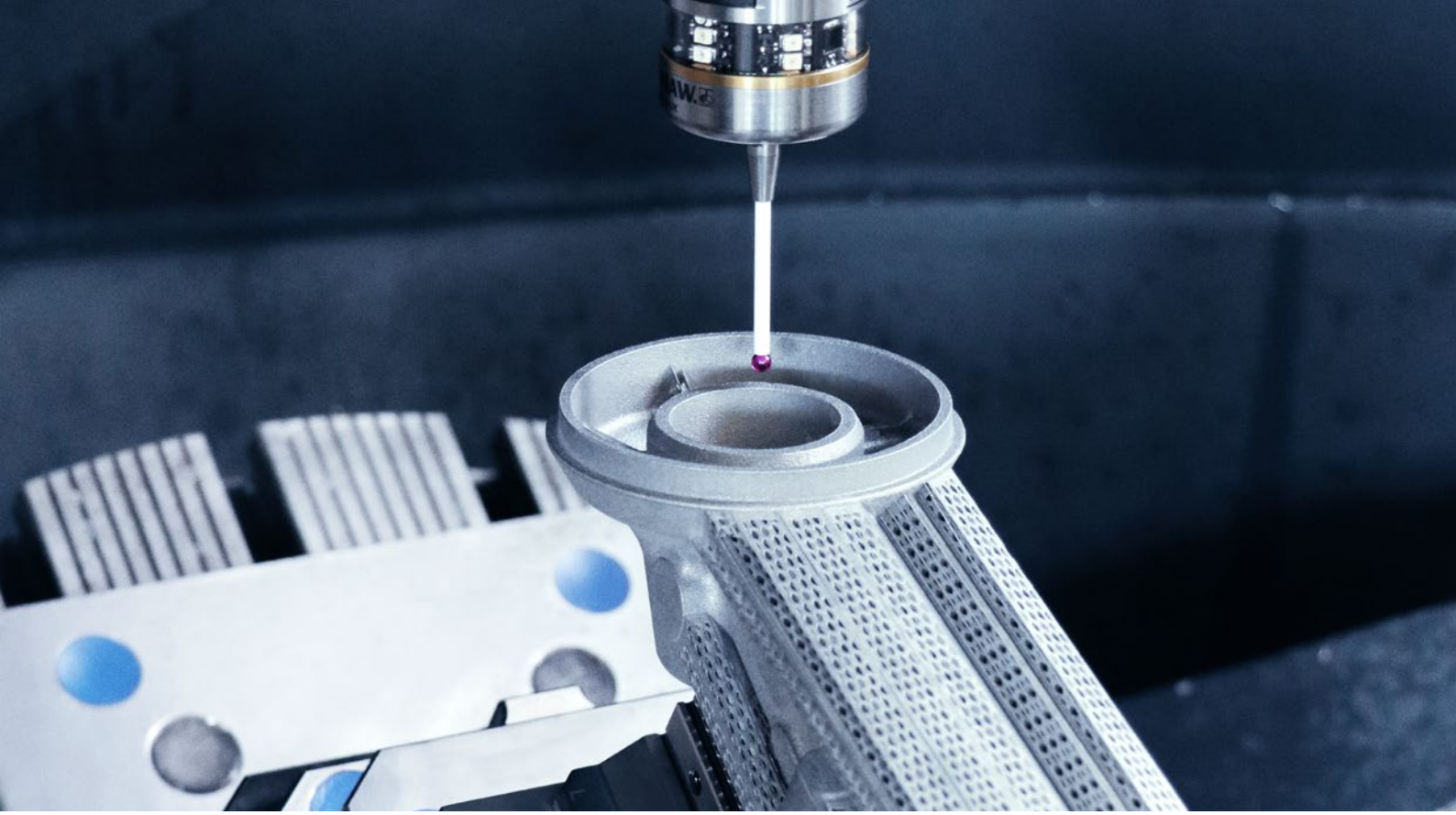
- Intuitive assembly of the individual tool components
- Simple definition of the cutting edge position
- All turning, milling, and drilling tools in one database
- Convenient turret assembly
- Management of different turret assemblies



Turning and drilling with a turret assembly

Precise mapping of the turret in *hyper*MILL® is crucial for safe machining. In *hyper*MILL® VIRTUAL Machining, the machine and all tools are mapped in detail and used for NC code simulation. The turret can be equipped conveniently with holders and tools directly in the virtual machine.





Real-time alignment with *hyper*MILL® BEST FIT – fast, safe, precise

With BEST FIT, we offer you intelligent component alignment in the CAM system that is perfectly integrated into *hyper*MILL® VIRTUAL Machining, providing an efficient solution at the touch of a button. The unaligned component is probed on the machine using 3D Probing, and the probing points are sent back to the CAM in the form of a measuring log. *hyper*MILL® BEST FIT then precisely adjusts the NC code to the actual component position. In this manner, the virtual world (programming) is adapted to the real world (clamping), and not the other way around!

Thanks to the unique consistency of our software, the entire process takes place in our VIRTUAL Machining Center. The adapted NC code is simulated on the actual clamping position, checked for collisions, and optimized automatically. The NC program is then transferred to the machine, and machining can begin. Component alignment you can rely on!

> „*hyper*MILL® VIRTUAL Machining and the BEST FIT function for component alignment in real time allow us to achieve enormous time savings plus machine reliably and safely.“
>
> **Dr. Boris Matuschka, Group Leader of Additive and CNC Manufacturing, STIHL Test Parts Production**

Read the STIHL user report now

The Optimal NC Program for Your Machines Every Time

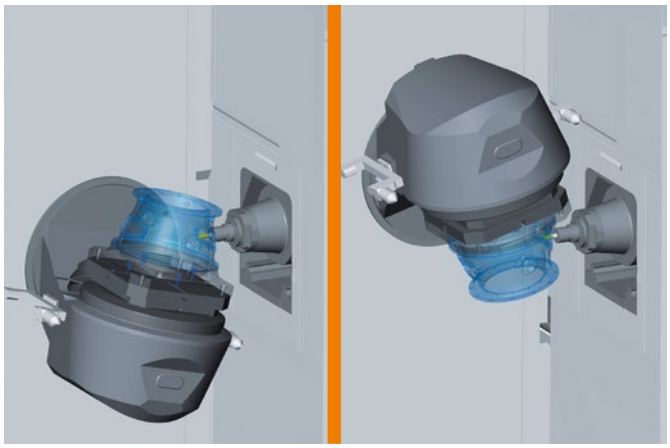
Having the right NC code is critical for smooth, reliable multi-axis machining – because the efficiency and quality of your machining ultimately depends on the movement sequences in the NC program. The *hyper*MILL® VIRTUAL Machining Optimizer analyzes the NC program as the NC code is being generated and perfectly adapts it to the kinematic properties of the chosen machine. The technically best positions are selected automatically, optimized linking movements between individual operations are generated, and any clearance movements that are needed are carried out for limited-function machines. These optimizations ensure a reliable NC program, significantly reduce the time spent on programming, shorten downtimes, and eliminate the need for subsequent editing of the NC program.

Features

- Automatic solution change in the event of collisions or axis limitations
- Automatic linking of any 2.5D, 3D, and 5-axis jobs
- Milling with rotary axis
- Preferred solution selection
- Optimization of clearance planes
- Optimized movement in case of collision risk
- Automatic clearance movements
- Automatic solution generation for 6-axis and multi-axis machines

Safe and simplified programming

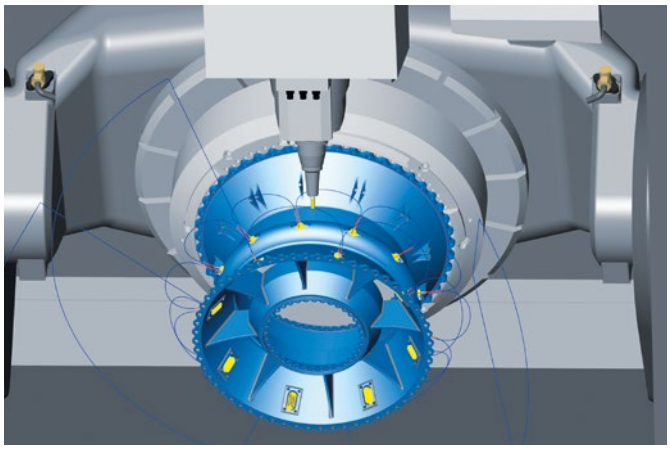
When programming multi-axis machines, such as a 5-axis machining center, the quality achieved depends on the experience of the programmer. This is why the quality of individual NC programs differs. The expertise of the programmer is particularly important when it comes to optimizing movement sequences during machining. Our VIRTUAL Machining technology allows you to simplify and standardize the programming process. This gives new programmers the opportunity to create NC programs safely and efficiently, while at the same time reducing the workload on your in-house experts. There is no need for any time-consuming evaluation of the right solution or definition of clearance planes during programming. This is handled fully automatically by our Optimizer. See the unique and automatic optimization functions for yourself.



Automatic solution selection

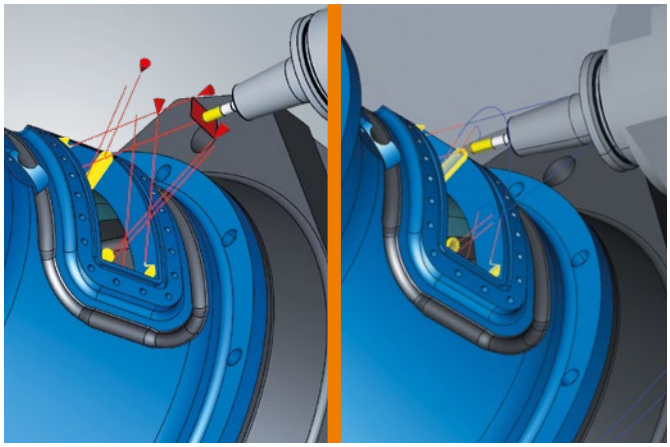
The *hyper*MILL® VIRTUAL Machining Optimizer automatically selects the best solution and can of course be adapted to your manufacturing standards:

- Separate check for each job
- Automatic search for alternative solution in the case of collision and machining area violations
- Operations can be split, if necessary, and output with alternating orientations



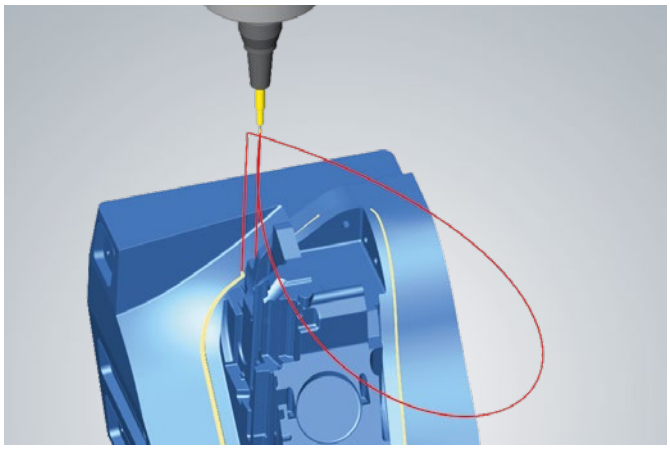
Automatic linking movements

Optimal linking movements are generated fully automatically between individual jobs or during changeover to a different machining solution. The type of machining is not a decisive factor here, and movement-optimized connecting paths are created for 2.5D, 3D, and 5-axis jobs.



Optimization of clearance planes

The Optimizer automatically adapts the clearance planes to the machining. The planes are positioned close to the component, ensuring efficient and reliable movement sequences during machining.



Automatic rewind movements

For machines with limited rotary axes, rewind or return movements are crucial for ensuring simultaneous or continuous reliable machining. The Optimizer automatically inserts the necessary clearance movements into the NC code. The approach and retract movements are carried out smoothly, resulting in a very high surface quality.

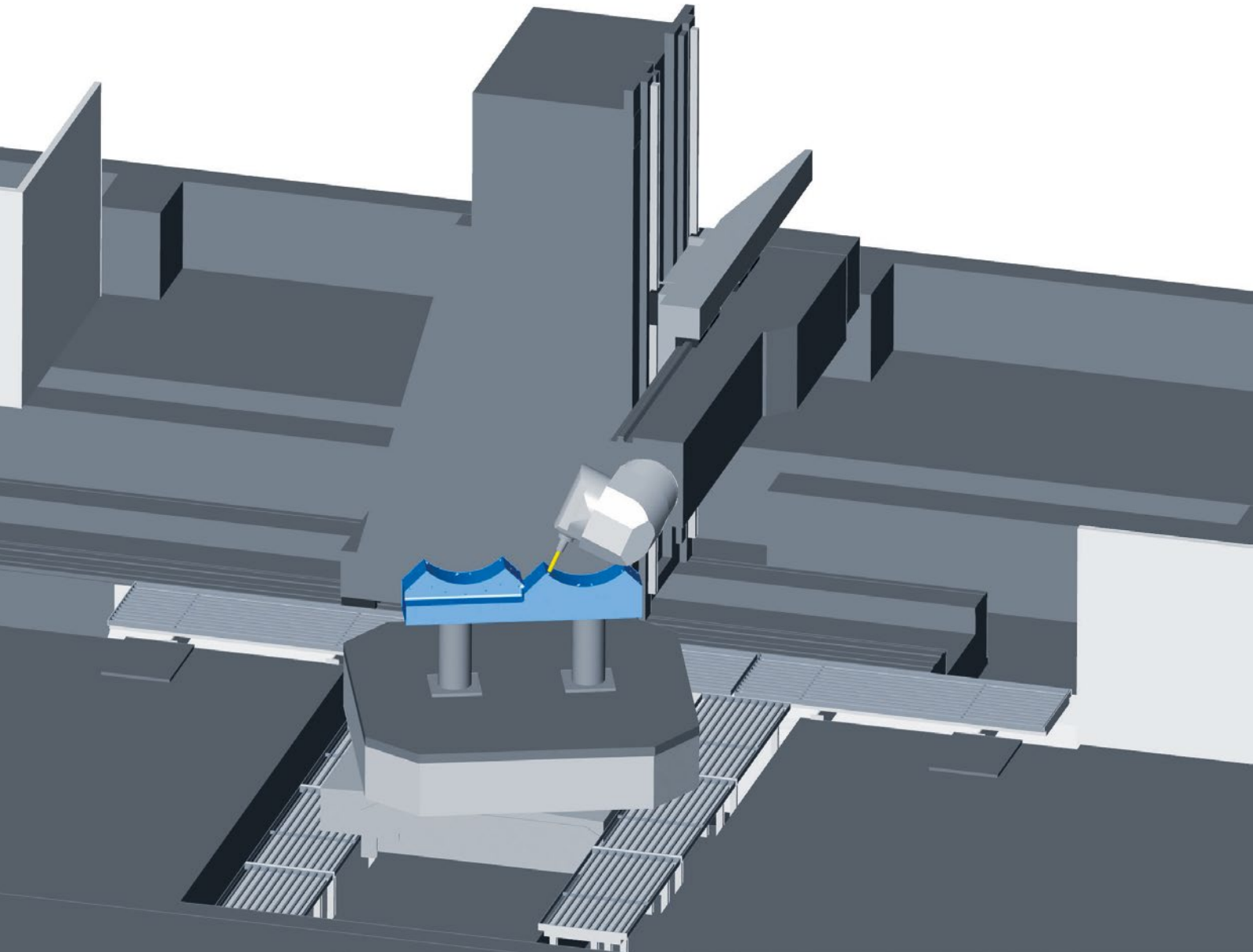
Machines with six or more axes

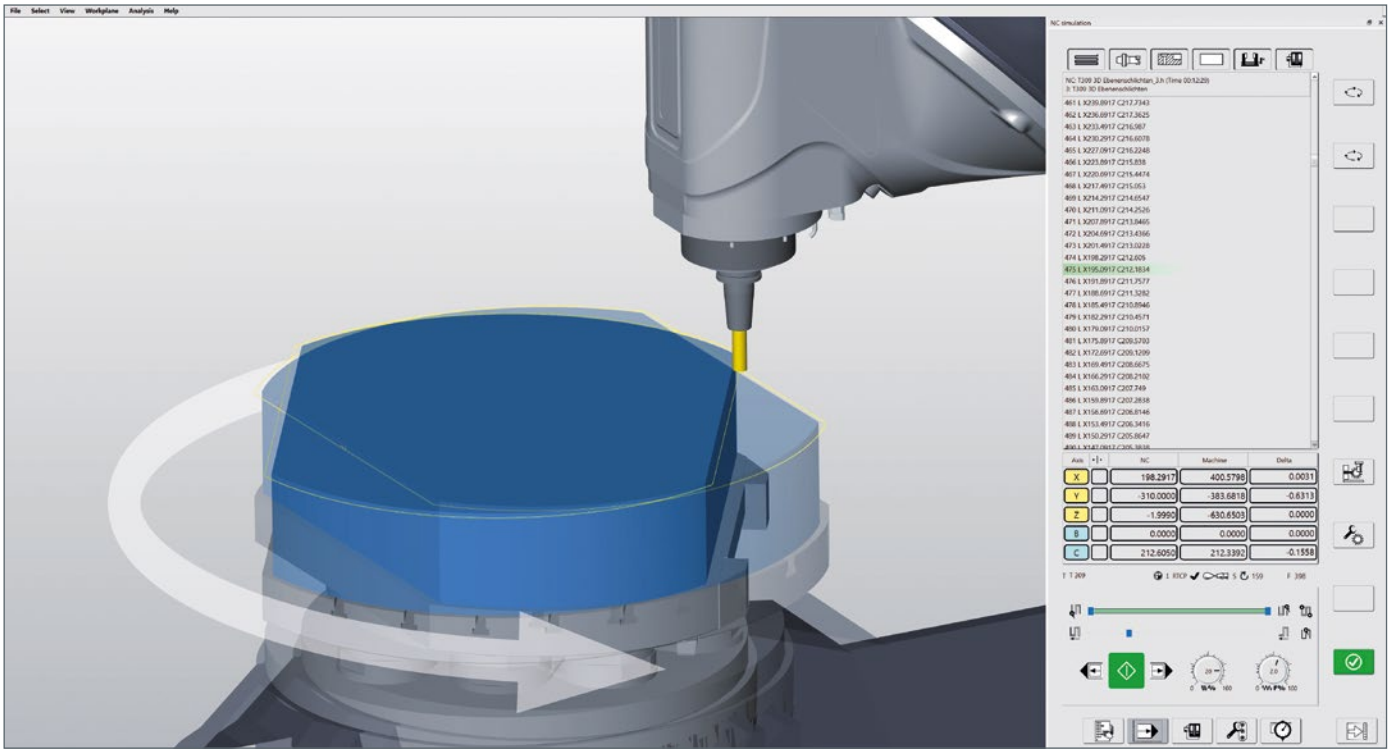
Machining on milling machines with six or more axes presents you with a variety of challenging tasks. Given the complexity of the kinematics, a deep understanding of the movement sequences and precise control are required in order to achieve exact positioning and reliable machining. Integrating a sixth or even a seventh axis opens up a wider range of machining options, however, at the same time, the movement sequences of the additional axes need to be precisely coordinated.

Use our Optimizer technology to simplify your programming and make your machining efficient and reliable – ensure even the most complex machines are safely under control.

Optimization functions

- Pre-positioning of parallel axes
- Automatic rewind movements
- Adjustment of additional parallel axis in case of limit violations
- Automatic positioning of the third rotary axis





Milling with rotary axis

Milling with a rotary axis offers significant advantages when machining components that are very large in relation to the size of the machine or when using machines with axis limitations. Our Optimizer can transform X- and Y-axis movements into one movement with the rotary axis in the table. By swapping axes, for example, an XY movement is transformed into a simultaneous CX movement. This allows, among other things, machining operations to be generated without rewind movements. This is particularly useful for machines that cannot move over the center of the table, or when machining components that take up a lot of space in the workspace.

Benefit from the possibilities offered by milling with a rotary axis, and create your NC program at the touch of a button thanks to our Optimizer technology.

Features

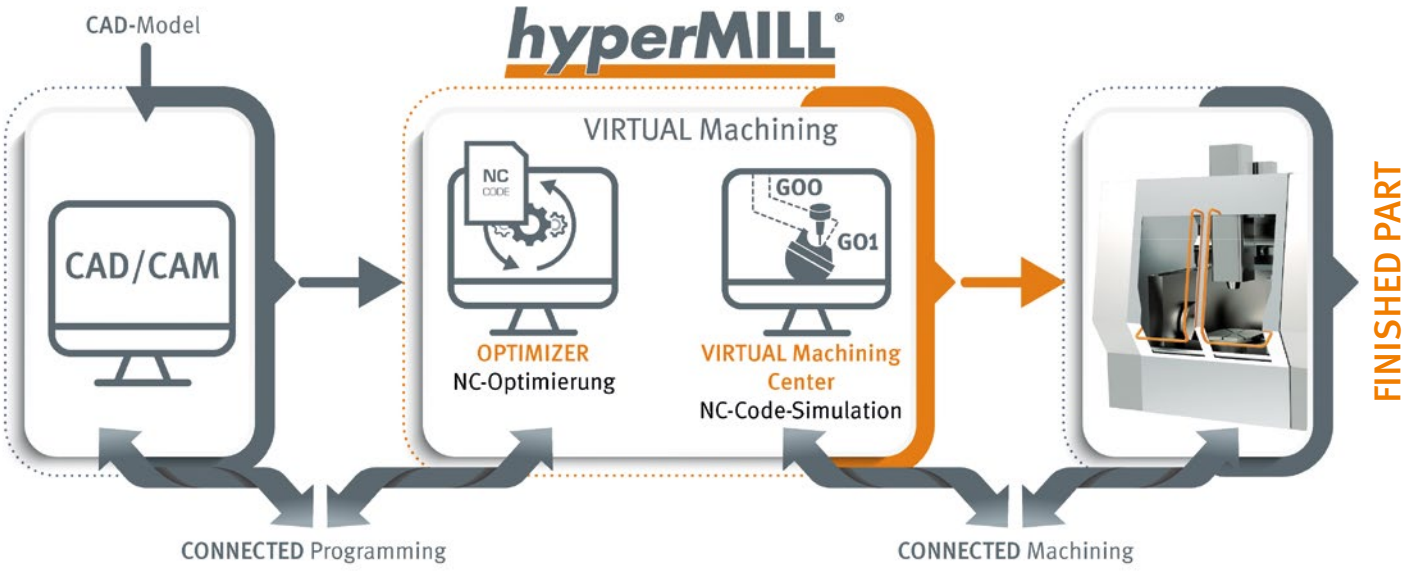
- Axis change for 3D and 5-axis jobs
- Simultaneous machining with rotary and linear axes
- Rewind movements can be avoided

Connectivity and Synchronization with the Machine

These days, if you deal with Industry 4.0, you cannot ignore the need to achieve the best possible connectivity of CAM software and machine tool. *hyper*MILL® CONNECTED Machining is able to provide this connectivity, as the module offers a bidirectional exchange of data with the machine controller, and therefore ensures unique consistency from the CAM system to the machine.

Connectivity of CAM system, simulation, and machine

Our in-house development of CAD, CAM, simulation, and other software technologies allows us to provide an unparalleled connectivity of all systems. CONNECTED Programming stands for an exchange of data between *hyper*MILL® and our simulation solution, where information can be transferred persistently in both directions. This offers the advantage that NC programs can be subsequently inserted into an active simulation session and tool information can be transferred to or received from the machine controller via CONNECTED Machining. *hyper*MILL® CONNECTED Machining therefore enables a bidirectional exchange of data between the simulation and machine, and forms the basis of many of our VIRTUAL Machining Center functions. In addition, *hyper*MILL® BEST FIT can be seamlessly integrated, ensuring a consistent process for component alignment.



Rely on our innovative connectivity solution for optimized workflows and maximum productivity!

Functions to ensure greater safety on your machines

Making mistakes is human. Safety mechanisms that effectively protect you from possible operating errors are therefore enormously important. Thanks to CONNECTED Machining, machine parameters such as zero points, tool data, and control settings are read from the machine and compared with the NC program. This means you can be sure that the NC program and machine are perfectly harmonized. In addition to safety mechanisms, *hyper*MILL® CONNECTED Machining also offers practical functions that make it easier to operate your machines.

Zero-point alignment

The machine zero points are aligned with those of the NC program. Clamping errors or incorrect positions are avoided.

Tool comparison

Tool data from the NC program is automatically compared with the tool data of the machine. If it does not match, an error message is output and the program run is halted.

NC block synchronization

The NC block of the machine can be synchronized with the *hyper*MILL® VIRTUAL Machining Center so that the machining position of the machine simulation corresponds exactly to the actual machine position.

NC program transfer

The NC program is transferred directly to the machine controller, either into a directory structure or directly into the machine's memory. This prevents program mix-ups.

Tool information transfer

Thanks to consistent data, information originating from a tool management system can be transferred from *hyper*MILL® directly to the controller's tool memory.

Reading out alarm messages

Alarm messages from the machine are read out automatically and displayed visually in the *hyper*MILL® VIRTUAL Machining Center. This means that problems can be identified at the CAM workstation.

Remote control

Perfect interaction with the machine via PC. Programs can be started and stopped easily from the computer. The feedrate can also be adjusted while the machine is running via the *hyper*MILL® VIRTUAL Machining Center.

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