



# HEIDENHAIN



## MANUALplus 620

The Contouring Control  
with Analog Drive Control  
for CNC and Cycle Lathes

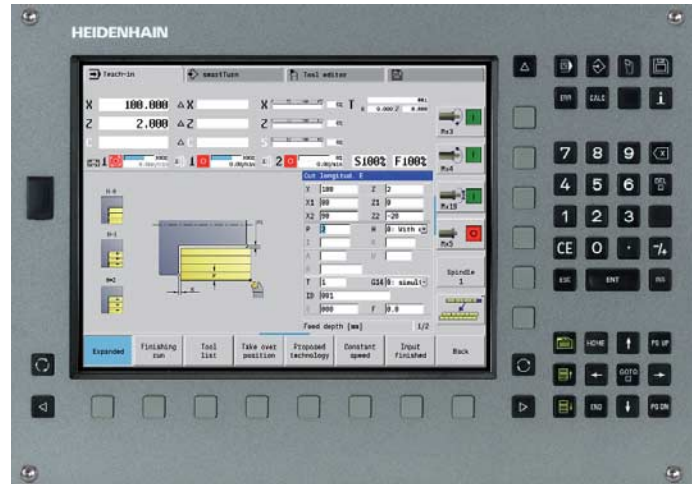
Information for the  
Machine Tool Builder

# MANUALplus 620

## Contouring Control for Analog Drive Control

### MANUALplus 620

- Contouring control for lathes with up to 3 axes (X, Z and Y), controlled spindle, C axis and driven tools
- In addition, a parallel W axis can be offset to the Z axis
- Compact design: Screen, keyboard and computer all in one unit
- Dimensions: 410 mm x 290 mm x 100 mm
- Integral 12.1-inch TFT color flat-panel display
- Storage medium for NC programs: CompactFlash memory card
- Cycle programming for turning, boring, drilling and milling
- smart.Turn programming for turning, boring, drilling and milling
- DIN programming for turning, boring, drilling and milling
- Free ICP contour programming for turning and milling contours
- The MANUALplus supports quick change tool posts (Multifix) and tool turrets. The tool carrier can be located in front of or behind the workpiece.
- The MANUALplus also supports vertical lathes
- USB removable media can be connected



MANUALplus 620 (MC 320T)

### 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.

### Parts subject to wear

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.

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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:

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<b>MANUALplus 620</b>	ID 548328-03
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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	MANUALplus 620	Page
<b>Control</b>	<ul style="list-style-type: none"> <li>• MC 320T main computer</li> <li>• Integral TFT color flat-panel display</li> <li>• Integral MANUALplus operating panel</li> <li>• MB 420 machine operating panel optional</li> </ul>	<b>12</b>
<b>Axes<sup>1)</sup> and spindles</b>		<b>23</b>
Axes	Up to 4 closed-loop axes X, Z: standard Y, W: option	23
C axis	With spindle motor or separate drive (option)	23
Driven tool	Option	24
<b>Spindle</b>	Closed-loop	<b>23</b>
Shaft speed <sup>2)</sup>	Max. 60000 min <sup>-1</sup>	23
<b>NC program memory</b>	250 MB	
<b>Input resolution and display step</b>		
Linear axes	X axis: 0.5 µm (diameter: 1 µm) Z axis: 1 µm Y axis: 1 µm W axis: 1 µm	
C axis	0.001°	
<b>Interpolation</b>		
Straight line	In 2 axes (max. ±100 m), optional in 3 principal axes	*
Circle	In 2 axes (radius max. 999 m), optional additional linear interpolation of the third axis	*
C axis	Interpolation of X and Z linear axes with the C axis (option)	*
<b>Axis feedback control</b>	Analog nominal speed value interface ± 10 V (X8)	<b>25</b>
With feedforward	✓	25
With following error	✓	25
Cycle time for block processing	3 ms	26
Cycle time for path interpolation	3 ms	26
<b>Feed rate</b>		<b>23</b>
Constant surface speed	✓	23
Input	mm/min or mm/revolution	23
<b>Permissible temperature range</b>	Operation: 0 °C to +50 °C Storage: -20 °C to +60 °C	

<sup>1)</sup> As ordered

<sup>2)</sup> On motors with two pole pairs

\* For further information, refer to the *MANUALplus 620* brochure

# Machine Interfacing

<b>Machine Interfacing</b>	<b>MANUALplus 620</b>	<b>Page</b>
<b>Error compensation</b>		<b>28</b>
Linear axis errors	✓	28
Nonlinear axis errors	✓	28
Backlash	✓	28
Hysteresis, reversal peaks	✓	28
Thermal expansion	✓	28
Static friction	✓	28
<b>Integrated PLC</b>		<b>29</b>
Program format	Statement list	29
Program input via the control	Via external USB keyboard	29
Program input via PC	✓	29
PLC memory	50 MB	29
PLC cycle time	21 ms, adjustable	29
PLC inputs, DC 24 V	31 (expandable by PL) 25 additional inputs on connector for machine operating panel	
PLC outputs, DC 24 V	31 (expandable by PL)	
Analog inputs, ±10 V	Via PL	15
Inputs for thermistors	Via PL	15
PLC soft keys	✓	29
PLC positioning	✓	29
PLC basic program	✓	30
<b>Encoder inputs</b>		<b>27</b>
Position	4 (optional: 5)	27
Incremental	1 V <sub>PP</sub>	27
Absolute	EnDat 2.1	27

# Machine Interfacing

<b>Machine Interfacing</b>	<b>MANUALplus 620</b>	<b>Page</b>
<b>Commissioning and diagnostic aids</b>		<b>32</b>
Integrated oscilloscope	✓	32
Commissioning wizard	For analog axes	32
Trace function	✓	33
Logic diagram	✓	32
API DATA	✓	33
Table function	✓	33
OnLine Monitor (OLM)	✓	33
Log	✓	33
TNCscopeNT	✓	33
<b>Data interfaces</b>		<b>34</b>
Ethernet (100BaseT)	✓	34
RS-232-C/V.24	Can only be controlled via PLC	34
USB 2.0	3 (1 on the front, 2 on the rear)	34
<b>Protocols</b>		<b>34</b>
Standard data transfer	✓	34
Blockwise data transfer	✓	34
LSV2	✓	34

# Accessories

Accessories	MANUALplus 620	Page
Electronic handwheels	<ul style="list-style-type: none"> <li>• One HR 410, one HR 130, or up to three HR 150 via HRA 110</li> <li>• Up to two HR 180</li> </ul>	16
Touch probes	<ul style="list-style-type: none"> <li>• One TS 220, TS 440, TS 444, TS 640 or TS 740 workpiece touch probe</li> <li>• One TT 140 tool touch probe</li> </ul>	18
PLC input/output systems	Modular external input/output systems <b>PL 510 or PL 550</b> consisting of <ul style="list-style-type: none"> <li>• Basic module with HEIDENHAIN PLC interface               <ul style="list-style-type: none"> <li><b>PLB 510:</b> for 4 I/O modules</li> <li><b>PLB 511:</b> for 6 I/O modules</li> <li><b>PLB 512:</b> for 8 I/O modules</li> <li><b>PLB 550:</b> for 4 I/O modules</li> </ul> </li> <li>• <b>PLD 16-8:</b> I/O module with 16 digital inputs and 8 digital outputs</li> <li>• <b>PLA 4-4:</b> Analog module with 4 analog inputs for <math>\pm 10</math> V and 4 inputs for PT 100 thermistors</li> </ul>	15
Machine operating panel	✓	14
USB hub	✓	34
PLC basic program <sup>1)</sup>	✓	30
DataPilot MP/CP 620 programming station	Control software for PCs for programming, archiving, and training	*
Software		
ConfigDesign	Software for configuring the machine parameters	32
PLCdesignNT <sup>1)</sup>	PLC software development environment	30
KinematicsDesign <sup>1)</sup>	Software for kinematic configuration	
TNCremoNT <sup>1)</sup>	Data transfer software	35
TNCremoPlus	Data transfer software with live-screen function	35
TNCscopeNT <sup>1)</sup>	Software for data recording	33
TeleService <sup>1)</sup>	Software for remote diagnostics, monitoring, and operation	33

\* For further information, refer to the *MANUALplus 620* brochure

<sup>1)</sup> Registered customers can download these software products from the Internet

# User Functions

User functions	Standard	Option	
<b>Configuration</b>	•	0-1 55+0-1 70+0-1 94+0-1	Basic version: X and Z axis, spindle Positionable spindle and driven tool C axis and driven tool Y axis W axis (as closed-loop PLC axis)
<b>Operating modes</b> Manual operation	• •	11	Manual slide movement through axis-direction keys, joystick or electronic handwheels Graphic support for entering and running cycles without saving the machining steps in alternation with manual machine operation Thread reworking (thread repair in a second workpiece setup)
Teach-in mode		8	Sequential linking of fixed cycles, where each cycle is run immediately after input, or is graphically simulated and subsequently saved
Program run	•	9 8	All are possible in single-block and full-sequence modes DIN PLUS programs smart.Turn programs Cycle programs
Setup functions	• • • •	17 17 17	Workpiece datum setting Definition of tool-change position Definition of protection zone Tool measurement by touching the workpiece Tool measurement with a TT tool touch probe Tool measurement with an optical gauge Workpiece measurement with a TS workpiece touch probe
<b>Programming</b> Cycle programming		8 8 8 8 8 8 8 8+55 8+55 8+55 8+55 8+55 8 8 8 8+9	Turning cycles for simple and complex contours, as well as contours defined with ICP Contour-parallel turning cycles Recessing cycles for simple or complex contours, as well as contours defined with ICP Repetitions with recessing cycles Recess turning cycles for simple and complex contours, as well as contours defined with ICP Undercut and parting cycles Threading cycles for single or multi-start longitudinal, taper or API threads Cycles for axial and radial drilling, pecking and tapping operations with the C axis Thread milling with the C axis Axial and radial milling cycles for slots, figures, single surfaces and polygons as well as for complex contours defined with ICP for machining with the C axis Helical slot milling with the C axis Linear and circular patterns for drilling, boring and milling operations with the C axis Context-sensitive help graphics Transfer of cutting values from technology database Use of DIN macros in cycle programs Conversion of cycle programs to smart.Turn programs
Interactive Contour Programming (ICP)		8/9 8/9 8/9 8/9 8/9 8/9 8/9	Contour definition with linear and circular contour elements Immediate display of entered contour elements Calculation of missing coordinates, intersections, etc. Graphic display of all solutions for selection by the user if more than one solution is possible Chamfers, rounding arcs and undercuts available as form elements Input of form elements immediately during contour creation or by superimposition later Changes to existing contours can be programmed



User functions	Standard	Option	
ICP (continued)		8/9+55  9+70  8/9+42	C-axis machining on face and lateral surface: Description of individual holes and hole patterns (only in smart.Turn) Description of figures and figure patterns for milling (only in smart.Turn) Creation of freely definable milling contours Y-axis machining on the XY and ZY planes (only in smart.Turn): Description of individual holes and hole patterns Description of figures and figure patterns for milling Creation of freely definable milling contours DXF import: Import of contours for lathe and milling operations
smart.Turn programming		9 9 9 9 9 9 9 9+55/70 9+55 9 9 9 9	The basis is the <b>unit</b> , which is the complete description of a machining block (geometry, technology and cycle data) Dialog boxes divided into overview and detail forms Fast navigation between the fillable forms and input groups via the "smart" keys Context-sensitive help graphics Start unit with global settings Transfer of global values from the start unit Transfer of cutting values from technology database Units for all turning and recessing operations for simple contours and ICP contours Units for boring, drilling and milling operations with the C and Y axis for simple holes, milling contours and drilling and milling patterns as well as those programmed with ICP Special units for subroutines, section repeats and activating/deactivating the C axis Verification graphics for blank and finished part and for C and Y axis contours Turret assignment and other setup information in the smart.Turn program Parallel programming Parallel simulation
DIN PLUS programming	• • • •	55 70  • • 8/9  • • 9  • •	Programming in DIN 66025 format Extended command format (IF... THEN ... ELSE...) Simple geometry programming (calculation of missing data) Powerful fixed cycles for area clearance, recessing, recess turning and thread machining Powerful machining cycles for boring, drilling and milling with the C axis Powerful machining cycles for boring, drilling and milling with the Y axis Subroutines Programming with variables Contour description with ICP Program verification graphics for workpiece blank and finished part Turret assignment and other setup information in the DIN PLUS program Conversion of smart.Turn units into DIN PLUS command sequences Parallel programming Parallel simulation
<b>Test run graphics</b>	• • • • • • • •		Graphic simulation of the cycle, smart.Turn or DIN PLUS program operations Display of the tool paths as wire-frame or cutting-path graphics, special identification of the rapid-traverse paths Machining simulation (2-D material-removal graphic) Side or face view, or 2-D view of cylindrical surface for verification of C-axis machining Display of programmed contours View of face and YZ plane for verification of Y-axis machining Three-dimensional display of the workpiece blank and finished part Shifting and magnifying functions
<b>Machining time analysis</b>	• • • •		Calculation of machining time and idle machine time Consideration of switching commands triggered by the CNC Representation of time per individual cycle or per tool change Three-dimensional display of the workpiece blank and finished part

User functions	Standard	Option	
<b>Tool database</b>	<ul style="list-style-type: none"> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> <li>•</li> </ul>	<p>10</p> <p>10</p>	<p>For 250 tools</p> <p>For 999 tools</p> <p>Tool description can be entered for every tool</p> <p>Automatic checking of tool-tip position with respect to the contour</p> <p>Compensation of tool-tip position in the X/Y/Z plane</p> <p>High-precision adjustment via handwheel, capturing compensation values in the tool table</p> <p>Automatic tool-tip and cutter radius compensation</p> <p>Tool monitoring for lifetime of the insert (tool tip) or the number of workpieces produced</p> <p>Tool monitoring with automatic tool change after tool insert wear</p> <p>Management of multipoint tools (multiple inserts or reference points)</p>
<b>Technology database</b>		<p>8/9</p> <p>8/9</p> <p>8/9</p> <p>8/9</p> <p>10</p>	<p>Access to cutting data after definition of workpiece material, cutting material and machining mode. The MANUALplus distinguishes between 16 machining modes. Each workpiece-material/tool-material combination includes the cutting speed, the main and secondary feed rates, and the infeed for 16 machining modes.</p> <p>Automatic determination of the machining modes from the cycle or the machining unit</p> <p>Cutting data is entered in the cycle or in the unit as default values</p> <p>9 workpiece-material/tool-material combinations (144 entries)</p> <p>62 workpiece-material/tool-material combinations (992 entries)</p>
<b>Conversational languages</b>	<ul style="list-style-type: none"> <li>•</li> </ul>	<p>41</p>	<p>English, Chinese (simplified), Chinese (traditional), Czech, Danish, Dutch, Finnish, French, German, Hungarian, Italian, Polish, Portuguese, Russian, Spanish, Swedish</p> <p>For more conversational languages, see <i>Options</i></p>

# Overview

## – Options

Option number	Option	ID	Comment
0 1	Additional axis	354540-01 353904-01	<b>Additional control loops 1 and 2</b>
8	Software option 1 Teach-in	632226-01	<b>Cycle programming</b> <ul style="list-style-type: none"> <li>• Contour description with ICP</li> <li>• Cycle programming</li> <li>• Technology database with 9 workpiece-material/tool-material combinations</li> </ul>
9	Software option 2 smart.Turn	632227-01	<b>smart.Turn</b> <ul style="list-style-type: none"> <li>• Contour description with ICP</li> <li>• Programming with smart.Turn</li> <li>• Technology database with 9 workpiece-material/tool-material combinations</li> </ul>
10	Software option 3 Tools and technology	632228-01	<b>Tools and technology</b> <ul style="list-style-type: none"> <li>• Tool database expanded to 999 entries</li> <li>• Technology database expanded to 62 workpiece-material/tool-material combinations</li> <li>• Support of multipoint tools</li> <li>• Tool life monitoring with exchange tools</li> </ul>
11	Software option 4 Thread cutting	632229-01	<b>Threads</b> <ul style="list-style-type: none"> <li>• Thread recutting</li> <li>• Handwheel superimposition during thread cutting</li> </ul>
17	Touch probe functions	632230-01	<b>Tool measurement</b> <ul style="list-style-type: none"> <li>• Determining tool-setting dimensions with a tool touch probe</li> <li>• Determining tool-setting dimensions with an optical gauge</li> </ul>
41	Additional language	530184-01 530184-02 530184-03 530184-04 530184-06 530184-07 530184-08 530184-09 530184-10	Slovenian Slovak Latvian Norwegian Korean Estonian Turkish Romanian Lithuanian
42	DXF import	632231-01	<b>DXF import</b> <ul style="list-style-type: none"> <li>• Loading of DXF contours</li> </ul>
55	C-axis machining	633944-01	<b>C axis machining</b>
70	Y-axis machining	661 881-01	<b>Y axis machining</b>
94	W-axis machining	679 676-01	<b>Support of W axis</b>

# MANUALplus 620

The MANUALplus 620 is offered with four inputs for position encoders. Additional software options can be enabled.

The MANUALplus 620 includes the MC 320T main computer with:

- Intel® Celeron M 1.0 GHz processor
- 1 GB RAM memory
- 12.1-inch TFT color flat-panel display; resolution: 1024 x 768 pixels
- MANUALplus control panel
- PLC
- Interface to handwheel and touch probes
- Further interfaces (PLC expansion, Ethernet, USB 2.0, RS-232-C/V.24)

To be ordered separately:

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

<b>MC 320T</b>	Position inputs	4 x 1 V <sub>PP</sub> or EnDat (optional 5 x 1 V <sub>PP</sub> or EnDat)
	Weight ID	6.1 kg 731 359-xx
Power supply	Supply voltage	DC 24 V
	Power consumption	35 W

<b>CFR CompactFlash</b>	The NC software for the MANUALplus 620 is contained on the CFR CompactFlash memory card (= CompactFlash Removable). It is also the memory medium for NC programs and the PLC program. Up to 250 MB of memory are available for NC programs, and up to 50 MB for PLC data.	
	ID	733606-51

<b>SIK component</b>	The SIK component contains the <b>NC software license</b> for enabling control loops and software options. It gives the MANUALplus 620 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 MANUALplus 620.	
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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.

Master keyword (general key)	There is a master keyword (general key) for putting the MANUALplus 620 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.
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SIK component

<b>NC software license</b>	<b>SIK with software license and enabling for</b>	<b>ID</b>
	Three control loops, including options: <ul style="list-style-type: none"> <li>• Teach-in (option 8)</li> <li>• smart.Turn (option 9)</li> </ul>	736 616-51

<b>Additional axes</b>	<b>Option number</b>	<b>ID</b>
1st additional axis (4th control loop)	0	354 540-01
2nd additional axis (5th control loop)	1	353 904-01

**Software options** The capabilities of the MANUALplus 620 can also be adapted retroactively with options to meet new requirements. These options are described on page 11. They are enabled by entering keywords based on the SIK number, and are saved in the SIK component. Please indicate your SIK number when ordering new options.

**Encoder input board** An additional encoder input board is necessary for expanding the MANUALplus 620 to the maximum number of options of four axes plus closed-loop spindle, or five axes plus open-loop spindle.  
ID 554 296-xx

<b>Possible configurations</b>	<b>Axes</b>	<b>Spindle<sup>1)</sup></b>	<b>Necessary options</b>
	Closed-loop		
	2	Closed-loop	–
	3	Open-loop	
	3	Closed-loop	• 1st additional axis
	4	Open-loop	
	4	Closed-loop	• 1st additional axis • 2nd additional axis
	5	Open-loop	• Encoder input board

<sup>1)</sup> For the *open-loop spindle*, the MANUALplus 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.



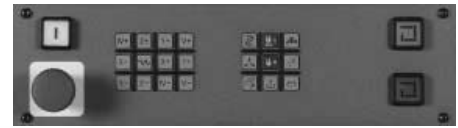
**Encoder input board**

# Accessories

## Machine operating panel

### MB 420 machine operating panel

- 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

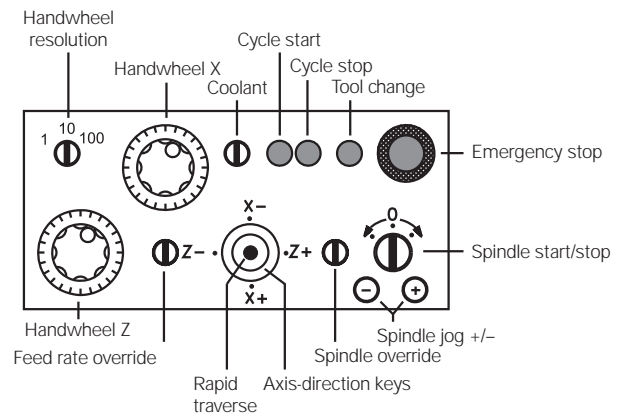


MB 420

### Machine operating panel

The machine tool builder can also design his own machine operating panel. It should contain the following components:

- Handwheels
- Axis-direction keys or joystick
- Emergency-stop button
- Feed rate override
- Spindle override
- Cycle keys
- Spindle keys



Proposal for a machine operating panel

# PLC Inputs/Outputs

**PL 510** If the PLC inputs/outputs of the MC do not suffice, additional PL 510 PLC input/output units can be connected. These external modular I/O systems consist of a basic module and one or more input/output modules.

**Basic modules** Basic modules for 4, 6 or 8 I/O modules are available. They are mounted on standard NS 35 rails (DIN 46227 or EN 50022).

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



**PL 510**

Basic modules with HEIDENHAIN PLC interface

<b>PLB 510</b>	Slots for 4 I/O modules	ID 358849-01
<b>PLB 511</b>	Slots for 6 I/O modules	ID 556941-01
<b>PLB 512</b>	Slots for 8 I/O modules	ID 557125-01

Up to four PLB 510, and up to two PLB 511 or PLB 512 can be connected to the control. The maximum cable length to the last PLB 51x is 30 meters.

**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: $\leq 4$ A
	Outputs 0 to 3, or 4 to 7: $\leq 2$ 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 for  $\pm 10$  V

Weight	0.2 kg
ID	366423-01

**Empty housing** For unused slots

ID	383022-01
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# Electronic Handwheels

Support of electronic handwheels is standard on the MANUALplus 620.

The following handwheels can be installed:

- For connection to the position inputs, up to two **HR 180** panel-mounted handwheels
- For connection to the handwheel input, one **HR 410** portable handwheel, or one **HR 130** panel-mounted handwheel, or up to three **HR 150** panel-mounted handwheels through the **HRA 110** handwheel adapter

Any combination is possible. Cycle machines, for example, typically use two HR 180 and—if required—one HR 410, or if there are not enough position inputs, up to three HR 150 handwheels via the HRA 110 handwheel adapter. CNC machines usually require only one HR 130 or HR 410.

## Function

- Incremental traverse of the slide:  
1  $\mu\text{m}$ /10  $\mu\text{m}$ /100  $\mu\text{m}$  per increment
- The handwheels with detent have 100 stops per revolution
- Positioning the slide to the starting position of MANUALplus cycles
- Fine adjustment of tool position

## HR 180

Panel-mounted handwheel with ergonomic control knob for connection to a position encoder input.

Weight	Approx. 0.7 kg
HR 180 with detent	ID 540940-08

## HR 130

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

Weight	Approx. 0.7 kg
HR 130 without detent	ID 254040-05
HR 130 with 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 selection 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 261097-xx  
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 detent ID 540940-07  
HR 150 with detent ID 540940-06



**HR 410**

Portable electronic handwheel with

- Keys for the selection of 5 axes
- Traverse direction keys
- 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**

HR 410 version	Mechanical detent	
	with	without
Standard assignment with the FCT A, FCT B, FCT C function keys	-	296 469-53
For PLC basic program with NC start/stop, spindle start	535 220-05	296 469-55
With spindle right/left/stop	-	296 469-54

# Touch Probes

Touch probes for workpiece measurement are connected via the system PL 62xx or the UEC 11x. These touch probes generate a trigger signal that saves the current position value to the NC. 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 MANUALplus 620 provides a sample cycle for measuring workpieces. Additionally, the machine manufacturers offer specially developed measuring cycles that are individually adapted to the machine series. 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 (e.g. turret magazine):

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 440 with SE 640

## Tool measurement

The touch probe for tool measurement from HEIDENHAIN is suited for probing tools directly on the machine. The MANUALplus 620 offers standard cycles. The MANUALplus 620 automatically saves the results of measurement in a tool table. It is also possible to measure tool wear between two machining steps. After measuring the tool, the MANUALplus 620 adjusts the tool data automatically for subsequent machining.

TT 140 With the triggering **TT 140 touch probe**, the cuboid probe contact is deflected from its rest position upon contact with a stationary or rotating tool, sending a trigger signal to the MANUALplus 620.

Cuboid probe contact The standard TT 140 is shipped with a disk-shaped probe contact. For use with lathes, it must be replaced by the cuboid probe contact.



TT 140

ID 676 497-01

# Snap-On Keys

The snap-on keys make it easy to replace the key symbols. In this way, the MB 420 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





# MANUALplus 620

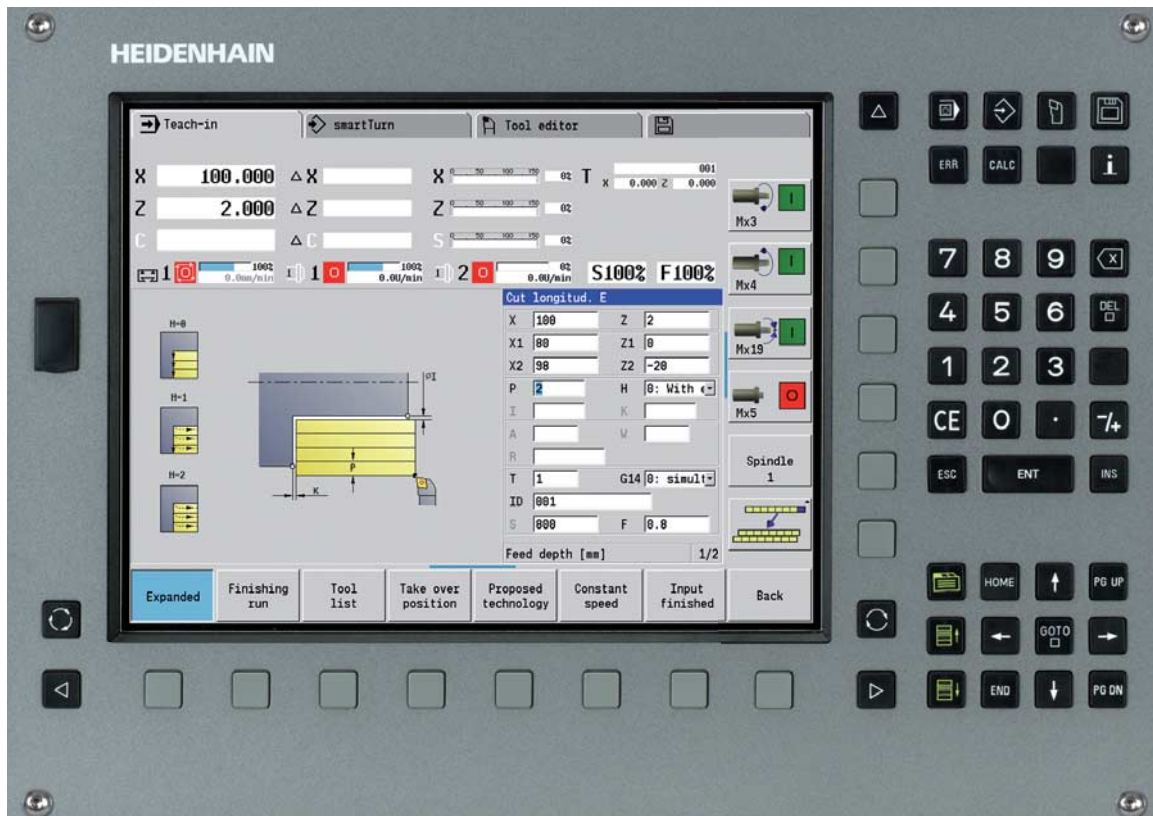
## The Contouring Control for CNC and Cycle Lathes

### The MANUALplus 620 for cycle lathes

- Conceived for general repairs, thread repairs, single parts and short production runs
- Supports action-oriented machining
- Quickly learned—requires minimum training time
- Supports boring, drilling and milling operations on the face and lateral surface
- Features a wide machining spectrum, from simple turned parts to complex workpieces

### The MANUALplus 620 for CNC lathes

- Conceived for medium-sized and large production runs
- Programming via smart.Turn and/or DIN PLUS
- smart.Turn is quickly learned and requires very little training time
- Supports boring, drilling and milling operations on the face and lateral surface
- Features a wide machining spectrum, from simple turned parts to complex workpieces



# Technical Description

## Axes

The MANUALplus 620 is a contouring control for lathes with one spindle and a slide (X, Z and Y) for tool movement. The control can also offset the display of movements in the Z axis with those of its secondary axis W.

The MANUALplus supports both horizontal and vertical lathes.

Display and programming

Feed rate in

- mm/min
- mm/revolution
- Feed rate override: 0 to 150%

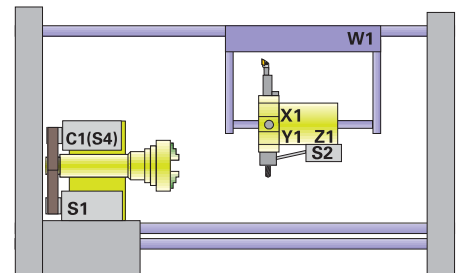
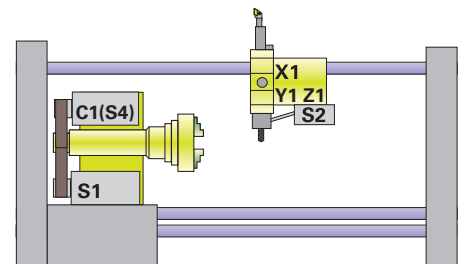
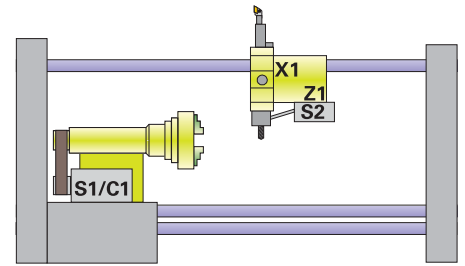
Traverse range

-99999.9999 to +99999.9999 [mm]

The machine tool builder defines the traverse range. It is also possible for the operator to limit the traverse range if he wishes to reduce the working space (with software limit switches). A protection zone for the spindle (Z-) can also be specified.

Tool carrier

The MANUALplus 620 supports quick change tool posts (Multifix) and tool turrets. The tool carriers can be located in front of or behind the workpiece.



## Spindle

For machines featuring a higher level of automation, you can position the spindle or switch to C-axis operation.

Display and programming

Spindle speed:

- Constant shaft speed: 1 to 99999 rpm
- Constant surface speed: 1 to 9999 m/min

Spindle positioning

Input resolution and display step: 0.001°

Spindle override

50 to 150 %

Shaft speed (input value)

$\leq 100000 \text{ min}^{-1}$

Speed limiting

- The MANUALplus monitors the actual speed.
- Speed limiting can be adjusted via parameter and in the feed rate/spindle/tool menu.

Gear ranges

A specific parameter set can be defined for each gear range. The gears are switched via the PLC.

C-axis operation

For milling, drilling and boring cycles, either the spindle is switched to C-axis operation or a separate C-axis drive is activated.

Input resolution and display step: 0.001°

# Driven Tool

The live (i.e. driven) tool is used for drilling and tapping holes as well as for milling in M19 or C-axis operation. Programs for a driven tool can be entered in manual operation, via cycles with smart.Turn or in the DIN editor.

Display and programming

Speed of the driven tool:

- Constant shaft speed: 1 to 99999 rpm
- Constant surface speed: 1 to 9999 m/min

Speed limiting

- The MANUALplus monitors the actual speed.
- Speed limiting can be adjusted via parameter and in the feed-rate/spindle/tool menu.

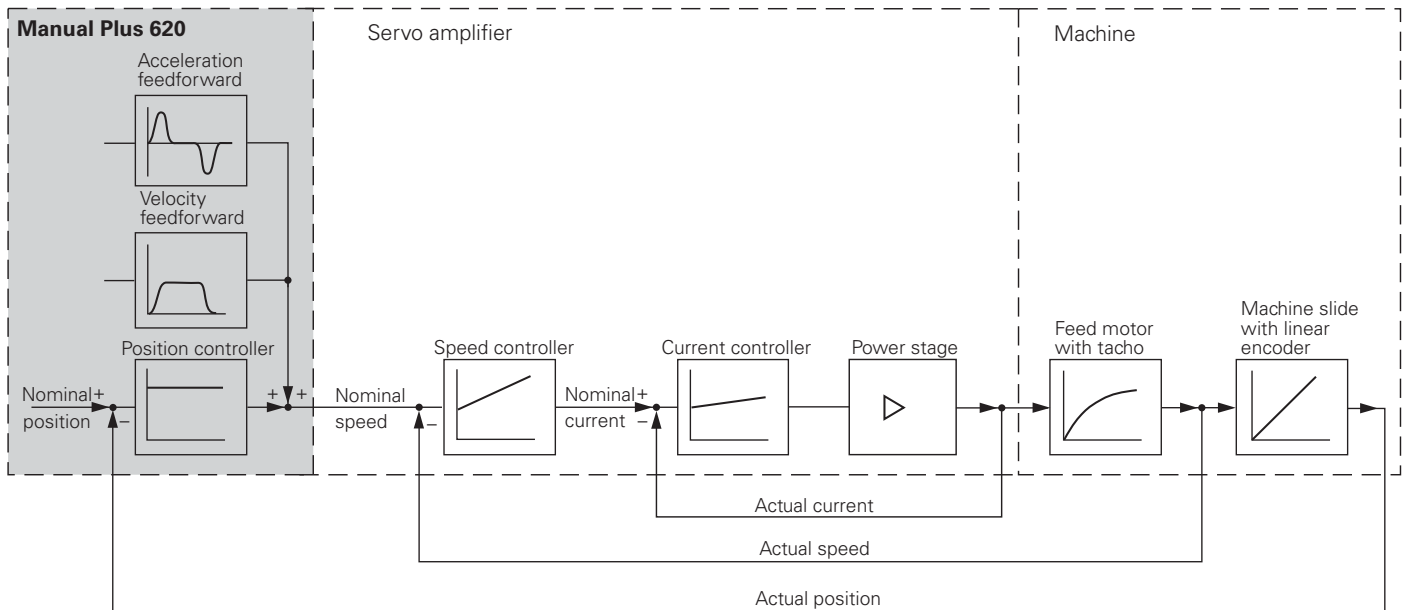


# Servo Control of Axes

## Analog speed-command interface

The position controller is integrated in the MANUALplus. The motor speed controller and the current controller are located in the servo amplifier.

The MANUALplus transmits the speed command signal through an analog  $\pm 10\text{V}$  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:

$$v = k_v \cdot s_a$$

$v$  = velocity  
 $k_v$  = position loop gain  
 $s_a$  = following error

## 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  $\mu\text{m}$ ). The feedforward is adjustable from 0 to 100% via a machine parameter.

**Control-loop cycle times**

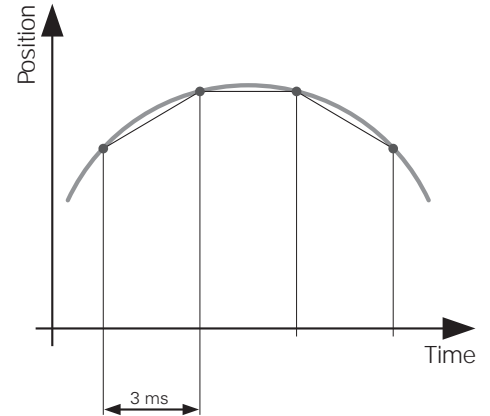
The cycle time for path interpolation is defined as the time interval during which interpolation points on the path are calculated. The control-loop cycle time of the MANUALplus 620 is 3 ms.

**Look-ahead**

The MANUALplus 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.



## 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.

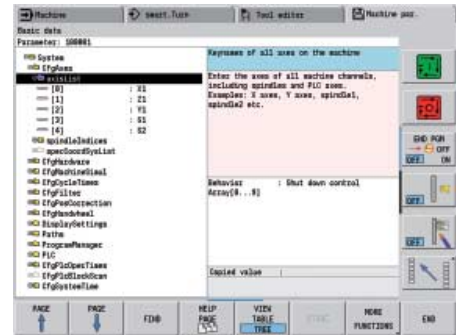
**Structured organization of machine parameters**

The MANUALplus 620 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 operating panel keys or a USB mouse. The parameters are entered in windows, similar to 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.



Parameter	PSL_0	PSL_1	PSL_2	PSL_3	PSL_01	PSL_8	PSL_8
EplSystemActive	off	off	off	off	off	off	off
EplSystemInval	off	off	off	off	off	off	off
modControl	CC_MOT0L	CC_MOT0R	CC_MOT0L	CC_MOT0R	CC_MOT0L	CC_MOT0R	CC_MOT0R
distDistPerFuz	300	300	300	300	300	300	300
posEncoderDist	200	200	200	200	200	200	200
posEncoderIncs	2048	2048	2048	2048	2048	2048	2048
posEncoderPulse	1000	1000	1000	1000	1000	1000	1000
posEncoderFactor	none	none	none	none	none	none	none
posEncoderZreal	1 Vss	1 Vss	1 Vss	1 Vss	1 Vss	1 Vss	1 Vss
posEncoderZsig	fast	fast	fast	fast	fast	fast	fast
posEncoderZinter	without	without	without	without	without	without	without
posEncoderZinput	328	328	328	328	328	328	328
posEncoderZoutput	330	330	330	330	330	330	330
ctrlPerfYassme							
hncScIndexer							

# 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 by counting the signals.

### Reference mark

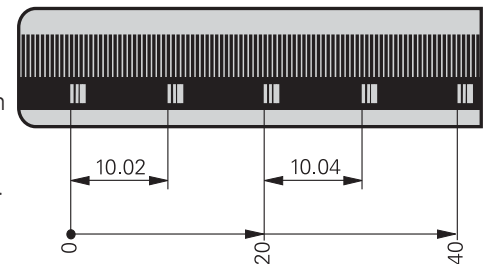
When the machine is switched on, the machine axes need to traverse a reference mark for an accurate reference to be established between measured value and machine position. For encoders with distance-coded reference marks, the maximum travel until automatic reference mark evaluation for linear encoders 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  $\sim 1 V_{PP}$  levels 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 MANUALplus 620 is fitted with the serial EnDat 2.1 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 MANUALplus 620.

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

<sup>1)</sup> switchable

# Types of Error Compensation

The MANUALplus 620 features functions for automatic compensation of mechanical errors of the machine.

<b>Linear error</b>	Linear error can be compensated over the entire travel range for each axis.
<b>Nonlinear error</b>	The MANUALplus 620 compensates for axis errors and errors that result from other axes (spindle-pitch error, sagging, misaligned axes, etc.).
<b>Backlash</b>	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.
<b>Hysteresis</b>	The hysteresis between table movement and motor movement is also compensated in length measurements. In this case the hysteresis is within the controlled system.
<b>Reversal peaks</b>	In circular movements, reversal peaks can occur at quadrant transitions due to mechanical influences. The MANUALplus 620 can compensate for these reversal peaks.
<b>Static friction</b>	At very low feed rates, high static friction can cause the slide to stop and start repeatedly for short periods. This is also known as stiction. The MANUALplus 620 can compensate for this problem condition.
<b>Thermal expansion</b>	<p>To compensate thermal expansion, the machine's expansion behavior must be known.</p> <p>The temperature can be recorded via temperature measurement thermistors connected to the analog inputs of the MANUALplus 620. The PLC evaluates the temperature information and transfers the compensation value to the NC.</p>

# Integral PLC

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

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

<b>PLC expansion</b>	If the PLC inputs/outputs of the MC 320T do not suffice, the external PL 510 PLC input/output system can be connected.	
<b>Rated operating current per output</b>	Logic unit: (For PL 5xx, see <i>PLC Inputs/Outputs</i> )	0.15 A
<b>PLC programming</b>	Format	Statement list
	Memory	50 MB
	Cycle time	21 ms, adjustable
	Instruction set	<ul style="list-style-type: none"><li>• Bit, byte and word commands</li><li>• Logical operations</li><li>• Arithmetic commands</li><li>• Comparisons</li><li>• Nested calculations (parentheses)</li><li>• Jump commands</li><li>• Subroutines</li><li>• Stack operations</li><li>• Submit programs</li><li>• 999 timers</li><li>• 48 counters</li><li>• Comments</li><li>• PLC modules</li><li>• 100 strings</li></ul>
<b>PLC soft keys</b>	The machine manufacturer can display his own PLC soft keys in the vertical soft-key row on the screen.	
<b>PLC positioning</b>	All closed-loop axes can be also positioned through the PLC. PLC positioning of the NC axes cannot be superimposed on NC positioning.	
<b>PLC axes</b>	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.	

**PLCdesignNT**  
(accessory)

PC software for PLC program development.  
**PLCdesignNT** 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 MANUALplus 620 and the PC
- Creation of PLC soft keys

PC requirements:

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

**PLC basic program**

The PLC basic program serves as a basis for adapting the MANUALplus 620 to the requirements of the respective machine.  
Registered customers can download it from the Internet.

The PLC basic program provides the following functions:

- Controlling all axes
- Positioning the axes after reference run
- Clamped axes
- Homing the axes, reference end positions
- Compensating the axis temperature
- Feed rate control
- Controlling and orienting the spindle
- Spindle brake
- Gear switching via M functions
- C axis via main drive
- C axis via separate drive<sup>1)</sup>
- PLC soft keys
- Displaying and managing PLC error messages
- Hydraulic control<sup>1)</sup>
- Hydraulic chuck<sup>1)</sup>
- Electronic handwheels
- Controlling the coolant system<sup>1)</sup>
- Handling of M and G functions
- Lubrication<sup>1)</sup>
- Chip conveyor<sup>1)</sup>
- Door control<sup>1)</sup>
- Tool change for Multifix (quick change tool holder)<sup>1)</sup>
- Positioning of the tool turret with three-phase motor<sup>1)</sup>

<sup>1)</sup> Basic functions are implemented

# Monitoring Functions

During operation, the MANUALplus 620 monitors:

- Amplitude of the encoder signals
- Edge separation of the encoder signals
- Absolute position with 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 MANUALplus 620 into the machine's EMERGENCY STOP loop is checked when the control system is switched on.

In the event of an error, the MANUALplus 620 displays a message in plain language.

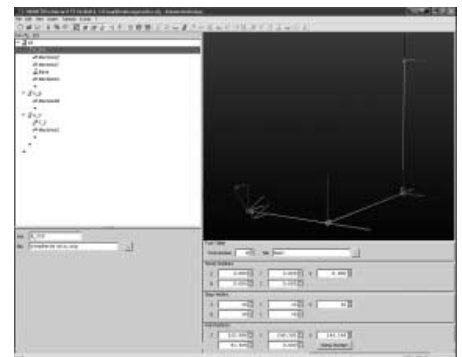
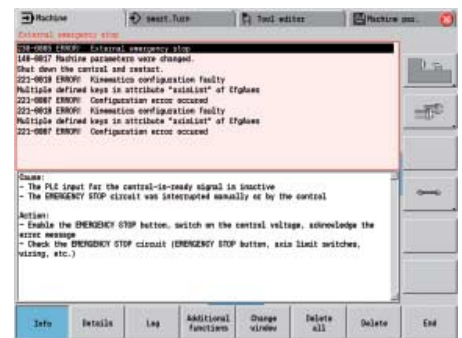
## Context-sensitive help

The HELP and ERR keys provide the user with context-sensitive help. This means that in the event of an error message, the MANUALplus 620 displays information on the cause of the error and proposes solutions. The machine manufacturer can also use this function for PLC error messages.

## KinematicsDesign

KinematicsDesign is a PC program for creating adaptable flexible kinematic configurations. When used with MANUALplus 620, it supports:

- Complete kinematic configurations
- Transfer of configuration files between control and PC
- Activation of different kinematics configurations
- Visualization of transformation chains



# Commissioning and Diagnostic Aids

The MANUALplus 620 provides internal commissioning and diagnostic aids.

## ConfigDesign

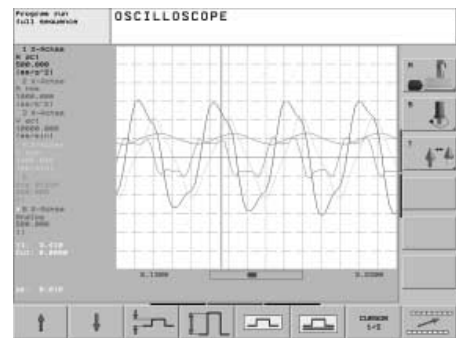
PC software for configuring the machine parameters

- Machine-parameter editor for the control; all support information, additional information 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 MANUALplus 620 features an integrated oscilloscope. Both X/t and X/Y graphs are possible. The following characteristic curves of six channels can be recorded and saved:

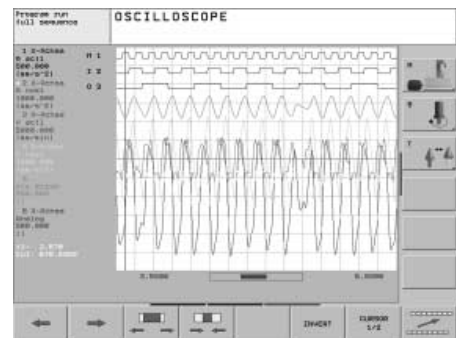
- Actual value of axis feed rate
- Nominal value of axis feed rate
- Contouring feed rate
- Actual position
- Nominal position
- Following error of the position controller
- Nominal values for speed, acceleration and jerk
- Actual values for speed, acceleration and jerk
- Nominal value of analog output
- 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)
- IpoLogic (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 set the following machine parameters with the aid of the Commissioning Wizard:

- Algebraic sign of the axis
- Axis traverse direction
- Velocity at an analog voltage of 9 volts
- Maximum acceleration of the axis
- $k_v$  factor of the axis
- Acceleration feedforward control for the axis



<b>OLM</b> Online monitor	<p>The online monitor (OLM) supports the commissioning and diagnosis of control components through:</p> <ul style="list-style-type: none"> <li>• Display of control-internal variables for axes and channels</li> <li>• Display of controller-internal variables (if a CC is present)</li> <li>• Display of hardware signal states</li> <li>• Various trace functions</li> <li>• Activation of spindle commands</li> <li>• Enabling control-internal debug outputs</li> </ul> <p>The online monitor is a component part of the MANUALplus 620 and is called by a code number.</p>
<b>TNCscopeNT</b> (accessory)	<p>PC software for transferring the oscilloscope files to the PC. Note: The trace files are saved in the TNCscopeNT data format.</p>
<b>API DATA</b>	<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><b>Note:</b> The API DATA function does not provide usable display values with the iTNC 530-compatible memory interface (API 1.0).</p>
<b>Table function</b>	<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>
<b>Trace function</b>	<p>The current content of the operands and the accumulators is shown in the instruction list in each line in HEX or decimal code. The active lines of the instruction list are marked.</p>
<b>Log</b>	<p>For the purposes of error diagnosis, there is one log for all error messages and one for all keystrokes.</p>
<b>TeleService</b> (accessory)	<p>PC software for remote diagnosis, remote monitoring, and remote control of the MANUALplus 620. For further information, ask for the <i>Remote Diagnosis with TeleService</i> Technical Information sheet.</p>

# Data Interfaces

The MANUALplus 620 is connected to PCs, networks and other data storage devices via data interfaces.

## Ethernet

The MANUALplus 620 can be interconnected via the Ethernet interface. The MANUALplus 620 features a 100BaseT Ethernet (Twisted Pair Ethernet) connection to the data network.

Maximum transmission distance:  
 Unshielded 100 m  
 Shielded 400 m

Protocol The MANUALplus 620 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  
 The RS-232-C/V.24 interface can be addressed only by the PLC.

Data transfer rate 115 200; 57 600; 38 400; 19 200;  
 9 600; 4 800; 2 400; 1 200; 600; 300; 150; 110 bps

Protocols The MANUALplus 620 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 363 987-02  
 25-pin ID 310 085-01

## USB

The MC 320T features three USB 2.0 ports for the connection of standard USB devices, such as the 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 ports are rated for a maximum supply current of 0.5 A.

USB cable Cable length up to 5 m ID 354 770-xx  
 Cable length 6 m to 30 m with integrated amplifier; USB 1.1. ID 624 775-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: DC 24 V / max. 300 mA  
 ID 582 884-02

Cover cap 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 cap can be used to protect the ports from contamination.

ID 508 921-01



# Software for Data Transfer

## **TNCremoNT** (accessory)

This PC software package helps the user to transfer data from the PC to the MANUALplus 620. The software on the PC carries out block-wise data transfer with block check character (BCC).

Functions:

- Data transfer (also blockwise)
- Remote control (only serial)
- Management of the MANUALplus 620 files
- Backup of the MANUALplus 620 data
- Reading out the log
- Print-out of screen contents
- Text editor
- Managing more than one machine (TNCremoNT)

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 TNCremoNT, 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

# Mounting Information

**Installation** When installing the MANUALplus 620, 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):

- MANUALplus 620 (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.

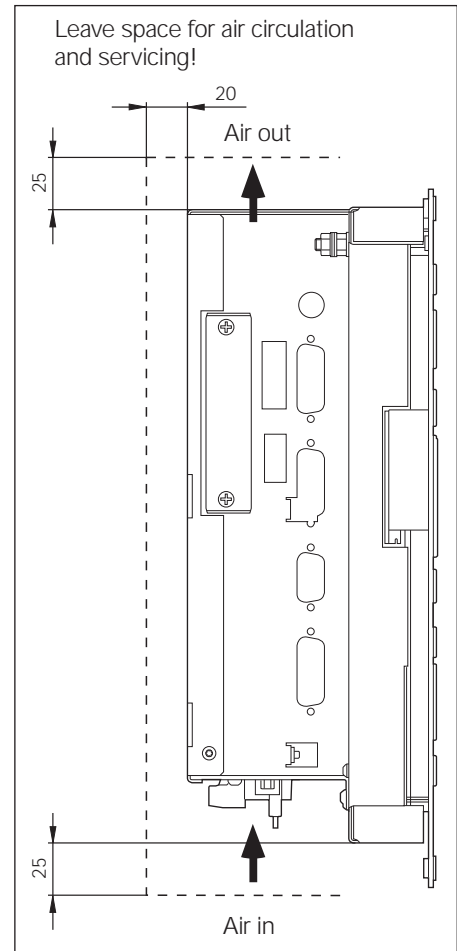
Protect your equipment from interference by observing the rules and recommendations specified in the Technical Manual.

**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 MANUALplus 620 and its leads to devices that carry interference signals
- Keep a minimum distance of 10 cm from the MANUALplus 620 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 potential compensating lines with a cross section of  $6 \text{ mm}^2$
- Use only genuine HEIDENHAIN cables, connectors and couplings



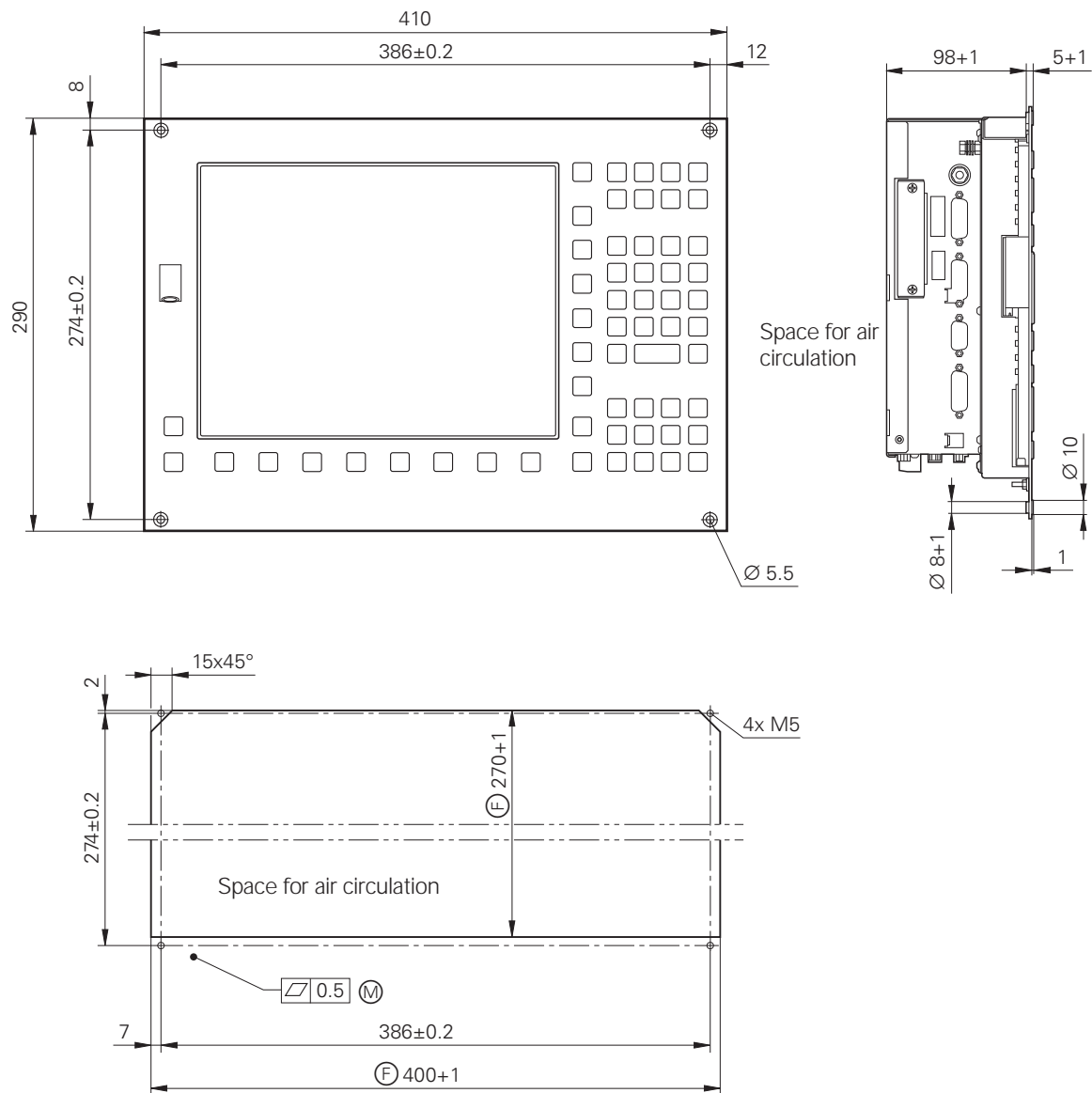
# Overall Dimensions

## MC 320T

Dimensions in mm



Tolerancing ISO 8015  
ISO 2768 - m H  
< 6 mm:  $\pm 0.2$  mm

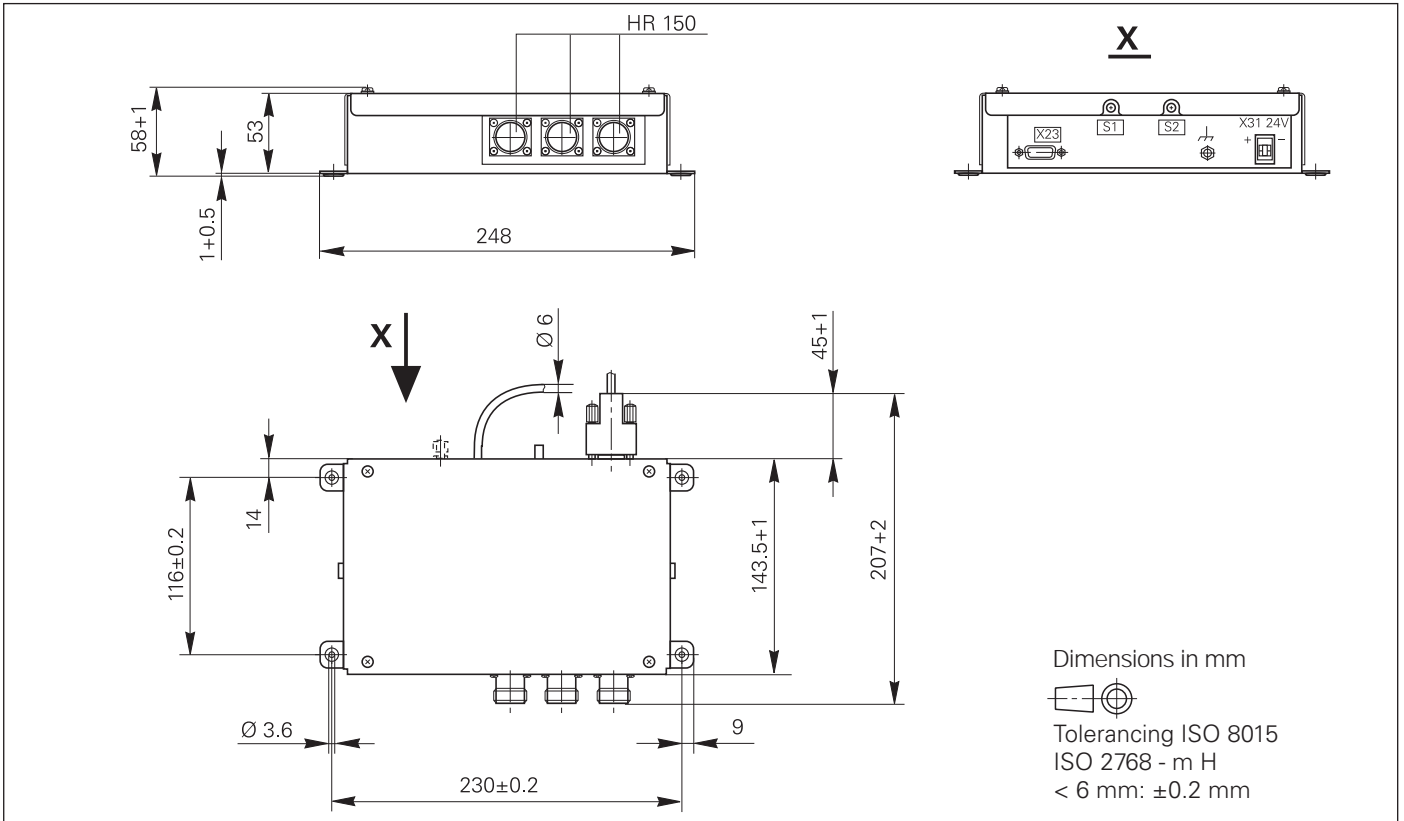


⊕ = Cutout in machine panel

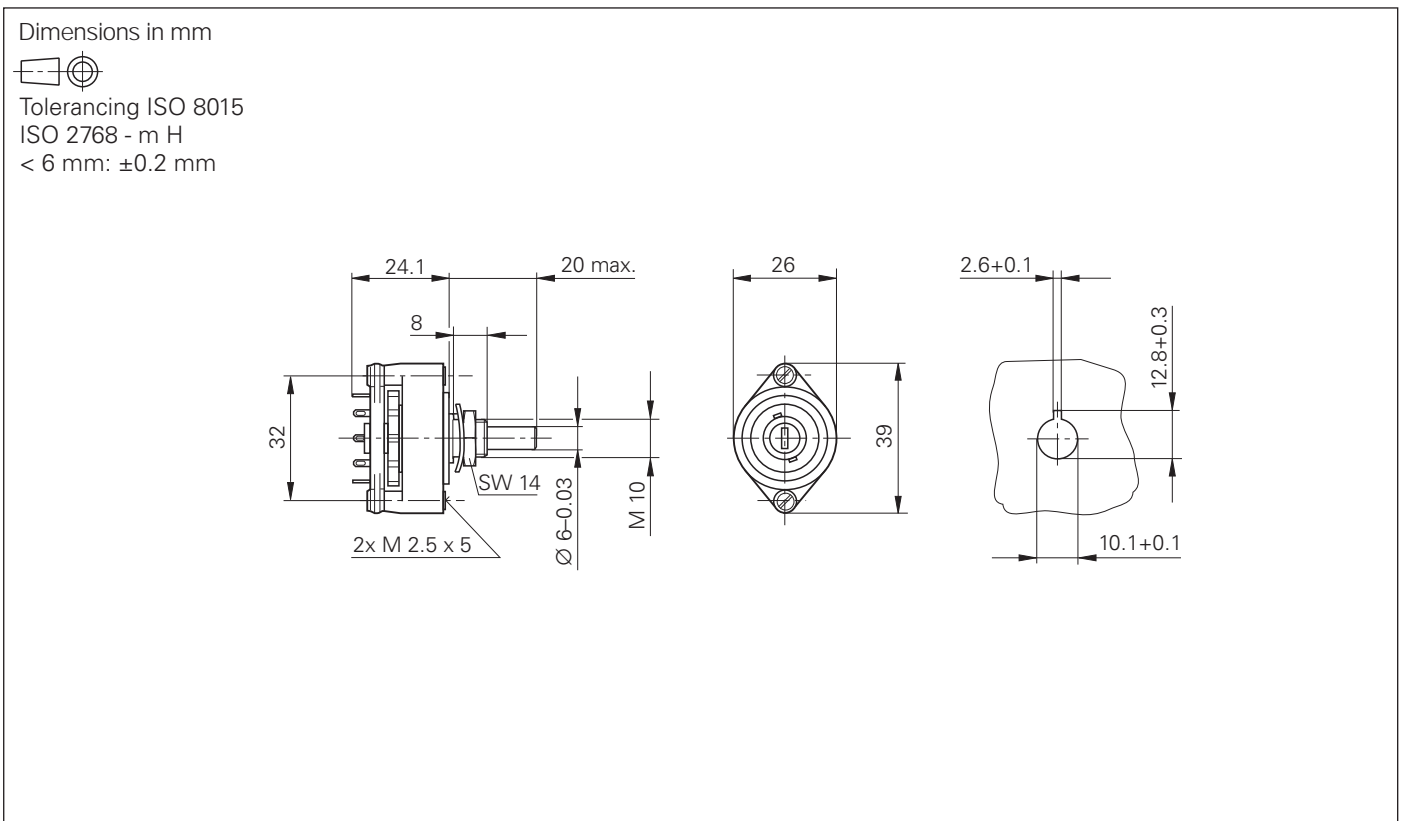
Ⓜ = Mounting surface



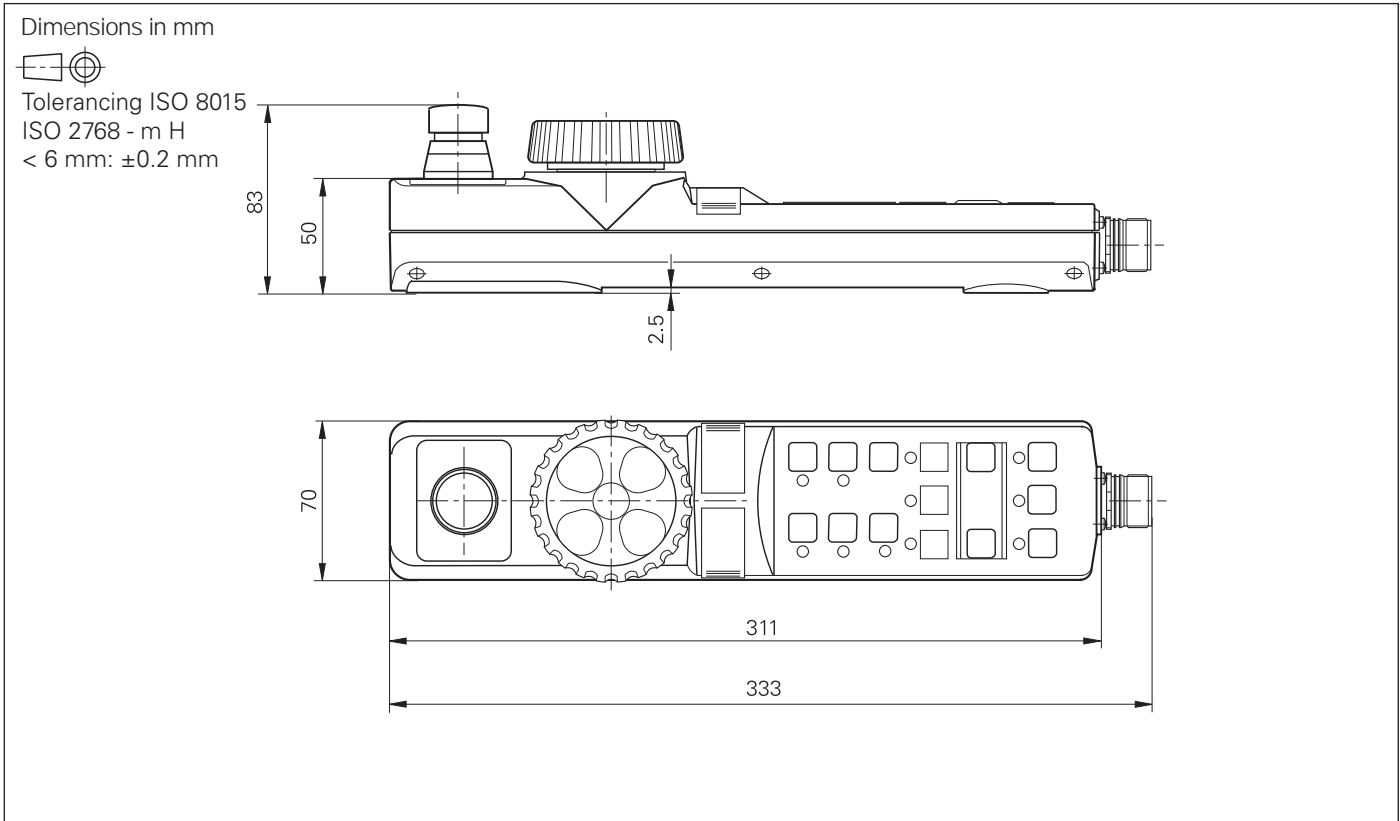
# HRA 110



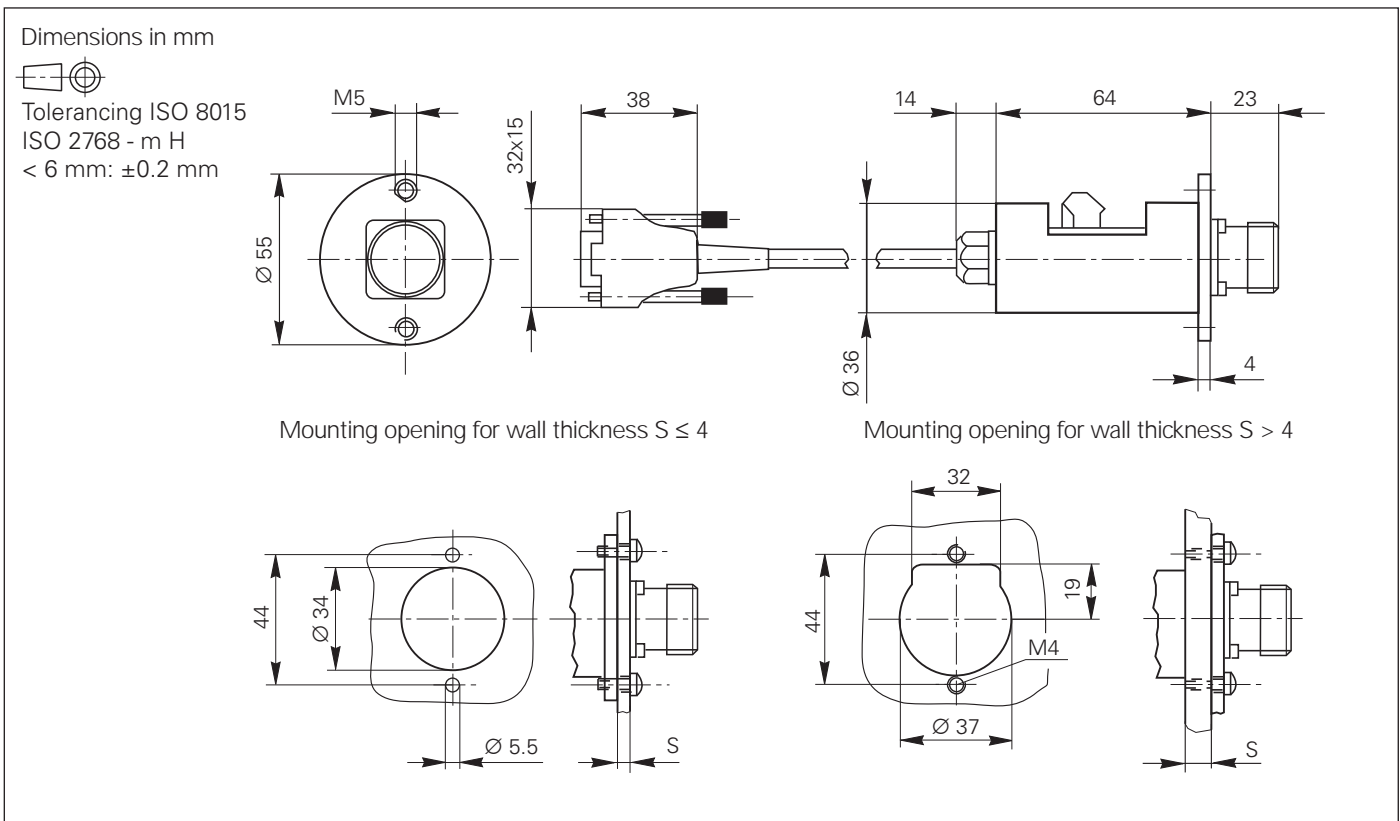
# Handwheel Selection Switch



# HR 410

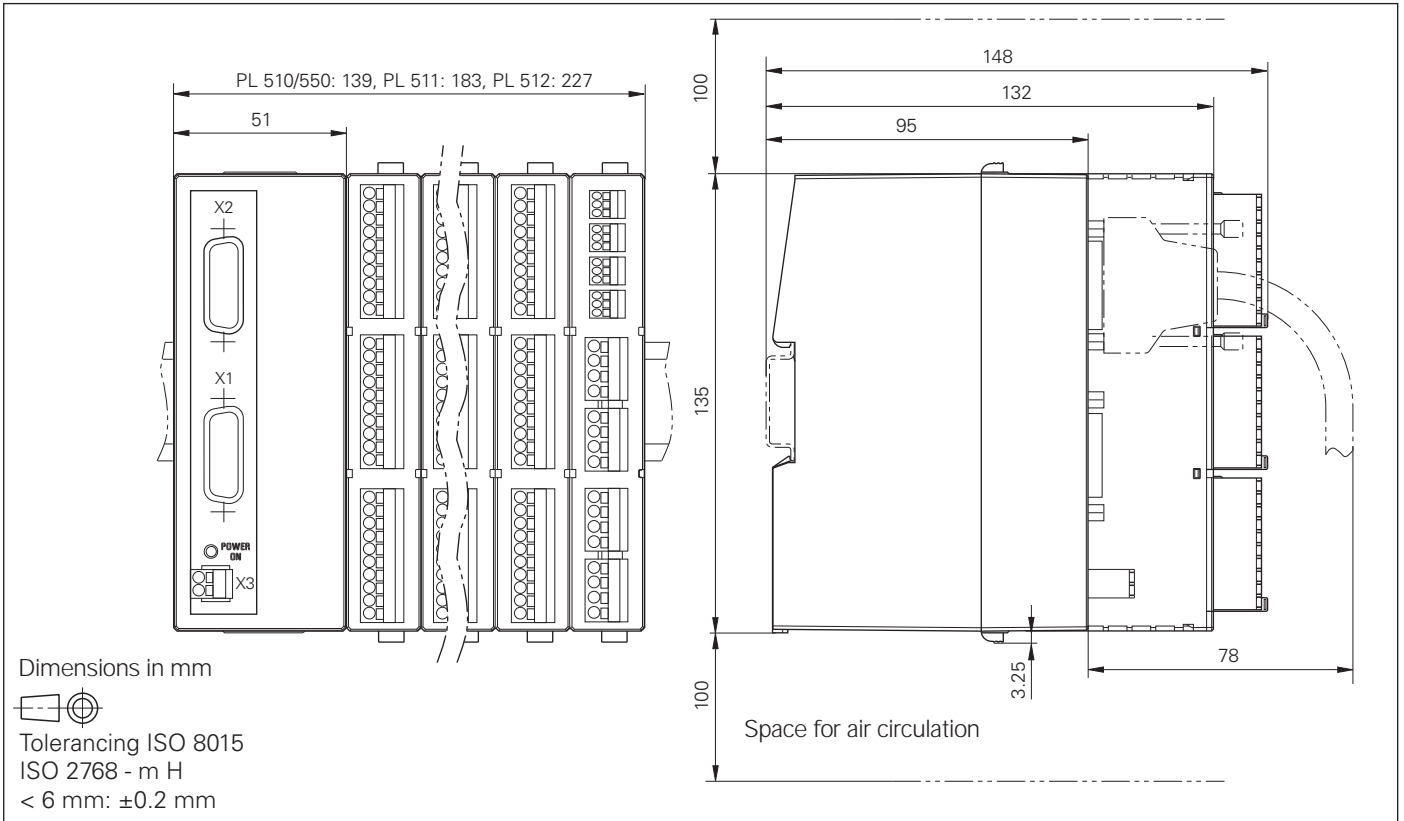


## Adapter Cable for HR 410

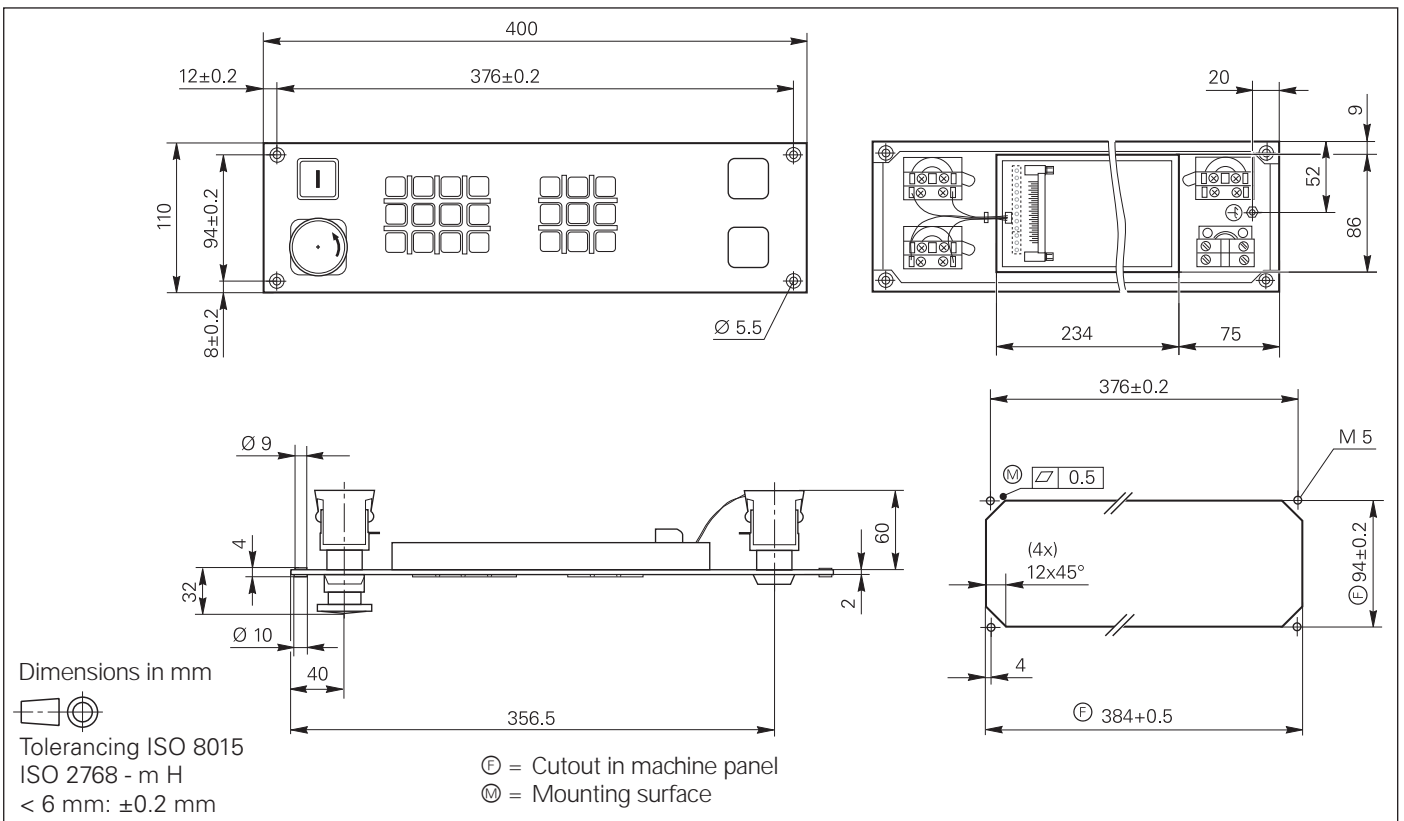




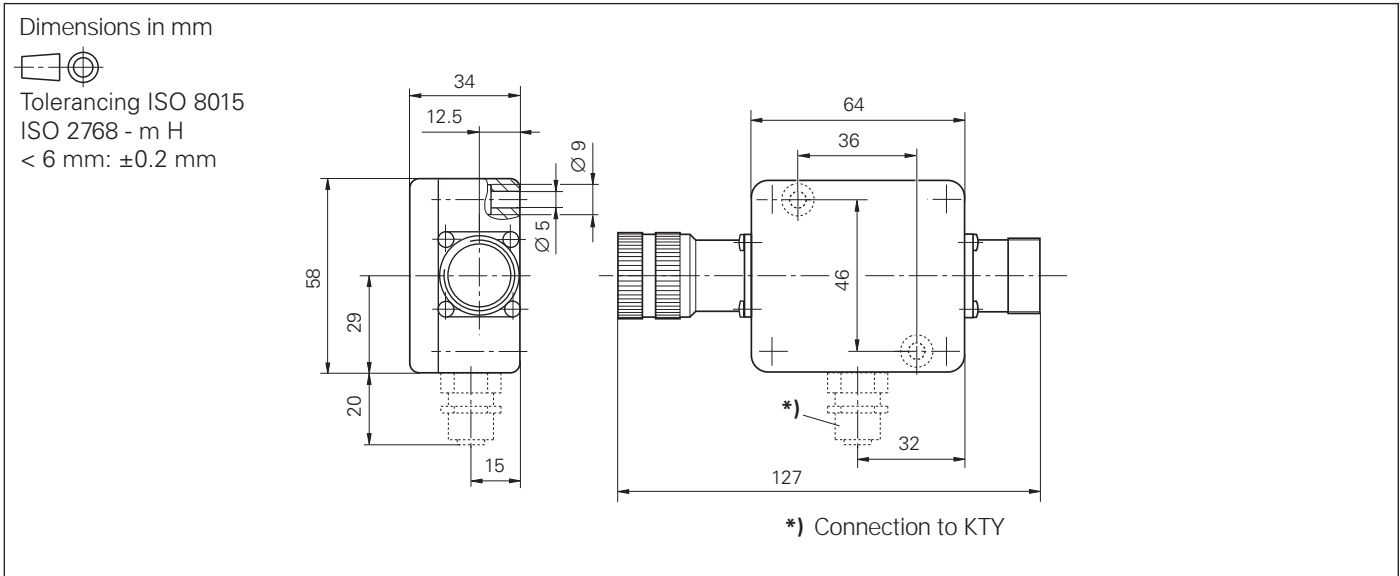
# PL 510



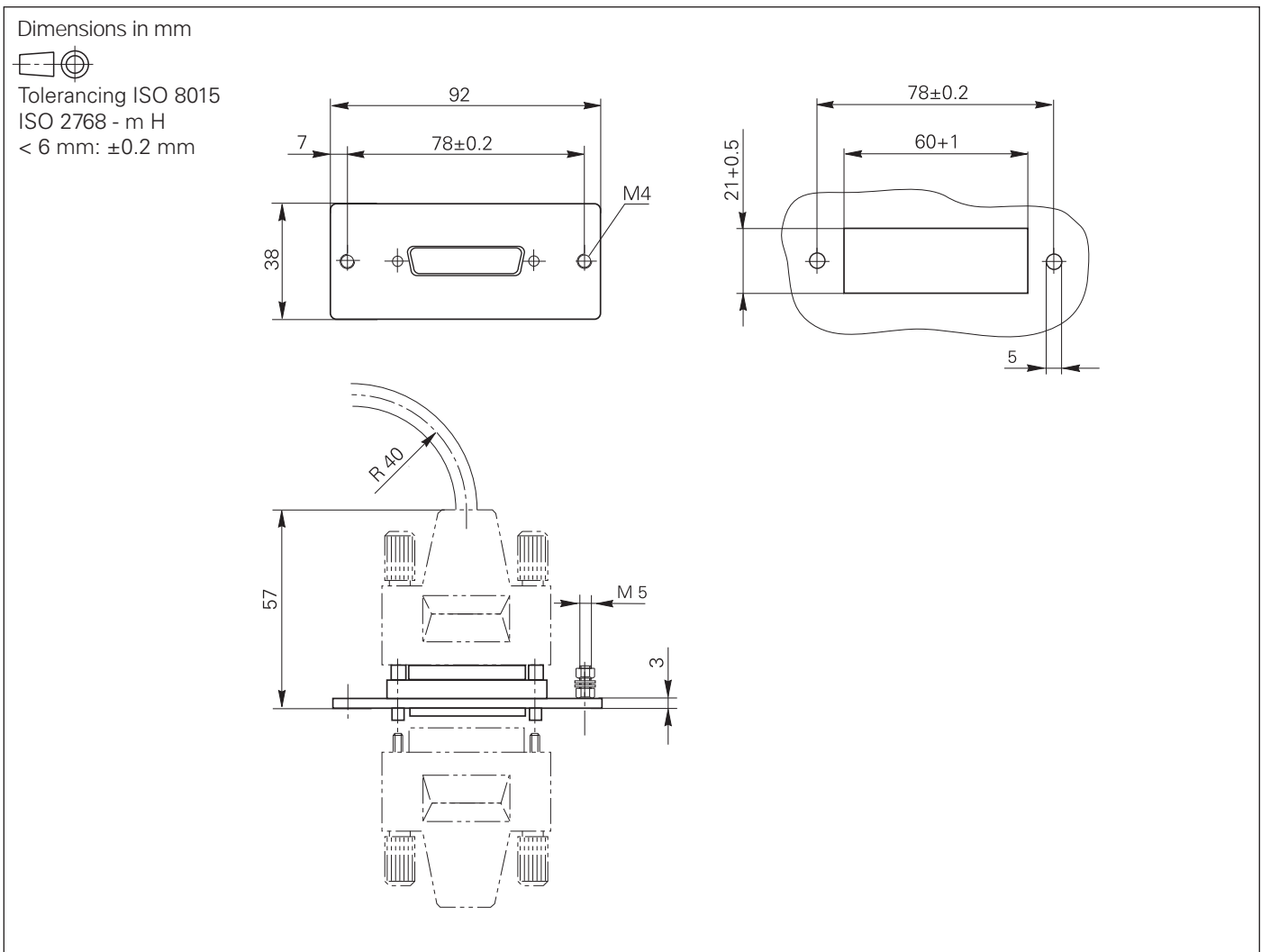
# MB 420



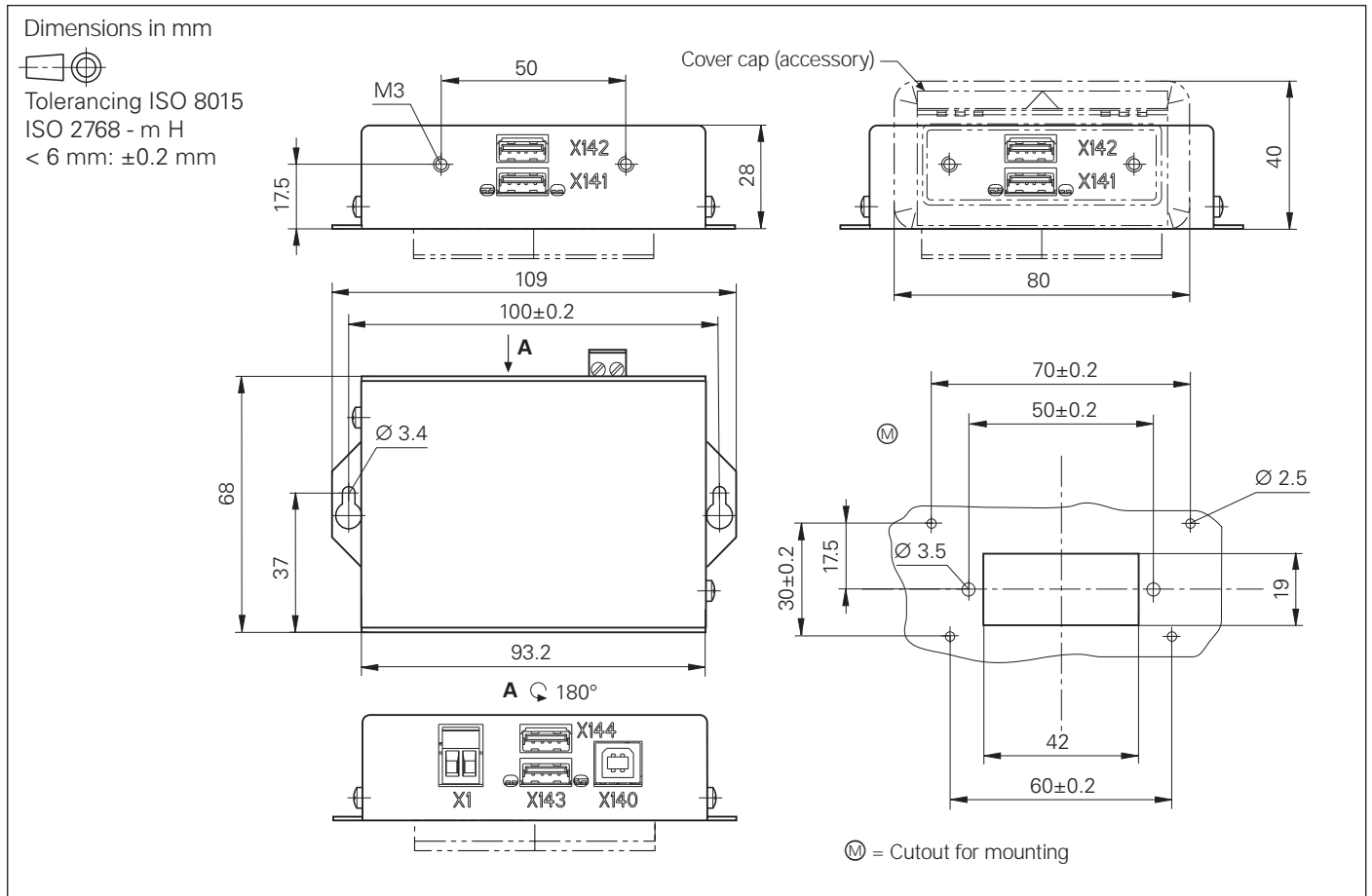
# Line Drop Compensator for Encoders with EnDat Interface



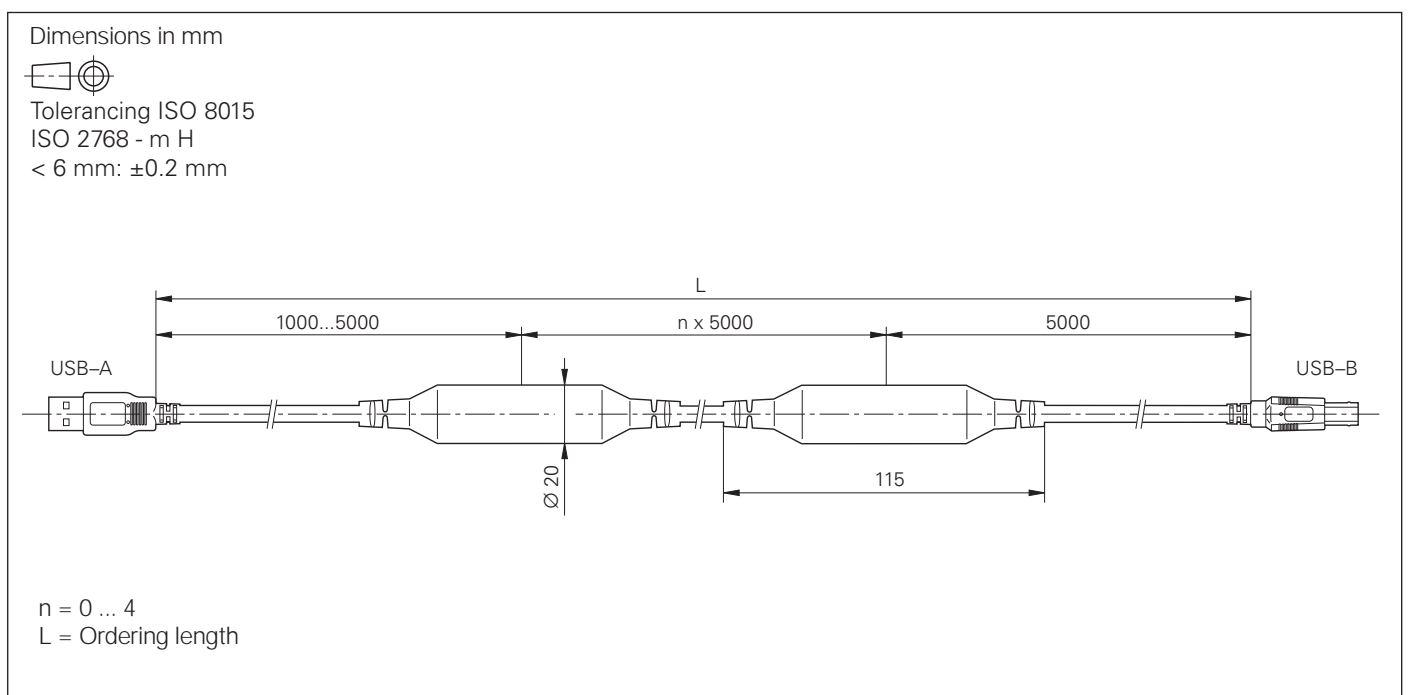
# RS-232-C Adapter



# USB Hub



# USB Extension Cable with Hubs





# Documentation

<b>Technical documentation</b>	• <b>MANUALplus 620</b> Technical Manual in English or German	ID 634863-xx
	• Mounting Instructions for <b>TS 220</b>	ID 312821-91
	• Mounting Instructions for <b>TS 440</b>	ID 632756-9x
	• Mounting Instructions for <b>TS 444</b>	ID 632757-9x
	• Mounting Instructions for <b>TS 640</b>	ID 632760-9x
	• Mounting Instructions for <b>TS 740</b>	ID 632761-9x
• Mounting Instructions for <b>TT 140</b>	ID 297510-xx	
<b>User documentation</b>	• User's Manual for <b>MANUALplus 620</b>	ID 634864-xx
	• User's Manual for <b>MANUALplus 620 smart.Turn and DIN Programming</b>	ID 685556-xx
	<b>Miscellaneous</b>	
	• User's Manual for <b>TNCremo</b>	As integrated help and in PDF format
	• User's Manual for <b>TNCremoNT</b>	As integrated help and in PDF format
	• User's Manual for <b>TNCremoPlus</b>	As integrated help and in PDF format
	• User's Manual for <b>PLCdesign</b>	As integrated help and in PDF format
• User's Manual for <b>IOconfig</b>	As integrated help and in PDF format	
• User's Manual for <b>KinematicsDesign</b>	As integrated help and in PDF format	
<b>Other documentation</b>	• <b>MANUALplus 620</b> brochure	ID 634865-xx
	• <b>Touch Probes</b> brochure	ID 208951-xx
	• Product Overview	
	• <b>Remote Diagnosis with TeleService</b>	ID 348236-xx
	• <b>Touch Probes</b> CD-ROM	ID 344353-xx
	• <b>DataPilot MP/CP 620</b> CD-ROM Demo version	ID 737139-xx

# HEIDENHAIN Service

- Technical support** HEIDENHAIN offers the machine manufacturer technical support to optimize the adaptation of the MANUALplus 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](mailto:service.nc-support@heidenhain.de)
- PLC programming** ☎ +49 8669 31-3102  
E-mail: [service.plc@heidenhain.de](mailto:service.plc@heidenhain.de)
- NC programming** ☎ +49 8669 31-3103  
E-mail: [service.nc-pgm@heidenhain.de](mailto:service.nc-pgm@heidenhain.de)
- Measuring systems** ☎ +49 8669 31-3104  
E-mail: [service.ms-support@heidenhain.de](mailto:service.ms-support@heidenhain.de)
- Lathe controls** ☎ +49 8669 31-3105  
E-mail: [service.lathe-support@heidenhain.de](mailto:service.lathe-support@heidenhain.de)

## Seminars

HEIDENHAIN provides technical customer training in the following subjects:

- NC programming
- PLC programming
- MANUALplus 620 mounting and commissioning
- MANUALplus 620 service
- Encoder service
- Special training for specific customers

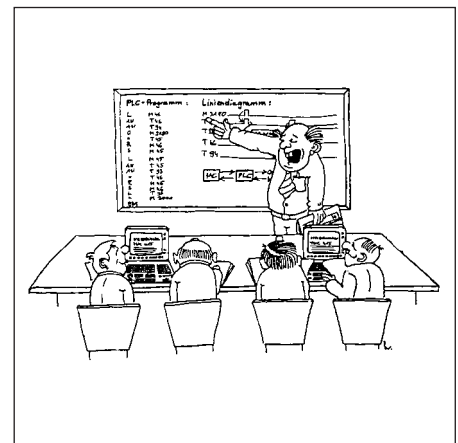
For more information on dates, registration, etc. call:

☎ +49 8669 31-2293 or 31-1695

FAX +49 8669 31-1999

E-mail: [mtt@heidenhain.de](mailto:mtt@heidenhain.de)

[www.heidenhain.de](http://www.heidenhain.de)



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