



Functions of the TNC7

Comparison with the TNC 640

Dynamic, convenient, intuitive

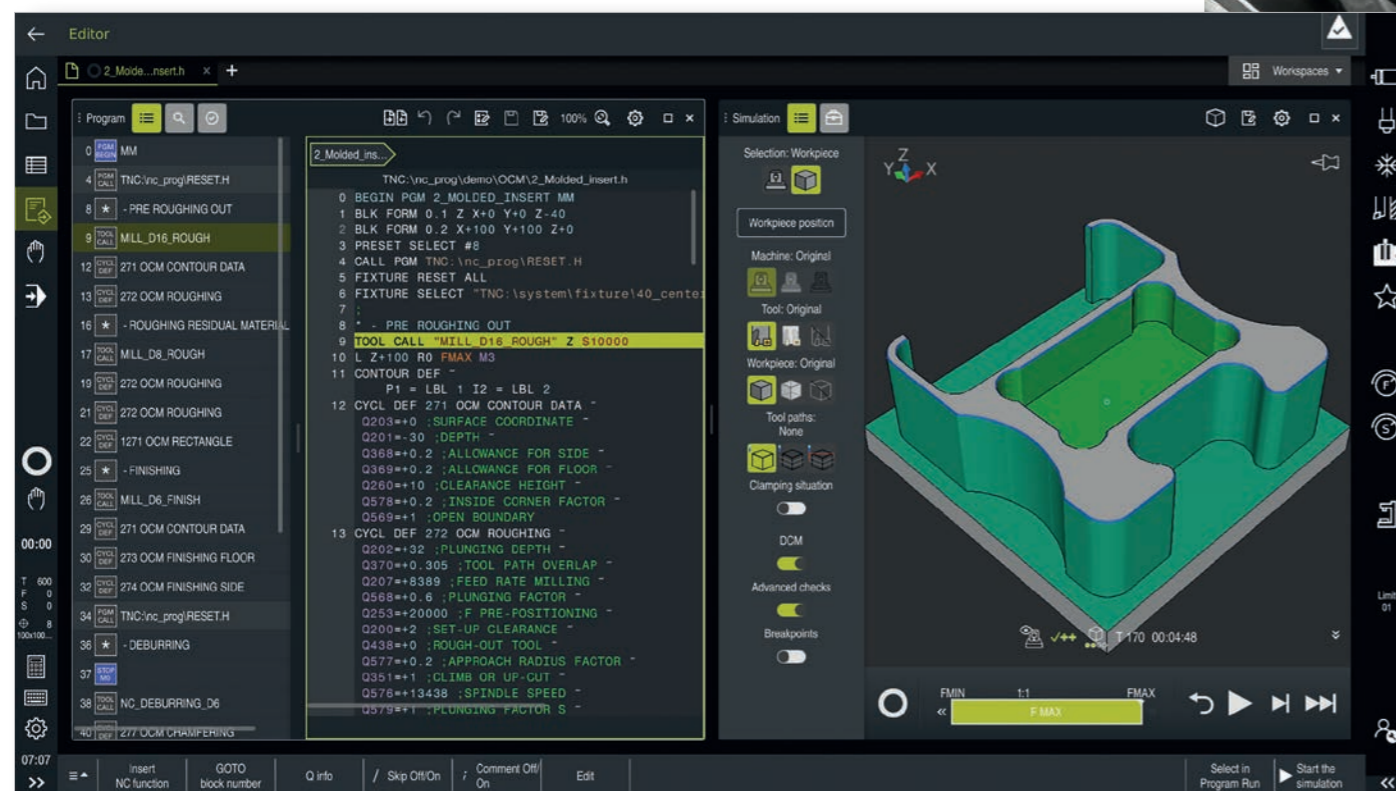
The TNC7 from HEIDENHAIN sets new standards: this next level of CNC control offers an outstanding user experience and puts new possibilities at your fingertips. In fact, the entire user guidance system is designed to assist you with programming, machine setup, or part measurement. Perfect visualization of the machined part and work envelope make everyday work much easier. This high level of performance is achieved by the very intuitive touch-operated software. You can rotate images, select functions, and navigate, all with dynamic tapping and swiping motions on the touchscreen.

Depending on the range of parts to be produced, the tasks placed on a milling machine can be highly complex and varied. The TNC7 can be adapted optimally to your individual needs. You can structure and organize the screen contents of the TNC7 any way you desire, including individual favorites and a home view for rapid selection, giving you information and functionality exactly where you need it.

The perfectly matched software and hardware components of the TNC7 make a particularly ergonomic work environment possible. The operating design of the TNC7 is fully touch-optimized. Naturally you can also continue to use the keyboard and the trackball.

Your benefits

- **Increase efficiency**
Arrange and select the workspaces fittingly to the tasks
- **Maximum flexibility**
Modes for right-handed and left-handed users, Dark mode, and more
- **Very dynamic operation**
Very fluid and quickly-responding touch operation
- **Get started quickly**
Brief training videos explain functions and the correct operation
- **Ergonomic operational design**
Perfectly matched software and hardware components



Programming with optimum efficiency

The TNC7 supports you in every situation ideally, from program creation to workpiece setup to inspection of the finished part. A special highlight of the TNC7 is a new function for contour programming.

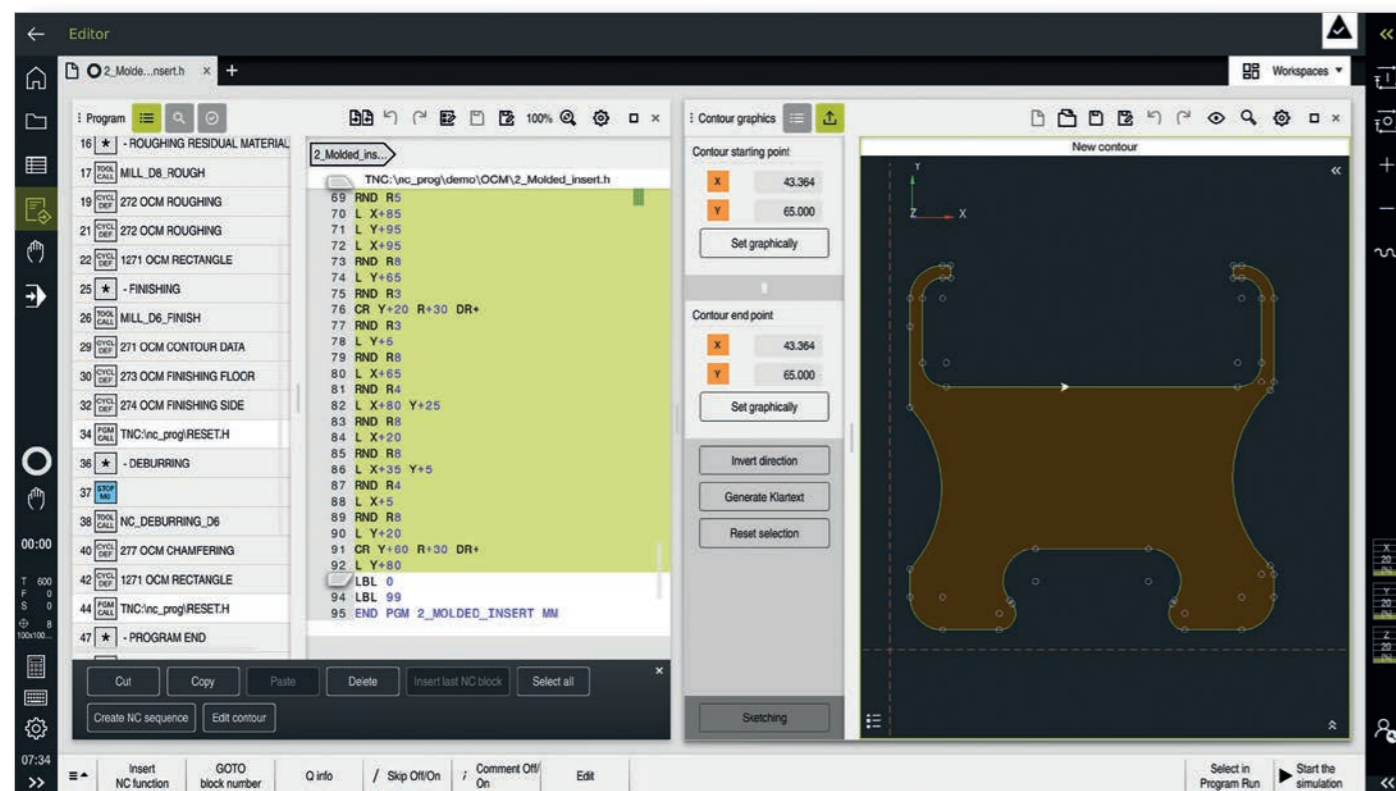
The TNC7 supplements the familiar Klartext programming with smart functions. With the newly developed graphical programming feature, you draw contours directly on the touchscreen and clearly define them with dimensional information. The TNC7 converts this drawing to Klartext and saves it as a program. From simple parts to complex contours, on a TNC7 you program your workpiece contours in a very short amount of time.

For a fast, guidance-supported start to programming, the new editor expands the well-established, dialog-guided programming method with fillable-form-based input screens for all Klartext commands. Using the optimized structuring function, you efficiently navigate through an NC program with ease.

The fast, high-resolution simulation offers you a perfect visualization of the workpiece, workholding equipment and work envelope. A touch-optimized zoom function very efficiently leads you to the decisive details in the virtual work envelope.

Your benefits

- **Simple operation**
Rapidly begin programming with form-based entries
- **Intuitive programming**
Program contours using touch gestures
- **Effective program checking**
Identify programming errors with a realistic simulation
- **Proven know-how**
Klartext is still the data basis and output format
- **Clearly arranged data organization**
Central file management with recycle bin functionality
- **Full compatibility**
Usability of already existing NC programs



Assistance throughout the machining process

The TNC7 supports you with thoughtfully designed solutions at every stage, from initial design to the finished workpiece. For example, with smart new probing functions and graphical guidance for aligning your workpieces and workholding equipment.

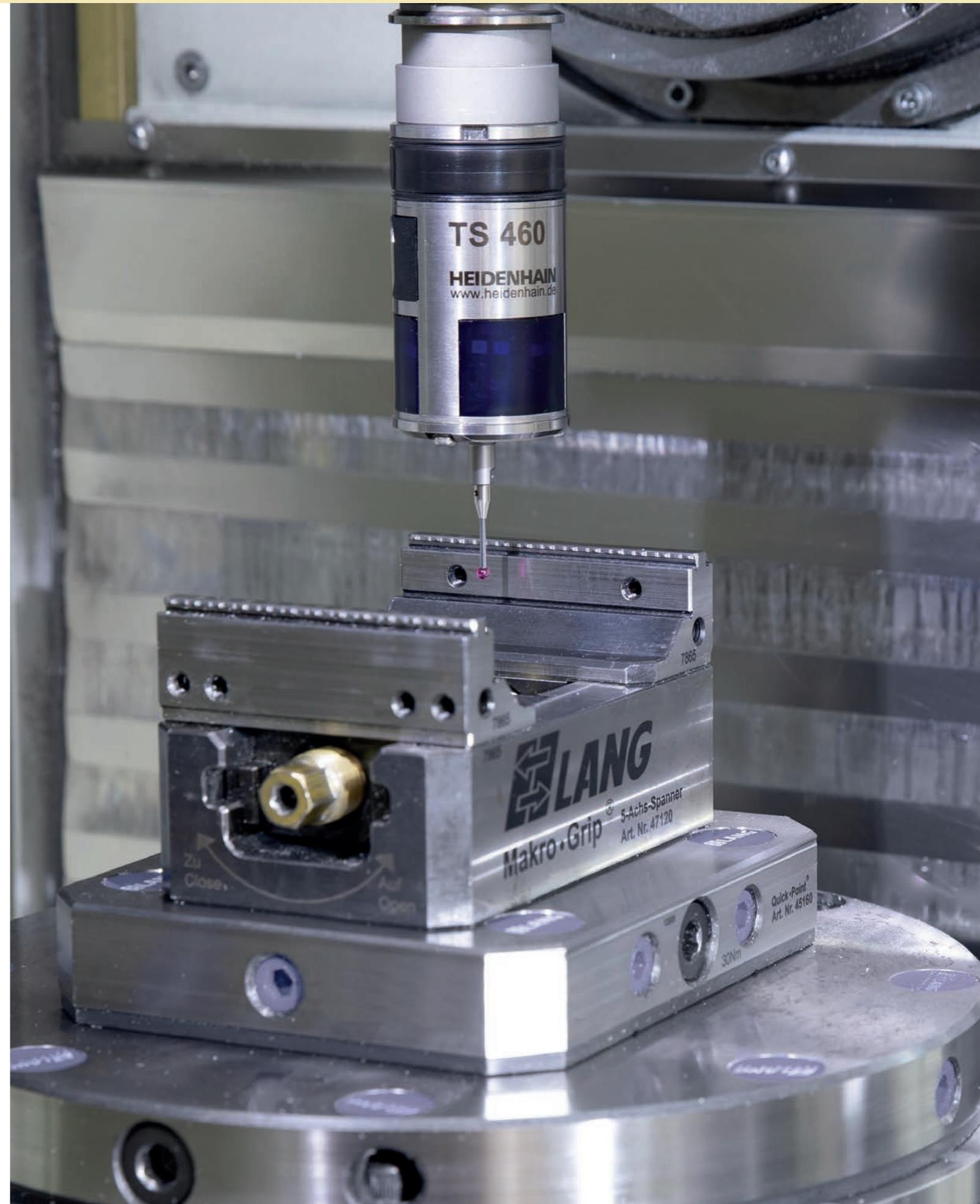
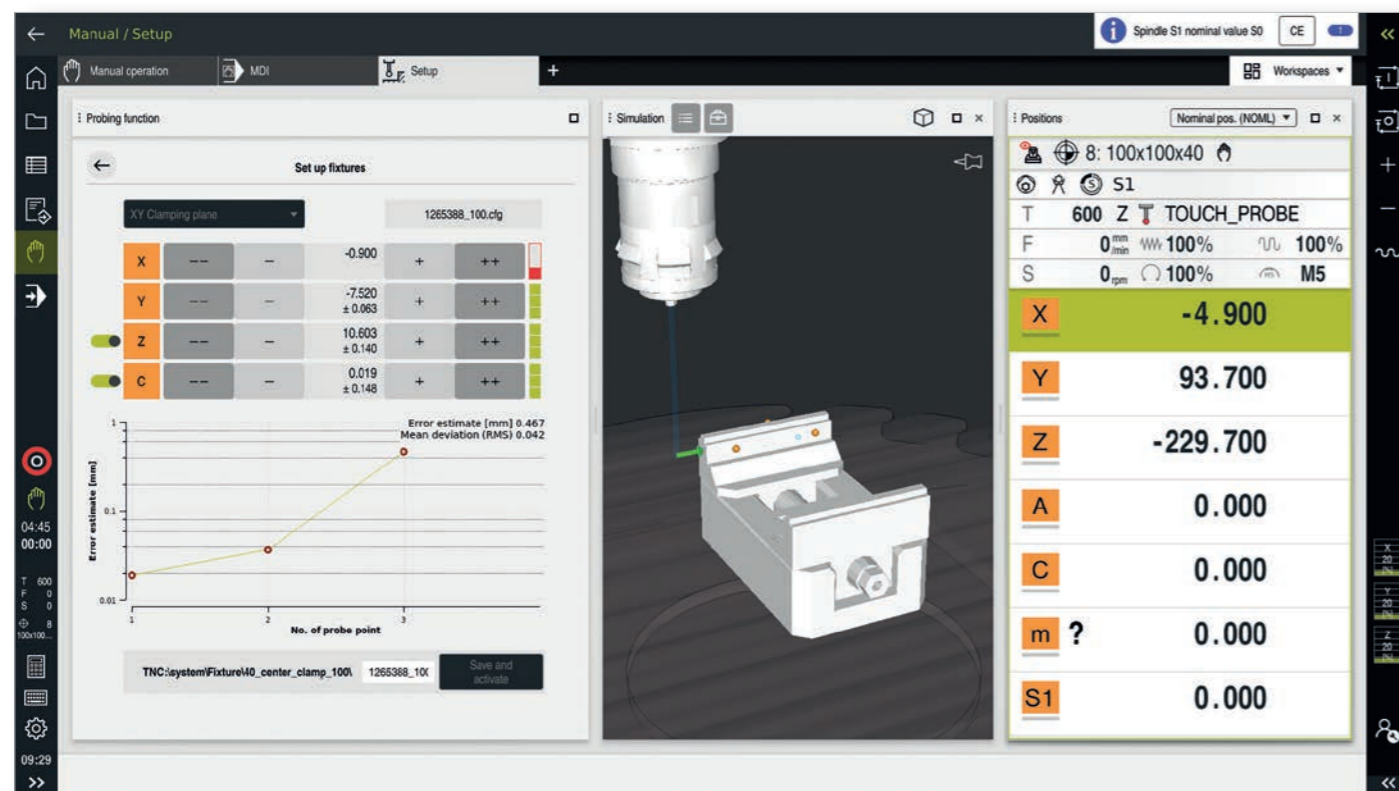
The TNC7 takes Dynamic Collision Monitoring to the next generation. DCM does more than prevent collisions between machine components and tools or workholding equipment. The new version of DCM also lets you graphically measure and record the workholding equipment on the machine table. With this unique function, you can intuitively and reliably record fully any workholding equipment on the machine table in very little time. All you need for this is a 3D model. The CAD Model Optimizer

function of the TNC7 lets you optimize your 3D models. That way, 3D models of workholding equipment with low data quality can be upgraded by the TNC7 for virtualization of the work envelope.

Along with graphical measurement and recording of the workholding equipment, you can use the Model Aided Setup function to measure and record workpieces with graphic guidance. That way you don't have to worry about either the probing functions or their sequence. The TNC7 guides you through the measuring task intuitively. So you can quickly and easily determine up to six degrees of freedom for a workpiece. The well-known manual probing functions for setting up workpieces were also fundamentally revised. The TNC7 now leads you through the measurement task with dialog guidance and context-sensitive help images.

Your benefits

- **Convenient setup**
Graphically supported setup of workpieces and workholding equipment
- **3D data optimization**
Generate and repair STL files for workholding equipment
- **Collision avoidance**
Dynamic collision monitoring for machine elements, tools and workholding equipment
- **Easy data transfer**
Import of workholding equipment with standard 3D file formats



Integrated component and process monitoring

The control's integrated process monitoring functionality reliably detects process disturbances. You can control this monitoring through simple Klartext syntax and an intuitive user interface. With no additional sensors required, it dependably detects deviations from reference machining operations and thus ensures high process quality. This avoids subsequent damage due to undetected tool breakage. The process monitoring function of the TNC7 reliably supports you during series production at all times and for every workpiece.

Your benefits

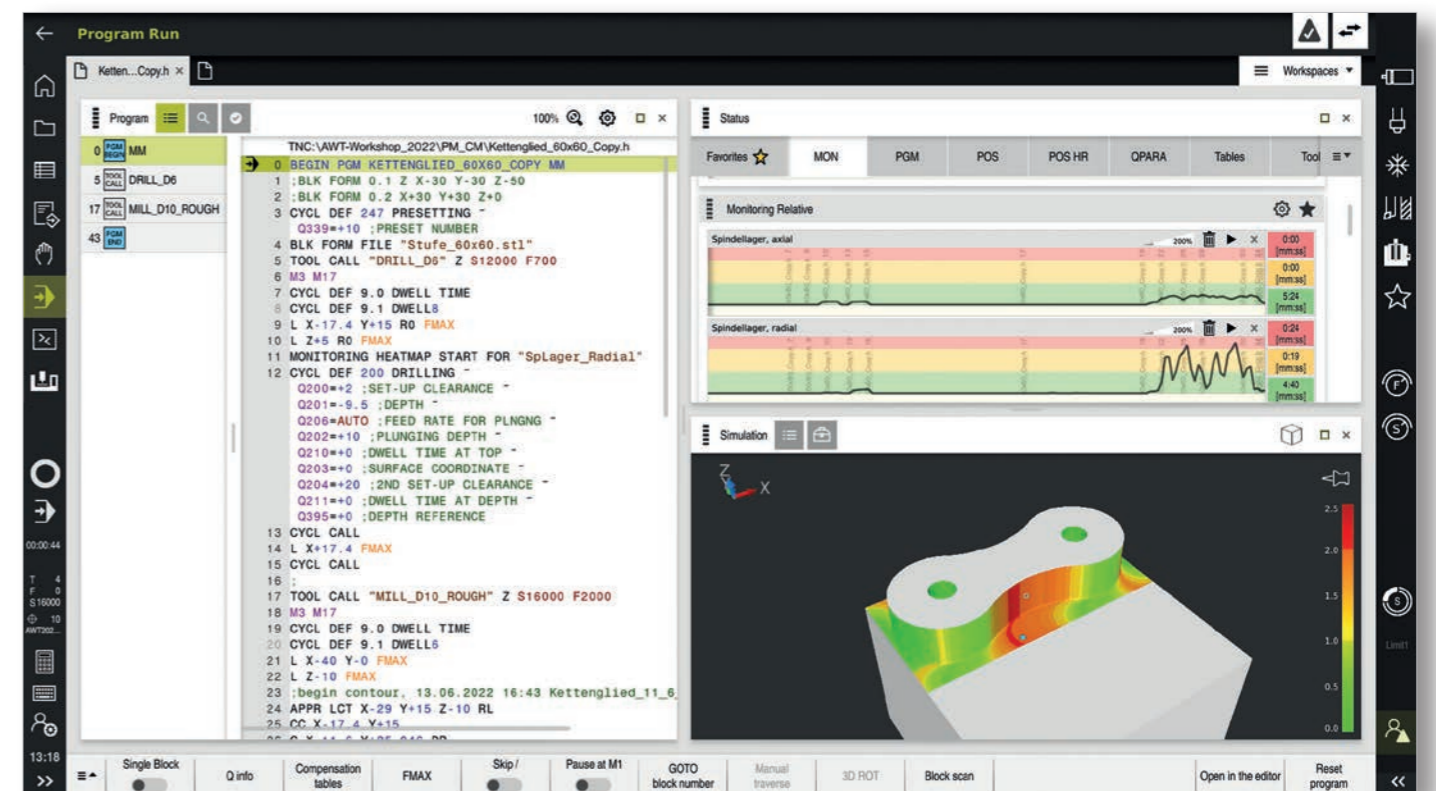
- **Increase process reliability**
Reliable monitoring due to reliable synchronization at the program block level
- **Ensure productivity**
Detect errors through deviations from a reference machining run
- **Reduce scrap**
Intelligent possible error reactions, such as inserting a replacement tool
- **Straightforward analysis**
Shown as a 3D visualization and a 2D graph
- **Simple and uncomplicated**
Easy to program, no installation necessary

The component monitoring functionality of the TNC7 protects your valuable investment in a machine tool. It's a toolbox that allows machine manufacturers to implement extensive monitoring functions. During machining, this function can protect the spindle bearing from overload, detect increased component wear in the drive train, and more.

The component monitoring function does not just monitor the running process: it also provides for predictive analysis of data. The TNC7 thus offers an optimum basis for economical planning of maintenance measures and an evaluation of the process capability.

Your benefits

- **Machine protection**
Reliably avoid damage to machine components
- **Predictive planning**
Monitoring of wear in the drive train
- **Simple checking**
Display wear levels and receive warnings
- **Overload avoidance**
Detect warning and error limits



Functions of the TNC7

New functions of the TNC7

Function	Explanation
TNC user interface	
TNC bar	The TNC bar gives you a perfect overview for confident navigation. The TNC bar can be expanded or minimized
Left-/Right-handed mode	The TNC7 lets you individually arrange the TNC and OEM bars
Dark mode	Special color scheme for working in low ambient light
Flexible arrangement of workspaces	In the individual operating modes, various workspaces can be selected, hidden, magnified, reduced, or shifted
Learning videos	Brief training videos where new functions are clearly explained step-by-step are integrated in the TNC7
Central area for settings and configuration options	The TNC7 features a Settings tab in the Home operating mode. From here you have access to all settings and configuration options
Favorites system for rapid access	User-defined selection of frequently used functions for better overview in daily use. The user can choose favorites (files, parameters, NC functions, entries in status displays) that are then shown in quick-access menus
Status overview	On the TNC bar, the control shows a status overview with the execution status, the current technology values, and the axis positions
Screen keyboard	You can use the virtual keyboard for entering NC functions, letters, and numbers, and for navigation
Integrated user documentation	User's Manuals are available in HTML format for use as the TNCguide, an integrated product help directly on the control
Operating modes	
Home	Simple and direct access to functions that are important to you. Two examples of this are the search function and a selection of frequently used favorites
Files	Central area for management of all files. In the file management, the control displays drives, folders, and files. You can, for example, create or delete folders or files and can also connect drives
Tables	Central area for management of all tables. In the Tables operating mode you can open various tables and edit them as necessary
Improved workflow through fewer operating modes	<ul style="list-style-type: none"> MDI operation is integrated in the Manual operating mode The operating modes Program Run, Single Block and Program Run, Full Sequence are now in the Program Run operating mode The operating modes Programming and Test Run are now in the Editor operating mode. This means you don't need to switch between operating modes when simulating and editing an NC program

Function	Explanation
File management	
File management	File management is independent of other operating modes. Tabs make file operations across multiple folders possible
Recycle bin	The TNC7 has a recycle bin. That way you can restore files that were deleted accidentally
Information area	In the information area of individual files the control shows the path of the file or folder, as well as other information (e.g., the last changed date). In the information area you can set write-protection for files or mark them as favorites
Shortcuts	Touch gestures and key combinations can be configured, e.g. for copying, pasting, undoing an action, redoing an action, deleting, marking, etc.
Context menu	With a long-press gesture or by right-clicking with the mouse, the control opens a context menu for the selected element
Tables	
Favorites in the Tables operating mode	You can use the favorites to show the most important entries of a form, and thus create your own form
Editor	
Entering cycles and functions through the "Insert NC function" button	As an alternative, you can still insert them through the CYCL DEF, TOUCH PROBE or SPEC FCT keys
Opening more than one NC program at a time	On the TNC7, you can open more than one NC program at a time, for example in order to compare contents and copy them from one program to another
Entries in forms	In the Form column, the TNC7 shows all possible syntax elements for the currently selected NC function. You can edit all syntax elements in the form
Program comparison	You use the program comparison function to determine differences between two NC programs. You can copy the differences into the active NC program
NC sequences	You use the NC sequences to store frequently used NC blocks as sequences. That way you don't have to repeatedly program the individual blocks, but can simply call the necessary NC sequence
Contour programming	
Graphical programming with intuitive drawing functions and gesture recognition	Graphical programming is an alternative to conventional Klartext programming. You draw lines and arcs to create a 2D sketch and then generate a Klartext contour from it. You can also edit existing contours
Simulation	
Cutout view	In the Cutout view you can cut through the simulated workpiece along any axis. This enables you to check for holes and undercuts in the simulation, for example
Model comparison	The Model comparison function is used to compare the blank and finished part in STL or M3D format with each other. Color gradients show differences in the amount of material. The more material there is, the deeper the color is. The probing function determines the material difference

Functions of the TNC7

New functions of the TNC7 (continued)

Function	Explanation
Setup	
Manual probing function for tool measurement	With the Tool measurement function you determine the tool dimensions by touching the workpiece
Manual probing function for aligning a plane via cylinders	With the Plane via cylinder function (PLC) you probe either one or two cylinders, each at two different heights. The control calculates the spatial angle of a plane from the probed points
Tool change in the Manual operating mode	Rapid tool change in the Manual operating mode without executing an NC block during program run or MDI
Graphic support for the measurement of fixtures	Determine the exact position of workholding equipment with interactive and graphically supported probing functions. The TNC7 correctly guides you through the entire probing process
Graphic support for the measurement of workpieces	Determine the exact workpiece position with interactive and graphically supported probing functions. The TNC7 correctly guides you through the entire probing process
Program execution	
Process Monitoring	Reference-based monitoring of the machining process: the control uses this software option to monitor defined machining sections during program run. The control compares changes in the spindle load and/or tool load with the values of a reference machining operation

Modified functions

Function	Explanation	TNC7	TNC 640
Programming			
Search function	The search function of the TNC7 has been enhanced. For example, you can search all opened programs for a certain tool. The search function is also available in other operating modes	✓	✓
Context-sensitive help for error messages	Error messages are shown directly at the input fields. Entries are checked as they are made. For example: excessive characters entered	✓	✓
Structure view in NC programs	The new structure function not only shows structure items in the NC program; it also shows subprograms, tool calls and labels, as desired. You can configure the elements that are shown. This greatly simplifies navigation in the NC program. On the TNC7, the configured elements are automatically available as structure items in the machine operating modes and in the Editor operating mode	✓	✓
Simulation			
Plane view	Plane-parallel view in six directions	✓	✓
Setup			
New manual probing functions	The TNC7 simplifies machine setup thanks to smart probing functions. Via a button menu, you select the desired probing function. The probing functions then provide step-by-step guidance through the measuring task, with intuitive user guidance, context-sensitive help images, and a clear presentation of the probing result	✓	✓
Program run			
Display of the program run time and progress	The TNC7 shows this information in the Status workspace and in the TNC bar	✓	✓
Operation			
Universal zoom function	The zoom function (two-finger gesture) is available everywhere in the user interface. That way you can magnify or reduce the 3D model in the simulation or the font size of tables or NC programs, for example	✓	-

✓ Available

Functions of the TNC7

Functions that will appear in a later version of the TNC7

Function		TNC7	TNC 6xx
Programming graphics	2D line graphics	<input type="radio"/>	<input checked="" type="checkbox"/>
Program execution	Autostart (automatic program start)	<input type="radio"/>	<input checked="" type="checkbox"/>
ISO programming	The TNC7 features basic functions for the editing of ISO program code. Dialog-guided program entry will be available in a later software version	<input type="radio"/>	<input checked="" type="checkbox"/>

- ✓ Available
○ Will be integrated in a later version

Functions no longer supported

Function	Explanation	TNC7	TNC 6xx
Operation			
MOD menu	The settings in the MOD menu are now in the Home operating mode under the Settings application	-	✓
Program entry			
smartSelect	The TNC7 has new, convenient possibilities for inserting new NC functions	-	✓
Soft keys	The TNC7 has a context-sensitive function bar with buttons; additional actions are commanded from within the respective workspaces	-	✓
Programming			
Cycle 7 Datum	Cycle 7 Datum is automatically converted into TRANS DATUM	-	✓
Cycle 19 Working Plane	The PLANE functions replace Cycle 19	-	✓
Contour programming			
FK free contour programming	With the new graphical programming function, FK contour definitions can be imported and processed. However, FK program code cannot be exported	-	✓

- ✓ Available
- Not available

Options

Machining functions

Option number	Option	Description	TNC7	TNC 640
0...7	Additional Axis	Additional control loop 1 to 8	•	•
8	Advanced Function Set 1	Rotary table machining <ul style="list-style-type: none"> Programming of contours M116: Feed rate in distance per minute Coordinate transformation <ul style="list-style-type: none"> Tilting the working plane, PLANE function Interpolation <ul style="list-style-type: none"> Circular in 3 axes with tilted working plane 	•	•
9	Advanced Function Set 2	3D machining <ul style="list-style-type: none"> 3D tool compensation via surface normal vectors Alteration of the swivel head angle via the electronic handwheel during program run without changing the position of the tool center point (TCPM = Tool Center Point Management) Keeping the tool perpendicular to the contour Tool radius compensation perpendicular to the tool direction Manual traverse in the active tool-axis system Interpolation <ul style="list-style-type: none"> Linear in more than four axes (export license required) 	•	•
17	Touch Probe Functions	Touch probe cycles <ul style="list-style-type: none"> Workpiece misalignment compensation, preset setting Automatic tool and workpiece measurement Touch-probe input enabling for non-HEIDENHAIN systems This option is automatically enabled upon connection of an SE 661 (EnDat)	✓	✓
18	HEIDENHAIN DNC	Communication with external PC applications over COM component	•	•
19	Advanced Programming Features	Extended Programming Functions <ul style="list-style-type: none"> Canned cycles Peck drilling, reaming, boring, counterboring, centering Milling internal and external threads Clearing level and oblique surfaces Complete machining of straight and circular slots Complete machining of rectangular and circular pockets Circular and linear point patterns Contour train, contour pocket, including contour-parallel machining Special cycles developed by the machine manufacturer can be integrated Engraving cycle: engrave text or numbers in a straight line or on an arc Contour slot with trochoidal milling 	✓	✓
20	Advanced Graphic Features	Program-verification graphics, program-run graphics <ul style="list-style-type: none"> Plan view Projection in three planes 3D view 	✓	✓
22	Pallet Management	Pallet management	✓	✓

Options

Machining functions (continued)

Option number	Option	Description	TNC7	TNC 640
24	Gantry Axes	Gantry axes via master-slave torque control	✓	✓
40	DCM Collision	Dynamic collision monitoring (DCM)	•	•
42	CAD Import	Download contours and machining positions from DXF files Import of contours from 3D models	•	•
44	Global PGM Settings	Global program settings <ul style="list-style-type: none"> • Superimposition of coordinate transformations in the program run modes • Handwheel superimposition 	•	•
45	Adaptive feed control (AFC)	AFC: Adaptive Feed Control (adaptive control of the contouring feed rate depending on spindle power)	•	•
46	Python OEM Process	Execute Python applications (Python is a powerful, object-oriented programming language that can be used within the control (PLC))	•	•
48	KinematicsOpt	Touch probe cycles for automatically measuring rotary axes (execution of an initial measurement and optimization of the active kinematics of rotary axes)	•	•
49	Double-Speed Axes	Double-speed control loops are used primarily for high-speed spindles as well as for linear motors and torque motors (short control loop cycle times for direct drives)	•	•
50	Turning	Turning functions <ul style="list-style-type: none"> • Tool management for turning • Tool radius compensation • Switching between milling and turning mode • Turning-specific contour elements • Package of turning cycles Eccentric turning	•	•
52	KinematicsComp	Spatial compensation of errors in linear motors and torque motors (short control loop cycle times for direct drives)	•	•
56...61	OPC UA	HEIDENHAIN OPC UA NC Server 1 to 6 Standardized interface for access to data and functions of the control	•	•
77	4 Additional Axes	4 additional control loops	•	•
78	8 Additional Axes	8 additional control loops	•	•
92	3D-ToolComp	3D radius compensation based on the contact angle (only with the Advanced Function Set 2 software option)	•	•
93	Extended Tool Management	Extended tool management	•	•
96	Advanced Spindle Interpolation	Additional function for interpolated spindle <ul style="list-style-type: none"> • Interpolation turning, coupling • Interpolation turning, contour finishing 	•	•
101...130	OEM option	Options of the machine tool builder	–	•
131	Spindle Synchronism	Synchronization of two or more spindles (requires software option 50)	•	•
133	Remote Desktop Manager	Display and remote operation of external computer units (e.g., a Windows PC)	•	•

Option number	Option	Description	TNC7	TNC 640
135	Synchronizing Functions	RTC: advanced synchronization of axes and spindles	•	•
136	Visual Setup Control	VSC: camera-based monitoring of the setup situation	–	•
137	State Reporting	State Reporting Interface (SRI): provision of operating conditions	–	•
140	DCM v2	Fixture measurement (automatically enables option 40)	•	–
141	Cross talk compensation	CTC: compensation of position errors due to axis coupling	•	•
142	Position Adaptive Control	PAC: position-dependent adaptation of control parameters	•	•
143	Load Adaptive Control	LAC: load-dependent adaptation of control parameters	•	•
144	Motion Adaptive Control	MAC: motion-dependent adaptation of control parameters	•	•
145	Active Chatter Control	ACC: active suppression of chatter	•	•
146	Machine Vibration Control	MVC: damping of machine vibrations	•	•
152	CAD Model Optimizer	<ul style="list-style-type: none"> • Generate correct STL files from STEP files • Repair existing STL files 	•	•
154	Batch Process Manager	Function for the planning and execution of multiple production orders (requires software option 22)	•	•
155	Component Monitoring	Monitoring for component overloading and wear	•	•
156	Grinding	Function for grinding operations on milling machines In addition, dressing of the grinding wheels is supported. The option also offers the user a comprehensive package of cycles for both types of operations (see User's Manual), which are programmed in HEIDENHAIN's shopfloor-oriented Klartext format	•	•
157	Gear Cutting	Functions for the machining of gear teeth	•	•
158	Turning v2	Expanded turning cycles and functions (automatically enables option 50)	•	•
159	Model Aided Setup	Function for graphically supported alignment of workpieces	•	–
160	Integrated FS: Full	Enabling of functional safety and four safe control loops	•	•
161	Integrated FS: Full	Enabling of functional safety and maximum number of safe control loops	•	•
162	Add. FS Ctrl. Loop 1	Additional control loop 1	•	•
163	Add. FS Ctrl. Loop 2	Additional control loop 2	•	•
164	Add. FS Ctrl. Loop 3	Additional control loop 3	•	•
165	Add. FS Ctrl. Loop 4	Additional control loop 4	•	•

Options

Machining functions (continued)

Option number	Option	Description	TNC7	TNC 640
166	Add. FS Ctrl. Loop 5	Additional control loop 5	•	•
167	Optimized Contour Milling	OCM: optimized contour milling	•	•
168	Process Monitoring	<ul style="list-style-type: none"> • Detect deviations from a reference machining run • Enjoy reliable monitoring thanks to robust program synchronization down to the block level • Ensure productivity through an extensive range of possible reactions, such as inserting a replacement tool • Convenient checking of the process result via 3D visualization and a 2D graph 	•	–
169	Add. FS Full	Enabling of all FS axis options or control loops. Options 160 and 162 to 166 must already be set	•	•

- Available as option
- ✓ Standard function
- Not available

This brochure describes the functions and specifications of the TNC7 with NC software 81762x-17.

HEIDENHAIN

Mastering nanometer accuracy



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