



HEIDENHAIN



TNC 320

The Compact Contouring Control for Milling, Drilling and Boring Machines

Information for the Machine Tool Builder

Representante oficial de:



HEIDENHAIN

[Argentina – Bolivia – Chile – Colombia - Costa Rica – Ecuador - El Salvador –
Guatemala – Honduras – Nicaragua – Panamá – Paraguay – Perú -
República Dominicana – Uruguay – Venezuela.]



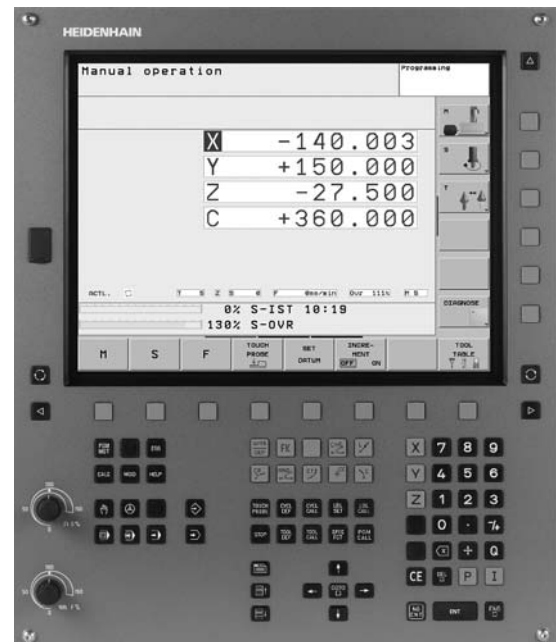
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HEIDENHAIN TNC Contouring Control

TNC 320

- Contouring control for machines with three closed-loop axes and closed-loop spindle (optional expansions possible), no export license required
- Analog command interface to the drives (± 10 V)
- Compact design: Screen, keyboard and main computer all in one unit
- Dimensions: 400 mm x 470 mm x 100 mm
- Integrated 15-inch TFT flat-panel display
- Memory medium for NC programs: CompactFlash memory card
- Programming in HEIDENHAIN conversational language
- Standard milling, drilling and boring cycles
- Touch probe cycles
- Short block processing times
- USB removable media can be connected



TNC 320

System tests

Controls, motors and encoders from HEIDENHAIN are in most cases integrated as components in larger systems. In these cases, comprehensive tests of the complete system are required, irrespective of the specifications of the individual devices.

Expendable parts

In particular the following parts in controls from HEIDENHAIN are subject to wear:

- Buffer battery
- Fan

Standards

Standards (ISO, EN, etc.) apply only where explicitly stated in the catalog.

Note

Microsoft Windows, Windows 2000, Windows XP, Windows Vista, Windows 7 and the Microsoft Internet Explorer logo are registered trademarks of Microsoft Corporation.

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Please refer to the **page references** in the **tables** with the **specifications**.

The features and specifications described here apply for the following control and NC software version:

TNC 320	340551-05
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Some of these specifications require particular machine configurations. Please note also that, for some functions, a special PLC program must be created by the manufacturer.

This catalog supersedes all previous editions, which thereby become invalid.

Subject to change without notice

Specifications

Specifications	TNC 320	Page
Control	<ul style="list-style-type: none"> • MC 320 main computer • Integrated 15-inch TFT color flat-panel display • Integral TNC operating panel • MB 420 machine operating panel optional 	11
Axes	3 closed-loop axes, optional: 4th and 5th axis	12, 22
PLC axes	✓	23, 33
Central drive	✓	24
Open-loop axes	✓	25
Spindle	Max. 2; second spindle can be controlled alternately with the first	29
Position-controlled spindle	✓	29
Oriented spindle stop	✓	29
NC program memory	300 MB	
Input resolution and display step		
Linear axes	1 μm	22
Rotary axes	0.001°	22
Interpolation		*
Straight line	4 of 5 axes	*
Circle	2 of 5 axes	*
Helix	✓	*
Axis feedback control	Analog speed command interface $\pm 10\text{ V (X8)}$	24
With feedforward	✓	24
With following error	✓	24
Cycle time for block processing	6 ms	25
Cycle time for path interpolation	3 ms	25
Spindle		29
Analog nominal speed value	Up to 100 000 min^{-1}	29
Position-controlled spindle	✓	29
Oriented spindle stop	✓	29
Gear shifting	✓	29
Permissible temperature range	Operation +5 °C to +45 °C Storage -35 °C to +65 °C	

* See TNC 320 brochure

Machine Interfacing

Machine interfacing	TNC 320	Page
Error compensation		27
Linear axis error	✓	27
Nonlinear axis error	✓	27
Backlash	✓	27
Thermal expansion	✓	27
Integral PLC		32
Program format	Statement list	32
Program input on the TNC	Via external USB keyboard	32
Program input via PC	✓	32
Symbolic PLC-NC interface	✓	32
PLC memory	50 MB	32
PLC cycle time	Typically 21 ms, adjustable	32
PLC inputs, 24 V DC	31 (expandable via PL); additional 25 on connector for machine operating panel	
PLC outputs, 24 V DC	31 (expandable by PL)	
Analog inputs, ± 10 V	Via PL	
Inputs for thermistors	Via PL	
PLC functions		33
Small PLC window	✓	33
PLC soft keys	✓	33
PLC positioning	✓	33
PLC basic program	✓	35
Commissioning and diagnostic aids		30
ConfigDesign	Software for creation of the machine configuration	30
Integrated oscilloscope	✓	30
Commissioning wizard	For analog axes	30
Trace function	✓	31
Logic diagram	✓	31
API DATA function	✓	31
Table function	✓	31
Online monitor (OLM)	✓	31
Log	✓	31
TNCscope	✓	31

Machine Interfacing

Machine interfacing	TNC 320	Page
Encoder inputs Position	4 (optional: 5)	26
Incremental	1 V _{PP}	26
Absolute	EnDat 2.1	26
Data interfaces		37
Ethernet (100BaseT)	✓	37
RS-232-C/V.24	✓	37
USB 2.0	✓ 2 on the rear, 1 on the front	37
Protocols		37
Standard data transfer	✓	37
Blockwise data transfer	✓	37
LSV2	✓	37
Integration of applications		34
High-level language programming	Python programming language used in combination with the PLC (option 46)	34
User interface can be custom-designed	Inclusion of specific user interfaces from the machine tool builder (option 46)	34

Options

Option	Option number	As of NC software 340551-	ID	Comment
Additional axis	01	01	354540-01 353904-01	<ul style="list-style-type: none"> • 1st additional axis for 4 axes plus spindle • 2nd additional axis for 5 axes plus spindle
Software option 1	8	01	536164-01	Rotary table machining <ul style="list-style-type: none"> • Programming of cylindrical contours as if in two axes • Feed rate in mm/min
		03		Interpolation <ul style="list-style-type: none"> • Circular in 3 axes with tilted working plane Coordinate transformation <ul style="list-style-type: none"> • Tilting the working plane
		04		<ul style="list-style-type: none"> • PLANE function
HEIDENHAIN DNC	18	01	526451-01	Communication with PC applications over COM component
Gantry axes	24	04	634621-01	Gantry axes (synchronized axes)
Additional languages	41	04	530184-01 -02 -03 -04 -06 -07 -08 -09 -10	<ul style="list-style-type: none"> • Slovenian • Slovak • Latvian • Norwegian • Korean • Estonian • Turkish • Romanian • Lithuanian
Python OEM Process	46		579650-01	Python application on the TNC

Accessories

Accessories	TNC 320	Page
Electronic handwheels	One HR 410, HR 130, or up to three HR 150 via HRA 110	14
Touch probes	<ul style="list-style-type: none"> • One TS 220, TS 440, TS 444, TS 640 or TS 740 workpiece touch probe • One TT 140 or TL tool touch probe 	17
PLC input/output systems	Modular external PL 510 I/O systems consisting of <ul style="list-style-type: none"> • Basic module with slots for 4 I/O modules • PLB 510: with HEIDENHAIN PLC interface • PLD 16-8: I/O module with 16 digital inputs and 8 digital outputs • PLA 4-4: Analog module with 4 analog inputs for ± 10 V and PT 100 thermistors 	16
Machine operating panel	✓	18
PLC basic program ¹⁾	✓	35
USB hub	✓	37
TNC 320 programming station	Control software for PCs for programming, archiving, and training	*
Software		
PLCdesign ¹⁾	PLC development software	34
KinematicsDesign ¹⁾	Software for kinematic configuration	28
TNCremo ²⁾	Data transfer software	38
TNCremoPlus ²⁾	Data transfer software with live-screen function	38
ConfigDesign ¹⁾	Software for configuring the machine parameters	30
CycleDesign ¹⁾	Software for creating cycle structures	36
TNCscope ¹⁾	Software for data recording	31
TeleService ¹⁾	Software for remote diagnostics, monitoring, and operation	31
RemoTools SDK ¹⁾	Function library for developing customized applications for communication with HEIDENHAIN controls	38

* See *TNC 320* brochure

¹⁾ Available to registered customers for downloading from the Internet

²⁾ Available to all customers (without registration) for downloading from the Internet

User Functions

User functions	Standard	Option	
Brief description	•	0/1	Basic version: 3 axes plus spindle One or two additional NC axes
Program entry	•		HEIDENHAIN conversational and DIN/ISO via soft keys or via external standard USB keyboard
Position entry	•		Nominal positions for lines and arcs in Cartesian coordinates or polar coordinates Incremental or absolute dimensions Display and entry in mm or inches
Tool compensation	•		Tool radius in the working plane and tool length Radius-compensated contour look-ahead for up to 99 blocks (M120)
Tool tables	•		Multiple tool tables with any number of tools
Constant contour speed	•		Relative to the path of the tool center Relative to the tool's cutting edge
Parallel operation	•		Creating a program with graphical support while another program is being run
Rotary table machining	•	8 8	Programming of cylindrical contours as if in two axes Feed rate in mm/min
Contour elements	•		Straight line Chamfer Circular path Circle center Circle radius Tangentially connecting circular arc Corner rounding
Approaching and departing the contour	•		Via straight line: tangential or perpendicular Via circular arc
FK free contour programming	•		FK free contour programming in HEIDENHAIN conversational format with graphic support for workpiece drawings not dimensioned for NC
Program jumps	•		Subroutines Program-section repeat Calling any program as a subroutine
Fixed cycles	•		Cycles for drilling, pecking, reaming, boring, counterboring, conventional and rigid tapping Cycles for milling internal and external threads Rectangular and circular pockets Cycles for clearing level and inclined surfaces Multioperation machining of straight and circular slots Multioperation machining of rectangular and circular pockets Linear and circular point patterns Contour train, contour-parallel contour pocket OEM cycles (special cycles developed by the machine tool builder) can be integrated
Coordinate transformation	•	8	Datum shift, rotation, mirror image, scaling factor (axis-specific) Tilting the working plane, PLANE function

User Functions

User functions	Standard	Option	
Q parameters Programming with variables	<ul style="list-style-type: none"> • • • • • 		Mathematical functions =, +, -, *, /, sin α , cos α , angle α of sin α and cos α , \sqrt{a} , $\sqrt{a^2 + b^2}$ Logical operations (=, = /, <, >) Calculating with parentheses tan α , arc sin, arc cos, arc tan, a^n , e^n , ln, log, absolute value of a number, constant π , negation, truncation of digits before or after the decimal point Functions for calculation of circles
Programming aids	<ul style="list-style-type: none"> • • • • • • 		Calculator Complete list of all current error messages Context-sensitive help function for error messages TNCguide: The integrated help system. User information available directly on the TNC 320 Graphical support for programming cycles Comment and structure blocks in the NC program
Actual position capture	<ul style="list-style-type: none"> • 		Actual positions can be transferred directly into the NC program
Test run graphics Display modes	<ul style="list-style-type: none"> • • • 		Graphic simulation before a program run, even while another program is running Plan view / projection in 3 planes / 3-D view, also in tilted working plane Magnification of details
Programming graphics	<ul style="list-style-type: none"> • 		In the Programming and Editing mode, the contour of the NC blocks is drawn on screen while the blocks are being entered (2-D pencil-trace graphics), even while another program is running
Program-run graphics Display modes	<ul style="list-style-type: none"> • • 		Graphic simulation during real-time machining Plan view / projection in 3 planes / 3-D view
Machining time	<ul style="list-style-type: none"> • • 		Calculation of machining time in the Test Run operating mode Display of the current machining time in the Program Run operating modes
Returning to the contour	<ul style="list-style-type: none"> • • 		Mid-program startup in any block in the program, returning the tool to the calculated nominal position to continue machining Program interruption, contour departure and return
Preset tables	<ul style="list-style-type: none"> • 		One preset table for storing reference points
Datum tables	<ul style="list-style-type: none"> • 		Several datum tables for storing workpiece-related datums
Touch probe cycles	<ul style="list-style-type: none"> • • • • 		Touch probe calibration Compensating workpiece misalignment Datum setting, manual or automatic Automatic tool and workpiece measurement
Parallel secondary axes	<ul style="list-style-type: none"> • • • 		Compensating movement in the secondary axis U, V, W through the principal axis X, Y, Z Including movements of parallel axes in the position display of the associated principal axis (sum display) Defining the principal and secondary axes in the NC program makes it possible to run programs on different machine configurations
Conversational languages	<ul style="list-style-type: none"> • 	41	English, German, Chinese (traditional, simplified), Czech, Danish, Dutch, Finnish, French, Hungarian, Italian, Polish, Portuguese, Russian (Cyrillic), Spanish, Swedish For more conversational languages, see <i>Options</i>

TNC 320

The TNC 320 is offered with four inputs for position encoders. It can also be provided with software options.

The TNC 320 includes the MC 320 main computer with:

- Processor (INTEL[®] Celeron M, 1 GHz)
- 1 GB SDRAM main memory
- 15-inch TFT flat-panel display; resolution: 1024 x 768 pixels
- TNC keyboard
- PLC
- Interface to handwheel and touch probes
- Further interfaces (PLC expansion, Ethernet, USB 2.0, RS-232-C/V.24)

To be ordered separately, and installed in the main computer by the OEM:

- **CFR** CompactFlash memory card with the NC software
- **SIK component** (System Identification Key) for enabling the control loops and software options

MC 320	Position inputs	4 x 1 V _{PP} or EnDat (optional 5 x 1 V _{PP} or EnDat)
	Weight	7.9 kg
	ID	511 442-xx
Power supply	Supply voltage	85 V AC to 264 V AC
	Frequency	47 Hz to 440 Hz
	Power consumption	60 W

CFR CompactFlash The CFR (= CompactFlash Removable) CompactFlash memory card holds the NC software of the TNC 320. It is also the memory medium for NC programs and the PLC program. Up to 300 MB of memory are available for NC programs, and up to 50 MB for PLC data.

ID 537 067-51



SIK component

The SIK component contains the **NC software license** for enabling control loops and software options. It gives the TNC 320 an unambiguous ID code—the SIK number. The SIK component is ordered and shipped separately. It must be inserted in a special slot on the side of the TNC 320.

There are different versions of the SIK component with the NC software license. Additional functions can be enabled later by entering a keyword. HEIDENHAIN provides the keyword, which is based on the SIK number.

When ordering, please indicate the SIK number of your control. When the keywords are entered in the control, they are saved in the SIK component. This enables and activates the options. Should service become necessary, the SIK component must be inserted in the replacement control to enable all required options.

**SIK component****Master keyword
(general key)**

There is a master keyword (general key) for putting the TNC 320 into service that will unlock all options for a duration of 90 days. After this period, only those options with the correct keywords will be active. The general key is activated using a soft key.

**Software Key
Generator
(accessory)**

The PC software makes it possible to generate an activation code for software options on HEIDENHAIN controls. The selected option is enabled for a limited time (10 to 90 days). It can only be enabled once. You generate the desired activation code by entering the SIK number, the option to be enabled, the duration and a manufacturer-specific password. The enabling is independent of the General Key.

**NC software
license**

SIK with software license and enabling for

- 4 control loops (3 axes and closed-loop spindle) ID 533093-51
- 5 control loops (4 axes and closed-loop spindle) ID 533093-52

Axis options

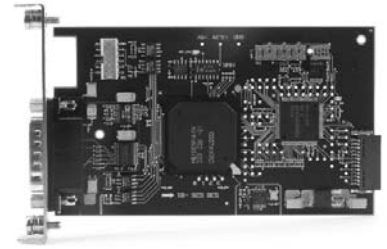
With the NC software license for three axes, two additional control loops can be enabled later.

- 1st additional axis ID 354540-01
- 2nd additional axis ID 353904-01

Encoder input board

An additional encoder input board is required for configurations with five or more closed control loops.

ID 554296-xx



Encoder input board

Possible configurations

Axes	Spindle¹⁾	NC software license for	Necessary options
Closed loop			
3	Closed-loop	4 control loops	–
4	Open-loop	4 control loops	1st additional axis
		5 control loops	–
4	Closed-loop	4 control loops	<ul style="list-style-type: none"> • 1st additional axis • Encoder input board
		5 control loops	Encoder input board
5	Open-loop	4 control loops	<ul style="list-style-type: none"> • 1st additional axis • 2nd additional axis • Encoder input board
		5 control loops	<ul style="list-style-type: none"> • 2nd additional axis • Encoder input board
5	Closed-loop	4 control loops	<ul style="list-style-type: none"> • 1st additional axis • 2nd additional axis • 2 encoder input boards
		5 control loops	<ul style="list-style-type: none"> • 2nd additional axis • 2 encoder input boards

¹⁾ For the *open-loop spindle*, the TNC commands an analog nominal speed value for the spindle speed. For the *closed-loop spindle*, position feedback is provided, for example for oriented spindle stop.

Options

The capabilities of the TNC 320 can also be expanded retroactively with options. These options are described on page 7. They are enabled by keywords based on the SIK number, and are saved in the SIK component. Please indicate your SIK number when ordering new options.

TNC keyboard

The keys for the axes Z, 4 and 5 are easily snapped off and exchanged for other symbols (see *Snap-On Keys*).

Export license

An **export license** is generally **not required** for the TNC 320 because the NC software limits the number of interpolatable axes to four. The 5th axis can be used for the spindle or as an auxiliary axis.

Accessories

Electronic Handwheels

The standard TNC 320 supports the use of electronic handwheels. The following handwheels can be installed:

- One **HR 410** portable handwheel, or
- One **HR 130** panel-mounted handwheel, or
- Up to three **HR 150** panel-mounted handwheels via **HRA 110** handwheel adapter

HR 410

Portable electronic handwheel with

- Keys for the selection of 5 axes
- Keys for traverse direction
- Keys for three preset feed rates
- Actual-position-capture key
- Three keys with machine functions (see below)
- Two permissive buttons (24 V)
- Emergency stop button (24 V)
- Magnetic holding pads

All keys are designed as snap-on keys and can be replaced by keys with other symbols. (For key symbols see *Snap-On Keys*.)

Weight Approx. 1 kg

HR 410 version	Mechanical detent	
	With	Without
Standard assignment with the functions keys FCT A, FCT B, FCT C	–	296469-53
For PLC basic program with NC start/stop, spindle start	535220-05	296469-55
With spindle right/left/stop	–	296469-54



HR 130

Panel-mounted handwheel with ergonomic control knob. It is connected to the logic unit directly or via extension cable.

Weight Approx. 0.7 kg

HR 130 without mechanical detent ID 540940-03
 HR 130 with mechanical detent ID 540940-01



HRA 110

Handwheel adapter for connection of up to three **HR 150** panel-mounted handwheels and two switches for axis selection and for selecting the interpolation factor. The first two handwheels are permanently assigned to axes 1 and 2. The third handwheel is assigned to the axes over a step switch (accessory) or by machine parameters. The position of the second selection switch (accessory) is evaluated by the PLC, for example to set the proper interpolation.

HRA 110

ID 261 097-03
Weight Approx. 1.5 kg

Handwheel selection switch with knob and cable
ID 270908-xx



HR 150

Panel-mounted handwheel with ergonomic control knob for connection to the **HRA 110** handwheel adapter.

Weight Approx. 0.7 kg
HR 150 without mechanical detent ID 540940-07
HR 150 with mechanical detent ID 540940-06



PLC Inputs/Outputs

If the PLC inputs/outputs of the control are insufficient, additional PL 510 PLC input/output systems can be connected. These external modular I/O systems consist of a PLB 510 basic module and one or more PLD 16-8 and PLA 4-4 input/output modules.



PL 510

Basic modules

Each basic module features slots for four I/O modules. They are mounted on standard NS 35 rails (DIN 46227 or EN 50022)

Supply voltage	24 V DC
Power consumption	approx. 20 W
Weight	0.36 kg (bare)

PLB 510

Basic module with HEIDENHAIN PLC interface
Up to four PLB 510 can be connected to the control. The maximum cable length to the last PLB 510 is 30 meters.

ID	358849-01
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I/O modules

The I/O modules consist of one module with digital inputs/outputs and one analog module. For partially occupied basic modules, the unused slots must be occupied by an empty housing.

PLD 16-8

I/O module with 16 digital inputs and 8 digital outputs

Total current	Outputs 0 to 7: ≤ 4 A
	Outputs 0 to 3, or 4 to 7: ≤ 2 A
Simultaneity factor:	2 outputs: 2 A each
	4 outputs: 1 A each
	8 outputs: 0.5 A each
Weight	0.2 kg
ID	360916-01

PLA 4-4

Analog module with
4 analog inputs for PT 100 thermistors
4 analog inputs, ± 10 V

Weight	0.2 kg
ID	366423-01

Empty housing

For unused slots	
ID	383022-01

Touch Probes

Before the TNC 320 leaves the factory, it is already prepared for the use of touch probes for workpiece measurement. These touch probes generate a trigger signal that captures the current position value. For more information on the touch probes, ask for our brochure or CD-ROM entitled *Touch Probes*.

Workpiece measurement

The TS touch trigger probe has a stylus with which it probes workpieces. The TNC provides standard routines for datum setting and workpiece measurement and alignment. The touch probes are available with various taper shanks. Assorted styli are available as accessories.

Touch probe with **cable connection for signal transmission** for machines with manual tool change:



TS 220

TS 220

TTL version

Touch probe with **infrared signal transmission** for machines with automatic tool change:

TS 440

Compact dimensions

TS 444

Compact dimensions, battery-free power supply through integrated air turbine generator over central compressed air supply

TS 640

Standard touch probe with wide-range infrared transmission and long operating time

TS 740

High probing accuracy and repeatability, low probing force

The infrared transmission is established between the TS touch probe and the SE transceiver unit. The following SE units can be combined with the TS touch probes:

SE 640 for integration in the machine's workspace

SE 540 for integration in the spindle head



TS 640 with SE 640

Tool measurement

The touch probes for tool measurement from HEIDENHAIN are suited for probing stationary or rotating tools directly on the machine. The TNC has standard routines for measuring length and diameter of the tool as well as the individual teeth. The TNC automatically saves the results of measurement in a tool table. It is also possible to measure tool wear between two machining steps. The TNC compensates the changed tool dimensions automatically for subsequent machining or replaces the tool after a certain limit—as for example after tool breakage.

TT 140

With the triggering **TT 140 touch probe** the disk-shaped contact plate is deflected from its rest position upon contact with a stationary or rotating tool, sending a trigger signal to the NC control.



TT 140

TL Micro/TL Nano

The **TL laser systems** operate without any contact. A laser beam probes the length, diameter or contour of the tool. Special measuring cycles in the TNC evaluate the information.



TL Micro 150,
TL Micro 300

Machine Operating Panel

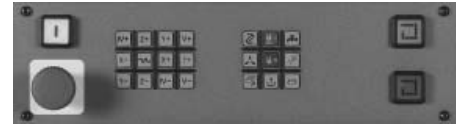
Machine operating panel MB 420

- ID 293 757-45
- Weight 0.9 kg

- 21 snap-on keys, freely definable via PLC
- Operation keys

Assigned according to PLC basic program with:
Control voltage on; Emergency stop; NC start; NC stop;
5 axis keys; Rapid traverse; Retract axis; Tool change;
Unclamp tool; Menu selection; Unlock door;
Spindle start; Spindle stop; Coolant; Rinse-water jet;
Chip removal. For further symbol keys, see *Snap-On Keys*.

- Additional connections
Terminals for 3 PLC inputs and 8 PLC outputs













Snap-On Keys





































The snap-on keys make it easy to replace the key symbols. In this way, the MB machine operating panel and the HR 410 handwheel can be adapted to different requirements. The snap-on keys are available in packs of five keys.

Axis keys

Orange

	ID 330 816-42		ID 330 816-24		ID 330 816-43		ID 330 816-37
	ID 330 816-26		ID 330 816-36		ID 330 816-38		
	ID 330 816-23		ID 330 816-25		ID 330 816-45		









Gray

	ID 330 816-95		ID 330 816-69		ID 330 816-0W		ID 330 816-0R
	ID 330 816-96		ID 330 816-0G		ID 330 816-0V		ID 330 816-0D
	ID 330 816-97		ID 330 816-0H		ID 330 816-0N		ID 330 816-0E
	ID 330 816-98		ID 330 816-71		ID 330 816-0M		ID 330 816-65
	ID 330 816-99		ID 330 816-72		ID 330 816-67		ID 330 816-66
	ID 330 816-0A		ID 330 816-63		ID 330 816-68		ID 330 816-19
	ID 330 816-0B		ID 330 816-64		ID 330 816-21		ID 330 816-16
	ID 330 816-0C		ID 330 816-18		ID 330 816-20		ID 330 816-0L
	ID 330 816-70		ID 330 816-17		ID 330 816-0P		ID 330 816-0K





















Machine functions

	ID 330 816-0X		ID 330 816-75		ID 330 816-0T		ID 330 816-86
	ID 330 816-1Y		ID 330 816-76		ID 330 816-81		ID 330 816-87
	ID 330 816-30		ID 330 816-77		ID 330 816-82		ID 330 816-88
	ID 330 816-31		ID 330 816-78		ID 330 816-83		ID 330 816-94
	ID 330 816-32		ID 330 816-79		ID 330 816-84		ID 330 816-0U
	ID 330 816-73		ID 330 816-80		ID 330 816-89		ID 330 816-91
	ID 330 816-74		ID 330 816-0S		ID 330 816-85		ID 330 816-3L

Spindle functions

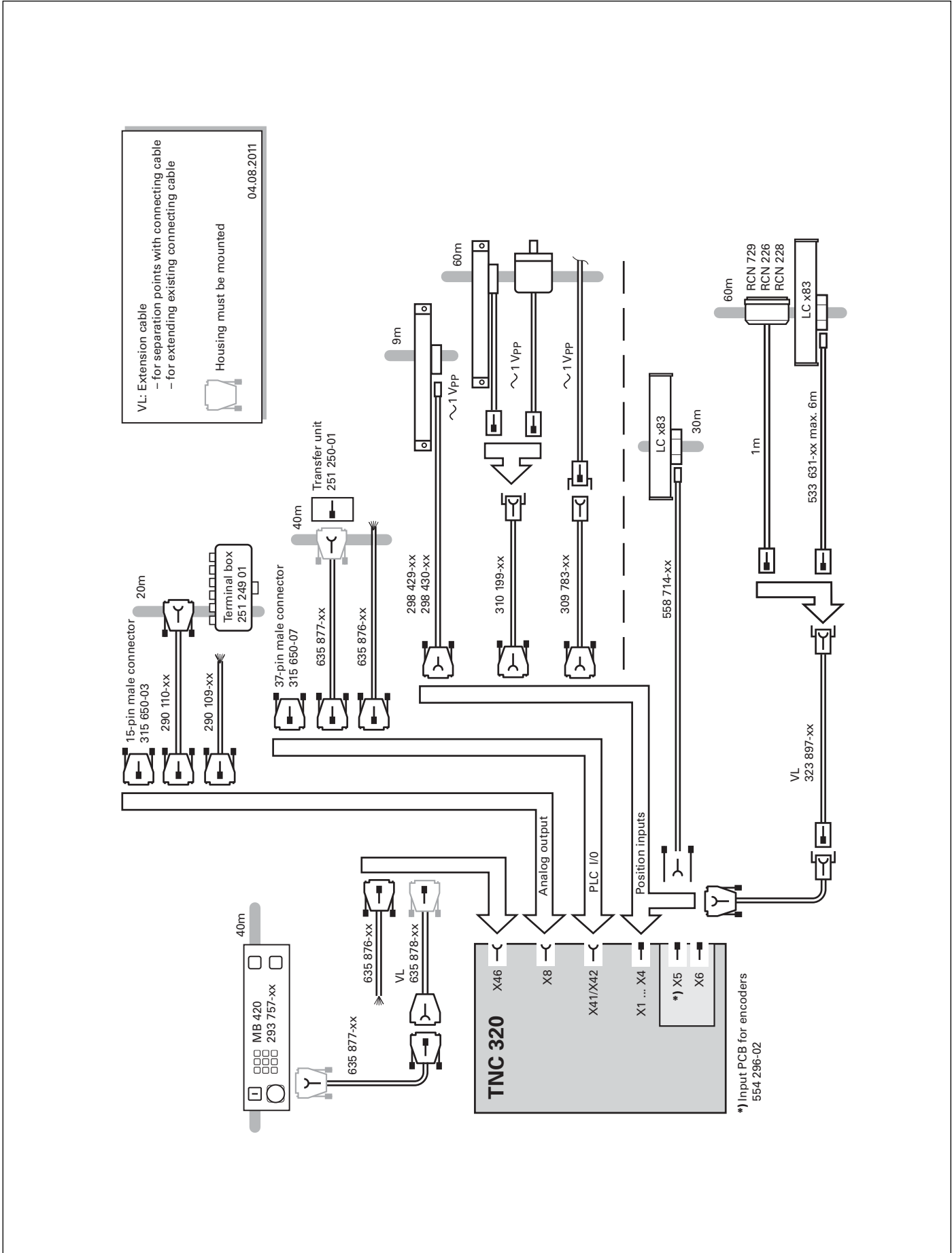
	ID 330 816-08		ID 330 816-40		(red) ID 330 816-47		ID 330 816-48
	ID 330 816-09		ID 330 816-41		(green) ID 330 816-46		ID 385 530-5X

Other keys

	ID 330 816-01		ID 330 816-50		ID 330 816-90		ID 330 816-93
	ID 330 816-61		ID 330 816-33		ID 330 816-27		ID 330 816-0Y
	(green) ID 330 816-11		ID 330 816-34		ID 330 816-28		ID 330 816-4M
	(red) ID 330 816-12		ID 330 816-35		ID 330 816-29		ID 330 816-3M
	ID 330 816-49		ID 330 816-22		ID 330 816-92		ID 330 816-3N

Cable Overview

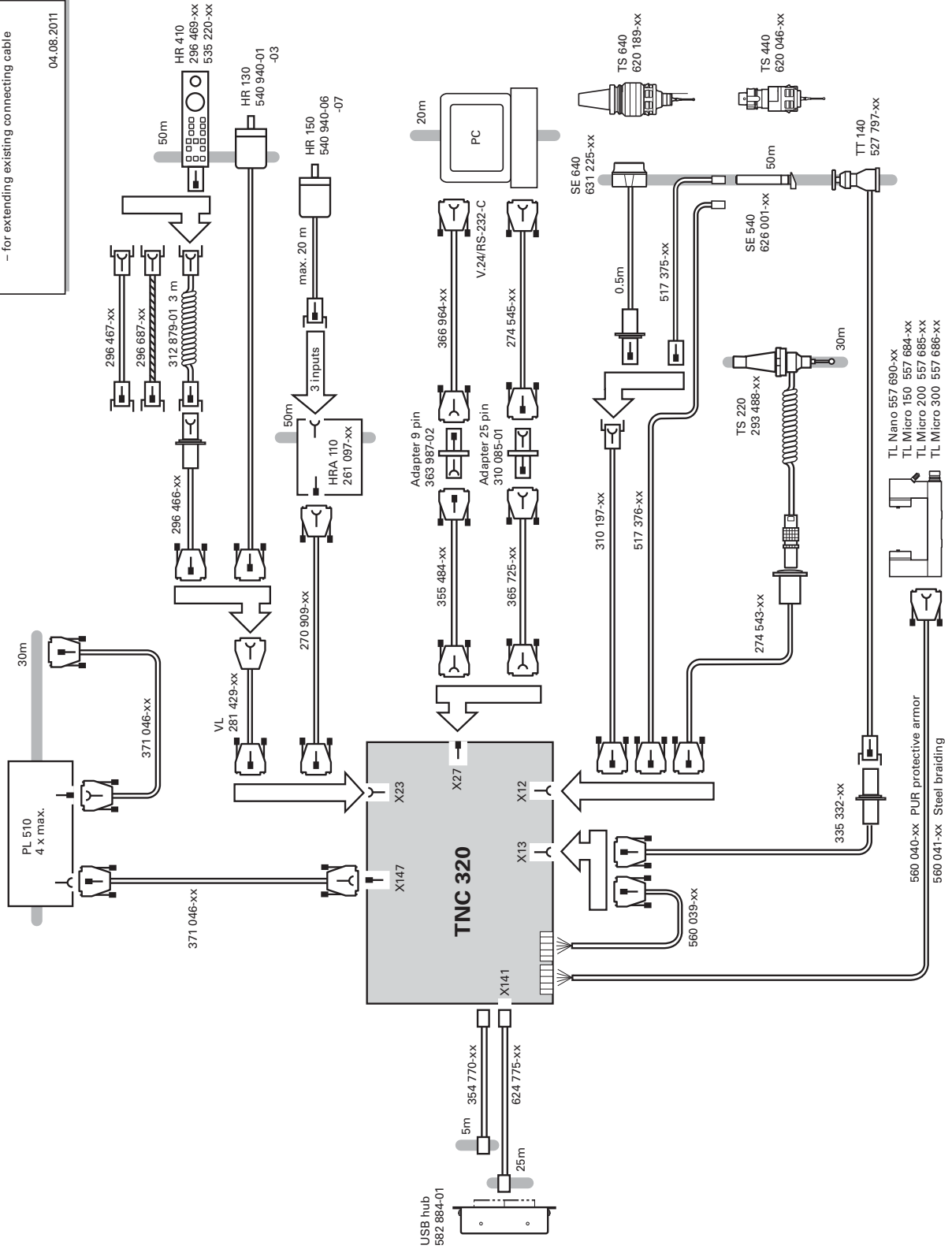
TNC 320



Accessories

VL: Extension cable
 - for separation points with connecting cable
 - for extending existing cable

04.08.2011



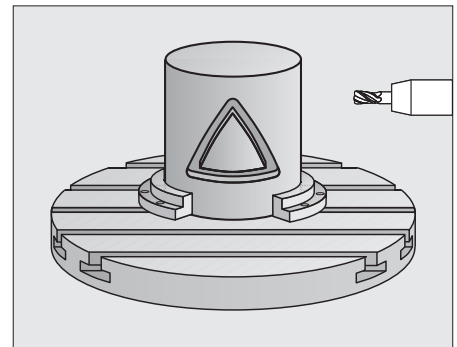
Technical Description

Axes

Linear axes	The TNC 320 can control linear axes with any axis designation (X, Y, Z, W...).
Display and programming	-99999.999 to +99999.999 [mm] Feed rate in mm/min relative to the workpiece contour, or mm per spindle revolution Feed rate override: 0 to 150 %
Traverse range	-99999.999 to +99999.999 [mm] The machine tool builder defines the traverse range. The user can set additional limits to the traverse range if he wishes to reduce the working space. Various traverse ranges can be defined per axis using parameter sets (selection by PLC).

Rotary axes	The TNC 320 can control a rotary axis with any axis designation (A, B, C, U...).
Display and programming	Special parameters and PLC functions are available for rotary axes with Hirth coupling. 0° to 360° or -99999.999 to +99999.999 [°] Feed rate in degrees per minute (°/min)
Traverse range	-99999.999 to +99999.999 [°] The machine tool builder defines the traverse range. The user can set additional limits to the traverse range if he wishes to reduce the working space. Various traverse ranges can be defined per axis using parameter sets (selection by PLC).

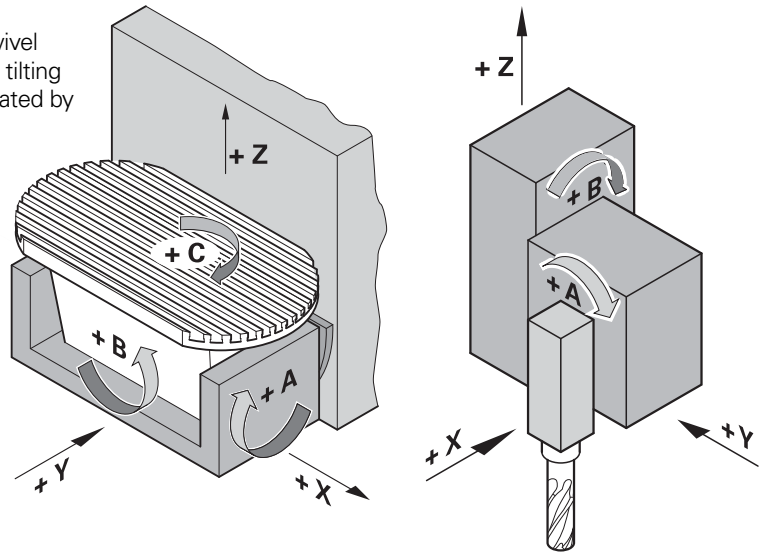
Cylindrical surface interpolation (software option 1)	A contour defined in the working plane is machined on a cylindrical surface.
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Tilting the working plane
(software option 1)

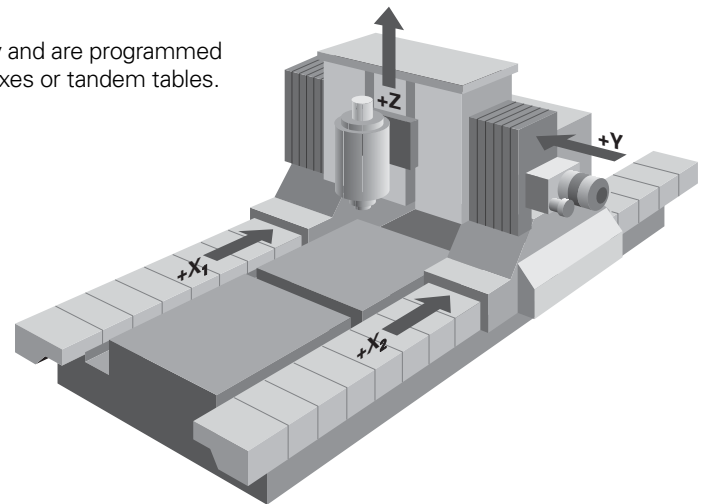
The TNC 320 has special coordinate transformation cycles for controlling swivel heads or tilting tables. The offset of the tilting axes and the tool lengths are compensated by the TNC.

The TNC 320 can manage more than one machine configuration (e.g. different swivel heads).



Synchronized axes
(option 24)

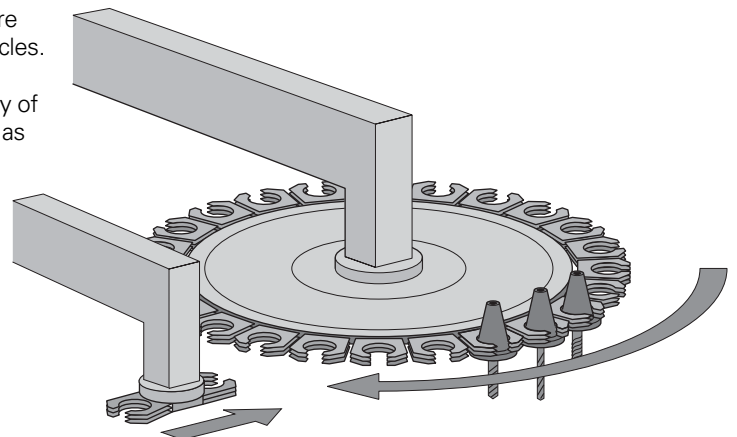
Synchronous axes are moved simultaneously and are programmed with the same axis designation, e.g. gantry axes or tandem tables.



PLC axes

Axes can be controlled by the PLC. They are programmed over M functions or OEM cycles.

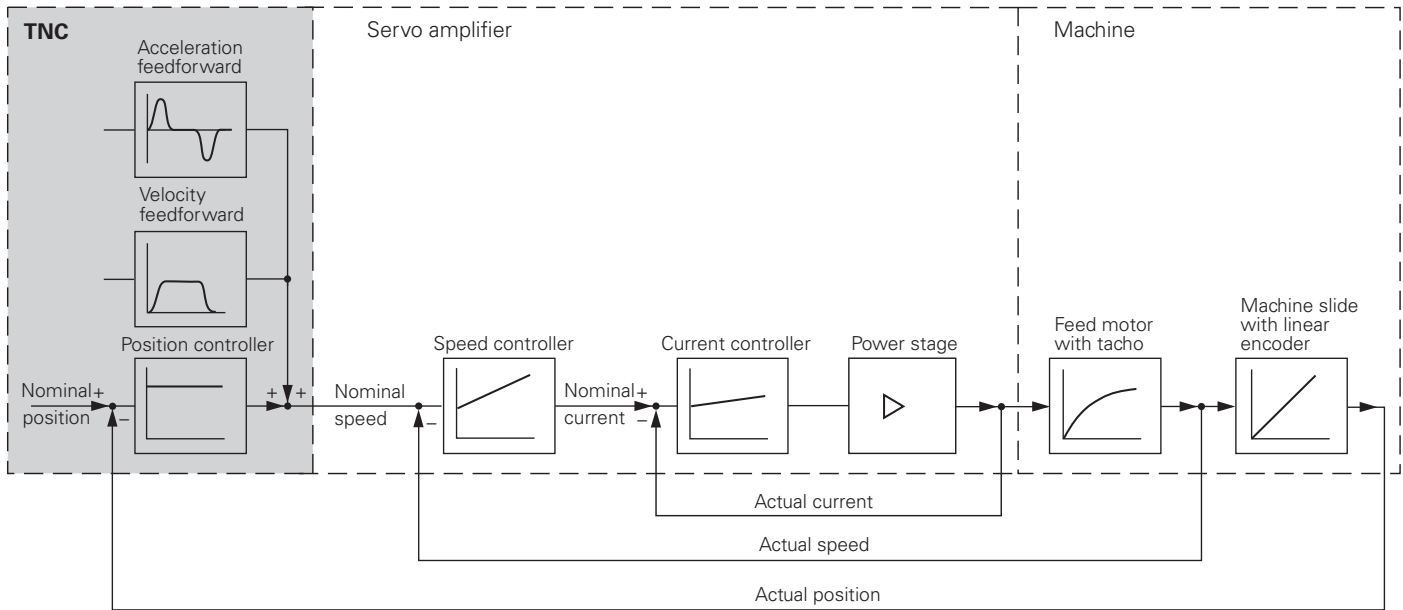
The PLC axes are positioned independently of the NC axes and are therefore designated as asynchronous axes.



Servo Control of Axes

Analog speed-command interface

The position controller is integrated in the TNC. The motor speed controller and the current controller are located in the servo amplifier. The TNC transmits the speed command signal through an analog ± 10 V interface (connection X8) to the servo amplifier.



Axis feedback control

HEIDENHAIN contouring controls can be operated with following error (also called lag) or with feedforward control.

Servo control with following error

The term "following error" denotes the distance between the momentary nominal position and the actual position of the axis.

The velocity is calculated as follows:

$$v = k_v \cdot s_a \quad \begin{array}{l} v = \text{velocity} \\ k_v = \text{position loop gain} \\ s_a = \text{following error} \end{array}$$

Servo control with feedforward

Feedforward means that the speed and the acceleration are adjusted to fit the machine. Together with the values calculated from the following error, it forms the nominal value. This greatly reduces the following error (in the range of a few μm). The feedforward is adjustable from 0 to 100% via a machine parameter.

Central drive

It is possible to use one common drive for several or all machine axes. The NC software allows the user to use the same nominal position value output for more than one axis. The most important basic requirements for realizing a machine with central drive:

- A common drive package with an analog nominal position value input exists for all axes.
- The machine axes are to be handled as clamping axes by the PLC.
- Use the PLC to monitor the drive regarding movement in multiple axes, and output an error message if necessary.

Control-loop cycle times

The cycle time for path interpolation is defined as the time interval during which interpolation points on the path are calculated. The control-loop cycle time of the TNC 320 is 3 ms.

Axis clamping

The control loop can be opened through the PLC in order to clamp specific axes.

Block processing time

When running long programs from the internal memory, the TNC has a short block processing time of only 6 ms. This means that the TNC can even mill contours made of 0.5 mm line segments at feed rates as high as 5 meters per minute.

Look-ahead

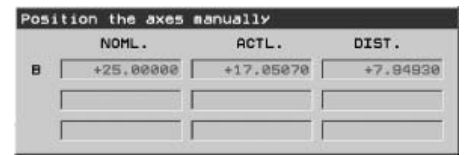
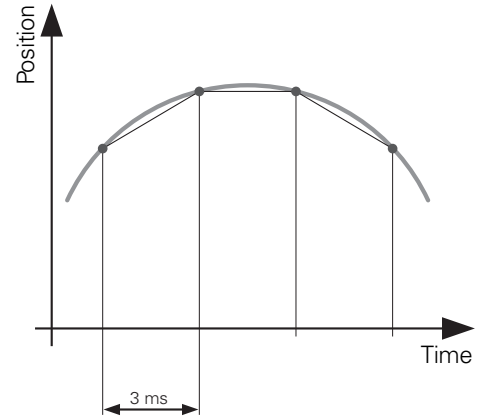
The TNC calculates the geometry ahead of time in order to adjust the feed rate. In this way directional changes are detected in time to accelerate or decelerate the appropriate NC axes.

Jerk limiting

To prevent machine oscillations, the jerk is limited to attain optimum path control.

Open-loop axes

One or more axes can be defined as open-loop axes (manually operated axes, counter axes). They have position encoders for determining and displaying the current position value, but no nominal-value outputs. The target position is approached by the machine operator manually (e.g. via mechanical handwheels). When an NC block with an open-loop axis is reached during machining, a dialog window appears, prompting the machine operator to traverse the axis to the nominal coordinates.



Machine Configuration

A control must have access to specific machine data (e.g. traverse distances, acceleration, speeds) before it can execute its programmed instructions. These data are defined in machine parameters. Every machine has its own set of parameters.

Structured organization of machine parameters

The TNC 320 features a simplified configuration editor. The machine parameters are displayed on the control's screen in a clear tree structure. Move through the structure with the TNC operating panel or a USB mouse. The parameters are entered in windows, much like on a PC.

As an alternative, the configuration editor can display a table view. The table view is especially beneficial when configuring the parameter sets, since you can see the parameters of all axes at a glance.

Quick access using MP numbers

Each machine parameter has a unique 6-digit MP number. The GOTO function can be used for quick access to any machine parameter.



Encoders

For speed and position control of the axes and spindle, HEIDENHAIN offers both incremental as well as absolute encoders.

Incremental encoders

Incremental encoders have as measuring standard a grating consisting of alternate lines and spaces. Relative movement between the scanning head and the scale causes output of sinusoidal scanning signals. The measured value is calculated from these signals.

Reference mark

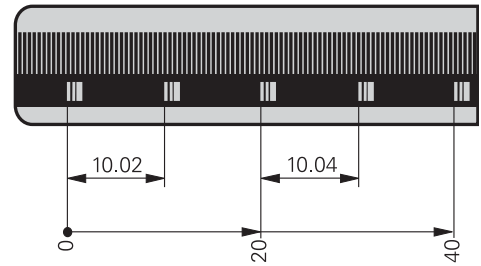
When the machine is switched on, the machine axes need to traverse a reference mark for an accurate reference to be established between measured value and machine position. For encoders with distance-coded reference marks, the maximum travel until automatic reference mark evaluation for linear encoders is only 20 mm or 80 mm, depending on the model, or 10° or 20° for angle encoders.

Reference mark evaluation

The routine for traversing the reference marks can also be started for specific axes via the PLC during operation (reactivation of parked axes).

Output signals

Incremental encoders with sinusoidal output signals with levels $\sim 1 V_{PP}$ are suitable for connection to HEIDENHAIN numerical controls.



Absolute encoders

With absolute encoders, the position information is contained in several coded tracks. Thus, an absolute reference is available immediately after switch-on. Reference-mark traverse is not necessary. Additional incremental signals are output for highly dynamic control loops.

EnDat interface

The TNC 320 is fitted with the serial EnDat interface for the connection of absolute encoders.

Note: The EnDat interface on HEIDENHAIN encoders differs in its pin assignment from the interface on Siemens motors with integrated absolute ECN/EQN rotary encoders. Special adapter cables are available.

Encoder inputs for position control

Incremental and absolute linear, angular or rotary encoders from HEIDENHAIN can be connected to encoder inputs of the TNC 320.

Inputs	Signal level/ Interface ¹⁾	Input frequency ¹⁾
Incremental	$\sim 1 V_{PP}$	33 kHz/350 kHz
Absolute	EnDat 2.1 $\sim 1 V_{PP}$	– 33 kHz/350 kHz

¹⁾ switchable

Types of Error Compensation

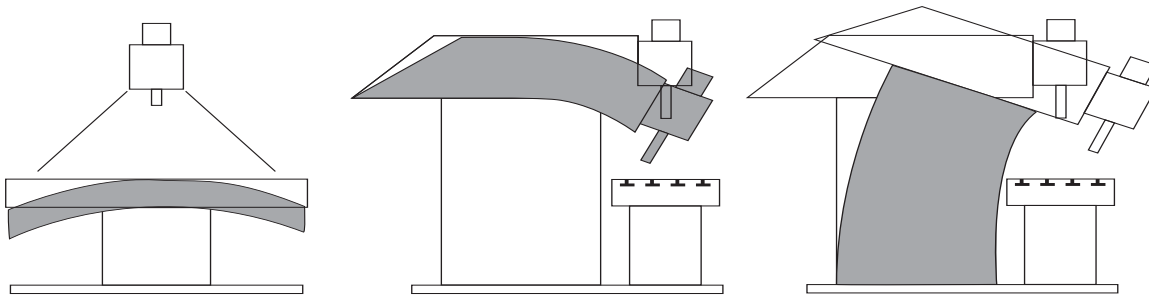
The TNC 320 automatically compensates mechanical errors on the machine.

Linear error

Linear error can be compensated over the entire travel range for each axis.

Nonlinear error

The TNC 320 can compensate for ballscrew pitch errors and sag simultaneously. The compensation values are stored in a table. A separate backlash can also be entered for each measuring point (outside of the controlled system).



Backlash

The play between table movement and rotary encoder movement on direction changes can be compensated in length measurements by spindle and rotary encoder. This backlash is outside the controlled system.

Thermal expansion

To compensate thermal expansion, the machine's expansion behavior must be known.

The temperature can be recorded via temperature measurement thermistors connected to the analog inputs of the PLC extension. The PLC evaluates the temperature information and transfers the compensation value to the NC.

Monitoring Functions

During operation, the TNC 320 monitors:

- Amplitude of the encoder signals
- Edge separation of the encoder signals
- Absolute position for encoders with distance-coded reference marks
- Current position (following error monitoring)
- Actual path traversed (movement monitoring)
- Position deviation at standstill
- Checksum of safety-related functions
- Supply voltage
- Buffer battery voltage
- Operating temperature of the MC and CPU
- Running time of the PLC program

In the case of hazardous errors, an EMERGENCY STOP message is sent to the external electronics via the control-is-ready output, and the axes are brought to a stop.

The correct connection of the TNC 320 into the machine's EMERGENCY STOP circuit is checked when the control system is switched on.

In the event of an error, the TNC 320 displays a message in plain language.

Context-sensitive help

The HELP and ERR keys provide the user with context-sensitive help. This means that in the event of an error message, the TNC 320 displays information on the cause of the error and proposes solutions. The machine manufacturer can also use this function for PLC error messages.



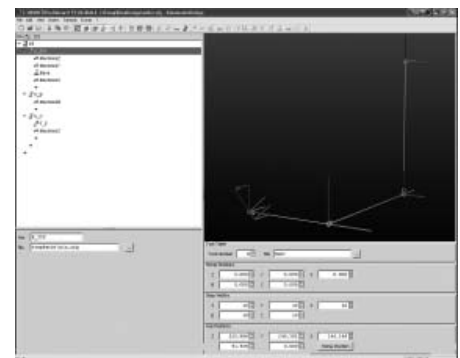
KinematicsDesign (accessory)

KinematicsDesign is a PC program for creating adaptable kinematic configurations. It supports:

- Complete kinematics configurations
- Transfer of configuration files between control and PC

When used with the iTNC 530, KinematicsDesign provides further conveniences:

- Assignment table
- Kinematics description table
- Kinematics subfile description table
- Tool-carrier kinematics description table
- Definition table for collision-monitored objects (CMO)
- Configuration and initial operation of Dynamic Collision Monitoring (DCM; option 40)



If KinematicsDesign is connected with a control online (operation is also possible with the programming station software), then machine movements can be simulated graphically along with axis traverse. With the iTNC 530, when DCM is active the workpiece space is also simulated and any collisions or collision-endangered objects are displayed in a definable color.

Depending on the control involved, the visualization capabilities include the pure depiction of the transformation sequence and even wire models or a complete representation of the working envelope on the iTNC 530.

Spindle

Analog nominal speed value	Up to 100000 min ⁻¹
Position-controlled spindle	The position of the spindle is monitored by the TNC 320.
Encoder	HEIDENHAIN rotary encoder with sinusoidal voltage signals (1 V _{PP}) or EnDat interface.
Tapping	There are special cycles for tapping with or without floating tap holder. For tapping without floating tap holder, the spindle must be operated under position control.
Oriented spindle stop	With a position-controlled spindle, the spindle can be positioned exactly to 0.1°.
Spindle override	0 to 150 %
Gear ranges	A specific nominal speed can be defined for each gear range. The gear stages are controlled by the PLC.
Second spindle	Up to two spindles can be alternately controlled. You can switch from spindle 1 to spindle 2 through the PLC. Because the second spindle is controlled instead of an axis, the number of available axes is reduced by one.

Commissioning and Diagnostic Aids

The TNC 320 provides internal commissioning and diagnostic aids.

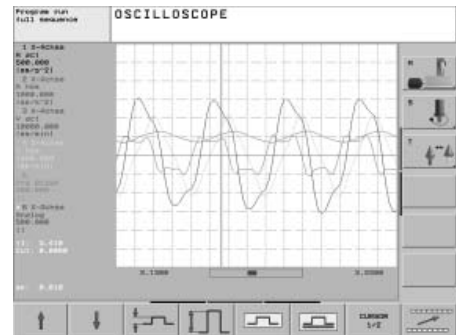
ConfigDesign (accessory)

- PC software for configuring the machine parameters
- Machine-parameter editor for the control; all support information; additional data and input limits are shown for each parameter
 - Configuration of machine parameters
 - Comparison of parameters from different controls
 - Importing of service files: easy testing of machine parameters in the field
 - Rule-based creation and management of machine configurations for multiple controls (together with PLCdesign)

Oscilloscope

The TNC 320 features an integrated oscilloscope. Both X/t and X/Y graphs are possible. The following characteristic curves can be recorded and stored in six channels:

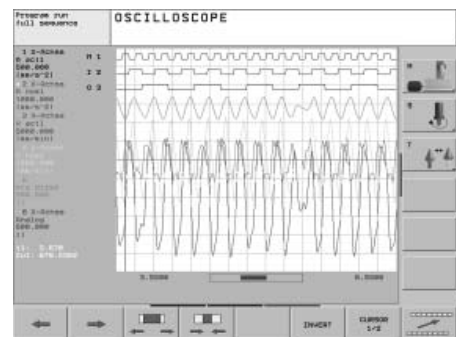
- Actual value of axis feed rate
- Nominal value of axis feed rate
- Contouring feed rate
- Actual position
- Nominal position
- Servo lag of the position controller
- Nominal values for speed, acceleration and jerk
- Actual values for speed, acceleration and jerk
- Nominal value of analog output
- Content of PLC operands
- Encoder signal (0° – A)
- Encoder signal (90° – B)



Logic signals

Simultaneous graphic representation of the logic states of up to 16 operands (markers, words, inputs, outputs, counters, timers)

- Marker (M)
- Input (I)
- Output (O)
- Timer (T)
- Counter (C)
- IpoLogik (X)



Commissioning Wizard

In order to simplify the adaptation of the axes and spindle, the **Commissioning Wizard for analog axes** guides you step-by-step through the commissioning of any axis parameter set.

You can define the following machine parameters with the aid of the Commissioning Wizard:

- Ascertain the algebraic sign of the axis
- Ascertain the axis traverse direction
- Ascertain the velocity at an analog voltage of 9 V
- Ascertain the maximum acceleration of the axis
- Ascertain the k_v factor of the axis
- Ascertain the acceleration feedforward of the axis

OLM Online monitor	<p>The online monitor (OLM) supports the commissioning and diagnosis of control components through:</p> <ul style="list-style-type: none"> • Display of control-internal variables for axes and channels • Display of controller-internal variables (if a CC is present) • Display of hardware signal states • Various trace functions • Activation of spindle commands • Enabling control-internal debug outputs <p>The online monitor is a component part of the TNC 320 and is called over a code number.</p>
TNCscope (accessory)	<p>PC software for transferring the oscilloscope files to the PC. Note: The trace files are saved in the TNCscope data format.</p>
API DATA	<p>The API DATA function enables the control to display the states or contents of the symbolic API markers and API double words. This function requires that your PLC program use the new symbolic memory interface.</p> <p>Note: The API DATA function does not provide usable display values with the iTNC 530-compatible memory interface (API 1.0).</p>
Table function	<p>The current conditions of the markers, words, inputs, outputs, counters and timers are displayed in tables. The conditions can be changed through the keyboard.</p>
Trace function	<p>The current content of the operands and the accumulators is shown in the statement list in each line in HEX or decimal code. The active lines of the statement list are marked.</p>
Log	<p>For the purposes of error diagnosis, there is one log for all error messages and one for all keystrokes.</p>
TeleService (accessory)	<p>PC software for remote diagnosis, remote monitoring, and remote control of the TNC 320. For further information, ask for the <i>Remote Diagnosis with TeleService</i> Technical Information sheet.</p>

Integral PLC

The PLC program is created by the machine manufacturer either with the PLC development software **PLCdesign** (accessory) or at the control with an external PC keyboard with a USB connection.

Machine-specific functions are activated and monitored via the PLC inputs/outputs. The number of PLC inputs/outputs required depends on the complexity of the machine.

PLC expansion If the PLC inputs/outputs of the TNC 320 are insufficient, the external PL 510 PLC input/output system can be connected.

Rated operating current per output Logic unit: 0.15 A
(for PL 510/PL 550 see *PLC Inputs/Outputs*)

PLC programming

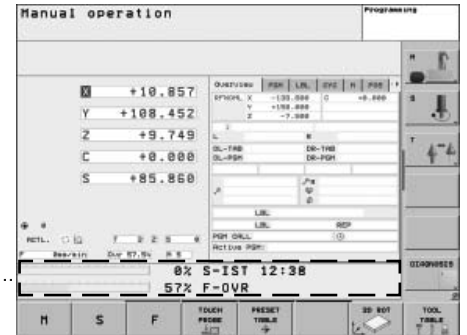
Format	Statement list
Memory	50 MB
Cycle time	Typically 21 ms, adjustable
Instruction set	<ul style="list-style-type: none">• Bit, byte and word commands• Logical operations• Arithmetic commands• Comparisons• Nested calculations (parentheses)• Jump commands• Subroutines• Stack operations• Submit programs• 952 timers• 48 counters• Comments• PLC modules• 100 strings

PLC window

PLC error messages can be displayed by the TNC 320 in the dialog line during operation.

Small PLC window

The TNC 320 can show additional PLC messages and bar diagrams in the small PLC window.



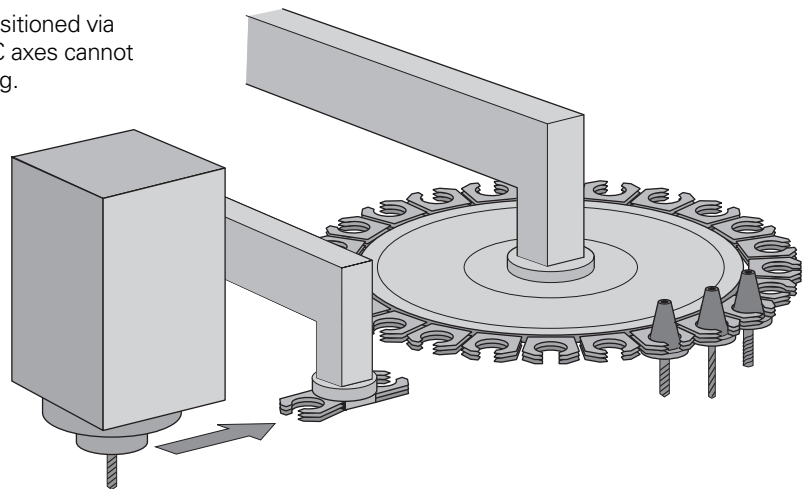
Small PLC window

PLC soft keys

The machine manufacturer can display his own PLC soft keys in the vertical soft-key row on the screen.

PLC positioning

All closed-loop axes can be also positioned via the PLC. PLC positioning of the NC axes cannot be superimposed on NC positioning.



PLC axes

Axes can be controlled by the PLC. They are programmed by M functions or OEM cycles. The PLC axes are positioned independently of the NC axes.

PLCdesign
(accessory)

PC software for PLC program development.
PLCdesign can be used to easily create PLC programs.
Comprehensive examples of PLC programs are included.

Functions:

- Easy-to-use text editor
- Menu-guided operation
- Programming of symbolic operands
- Modular programming method
- "Compiling" and "linking" of PLC source files
- Operand commenting, creation of a documentation file
- Comprehensive help system
- Data transfer between the TNC 320 and the PC
- Creation of PLC soft keys

PC requirements:

- Windows 2000/XP/Vista/7 operating system
- At least 20 MB free memory on the hard disk
- Serial interface; Ethernet interface recommended
- Internet Explorer

Python OEM process
(option 46)

The Python OEM Process option is an effective tool for the machine tool builder to use an object-oriented high-level programming language in the control (PLC).

Python is an easy-to-learn script language that supports the use of all necessary high-level language elements.

Python OEM Process can be universally used for machine functions and complex calculations, as well as to display special user interfaces.

User-specific or machine-specific solutions can be efficiently implemented. Numerous libraries on the basis of Python and GTK are available, regardless of whether you want to create special algorithms for special functions, or separate solutions such as an interface for machine maintenance software.

The applications created can be included in the familiar PLC windows via the PLC, or they can be displayed in separate free windows that can be expanded to the TNC's full screen size.



PLC basic program The PLC basic program serves as a basis for adapting the TNC 320 to the requirements of the respective machine. Registered customers can download it from the Internet.

These essential functions are covered by the PLC basic program:

- Controlling all axes
- Clamped axes
- Homing the axes; reference end positions
- Positioning the axes after reference run
- Compensating the axis temperature
- Feed rate control
- Controlling and orienting the spindle
- Tool changer
- Vertical PLC soft-key row
- Displaying and managing PLC error messages
- Status display in the small PLC window
- Hydraulic control
- Control of the coolant system (internal, external, air)
- Handling M functions
- Lubrication
- Chip conveyor
- Operation of the second spindle alternately with the first
- S-coded spindle
- Positioning the spindle as an axis
- Operation with clamped axes
- Axes with central drive
- Axes with Hirth grid
- Indexing fixture
- PLC log
- Touch probes
- PLC support for handwheels
- Control of doors

OEM Cycles

The machine manufacturer can create and store his own cycles for recurring machining tasks. These OEM cycles are used in the same way as standard HEIDENHAIN cycles.

CycleDesign (accessory)

The soft-key structure for the OEM cycles is managed using the **CycleDesign** PC program. In addition, CycleDesign can be used to store help graphics and soft keys in BMP format on the memory card of the TNC 320. Graphic files can be compressed to ZIP format to reduce the amount of memory used.

Tool Management

With integral PLC, the tool changer is moved either via proximity switch or as a controlled axis. Tool management including tool life monitoring and replacement tool monitoring is carried out by the TNC 320.

Tool measurement

Tools can be measured and checked using the TT 140 tool touch probe (accessory). The TNC 320 provides standard cycles for automatic tool measurement. It calculates the probing feed rate and the optimal spindle speed. The measured data is stored in a tool table.



Touch-Probe Configuration

All touch-probe data can be configured conveniently through a table. All HEIDENHAIN touch probe systems are preconfigured and can be selected through a drop-down menu.



Data Interfaces

The TNC 320 is connected to PCs, networks and other data storage devices via data interfaces.

Ethernet

The TNC 320 can be interconnected via the Ethernet interface. The TNC 320 features a 100BaseT Ethernet (Twisted Pair Ethernet) connection to the data network.

Maximum transmission distance:
 Unshielded 100 m
 Shielded 400 m

Protocol The TNC 320 communicates using the TCP/IP protocol.

Network connection

- NFS file server
- Windows networks (SMB)

Data transfer rate Approx. 40 to 80 Mbps (depending on file type and network utilization)

RS-232-C/V.24 Data interface according to DIN 66020 or EIA standard RS-232-C. Maximum transmission distance: 20 m

Data transfer rate 115200; 57600; 38400; 19200; 9600; 4800; 2400; 1200; 600; 300; 150; 110 bps

Protocols The TNC 320 can transfer data using various protocols.

Standard data transfer The data is transferred character by character. The number of data bits, stop bits, the handshake and character parity must be set by the user.

Blockwise data transfer The data is transferred blockwise. A block check character (BCC) is used to ensure data integrity. This method improves data security.

LSV2 Bidirectional transfer of commands and data according to DIN 66019. The data is divided into blocks and transferred.

Adapter block For connecting the interface to the electrical cabinet or operating panel
 RS-232-C/V.24 adapter 9-pin ID 363987-02
 25-pin ID 310085-01

USB

The TNC 320 features three USB 2.0 ports for the connection of standard USB devices, such as a mouse, drives, etc. Two are on the back of the control, and one is on the front. A cover cap protects it from contamination. The USB interfaces are rated for a maximum supply current of 0.5 A.

USB cable Cable length up to 5 m ID 354770-xx
 Cable length 6 m to 30 m with integrated amplifier; USB 1.1. ID 624775-xx

USB hub

If you need further USB ports or if the supply current is not sufficient, a USB hub is required. The USB hub from HEIDENHAIN offers four free USB ports.

Power supply: 24 V DC / max. 300 mA
 ID 582884-02

Cover The USB hub can be installed in the operating panel in such a way that two USB ports can be accessed from the outside. An optionally available cover can be used to protect the ports from contamination.

ID 508921-01



Software for Data Transfer

TNCremo (accessory)

This PC software package helps the user to transfer data from the PC to the TNC 320. The software on the PC transfers data blockwise with block check character (BCC).

Functions:

- Data transfer (also blockwise)
- Remote control (only serial)
- Management of the TNC 320 files
- Backup of the TNC 320 data
- Reading out the log
- Print-out of screen contents
- Text editor
- Managing more than one machine

Requirements:

- Windows 2000/XP/Vista/7 operating system
- At least 10 MB free hard-disk space
- Serial or Ethernet interface

TNCremoPlus (accessory)

In addition to the features you are already familiar with from TNCremo, TNCremoPlus can also transfer the current content of the control's screen to the PC ("live screen"). This makes it very simple to monitor the machine.

ID

340447-xx

DNC Applications

The development environments on Windows operating systems are particularly well suited as flexible platforms for application development in order to come to terms with the increasingly complex requirements of the machine's environment. The flexibility of the PC software and the large selection of ready-to-use software components and standard tools in the development environment enable you to develop PC applications of great use to your customers in a very short time, for example:

- Error reporting systems that, for example, send the customer a text message to his cell phone reporting problems on the currently running machining process
- Standard or customer-specific PC software that decidedly increases process security and equipment availability
- Software solutions controlling the processes of manufacturing systems
- Information exchange with job management software

HEIDENHAIN DNC (option 18)

The **HEIDENHAIN DNC** software interface (available as of NC software 340551-03) is an attractive communication platform for this purpose. It provides all the data and configuration capabilities needed for these processes so that an external PC application can evaluate data from the control and, if required, influence the manufacturing process.

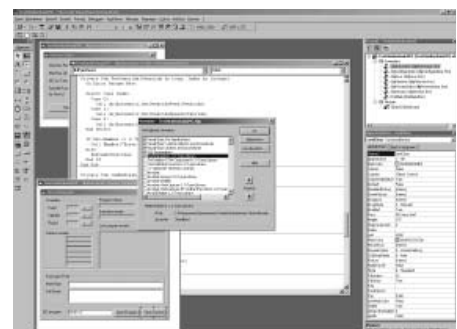
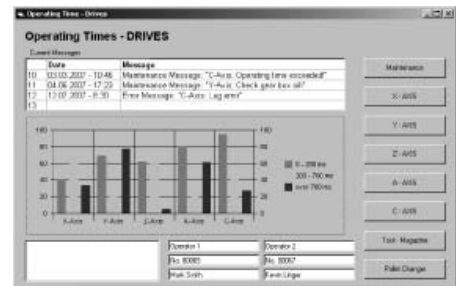
RemoTools SDK (accessory)

To enable you to use HEIDENHAIN DNC effectively, HEIDENHAIN offers the **RemoTools SDK** development package. It contains the COM components and the ActiveX control for integration of the DNC functions in development environments.

ID

340442-xx

For more information, refer to the brochure *HEIDENHAIN DNC*.



Mounting Instructions

Installation When installing the TNC 320, take note of the minimum spacing, space needed for servicing, and the appropriate length and location of the connecting cables.

Mounting and electrical installation Keep the following in mind during mounting and electrical installation:

- National regulations for power installations
- Interference and noise immunity
- Conditions of operation
- Mounting attitude

Degrees of protection The following components fulfill the requirements for IP 54 (dust protection and splash-proof protection):

- TNC 320 (when properly installed)
- Machine operating panel (when properly installed)
- Handwheel

Electromagnetic compatibility

Intended place of operation The unit fulfills the requirements for a Class A device in accordance with the specifications in EN 55022, and is intended for use in industrially zoned areas.

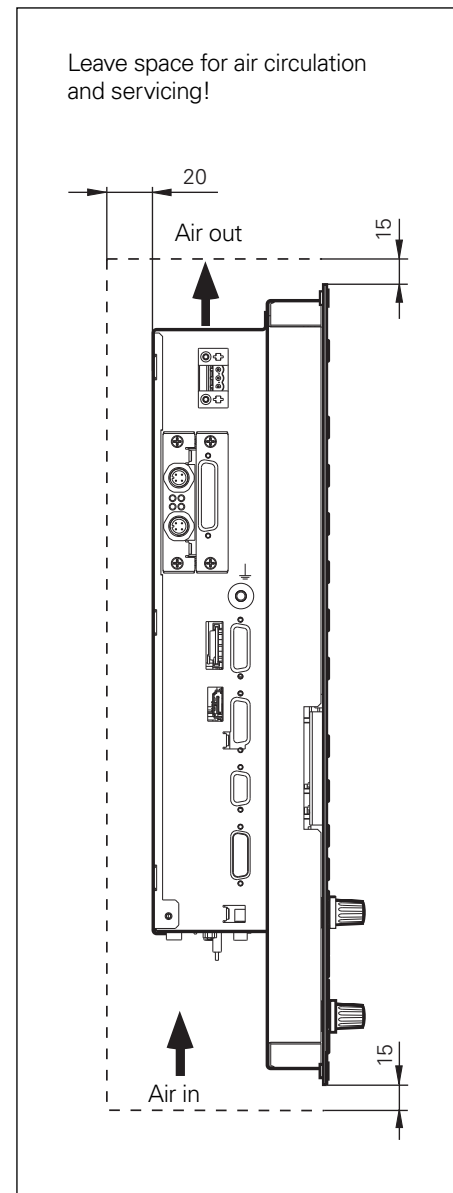
Protect your equipment from interference by observing the rules and recommendations specified in the Technical Manual.

Likely sources of interference Interference is mainly produced by capacitive and inductive coupling from electrical conductors or from device inputs/outputs, such as:

- Strong magnetic fields from transformers or electric motors
- Relays, contactors and solenoid valves
- High-frequency equipment, pulse equipment and stray magnetic fields from switch-mode power supplies
- Power lines and leads to the above equipment


Protective measures

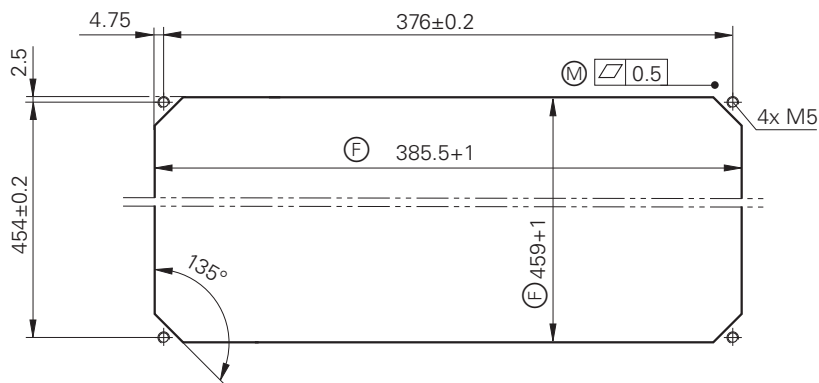
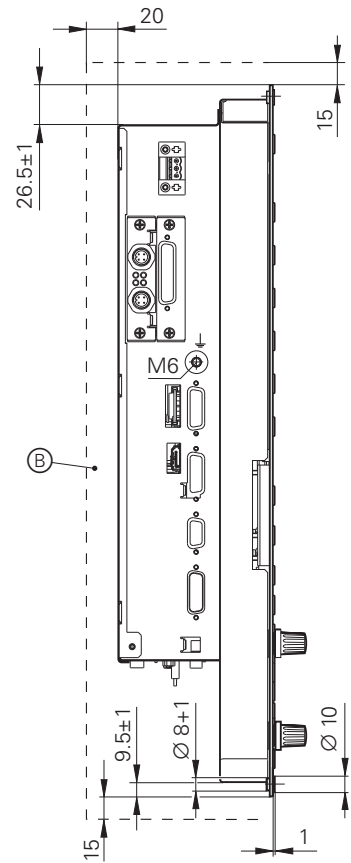
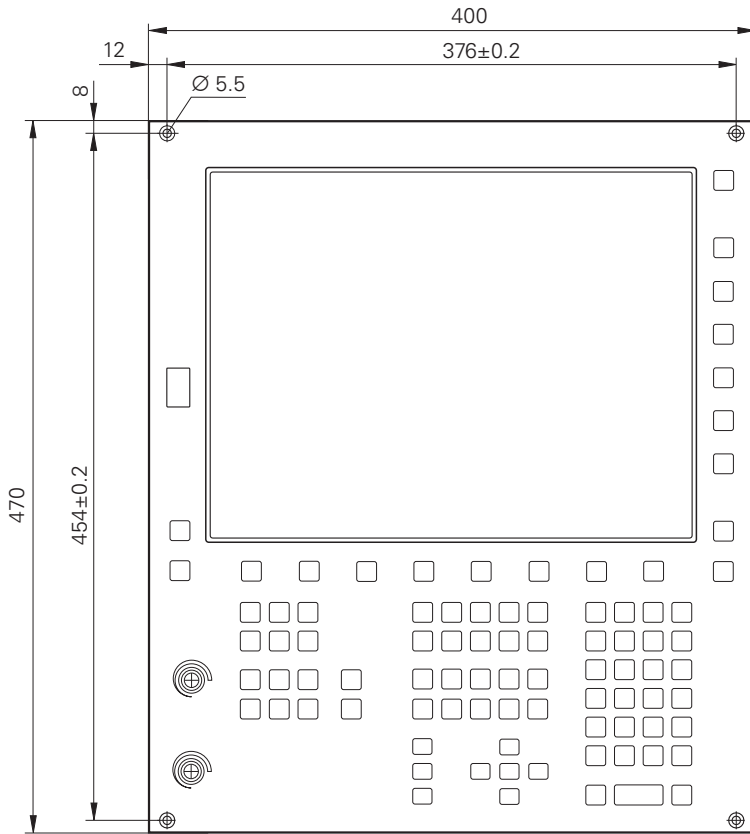
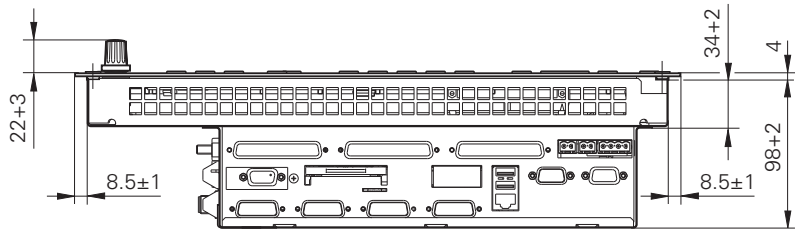
- Keep a minimum distance of 20 cm from the TNC 320 and its leads to devices that carry interference signals.
- Keep a minimum distance of 10 cm from the TNC 320 and its leads to cables that carry interference signals. For cables in metallic ducting, adequate decoupling can be achieved by using a grounded separation shield.
- Shielding according to EN 50178
- Use equipotential bonding conductors with a cross section of 6 mm²
- Use only genuine HEIDENHAIN cables, connectors and couplings



Overall Dimensions

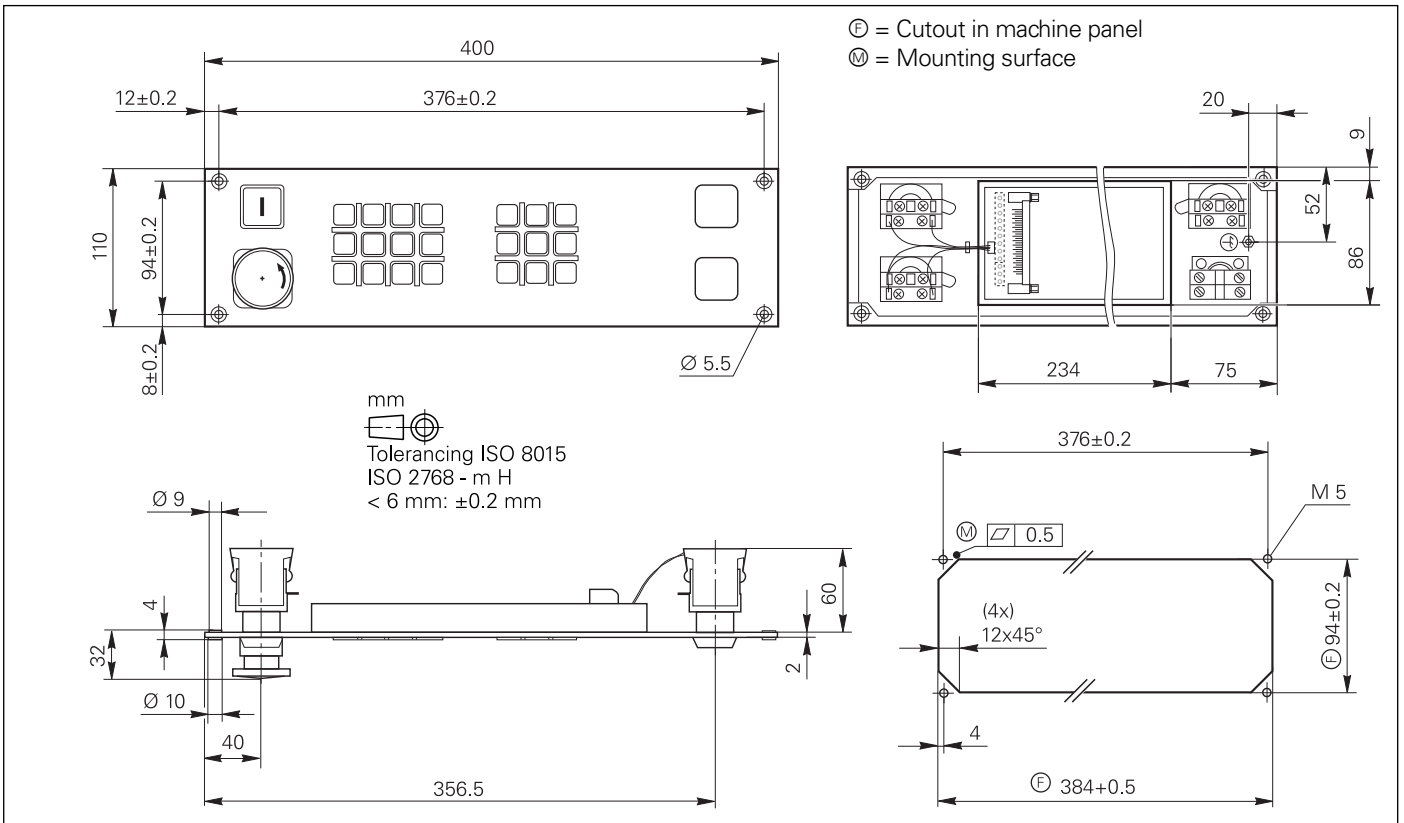
TNC 320

mm

 Tolerancing ISO 8015
 ISO 2768 - m H
 < 6 mm: ±0.2 mm

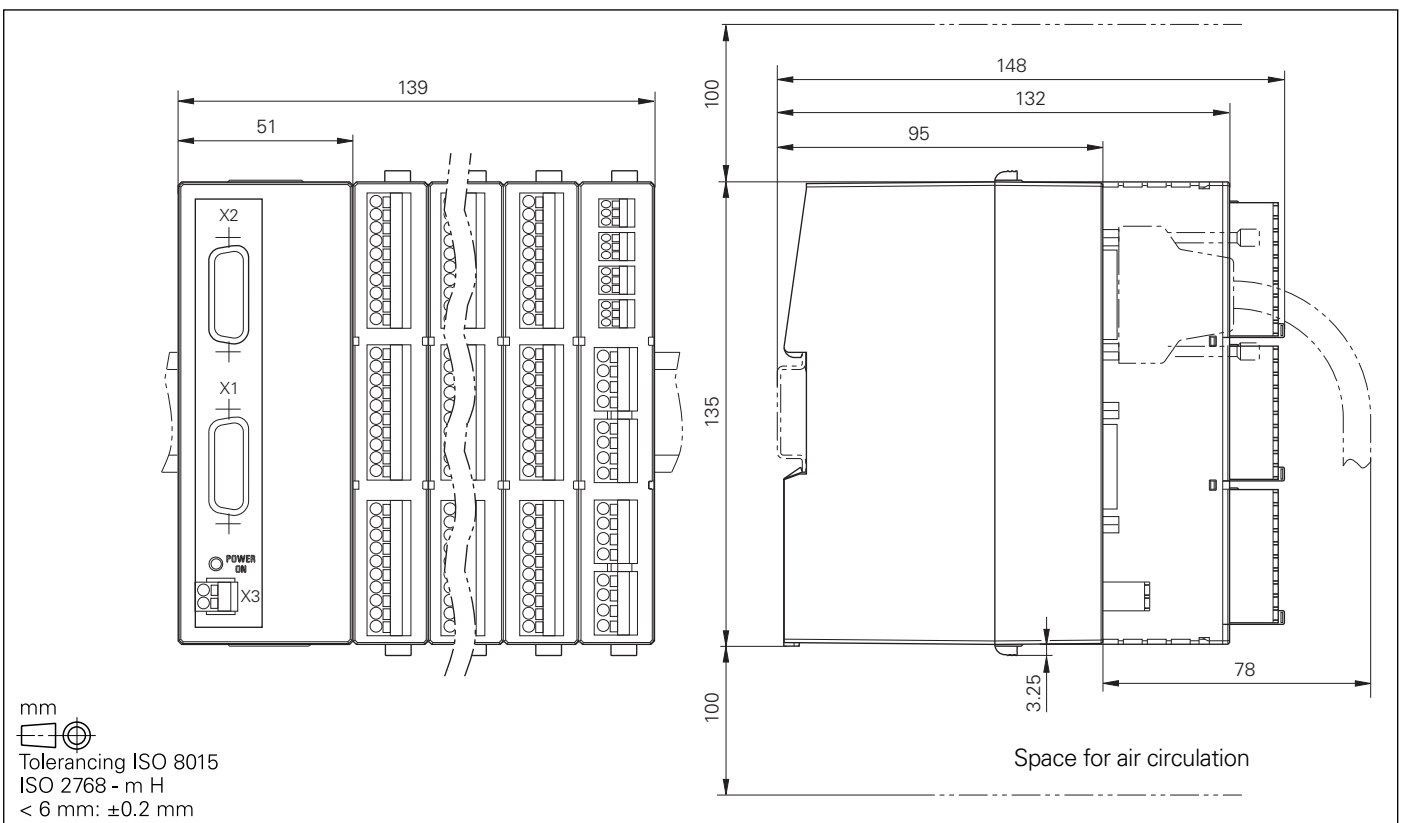


- ⊖ = Cutout in machine panel
- Ⓜ = Mounting surface
- ⊕ = Space for air circulation

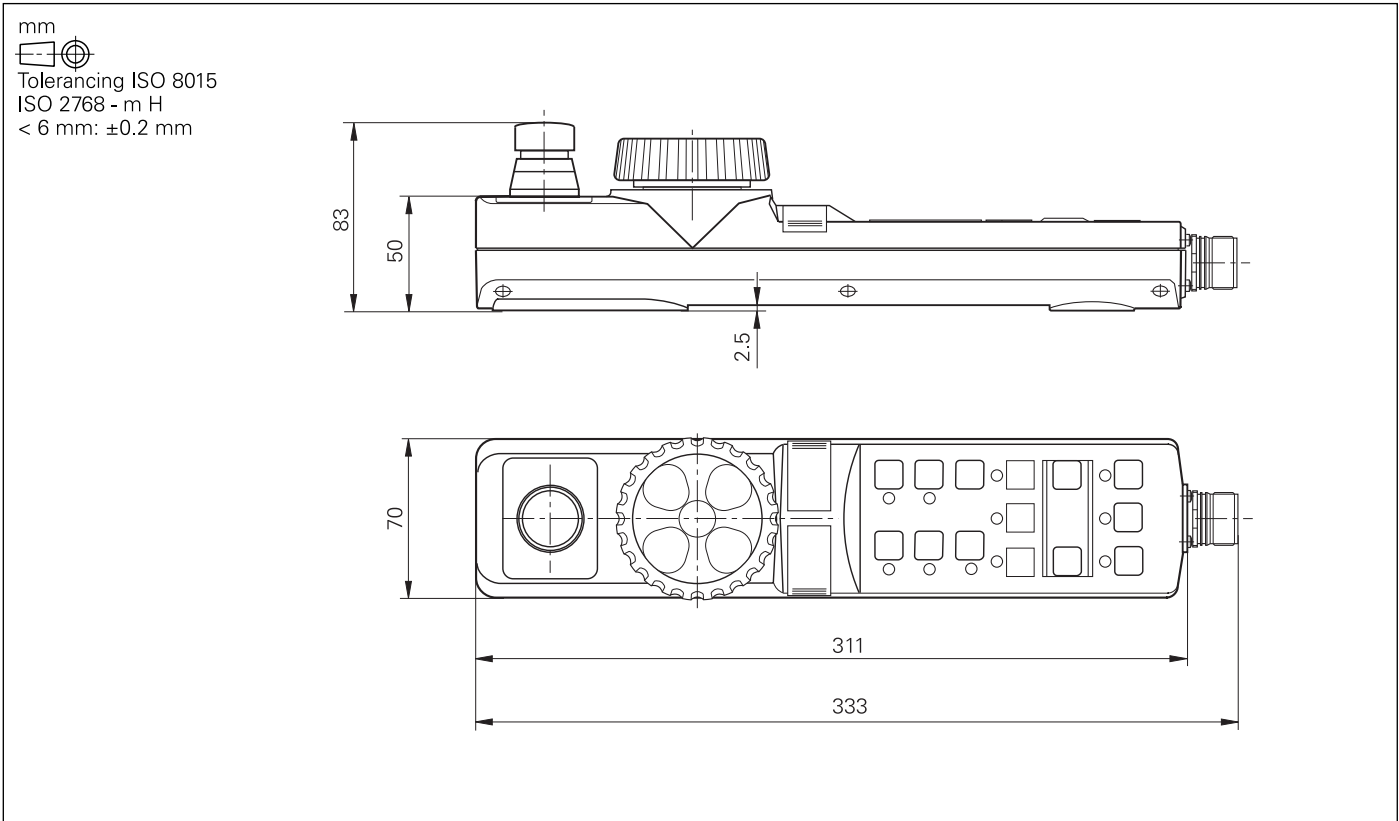
MB 420



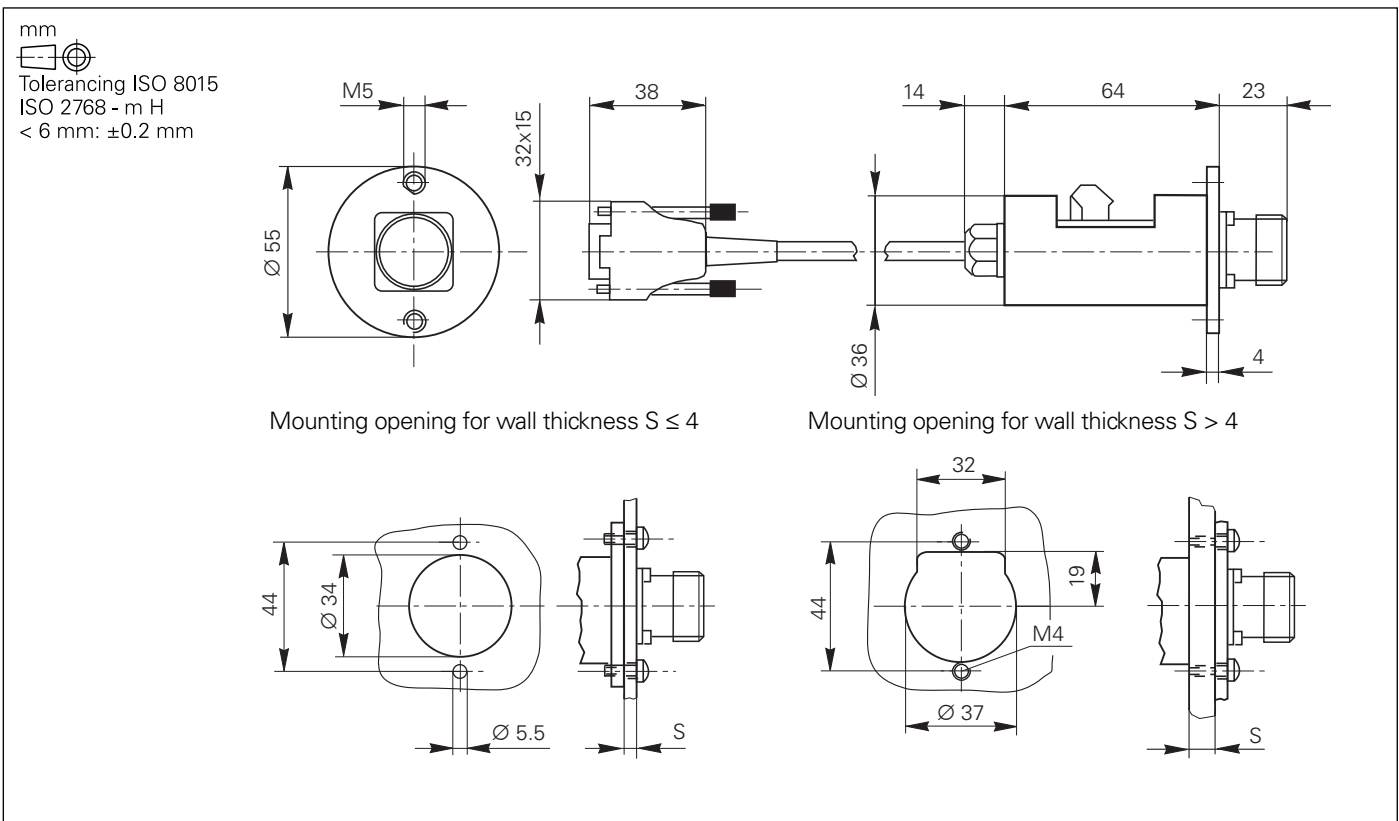
PL 510



HR 410



Adapter Cable for HR 410



HR 130, HR 150 with Control Knob

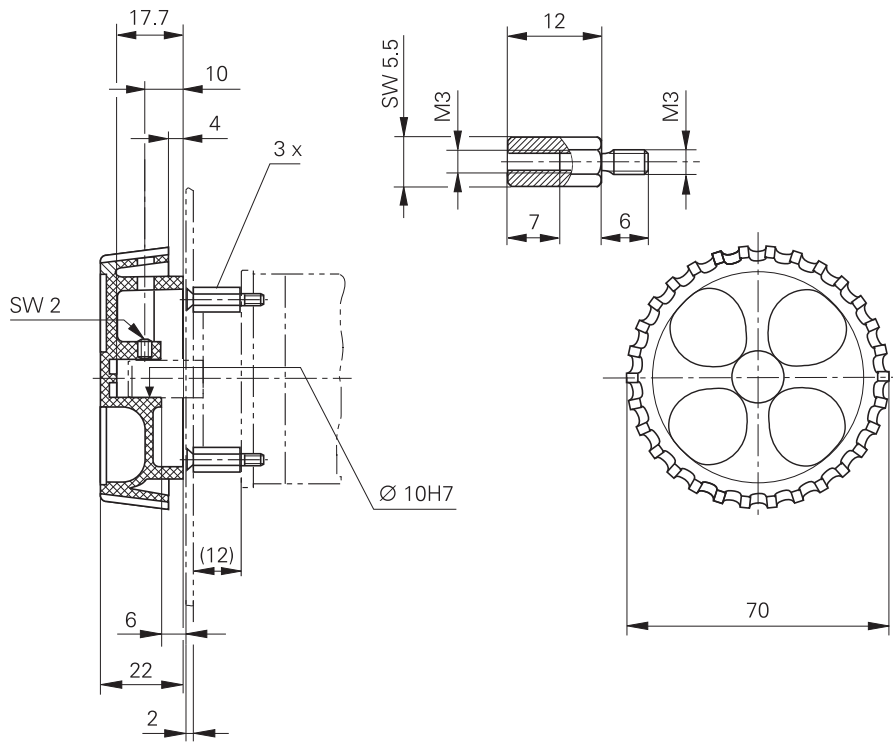
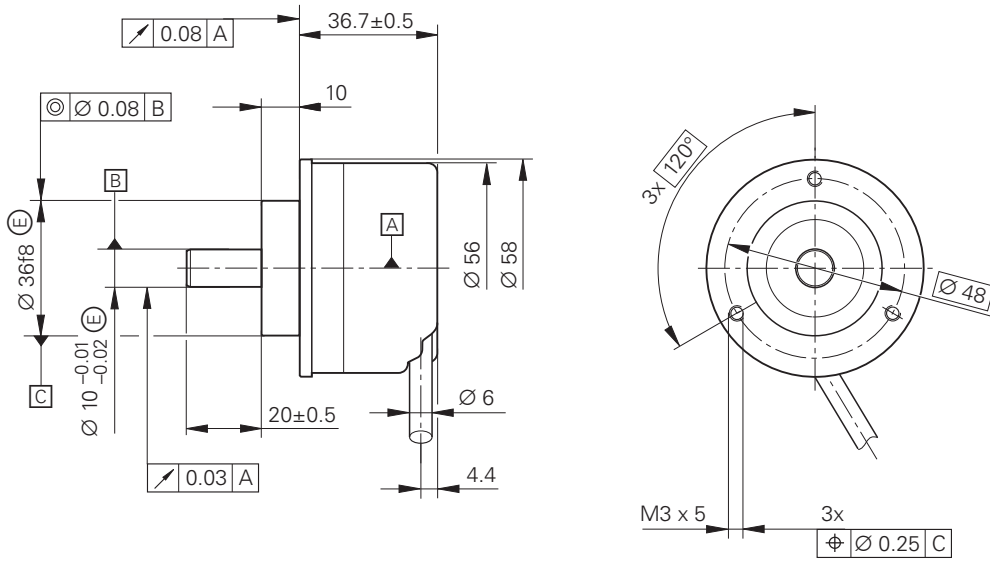
mm



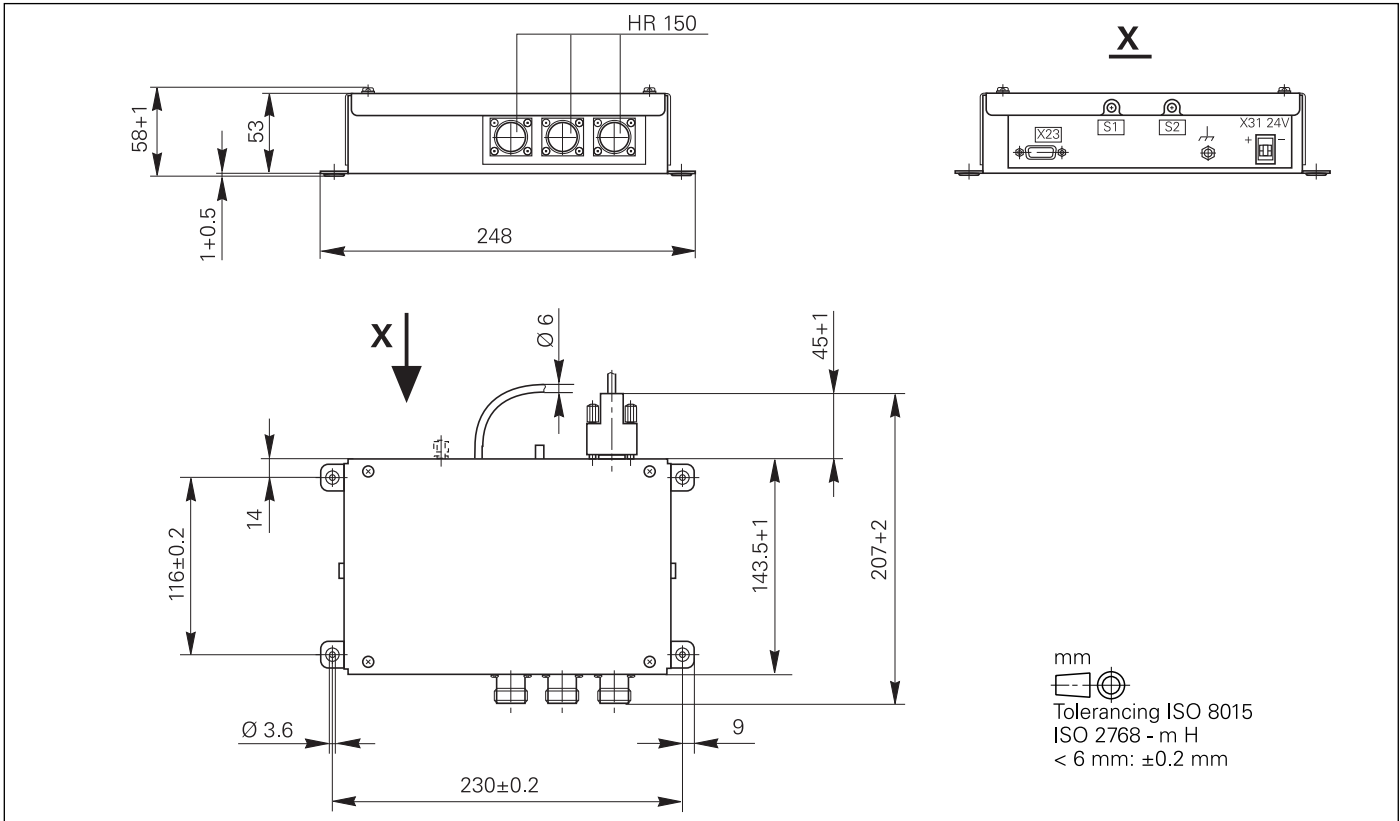
Tolerancing ISO 8015

ISO 2768 - m H

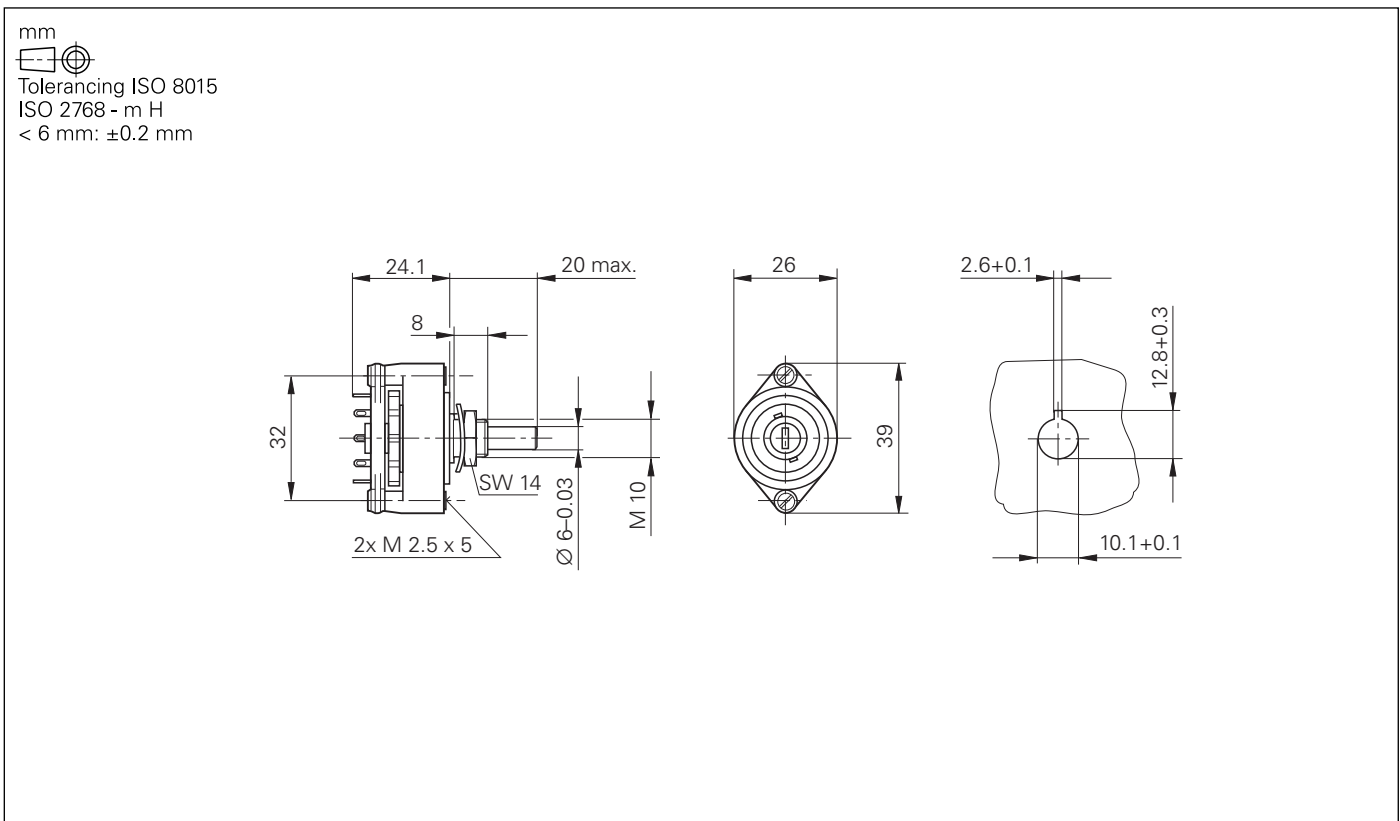
< 6 mm: ±0.2 mm



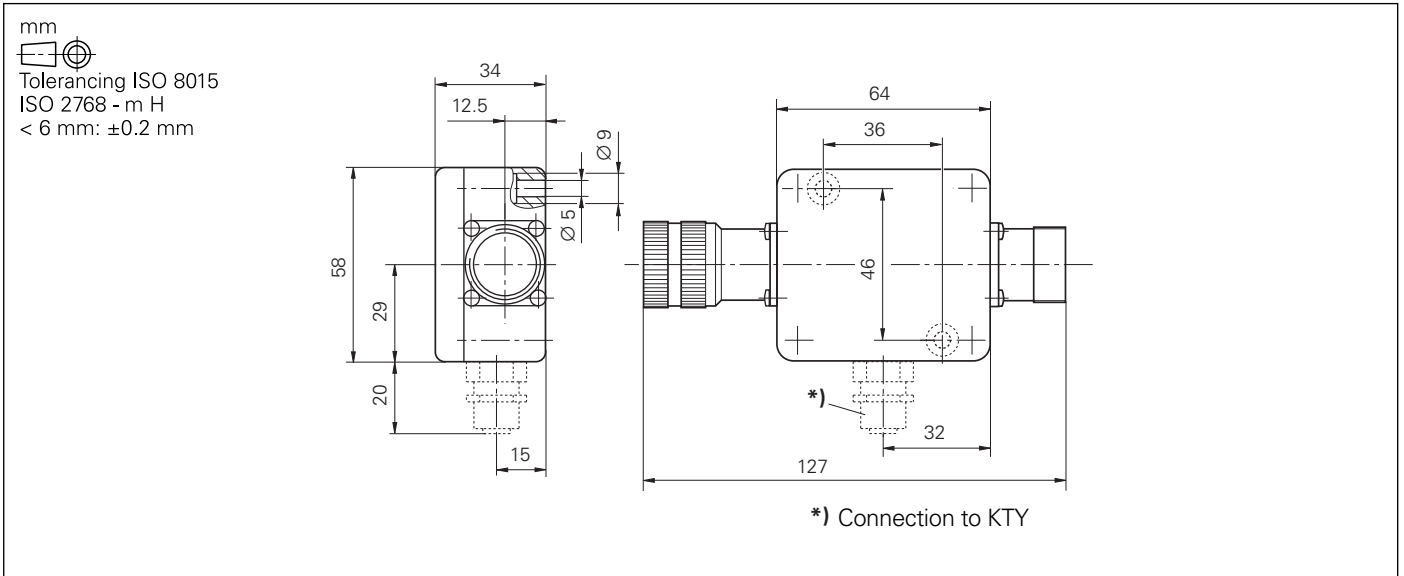
HRA 110



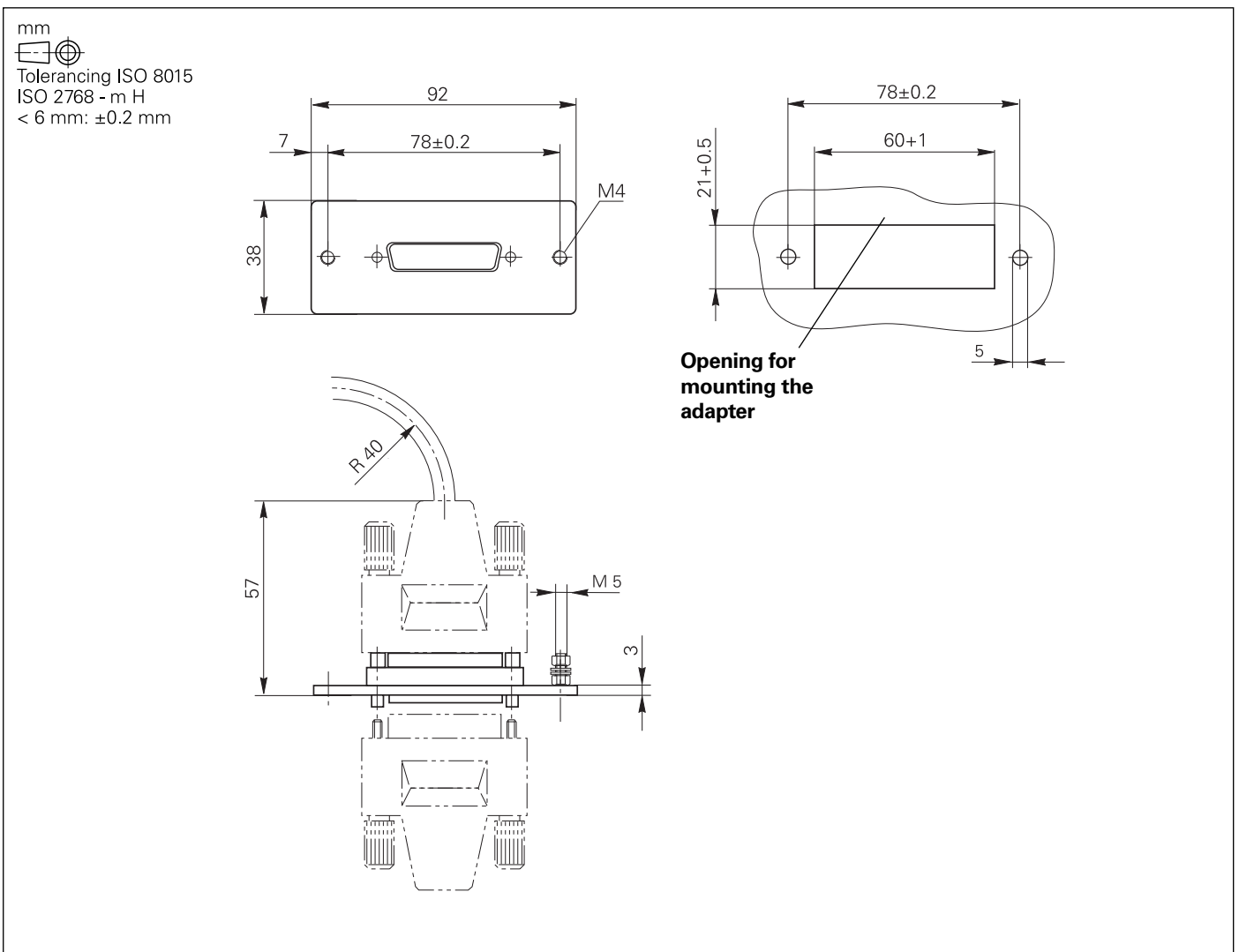
Step Switch



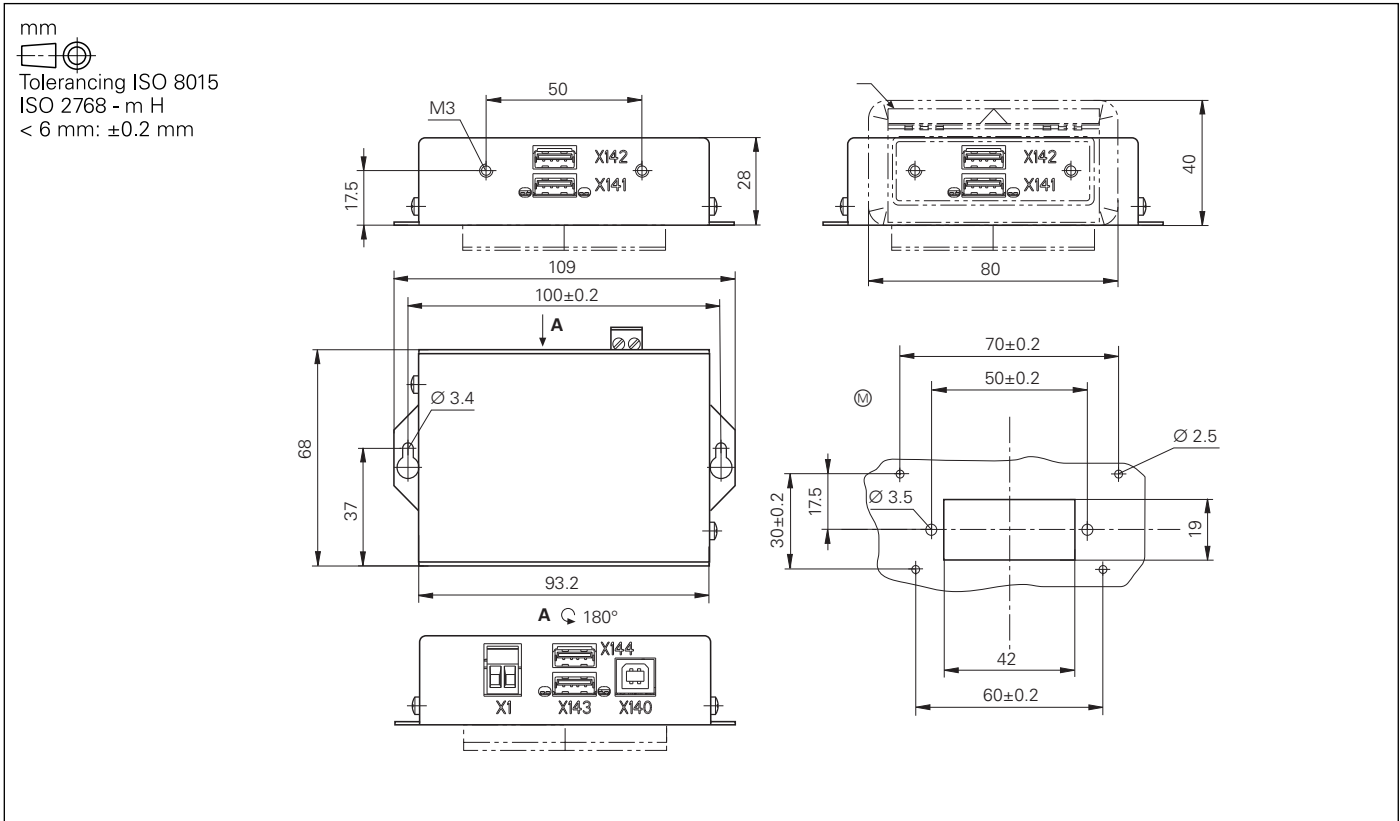
Line Drop Compensator for Encoders with EnDat Interface



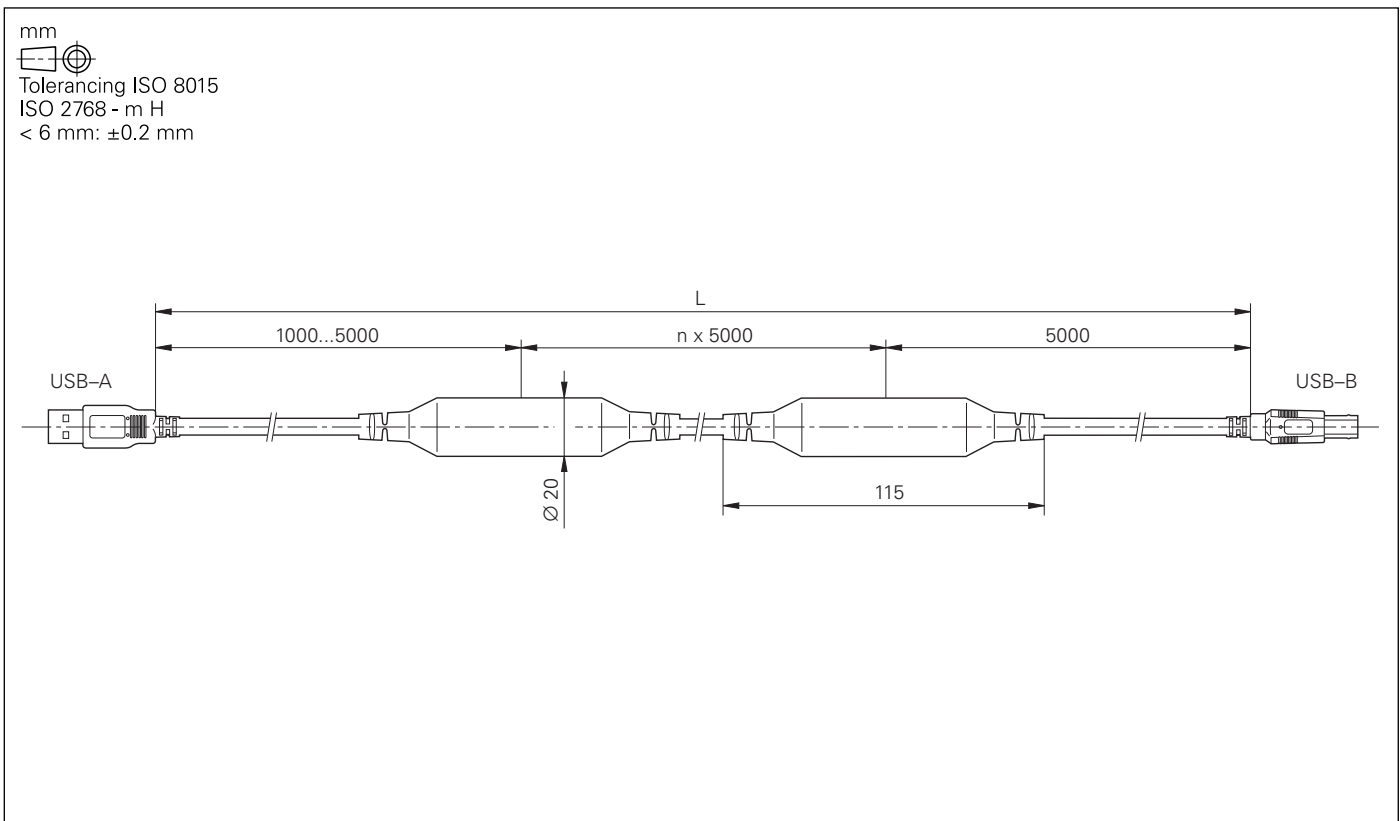
RS-232-C Adapter



USB Hub



USB Extension Cable with Hubs



Documentation

Items supplied with the control include:

- 1 User's Manual for HEIDENHAIN conversational programming
- 1 User's Manual for DIN/ISO programming
- 1 User's Manual for Cycle Programming

This documentation must be ordered separately in the language required.

Further documentation is available from HEIDENHAIN.

Technical documentation

- **TNC 320** Technical Manual in PDF format on the HESIS web including FileBase
- **TS 220** Mounting Instructions ID 312821-91
- **TS 440** Mounting Instructions ID 632756-9x
- **TS 444** Mounting Instructions ID 632757-9x
- **TS 640** Mounting Instructions ID 632760-9x
- **TS 740** Mounting Instructions ID 632761-9x
- **TT 140** Mounting Instructions ID 297510-xx

User documentation

- TNC 320**
- **Conversational** User's Manual ID 679222-xx
- **Cycle Programming** User's Manual ID 679220-xx
- **DIN/ISO** User's Manual ID 679226-xx

Other documentation

- **TNCremo** User's Manual As integrated help and in PDF format
- **TNCremoPlus** User's Manual As integrated help and in PDF format
- **PLCdesign** User's Manual As integrated help and in PDF format
- **CycleDesign** User's Manual As integrated help and in PDF format
- **KinematicsDesign** User's Manual As integrated help and in PDF format

Other documentation

- **TNC 320** brochure ID 551025-xx
- **Touch Probes** brochure ID 208951-xx
- **HEIDENHAIN DNC** brochure ID 628968-xx
- **Remote Diagnosis with TeleService** Product Overview ID 348236-xx
- **Touch Probes** CD-ROM ID 344353-xx
- **TNC 320 Programming Station** CD-ROM demo version ID 620943-xx

HEIDENHAIN Service

- Technical support** HEIDENHAIN offers the machine manufacturer technical support to optimize the adaptation of the TNC to the machine—including on-site support.
- Replacement control system** In the event of a fault, HEIDENHAIN guarantees the rapid supply of a replacement control system (usually within 24 hours in Europe).
- Hotline** Our service engineers are naturally at your disposal by telephone if you have any questions on the interfacing of the control or in the event of faults.
- TNC support** ☎ +49 8669 31-3101
E-mail: service.nc-support@heidenhain.de
- PLC programming** ☎ +49 8669 31-3102
E-mail: service.plc@heidenhain.de
- NC programming** ☎ +49 8669 31-3103
E-mail: service.nc-pgm@heidenhain.de
- Measuring systems** ☎ +49 8669 31-3104
E-mail: service.ms-support@heidenhain.de
- Lathe controls** ☎ +49 711 952803-0
E-mail: service.hsf@heidenhain.de
- Machine calibration** On request, HEIDENHAIN engineers will calibrate your machine's geometry, for example with a KGM grid encoder.

Seminars

HEIDENHAIN provides technical customer training in the following subjects:

- NC programming
- PLC programming
- TNC optimization
- TNC service
- Encoder service
- Special training for specific customers

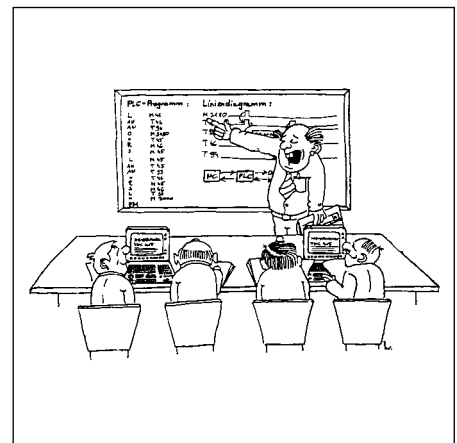
For more information on dates, registration, etc. call in Germany:

☎ +49 8669 31-2293 or 31-1695

FAX 08669 31-1999

E-mail: mtt@heidenhain.de

www.heidenhain.de

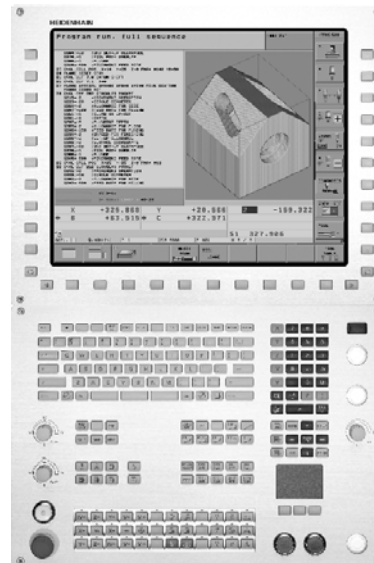


Other HEIDENHAIN Controls

iTNC 530

Information:
Brochure
iTNC 530

- Contouring control for **milling, drilling and boring machines, and machining centers**
- Up to 18 axes and controlled main spindle
- HEIDENHAIN inverter systems and motors recommended
- Uniformly digital with HSCI interface and EnDat interface
- TFT color flat-panel display, 15- or 19-inch
- Storage medium: HDR hard disk with 160 GB/SSDR solid state disk with 32 GB
- Programming in HEIDENHAIN conversational format, with smarT.NC or according to DIN/ISO
- Standard milling, drilling and boring cycles
- Touch probe cycles
- FK free contour programming
- Special functions for fast 3-D machining
- Short block processing time (0.5 ms)
- Automatic calculation of cutting data
- Pallet management



TNC 640

Information:
Brochure
TNC 640

- Contouring control for **milling and milling/turning machines**
- Up to 18 axes and controlled main spindle
- HEIDENHAIN inverter systems and motors recommended
- Uniformly digital with HSCI interface and EnDat interface
- 19-inch TFT color flat-panel display
- HDR 160 GB hard disk as storage medium
- Programming in HEIDENHAIN conversational format or according to ISO
- Comprehensive cycle package for milling and turning operations
- Constant surface speed
- Tool-tip radius compensation
- Touch probe cycles
- FK free contour programming
- Special functions for fast 3-D machining
- Short block processing time (0.5 ms)



TNC 620

Information:
Brochure
TNC 620

- Contouring control for **milling machines**
- Up to 5 axes and controlled main spindle
- HEIDENHAIN inverter systems and motors recommended
- Uniformly digital with HSCI interface and EnDat interface
- Compact design:
 - Screen, keyboard and main computer in one unit (MC 7110)
 - Screen and main computer in one unit (MC 7120) and separate keyboard with integrated ASCII keys
- Dimensions: 400 mm x 470 mm x 100 mm
- Integrated 15-inch TFT flat-panel display
- Memory medium for NC programs: CompactFlash memory card
- Programming in HEIDENHAIN conversational format or according to ISO
- Standard milling, drilling and boring cycles
- Touch probe cycles
- Short block processing time (1.5 ms)



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