HEIDENHAIN

iTNC 530

New Functions with
NC Software 340 49x-03

June 2006

New Functions with NC Software 340 49x-03
—The iTNC 530 Makes the Work Even Easier

The **iTNC 530** from HEIDENHAIN has proven itself for years as a versatile contouring control for milling, drilling and boring machines as well as machining centers. Along with HEIDENHAIN's plain-language conversational programming for the shop-floor, the iTNC 530 is characterized by many **useful functions** and **innovative features.** To name just a few, they include:

- Exact tool guidance with five-axis machining
- Simple tilting of the working plane
- Practice-oriented setup functions
- Very high contour accuracy for HSC milling
- Extensive fixed cycles
- Useful programming support through unambiguous function keys, free contour programming and help graphics
- Upwardly compatible part programs
- External programming and fast data transfer

The success story of the iTNC 530 also includes **smarT.NC**—the new operating mode from HEIDENHAIN. It represents another successful step toward a user-friendly interface for shop-floor programming. Well-structured input forms, straightforward graphic support, and comprehensive help texts combine with the easy-to-use pattern generator to form a compelling programming environment.

New functions for the iTNC 530
Of course there is always potential for new development, improvement and simplification. The NC software 340 49x-03 for the iTNC includes a series of new functions for machine manufacturers and users. These functions make it even easier to work with the control, and they also make operation of the machine more safe. The most important are:

- TNCguide help system
- Adaptive feed rate control (AFC)
- Global program settings
- Expansion of the DXF converter
- Tool table in smarT.NC
- Expanded file management in smarT.NC
- Programming with smarT.NC during a program run

Error fixes, expansion of functions and options
As of NC software 340 49x-02, error fixes were separated from software improvements. An update of NC software will predominantly contain only **error fixes.**

New functions offer true added value in user-friendliness and operational reliability. Of course you also have the opportunity to purchase these new functions after a software update: These **improvements in function** will be offered as "feature upgrades," and are enabled via the Feature Content Level option.

If, for example, a control is updated from 34049x-02 to 34049x-03, the functions identified with "FCL 03" in the following tables are only available if the **Feature Content Level** is set from 02 to 03. Of course, the current feature content level also includes the upgrade functions of the previous NC software levels.

All of the **options** included in the respective NC software can be purchased, no matter which feature content level you have.

Fast Availability of Information
—TNCguide Help System Integrated in the iTNC (Upgrade Function)*

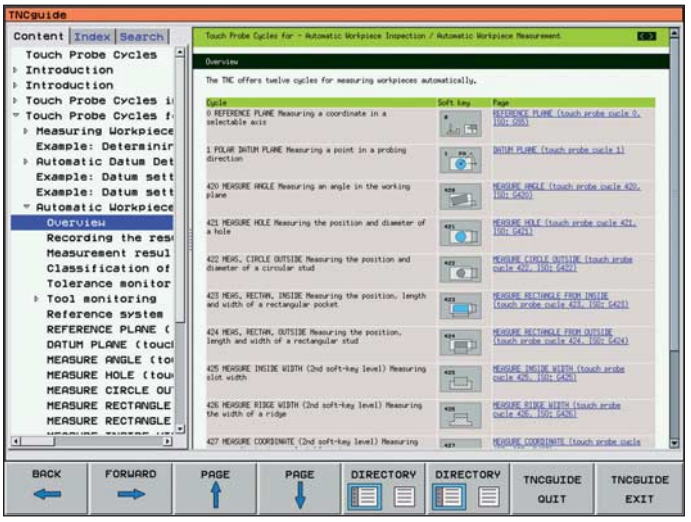
Do you have questions on a programming step but your User's Manual is not at hand? No problem: The iTNC 530 numerical control and iTNC 530 programming station now feature TNCguide, a convenient help system that can show the user documentation in a separate window.

You can activate the TNCguide by simply pressing the help key on the iTNC keyboard or by using the mouse. You simply click the help symbol ( ) always present on the TNC screen—and the cursor becomes a moving question mark for clicking any soft key.

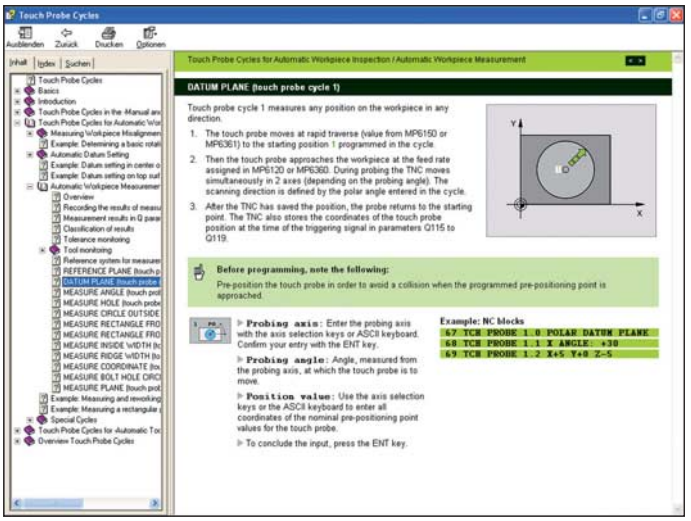
The TNCguide usually displays the information in the immediate context of the element in question (context-sensitive help). This means that you immediately receive the relevant information. This function is particularly helpful with the soft keys. The method and effect of operation is explained in detail.

The iTNC 530 is shipped with integrated documentation for the respective NC software in English and German. Other languages are available for download free of charge as soon as the translations become available. After download, you can save the national language files in the corresponding language directory on the TNC's hard disk.

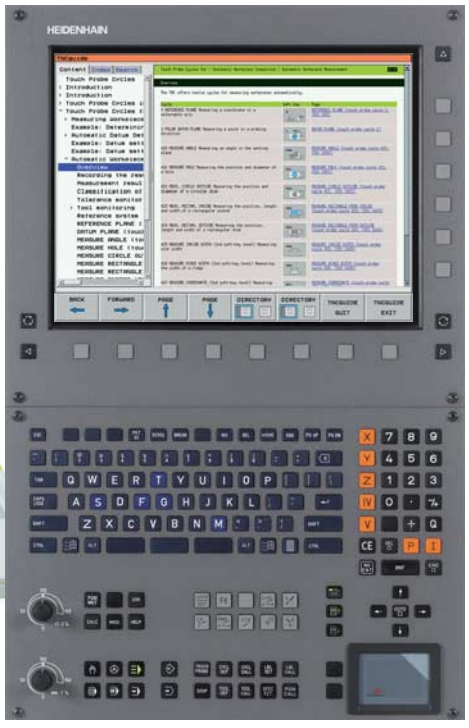
The following manuals are available in the help system:
- User's Manual, conversational programming
- User's Manual, smarT.NC (pilot format)
- User's Manual, Touch Probe Cycles
- User's Manual, iTNC 530 Programming Station (installed only for the programming station)



TNCguide integrated in the control, e.g. on the iTNC 530 ...



… or at the Programming Station



* Only with 256 MB RAM

Machining According to the Conditions
—Option for Adaptive Feed Rate Control (AFC)

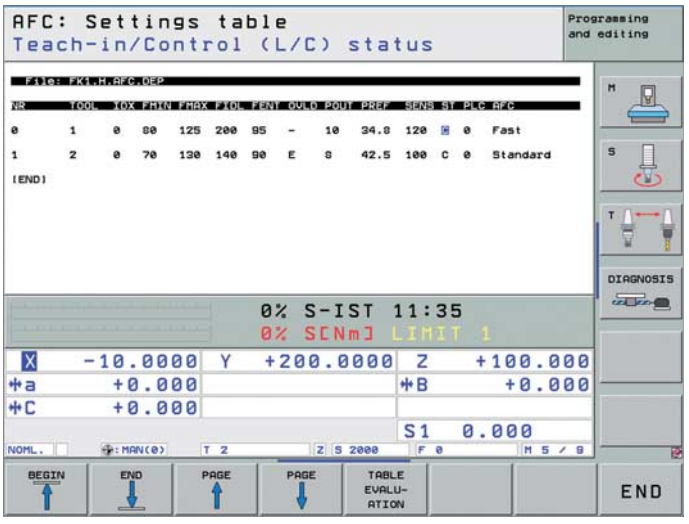
Besides the feed rate for each block or cycle, HEIDENHAIN controls have always allowed the programmer to enter a manual compensation through the override potentiometer to adjust for the actual machining situation. But this always depends on the experience and, of course, the presence of the operator.

With Adaptive Feed Control (AFC), the feed rate is automatically regulated by the TNC according to the respective utilized percentage of spindle power. This is done with the aid of the feed-rate override factor, which is normally calculated from the position of the override potentiometer. When AFC is active, this factor is no longer derived from the potentiometer, but from the spindle power and other process data, from which the feed rate is calculated.

In a teach-in cut, the iTNC records the maximum spindle power. Then, before actual machining, you define in a table the respective limit values between which the iTNC can influence the feed rate in the adaptive control mode in the "control" mode. Of course, various overload reactions can be specified, which can also be defined by your machine tool builder.

Benefits of adaptive feed control:

- **Optimizing the machining time**
  Fluctuations in dimensions or material (blowholes) often appear particularly on cast parts. With a corresponding adaptation of the feed rate, the control tries to keep the previously "learned" maximum spindle power during the entire machining time. The total machining time is shortened by an increased feed rate in the machining zones with less stock removal.
- **Tool monitoring:**
  The iTNC's adaptive feed rate control permanently compares the spindle power with the feed rate. As a tool becomes blunt, the spindle power increases. As a result, the iTNC reduces the feed rate. As soon as the feed rate falls below a defined minimum, the iTNC reacts with an error message or by switching off. This prevents damage resulting from tool breakage or wear.
- **Reduction of machine wear:**
  Reducing the feed rate down to the reference value whenever the learned maximum permissible spindle power is exceeded also reduces the strain and wear on the machine. It effectively protects the spindle from overload.



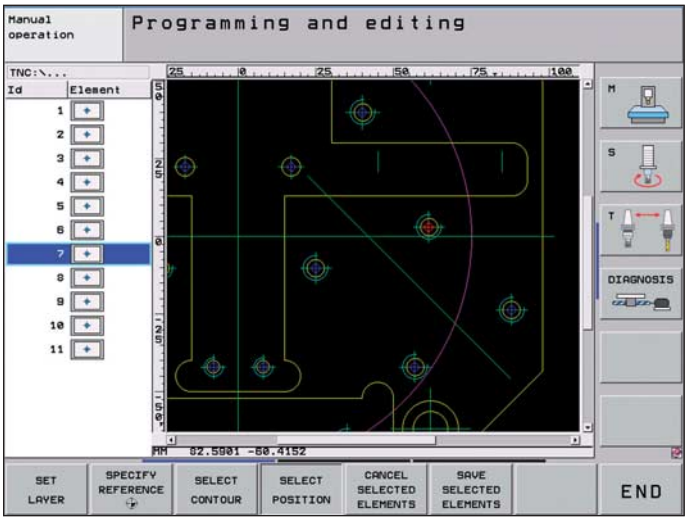
New Programming Functions
—Improvements in the DXF Converter (Option)

With the DXF converter you can now also select machining positions in addition to contours and save them as a point table. The following locations can be defined as machining positions:

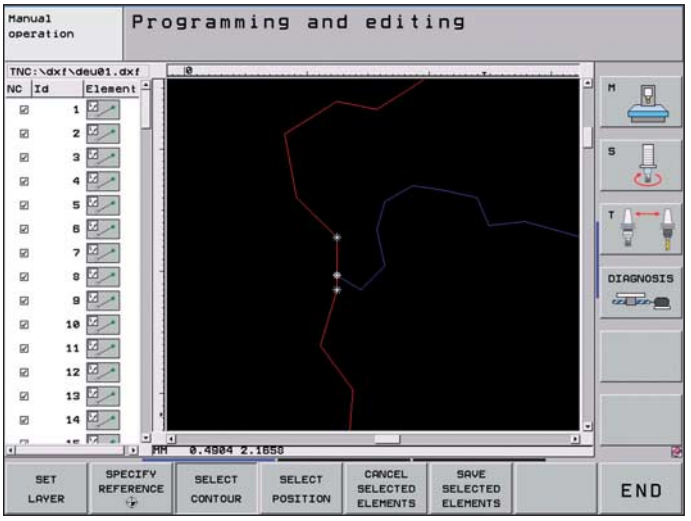
- The beginning, end or mid-point of a line
- The beginning, end or midpoint of an arc
- Quadrant transitions or center of a circle
- Intersection of two lines, regardless of whether it is located inside or outside the programmed segments
- Intersection of a line and arc
- Intersection of a line and circle

You can use the point tables generated in the DXF converter very conveniently in smarT.NC, however the function is also available in conversational programming.

The selection of contours was simplified as well: the design engineer does not always define the contours so that they can be selected directly without manual work. For example, now you can separate laterally joined contour elements that would otherwise prevent contour selection. The extension and shortening of contour elements is now also allowed for when the desired element limits are too far apart. Both functions are always available, by the way, within the contour selection mode. So you need not decide beforehand which elements are to be modified. The iTNC automatically detects critical places and indicates with symbols that the elements have to be separated, lengthened, or shortened.



Selecting the machining positions



Separating a contour element

New Programming Functions
—General

Global program settings (option)
The global program settings come into play especially in large-scale mold making. It is available in the Program Run modes and the MDI mode. It allows you to define various coordinate transformations and settings with global and priority effect for the selected NC program, without having to edit it.

You can change the global program settings during a program stop even in mid-program. After program start the iTNC then moves, if necessary, to a new position with a positioning logic influenced by you.
The following functions are available:
- Swapping axes
- Additive datum shift
- Superimposed mirroring
- Axis locking
- Handwheel superimposition, with axis-specific memory of paths covered per handwheel
- Superimposed basic rotation
- Superimposed rotation
- Globally effective feed rate factor

Q parameter programming: string processing
Now you can manipulate QS string variables in various ways, for example extract text parts or add QS text variables. The functions find application when log files with variable text contents are created with the F-PRINT (FN16) function. In various cycles you can now also define tool names as transfer parameters.

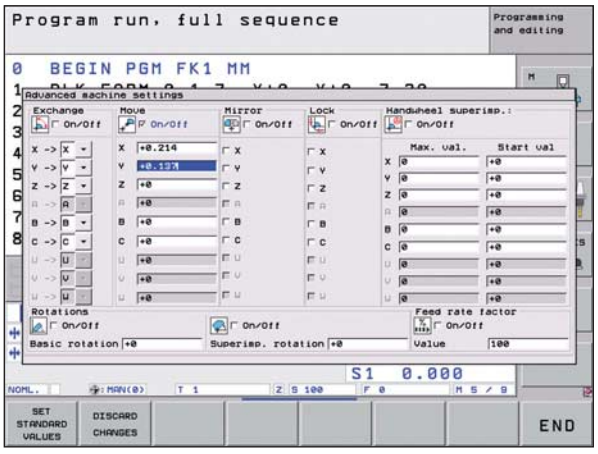
Feed rate reduction during contour pocket machining (upgrade function)
When a contour pocket is cleared out with the Cycle 22 (Unit 122 in smarT.NC), the tool is sometimes fully engaged in the material, for example in narrow channels or when moving to the next clearing pass. Now you can define a percentage value by which the iTNC reduces the feed rate in such situations. The benefit: Machining time is reduced because you can define a higher standard feed rate that the iTNC automatically reduces during full tool engagement.

New touch probe cycles (upgrade functions)
The group of cycles for automatic workpiece presetting has been expanded by the touch probe cycles 408 and 409 (Units 408 and 409 in smarT.NC). These cycles measure the center of a slot or ridge and write the result in any desired line of the datum table or preset table.

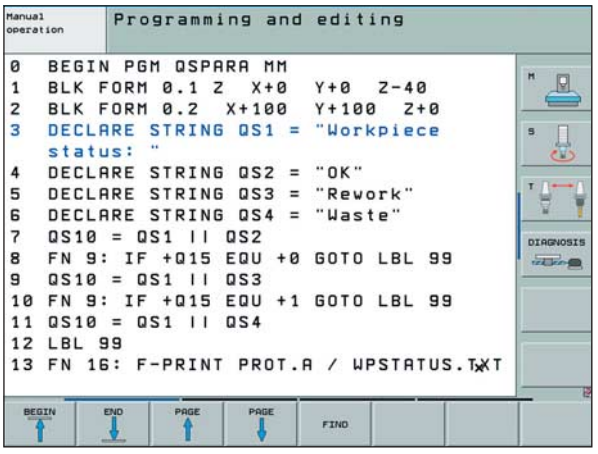
In addition, touch probe cycle 4 is introduced, which allows easy three-dimensional probing.

Additional conversational languages (option)
The conversational languages Norwegian, Slovak, Latvian, Korean and Estonian are available.

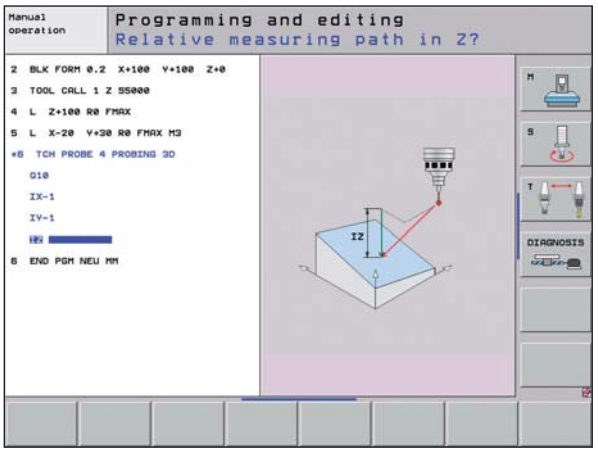
Time setting
A page is now available—as in a Windows PC—for simple adjustment of the time of day and the change to and from daylight-saving time.



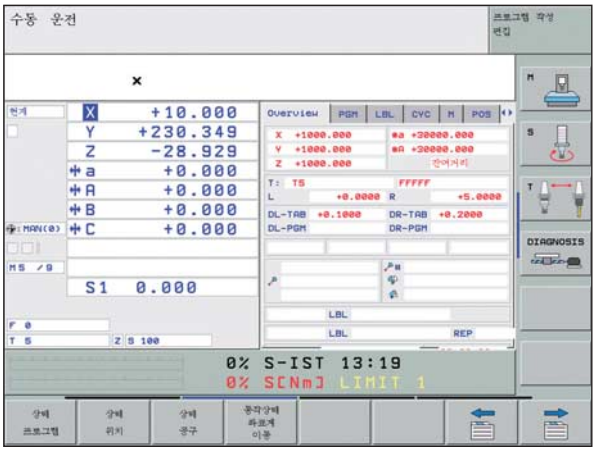
Global program settings



Q parameter programming



New touch probe cycles



Additional conversational languages, e.g. Korean

Expanded file management
The file management in smarT.NC was completely revised. The following functions are available:

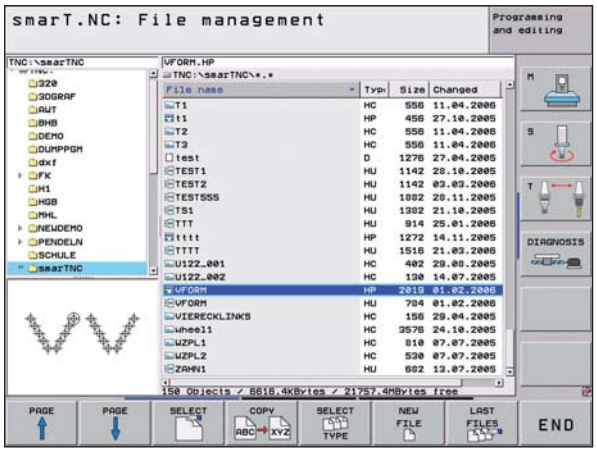
- smarT.NC programs (file types .HU, .HC, HP) can now be saved in any directories. The pop-up window for file selection was expanded so that the user can navigate within the window to any directories.
- File management can now be handled completely by mouse as well as by the familiar soft keys.
- When the file types .HP (point pattern) and .HC (contour programs) are selected, a preview appears showing the file content before actual selection.
- Sorting by name, type, size, change date and status.
- Favorites management for very quick access to key directories.
- Fast file selection by positioning the cursor in relation to the file name entry.
- Display of file information is configurable.
- Date display is configurable.

Contour pocket on point pattern (upgrade function)
Any contour pocket can now be run on any point pattern. This makes it possible to easily define repeated machining of a contour pocket.

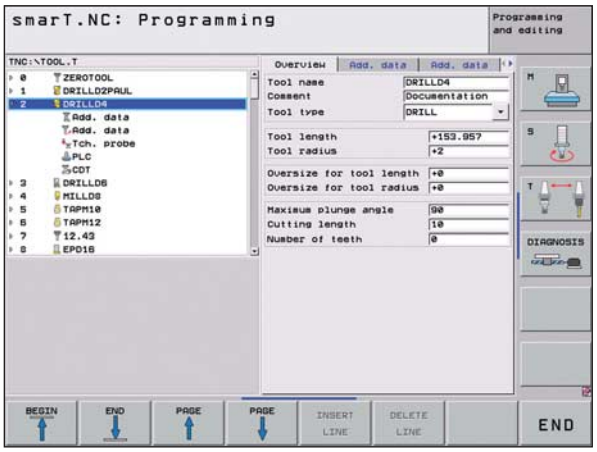
Programming while machining (upgrade function)
smarT.NC is a separate operating mode in which you can create, test and run part programs on the basis of editable forms. When you start a program in this mode—or in a full sequence-mode—you can now also edit and create other smarT.NC programs (.HU and .HC files) in the programming and editing mode using the smarT.NC user interface. With an OPEN WITH soft key you can now choose at any time the editor—smarT.NC or HEIDENHAIN conversational—in which you want to open an .HU or an .HC program.

Tool table in smarT.NC
In the smarT.NC operating mode you can now also edit a tool table directly. The display of tool data is oriented to the forms in smarT.NC. Now it presents a well organized screen that provides a fast overview of the existing tool data and offers a easy editing function. As always, smarT.NC helps you to gain a quick grasp of the information by showing graphic symbols that differ depending on the defined tool type.

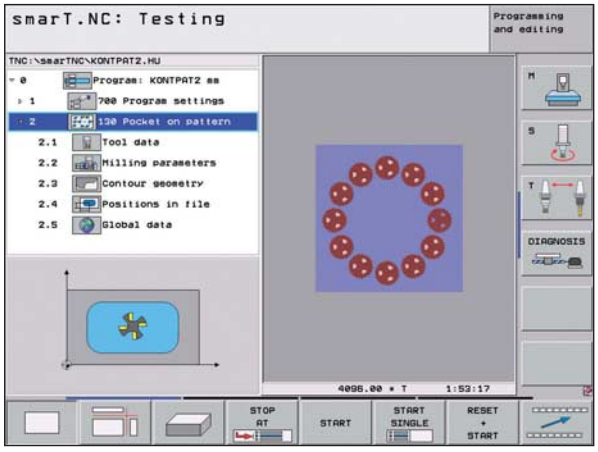
Positioning height in point patterns (upgrade function)
In a point pattern, any defined machining position can be assigned an approach height. The tool then moves to the position at the height that you defined, effectively avoiding fixtures and other obstacles.



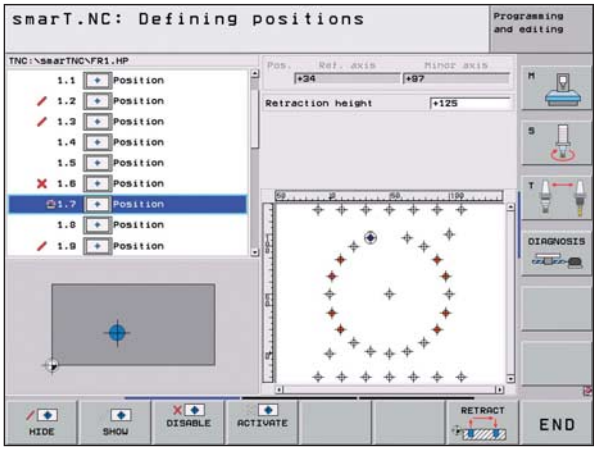
smarT.NC: New file management



smarT.NC: Editing the tool table



smarT.NC: Combining point patterns and contour pockets



smarT.NC: Variable definition of positioning heights in point patterns

Overview
—New Functions with NC Software 340 49x

Mode of operation	As of NC software	Standard	FCL	Option	Function
General information	34049x-02			40	DCM: Dynamic Collision Monitoring (only with MC 422 B)
			02		USB support for peripheral memory devices (memory sticks, hard disks, CD-ROMs)
			02		DHCP (Domain host control protocol) and DNS (domain name server) possible for network settings
		•			Freely definable tables visible also in form view
		•			All soft keys revised
				41	Slovenian language
		•			Czech user interface now with native characters
		•			Configurable update procedure for future software updates (e.g. automatic update over USB storage devices)
		•			Additional HR 420 functions: • Selection of the active override possible on the HR 420 • Freely definable soft-key menu for machine functions
		•			Smaller pop-up window when HR 420 is active, to improve legibility of axis positions on screen
		•			Look-ahead can be configured via machine parameters
		•			Calculation of dynamic load for tilting axes
		•			Inclined tool machining with noncontrolled axes
	34049x-03			44	Global program settings make it possible to superimpose various coordinate transformations and settings in the Program Run operating modes
				45	AFC: Adaptive feed control adjusts the contouring feed rate to the spindle power
			03		TNCguide: The integrated help system. User information available directly on the iTNC 530 (only with 256 MB RAM)
				41	Conversational languages in Slovak, Norwegian, Estonian, Latvian, Korean (Asian languages only with 256 MB RAM)
smarT.NC	340 49x-02			42	Direct loading of contours from DXF files and saving as smarT.NC contouring programs
			02		Cycles for coordinate transformation introduced
			02		PLANE function introduced
			02		Contour pocket: Separate depth can be assigned for each subcontour
			02		Mid-program startup with graphical support
		•			Cutting speed as alternate entry to the spindle shaft speed
		•			Feed rate can also be entered as Fz (feed per tooth) or Fu (feed per revolution)
		•			Tool data can be edited in a pop-up window during tool selection

Mode of operation	As of NC software	Standard	FCL	Option	Function
smarT.NC	34049x-02	•			Axis keys now also position the cursor in the forms. The **I** key (incremental/absolute switchover) and **P** key (polar/rectangular switchover) now also function for contour programming.
		•			CUT/COPY/PASTE of one or more units
		•			Automatic entry of workpiece blank into contour program
		•			Incremental entry of machining positions in forms for machining units
		•			Tooltips displayed when using the mouse
		•			Navigation through the forms using the axis keys
	34049x-03			42	DXF: • Separation of laterally joined contour elements • Generate point files (.HP files) directly from the DXF converter
			03		smarT.NC editor in the Programming and Editing operating mode
		•			Expanded and completely revised file management
		•			Tool table shown as a fillable form
			03		Machining a contour pocket on a point pattern
			03		Individually definable positioning heights in point patterns
			03		Touch probe cycles for setting datums in the centerline of a slot or ridge
		•	03		Setting of probing parameters in a separate unit
			03		Automatic feed rate reduction in contour pockets during full tool engagement
		•			Climb milling/up-cut milling during helical finish milling
		•			Spindle speed of retraction during rigid tapping
		•			Measured workpiece misalignment can now also be compensated by rotating a C axis
		•			Zoom function in the pattern generator
		•			Entry of stopping angle or angular step in a pitch circle definition

Mode of operation	As of NC software	Standard	FCL	Option	Function
Conversational programming	34049x-02			42	Reading of contours from DXF files and saving them as conversational programs
			02		Cycle for global setting of touch-probe parameters
			02		Point filter for smoothing NC programs created offline
			02		3-D line graphics for verification of programs created offline
			02		Manual traverse in the active tool-axis system
		•			Cutting speed as alternate entry to the spindle shaft speed
		•			Simplification when working with the preset table, incremental correction of preset values, correction of the active preset
		•			Contour pockets can now contain significantly more contour elements
		•			Consideration of an active basic rotation in manual probe cycles
		•			Measuring log for probing cycles can now also be displayed on the screen during program interruption
		•			FK transformation selectable as structured plain-language or linearized plain-language
	34049x-03			42	DXF: • Separation of laterally joined contour elements • Generate point files (.HP files) directly from the DXF converter
			03		Touch probe cycles for setting datums in the centerline of a slot or ridge
			03		Probing cycle for three-dimensional measurements. Results of measurement shown as desired in the coordinate system of the tool or the machine
			03		Automatic feed rate reduction in contour pockets during full tool engagement
		•			Climb milling/up-cut milling during helical finish milling
		•			Spindle speed of retraction during rigid tapping
		•			Workpiece misalignment can now also be compensated by rotating a C axis
ISO	34049x-02	•			PLANE function also in possible in ISO
Programming station		•			Virtual keyboard display in new version of the programming station
		•			PLC program provided for optional installation (can be used to move axes)
		•			Access to the PLC with the keyword "PLC"
		•			All options and FCL functions are fully enabled

Overview
—All Options in the NC Software 340 49x-03

Option number	Option	Id. Nr.	Comment
0 **1** **2** **3** **4** **5** **6** **7**	Additional axis	354 540-01 353 904-01 353 905-01 367 867-01 367 868-01 370 291-01 370 292-01 370 293-01	Additional control loops 1 to 8
8	Software option 1 (for MC 420)	367 591-01	**Machining with a rotary table** • Programming of cylindrical contours as if in two axes • Feed rate in mm/min **Coordinate transformations** • Tilting the working plane, PLANE function **Interpolation** • Circular In 3 axes with tilted working plane
9	Software option 2 (for MC 420)	367 590-01	**3-D machining** • Motion control with minimum jerk • 3-D tool compensation through surface normal vectors • Tool Center Point Management (TCPM): Using the electronic handwheel to change the angle of the swivel head during program run without affecting the position of the tool point • Keeping the tool perpendicular to the contour • Tool radius compensation perpendicular to the direction of the tool • Manual traverse in the active tool-axis system **Interpolation** • Linear in 5 axes (export license required) • Spline: execution of splines (3rd degree polynomial) **Block processing time** 0.5 ms
18	HEIDENHAIN DNC	526 451-01	Communication with external PC applications over COM components
40	DCM Collision	526 452-01	Dynamic Collision Monitoring DCM (only with MC 422 B, MC 422 C)
41	Additional language	530 184-xx	Additional conversational language: -01 – Slovenian -02 – Slovak -03 – Latvian -04 – Norwegian -06 – Korean[1)] -07 – Estonian
42	DXF Converter	526 450-01	Load and convert DXF contours
44	Global PGM Settings	576 057-01	Global program settings
45	AFC Adaptive Feed Control	579 648-01	Adaptive feed rate control
53	FCL	529 969-01	Feature Content Level

[1)] Only with 256 MB RAM

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