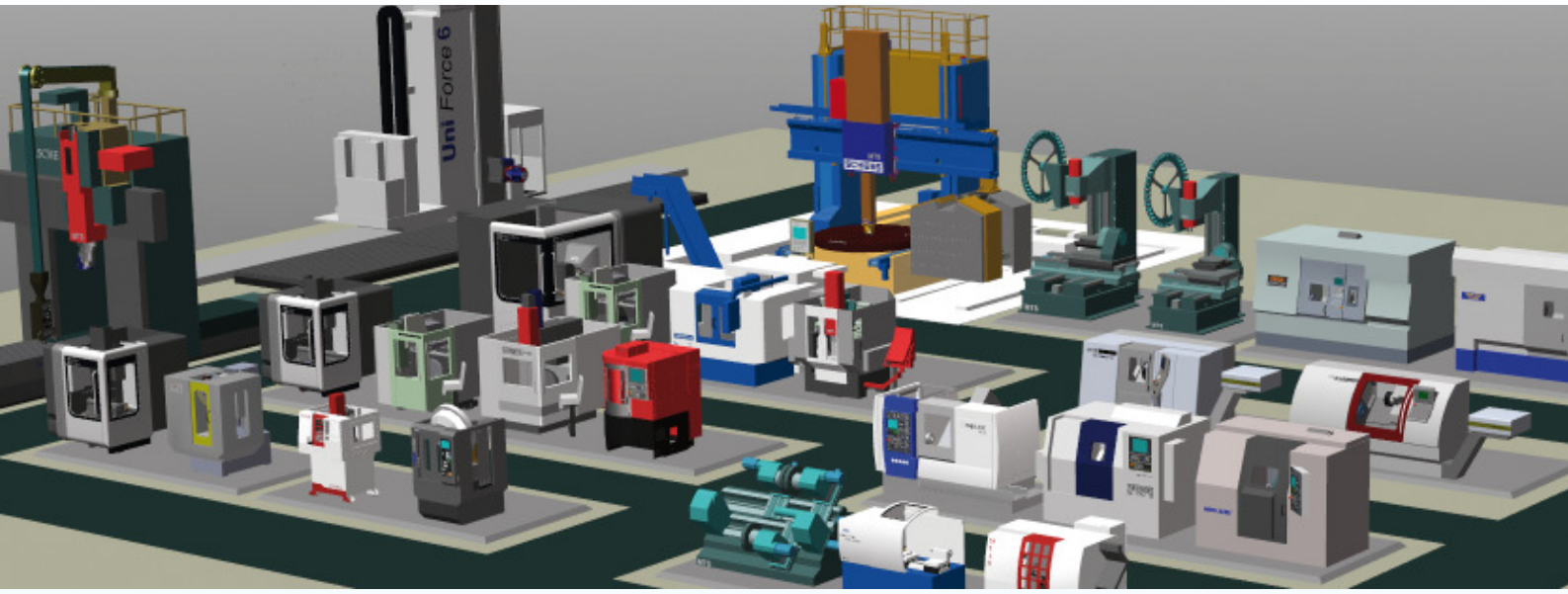
MTS CNC System

The integrated and universal CNC and CAM solution for training and production



CNC simulation of NC programs featuring the machines of the virtual 3D work shop

Training Contents in 3D Virtual Reality:

- **CAM programming**

Postprocessors

TopCAM 2D

TopCAM 3D

- **Multi-sided and complete machining**
- **Shop floor programming with canned cycles**
- **Parameter programming**

TopMill
TopTurn
TopCAT

TopFix

- **Elementary ISO programming**
- **Setup:**
  Tools, workpiece, workpiece clamping and workpiece zero point

NCTest

- **Introduction to ISO programming turning and milling**
- **CNC basics**

TopTrain
E-Learning

MATHEMATISCH TECHNISCHE SOFTWARE-ENTWICKLUNG GMBH

The tested and approved **Top Products of MTS**, which together form the **MTS CNC System**, allow a comprehensive and universal CNC and CAM training that contains and combines continuously elementary CNC learning contents to most current and advanced CAM methods. The didactic concept is based on the principle of „**working with the CNC simulators TopMill and TopTurn, in the same way as with real machine tools**“.

The **MTS CNC System** can be adapted to the CNC training contents for CNC machine operators, industrial mechanics, mechatronics technicians, tool mechanics, CNC production specialists and CNC machine tool programmers, e. g. according to the German PAL standards, as well as to the CNC training contents for technicians, master craftsmen and up to mechanical engineers. Learning assessments for each training level can be carried out simultaneously with **NCTest** (cloze text method with automatic evaluation). The use of control specific CNC command codes or the implementation of postprocessors allows a smooth and continuous transition from the virtual CNC machine tools to practical training on real CNC machines.

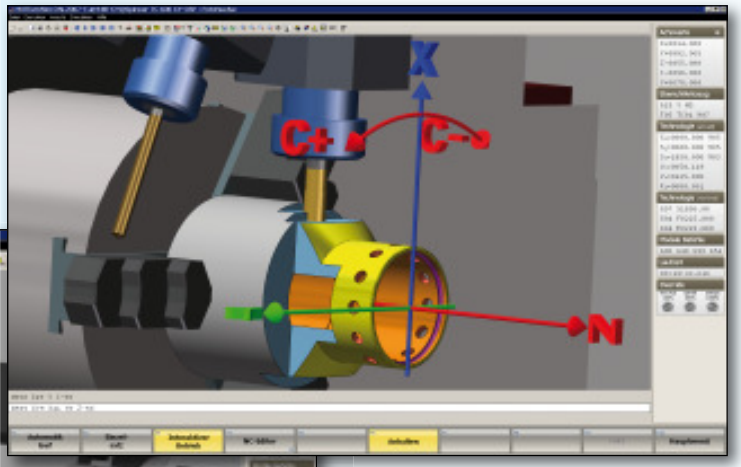
This software is able to cover technical qualifications in the vast CNC area, from CNC basics to the programming of complex machining processes on 5 axes machining centers and even up to optimizing programs.

Thereby we offer the perfect, efficient and cost effective, as well as easily implementable solution for initial CNC training, CNC staff qualification and continuing CNC education and training, starting from varying initial qualifications towards differing qualification levels, relevant for your production.

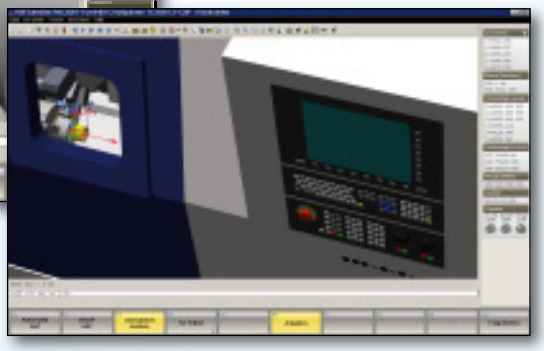
The present comprehensive CNC and CAM training solution is the result of thirty years of continuous advancement and adaption of the **MTS** CNC training and continuing training software to the development and progress of CNC-machines and their CNC controls towards the multiple axes turn-mill or mill-turn production centers of today. The development of our high quality and sophisticated material removal and machine room simulation with collision detection for turning, milling and tool grinding has established new standards in the industrial sector as well (Leading CNC control manufacturers are using our CNC simulation and canned cycles within their CNC controls).

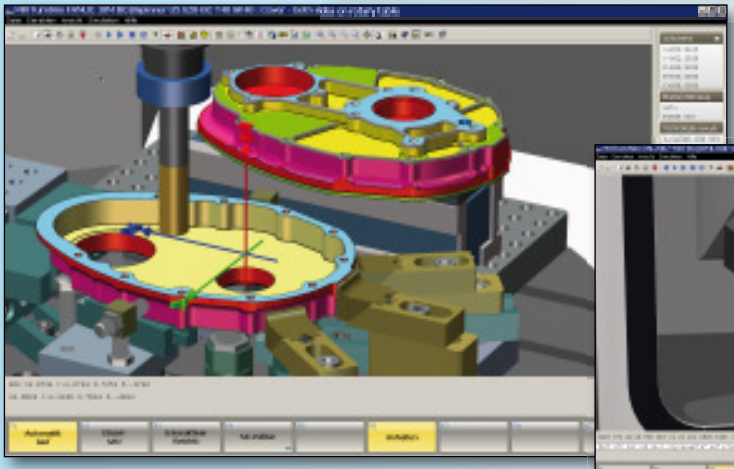
TopTurn and TopMill

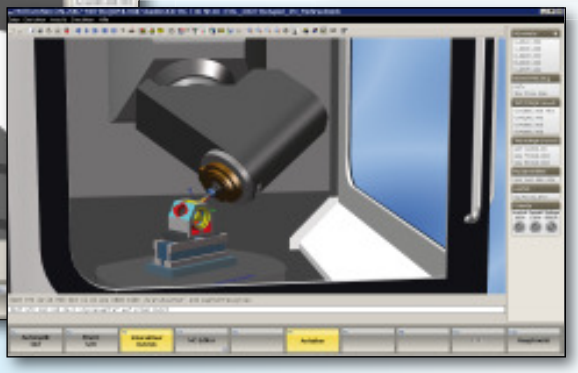
TopTurn and **TopMill** enable to write NC programs in dialogue input or in the interactive operation mode for any CNC controls and to simulate in a 2D view or in the 3D representation of workpiece and the machine room. The workpiece, the geometry of the cutting tool edge and some machine components are, however, insufficient for a realistic simulation with collision detection.



In addition, precise tool representations with the cutting edge, tool holder and tool mounting and workpiece clamping devices, as well as all collision relevant components of the machine (e.g. neighboring tools of tool turrets, tailstock, opposite spindle, dividing head) have to be included for collision detection, as a program may run collision-free in one machine but cause collisions in a different machine.







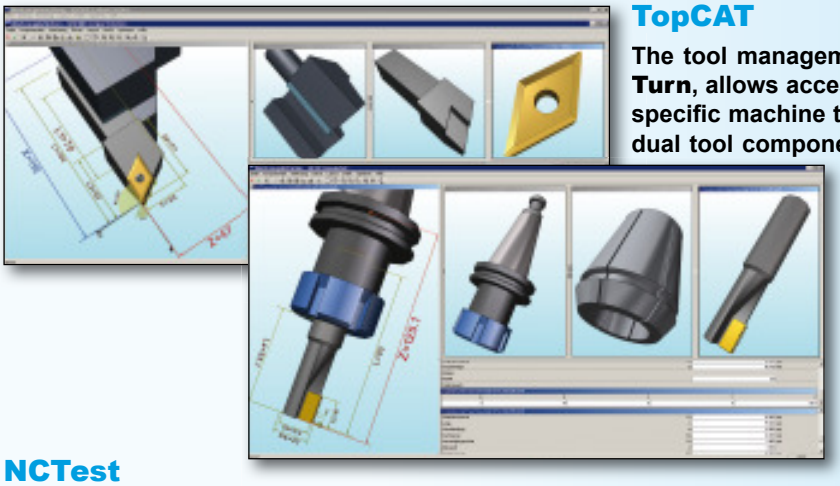
These specifications are achieved by setting up the virtual **TopMill** or **TopTurn** machine **in the same way as an actual machine**, with the assembly of the tools, determination of tool correction values, clamping of the workpiece and the determination of the workpiece zero point.

TopMill and **TopTurn** are equipped for this purpose with an easy to handle and comfortable setup dialogue, that realistically simulates all these activities in the virtual machine tools (e.g. scratching a workpiece under manual control with a hand wheel, to set the zero point of an axis). The entire setup information is summarized in a setup sheet, located in the commentary block at the beginning of the NC program.

TopTrain

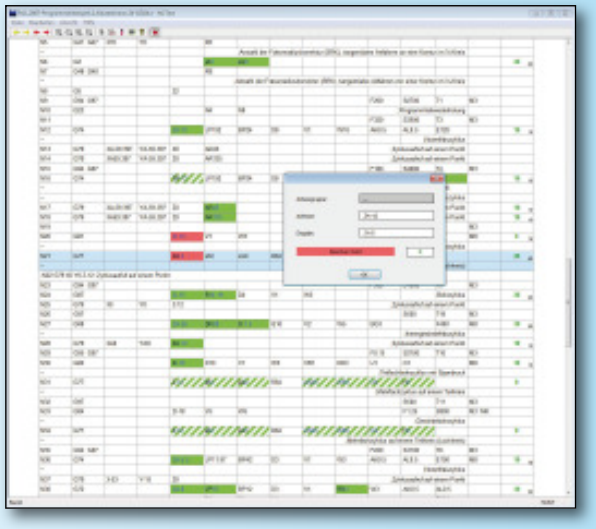
TopTrain is an E-learning module for CNC basics, CNC turning and CNC milling based on ISO standards with the inclusion of the **MTS** 3D machine room and machining simulation of exercises. The training chapters in TopTrain include the subject matters of CNC programming in the metalworking professions, from industrial mechanics to CNC machine operators and programmers.

The training content of **TopTrain** is supplemented by interactive programming exercises in cloze text format, where entries may be evaluated and corrected instantly as a means of learning assessment. The **TopTrain** evaluation module offers a convenient means of training assessment for all covered subjects, both for the trainee as well as the trainer.



TopCAT

The tool management system **TopCAT**, integrated in **TopMill** and **TopTurn**, allows access to all standard tools for the tool mounting norm of a specific machine tool, e.g. VDI 30, Shaft 20x20, SK 40 or Capto 30. Individual tool components, inserts, tool holders and tool mountings are also available for any tool assembly with correction value determination and for studying the standardized tool designations.

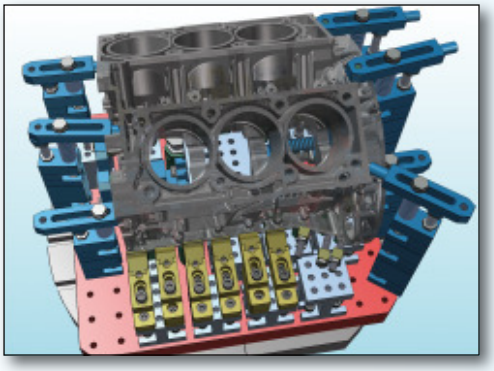


NCTest

NCTest enables you to conduct CNC examinations in cloze text format according to UTC (UTC: Fanuc compatible training control) or German PAL examination standards on PC. **NCTest** differentiates between an examination preparation and the actual examination mode. In examination mode, the start time and maximal duration of the examination can be preset. Evaluation of the examination is done automatically at the end of the exam and includes the calculation of the achieved number of points.

The cloze text examination programs can be created through the PCPrint function of **TopMill** and **TopTurn**.

In principle, **NCTest** can not only be used for the UTC or German PAL2007/2009 examination CNC control languages, but also for any other ISO-NC programming language using letters as NC addresses.



TopFix as extension of TopMill

Aside from the standard clamping devices for setup, as jaw chucks, clamping between centers or parallel vises, the modular clamping system **TopFix** can be added in order to clamp a workpiece directly onto the machine table with, e.g. rests, arresters, clamps and clamping shoes, or to clamp a complex cast workpiece with clamping elements of a modular clamping system.

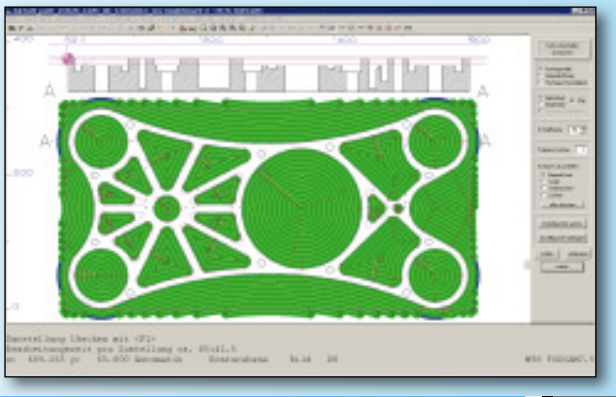
TopFix allows you to quickly and easily design a workpiece clamping by means of a interactive graphic process, for any given, prefabricated workpiece or free form raw piece, free of mounting errors and mounting collisions of the clamping components. Even complex clamping tasks can easily be planned and accomplished.

TopCAM 2D Turning and Milling Programming System

TopCAM2D is a programming system for turning and milling, integrated into a 2D-CAD-system for 2½D multi-sided milling machining and complete turnmill machining with driven tools and an opposite spindle. The CAM-section uses the **TopCAT** tool management.

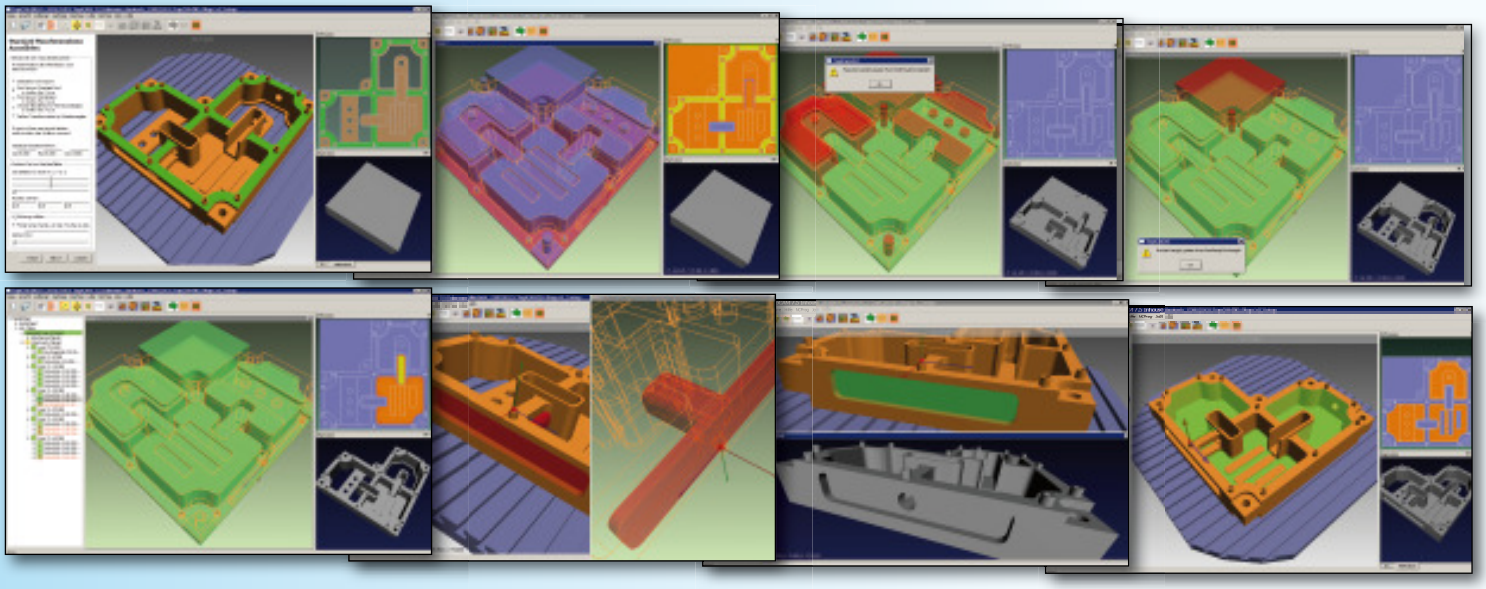
Generating the programs is done through a simply, interactive dialogue, during with the work plan (schedule) is written automatically. PAL command coding is used internally as a control-neutral format, which is converted by postprocessors into the target control code.

Due to the automated **TopMill**/**TopTurn** setup sheet creation and the inclusion of postprocessors, it is possible to simulate the created programs in **TopMill** or **TopTurn** in the **programming code of the target control** for every intermediate machining step.



TopCAM3D - 3D Milling Programming System

TopCAM3D as extension of **TopCAM2D**, supplements the **MTS** product **TopMill** with a 3D programming system for prismatic 2½D multi-sided and complete machining with 5-axes machining centers and with the import of 3D-step milling workpiece data.



TopCAM3D is a machining plane oriented 3D milling programming system with automatic machining feature recognition for classic, multi-sided machining of usually complex machine parts with 5-axes machining centers.

It will recognize features such as boreholes, rectangular, circular pockets and any other contour pockets with islands, groves as well as any other free cutting of contour areas with islands and will automatically assign roughing, residual chip roughing as well as finishing tools with its technologies Chamfers will be recognized and may also be added (e.g. for edge breaking). The system will make suggestions in regards to tools and the machining technologies and offers additional optimization algorithms for the selection of roughing tools. A selection can be made between contour-parallel, meandering and trochodial (HSC high speed cutting) removal strategies.

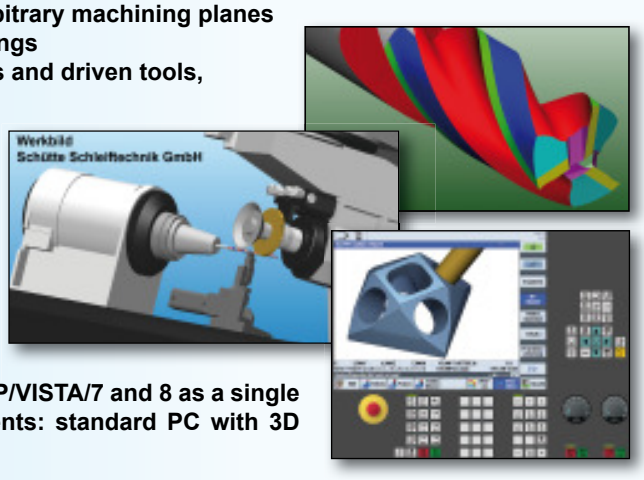
The program generation is done either completely automatic based on the machining strategy, by marking the various machining planes on the workpiece, or the user may select only some features in a machining plane and determine also their machining sequence. The corresponding NC-program is written automatically by TopCAM3D and may be simulated in TopMill as virtual test machine in the NC code of the target control at any time.

MachineAssembler

New machine models can be defined with the extension module **MachineAssembler**.

Employable training contents

TopTrain	CNC basics (general basic information and knowledge, turning basics, milling basics)
TopCAT/Fix	Setup activities, tools, tool assembly, tool correction values, workpiece clamping and workpiece zero points
TopMill/Turn	Simulation of control specific programs on different virtual machines by setup the target simulation machine via a setup sheet
TopTurn	ISO programming turning, e.g. PAL2009, UTC, Fanuc, Mazak, Siemens canned cycle programming turning, workpiece transfer to opposite spindle turnmill machining with driven tools on the front face, cylindrical surface and tendon surfaces (with Y and B axes)
TopMill	ISO programming milling, e.g. PAL2009, UTC. Fanuc, Heidenhain, Siemens, canned cycle programming milling multi-sided milling machining with the programming of arbitrary machining planes
TopCAM2D	Preparation: Interpretation and creation of technical drawings CAM introduction turning rotational symmetric workpieces and driven tools, CAM introduction milling for 2½D machining
TopCAM3D	3D-CAM multi-sided machining with feature recognition



Reference products in Production

A.H. Schütte CNC simulation of tool grinding and multi spindle machining
Siemens 828D/840D CNC control simulation and Sinutrain simulation

System requirements

The software is compatible with the operating systems WINDOWS 2000/XP/VISTA/7 and 8 as a single user license or multiuser network license version. Hardware requirements: standard PC with 3D standard graphic card

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