HEIDENHAIN

MANUALplus 620

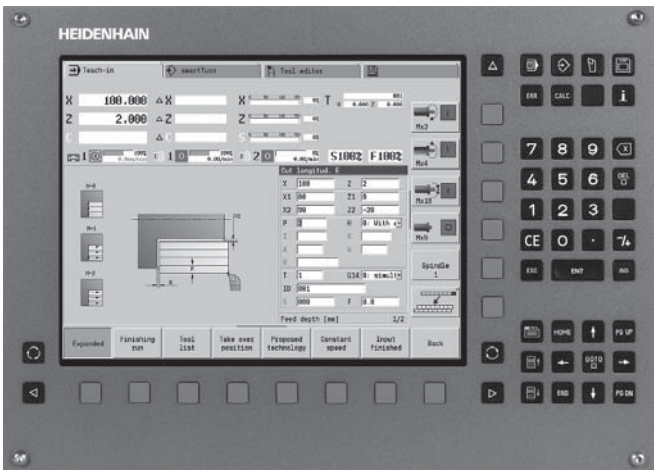
The Contouring Control for CNC and Cycle Lathes

Information for the Machine Tool Builder

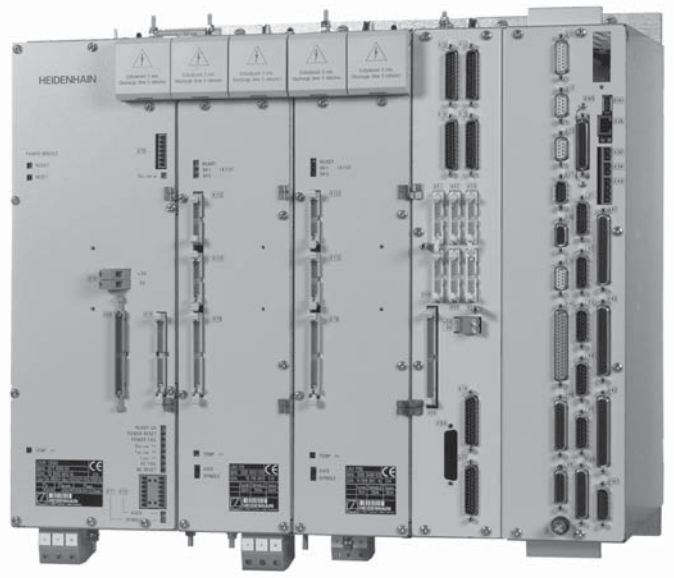
October 2009

MANUALplus 620
Contouring Control with Drive System from HEIDENHAIN

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
- HEIDENHAIN inverter systems and motors
- 12.1-inch TFT flat-panel color display
- Hard disk
- Cycle programming for turning, drilling, boring and milling operations
- smart.Turn programming for turning, boring drilling and milling operations
- DIN programming for turning, boring, drilling and milling operations
- 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.
- Also suited for analog drive control



BFT 131



MC 420, CC 422
with modular inverter

System tests

Controls, motors and encoders from HEIDENHAIN are usually 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:
- Hard disk
- Buffer battery
- Fan

Standards

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

Contents

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:

MANUALplus 620	ID 548328-02

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
Control systems		**12**
Main computer	MC 420	**13**
Controller unit	CC 422	**15**
Operating panel	• BFT 131 color flat-panel TFT display • NC keyboard	**16**
Inverter systems		*
Compact inverters	✔	*
Modular inverters	✔	*
Axes[1] **and spindles**		**25**
Axes	Up to 4 closed-loop axes X, Z: standard Y, W: option	**25**
C axis	With spindle motor or separate drive (option)	**25**
Driven tool	Option	**25**
Main Spindle	Closed-loop	**25**
Shaft speed[2]	Max. 60000 min^{-1}	**25**
NC program memory	At least 15 GB on hard disk	
Input resolution and display step		
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°	
Interpolation		
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	**

[1] As ordered
[2] On motors with two pole pairs
* For further information, refer to the *Inverters* brochure (ID 622420-xx)
** For further information, refer to the brochure *MANUALplus 620*

Specifications	MANUALplus 620	Page
Axis feedback control	• Digital drive control for synchronous and asynchronous motors with CC 422 • Analog drive control with UV 106 B	**26**
With following error	✔	**27**
With feedforward	✔	**27**
With jerk limiting	✔	**28**
Feed rate	Maximum feed rate: $\frac{60000\ \text{min}^{-1}}{\text{No. of pole pairs in motor}} \cdot$ screw pitch [mm] at f_{PWM} = 5000 Hz	**25**
Constant surface speed	✔	**25**
Input	mm/min or mm/revolution	**25**
Cycle times of main computer	MC 420	
Block processing	3 ms	
Position controller	3 ms	**27**
Cycle times of controller unit	CC 422	**27**
Speed controller	0.6 ms	**27**
Current controller	f_{PWM} / T_{INT} 3333 Hz / 150 µs 4166 Hz / 120 µs 5000 Hz / 100 µs 6666 Hz / 75 µs 8333 Hz / 60 µs 10000 Hz / 50 µs	**27**
Power supply	Inverter with logic unit: 3 x 400 V~ Color flat-panel display and PLC: 24 V–	
Permissible temperature range	Operation: 0 °C to 40 °C Storage: –35 °C to +65 °C	

Machine Interfacing

Machine Interfacing	MANUALplus 620	Page
Error compensation		**30**
Linear axis error	✔	**30**
Nonlinear axis errors	✔	**30**
Backlash	✔	**30**
Hysteresis, reversal peaks	✔	**30**
Thermal expansion	✔	**30**
Stick-slip friction	✔	**30**
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Program format	Statement list	**31**
Program input via the control	Via external USB keyboard	**31**
Program input via PC	✔	**31**
PLC memory	Hard disk	**31**
PLC cycle time	18 ms	**31**
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PLC outputs, 24 V–	31 (expandable by PL)	
Analog inputs, ±10 V	3 (expandable by PL)	
Analog outputs, ±10 V	6 (expandable by PL)	
Inputs for thermistors	3 (expandable by PL)	
PLC soft keys	✔	**31**
PLC positioning	✔	**31**
PLC basic program	✔	**32**
Encoder inputs		**29**
Position	5	**29**
Incremental	1 V_{PP}	**29**
Absolute	EnDat 2.1	**29**
Spindle speed	6	**29**
Incremental	1 V_{PP}	**29**
Absolute	EnDat 2.1	**29**
Commissioning and diagnostic aids		**33**
Integrated oscilloscope	✔	**33**

Machine Interfacing, Accessories

Machine Interfacing	MANUALplus 620	Page
Trace function	✔	**33**
Logic diagram	✔	**33**
Table function	✔	**33**
OLM (online monitor)	✔	**34**
Log	✔	**33**
Data interfaces		**36**
Ethernet (100BaseT)	✔	**36**
RS-232-C/V.24	Can only be controlled via PLC	**36**
RS-422/V.11	Can only be controlled via PLC	**36**
USB 1.1	2	**36**

Accessories	MANUALplus 620	Page
Electronic handwheels	• One HR 410, one HR 130, or up to three HR 150 via HRA 110 • Up to two HR 180	**18**
Touch probes	One TT 140 tool touch probe	**19**
PLC input/output systems	Modular external input/output systems **PL 510 or PL 550** consisting of • Basic module with HEIDENHAIN PLC interface **PLB 510:** for 4 I/O modules **PLB 511:** for 6 I/O modules **PLB 512:** for 8 I/O modules **PLB 550:** for 4 I/O modules • **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 inputs for PT 100 thermistors	**17**
USB hub	✔	**36**
PLC basic program[1)]	✔	**32**
DataPilot MP 620 programming station	Control software for PCs for programming, archiving, and training	*
Software		
PLCdesignNT[1)]	PLC software developing environment	**32**
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TNCremoPlus	Data transfer software with live-screen function	**37**
TNCscopeNT[1)]	Software for data recording	**33**
DriveDiag[1)]	Software for diagnosis of digital drive systems	**34**
TNCopt[1)]	Software for putting digital control loops into service	**34**
TeleService[1)]	Software for remote diagnostics, monitoring, and operation	**33**

***** For further information, refer to the brochure *MANUALplus 620*
[1)] For registered customers, these software products are available for downloading from the Internet.

User Functions

User functions	Standard	Option	
Configuration	•		Basic version: X and Z axis, spindle
		0-2	Positionable spindle and driven tool
		55+0-2	C axis and driven tool
		70+0-2	Y axis
		94+0-2	W axis (as closed loop PLC axis)
	•		Digital current and speed control
Modes of operation			
Manual operation	•		Manual slide movement through manual direction keys, intermediate switch or electronic handwheels
	•		Graphic support for entering and running cycles without saving the machining steps in alternation with manual machine operation
		11	Thread reworking (thread repair in a second workpiece setup)
Teach-in		8	Sequential linking of fixed cycles, where each cycle is run immediately after input, or is graphically simulated and subsequently saved.
Program run			All are possible in single-block and full-sequence modes
	•		DIN PLUS programs
		9	smart.Turn programming
		8	Cycle programs
Setup functions	•		Workpiece datum setting
	•		Definition of tool-change position
	•		Definition of protection zone
	•		Tool measurement by touching the workpiece
		17	Tool measurement with a tool touch probe
		17	Tool measurement with an optical gauge
Programming			
Cycle programming		8	Area clearance cycles for simple and complex contours, and contours described with ICP
		8	Contour-parallel area clearance cycles
		8	Recessing cycles for simple contours, complex contours, and contours described with ICP
		8	Repetitions with recessing cycles
		8	Recess turning cycles for simple and complex contours, and contours described with ICP
		8	Undercut and parting cycles
		8	Threading cycles for single or multi-start longitudinal, taper or API threads
		8+55	Cycles for axial and radial drilling, pecking and tapping operations with the C axis
		8+55	Thread milling with the C axis
		8+55	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
		8+55	Helical slot milling with the C axis
		8+55	Linear and circular patterns for drilling and milling operations with the C axis
		8	Context-sensitive help graphics
		8	Transfer of cutting values from technology database
		8	Use of DIN macros in cycle programs
		8+9	Conversion of cycle programs to smart.Turn programs
Interactive Contour Programming (ICP)		8/9	Contour definition with linear and circular contour elements
		8/9	Immediate display of entered contour elements
		8/9	Calculation of missing coordinates, intersections, etc.
		8/9	Graphic display of all solutions for selection by the user if more than one solution is possible
		8/9	Chamfers, rounding arcs and undercuts available as form elements
		8/9	Input of form elements immediately during contour creation or by superimposition later
		8/9	Changes to existing contours can be programmed

User functions	Standard	Option	
ICP (continued)		8/9+55	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
		9+70	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
		8/9+42	DXF import: Import of contours for lathe and milling operations
smart.Turn programming		9	The basis is the **unit**, which is the complete description of a machining block (geometry, technology and cycle data)
		9	Dialog boxes divided into overview and detail forms
		9	Fast navigation between the fillable forms and input groups via the "smart" keys
		9	Context-sensitive help graphics
		9	Start unit with global settings
		9	Transfer of global values from the start unit
		9	Transfer of cutting values from technology database
		9	Units for all turning and recessing operations for simple contours and ICP contours
		9+55/70	Units for boring, drilling and milling operations with the C and Y axis for simple holes, milling contours and drilling and milling patterns or those programmed with ICP
		9+55	Special units for activating/deactivating the C axis, subprograms and section repeats
		9	Verification graphics for blank and finished part and for C and Y axis contours
		9	Turret assignment and other setup information in the smart.Turn program
		9	Parallel programming
		9	Parallel simulation
DIN PLUS programming	•		Programming in DIN 66025 format
	•		Extended command format (IF... THEN ... ELSE...)
	•		Simple geometry programming (calculation of missing data)
	•		Powerful machining cycles for area clearance, recessing, recess turning and thread machining
		55	Powerful machining cycles for boring, drilling and milling with the C axis
		70	Powerful machining cycles for boring drilling and milling with the Y axis
	•		Subprograms
	•		Programming with variables
		8/9	Contour description with ICP
	•		Program verification graphics for workpiece blank and finished part
	•		Turret assignment and other setup information in the DIN PLUS program
		9	Conversion of smart.Turn units into DIN PLUS command sequences
	•		Parallel programming
	•		Parallel simulation
Test run graphics	•		Graphic simulation of the cycle process or of the cycle, smart.Turn or DIN PLUS program
	•		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
	•		Shifting and magnifying functions
Machining time analysis	•		Calculation of machining time and idle machine time
	•		Consideration of switching commands triggered by the CNC
	•		Representation of time per cycle or per tool change

User functions	Standard	Option	
Tool database	•		For 250 tools
		10	For 999 tools
	•		Tool description can be entered for every tool
	•		Automatic inspection of tool-tip position with respect to the contour
	•		Compensation of tool-tip position in the X/Y/Z plane
	•		Precision path correction via handwheel, transferring compensation values to the tool table
	•		Automatic tool-tip and cutter radius compensation
	•		Tool monitoring for lifetime of the insert (tool tip) or the number of workpieces produced
		10	Tool monitoring with automatic tool change after tool insert wear
		10	Management of multipoint tools (multiple inserts or reference points)
Technology database		8/9	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.
		8/9	Automatic determination of the machining modes from the cycle or the machining unit
		8/9	The cutting data are entered in the cycle or in the unit as default values
		8/9	9 workpiece-material/tool-material combinations (144 entries)
		10	62 workpiece-material/tool-material combinations (992 entries)
Conversational languages	•		Chinese (simplified), Chinese (traditional), Czech, Danish, Dutch, English, Finnish, French, German, Hungarian, Italian, Polish, Portuguese, Russian, Spanish, Swedish
		41	For more conversational languages, see *Option*

Overview
– Options

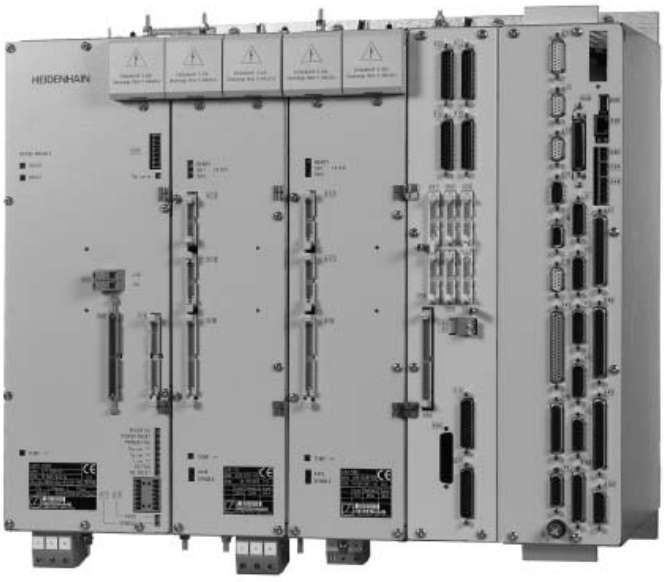
Option number	Option	ID	Comment
0 **1** **2**	Additional axis	354 540-01 353 904-01 353 905-01	**Additional control loops 1 to 3**
8	Software option 1	632 226-01	**Cycle programming** • Contour description with ICP • Cycle programming • Technology database with 9 workpiece-material/tool-material combinations
9	Software option 2	632 227-01	**smart.Turn** • Contour description with ICP • Programming with smart.Turn • Technology database with 9 workpiece-material/tool-material combinations
10	Software option 3	632 228-01	**Tools and technology** • Tool database expanded to 999 entries • Technology database expanded to 62 workpiece-material/tool-material combinations • Support of multipoint tools • Tool life monitoring with exchange tools
11	Software option 4	632 229-01	**Threads** • Thread recutting • Handwheel superimposition during thread cutting
17	Software option TCH PROBE functions	632 230-01	**Tool measurement** • Determining tool-setting dimensions with a tool touch probe • Determining tool-setting dimensions with an optical gauge
41	Additional language	530 184-01 530 184-02 530 184-03 530 184-04 530 184-06 530 184-07 530 184-08 530 184-09 530 184-10	Slovenian Slovak Latvian Norwegian Korean Estonian Turkish Romanian Lithuanian
42	DXF import software option	632 231-01	**DXF import** • Loading of DXF contours
55	C-axis machining software option	633 944-01	**C-axis machining**
70	Y-axis machining	661 881-01	**Y-axis machining**
94	W-axis machining	679 676-01	**Support of W axis**

HEIDENHAIN Control Systems

The MANUALplus 620 lathe machine control from HEIDENHAIN includes various components, which can be selected and combined to fit the application.

		Model	Page
MANUALplus 620	Main computer	**MC 420**	**13**
	Controller unit for digital servo control	**CC 422**	**15**
	Power supply unit for analog servo control	**UV 106B**	**15**
	Operating panel	**BFT 131**	**16**
	Connecting cables		**21**
Accessories	Machine operating panel	**MB 420**	**16**
	PLC inputs/outputs	**PL 510**	**17**
	Electronic handwheels	**HR 410, HR 180, HR 130** or **HR 150**	**18**
	Tool touch probe	**TT 140**	**19**

MC 420, CC 422
with compact inverter



MC 420, CC 422
with modular inverter

Main Computer

Main computer

The **MC 420** main computer includes:
- Processor (Celeron, 400 MHz)
- 512 MB RAM memory
- PLC
- Interface to the CC controller unit
- Interface to the control panel
- Interface to the handwheel
- Further interfaces (PLC expansion, Ethernet, USB, RS-232-C/V.24, RS-422/V.11)

To be ordered separately:
- **HDR** hard disk with the NC software
- **SIK component** (System Identification Key) for enabling the control loops and software options

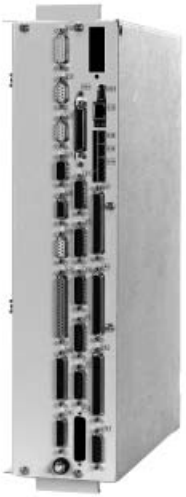
Power supply

The main computer is powered over the CC controller unit.

MC 420

The MC 420 main computer features five position encoder inputs.

Position inputs	5 x 1 V_{PP} or EnDat 2.1
Weight	4.2 kg
ID	515929-02

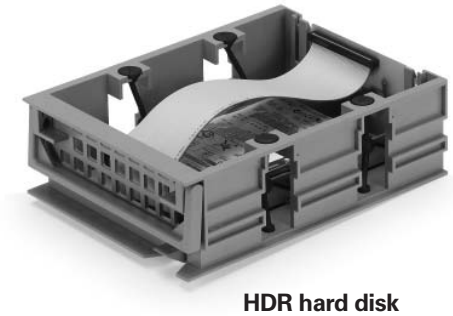


MC 420
with 5 position encoder inputs

HDR hard disk

The HDR hard disk is removable. It contains the NC software and a slot for the SIK component.

HDR for	ID
MANUALplus 620	628935-51



HDR hard disk

SIK component

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

Additional control loops and options 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.

SIK component

Master keyword

For commissioning the MANUALplus 620, a master keyword can be used that will unlock all options for a duration of two weeks. After this period, the control loop options will be active only through the correct keyword. Should service become necessary, the SIK component must be inserted in the replacement control to enable all required options.

NC software license

SIK with software license and enabling for:	**ID**
Three control loops and options Cycle programming (option 8) smart.Turn (Option 9) Thread (option 11) C axis (option 55)	530005-53

Additional axes

	Option number	**ID**
1st additional axis (4th control loop)	0	354540-01
2nd additional axis (5th control loop)	1	353904-01
3rd additional axis (6th control loop)	2	353905-01

Software options

The features of the MC 420 can also be adapted with options retroactively 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.

Controller Unit

Digital control

The **CC 422** controller unit serves for digital drive control.
The components:
- Speed controller
- Current controller
- Interfaces to the UM 1xx, UR 2xx, UE 2xx power modules (PWM outputs)
- Interfaces to the shaft speed encoders
- Interfaces for power supply for controller unit and main computer (supply via UVR 1xxD, UE 2xxD, UR 2xx)

CC 422

CC 422

The CC 422 can control up to 6 digital control loops.

The number of enabled control loops is saved in the SIK (see *Main Computer*).

The CC 422 controller unit is combined with the MC 420 main computer. The position controllers and position encoder inputs are located on the MC 420 main computer (version with 5 position encoder inputs).

CC 422	Max. 6 digital control loops
Speed inputs	6 x 1 V_{PP} or EnDat 2.1
PWM outputs	6
Weight	4.0 kg
ID	359651-xx

Analog control

For analog drive control, a **UV 106B** is required instead of the CC 422 to supply power to the main computer. In this case, the axes to be controlled are driven through the analog speed command interface of the MC 420 main computer. For further information on the UV 106B, refer to the *UV 106B* product information sheet on www.heidenhain.de/docu.

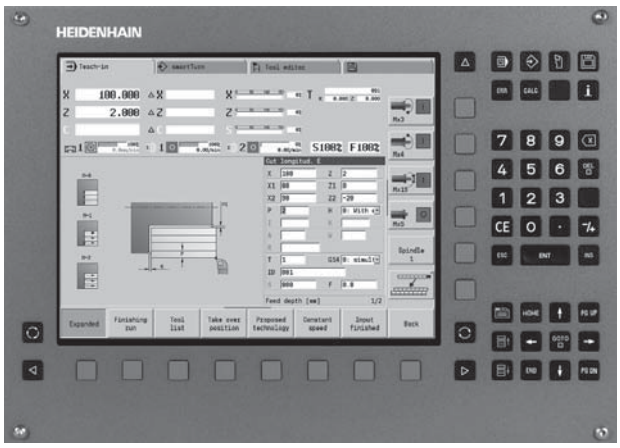
UV 106B

Operating Panel

BFT 131 operating panel

ID 583683-01
Weight (approx.) 3 kg

- 12.1-inch color flat-panel display (1024 x 768)
- Operating mode keys
- Horizontal and vertical soft keys
- Numeric keypad
- Editing keys
- smart.Turn keys



BFT 131

MB 420 machine operating panel

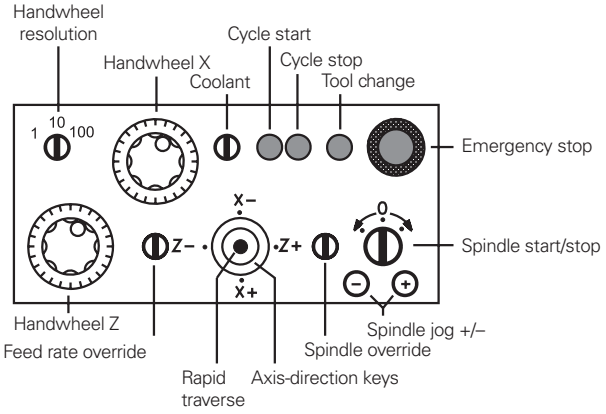
- ID 293757-45
- Weight 0.9 kg
- 21 snap-on keys, freely definable via PLC
- Operation keys
  Assigned according to PLC basic program with:
  Control voltage on, emergency stop, NC start, NC stop, 5 axis keys, rapid traverse, retract axis, tool change, unclamp tool, menu selection, unlock door, spindle 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 manufacturer can also design its own machine operating panel. It should contain the following components:

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



Proposal for a machine operating panel

Accessories

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.

PL 510

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	24 V–
Power consumption (approx.)	20 W
Weight	0.36 kg (bare)

Basic modules with HEIDENHAIN PLC interface

PLB 510	Slots for 4 I/O modules	ID 358849-01
PLB 511	Slots for 6 I/O modules	ID 556941-01
PLB 512	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 assembled 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

Electronic Handwheels

The standard MANUALplus 620 supports the use of electronic handwheels.

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 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 µm/10 µm/100 µm 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 540940-06
HR 150 with detent	ID 540940-07

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

HR 410

Tool Touch Probe

Before the MANUALplus620 leaves the factory, it is already prepared for the use of a touch probe for workpiece measurement. The touch probe generates a trigger signal that saves the current position value to the NC. For more information on the touch probes, ask for our *Touch Probes* brochure or CD-ROM.

Tool calibration

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. The MANUALplus 620 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 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.

ID 676497-01

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

A	ID 330 816-42	X	ID 330 816-24	U	ID 330 816-43	IV	ID 330 816-37
B	ID 330 816-26	Y	ID 330 816-36	V	ID 330 816-38		
C	ID 330 816-23	Z	ID 330 816-25	W	ID 330 816-45		

Gray

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

Machine functions

SPEC FCT	ID 330 816-0X	FN 3	ID 330 816-75		ID 330 816-0T		ID 330 816-86
SPEC FCT	ID 330 816-1Y	FN 4	ID 330 816-76		ID 330 816-81		ID 330 816-87
FCT A	ID 330 816-30	FN 5	ID 330 816-77		ID 330 816-82		ID 330 816-88
FCT B	ID 330 816-31		ID 330 816-78		ID 330 816-83		ID 330 816-94
FCT C	ID 330 816-32		ID 330 816-79		ID 330 816-84		ID 330 816-0U
FN 1	ID 330 816-73		ID 330 816-80		ID 330 816-89		ID 330 816-91
FN 2	ID 330 816-74		ID 330 816-0S		ID 330 816-85		

Spindle functions

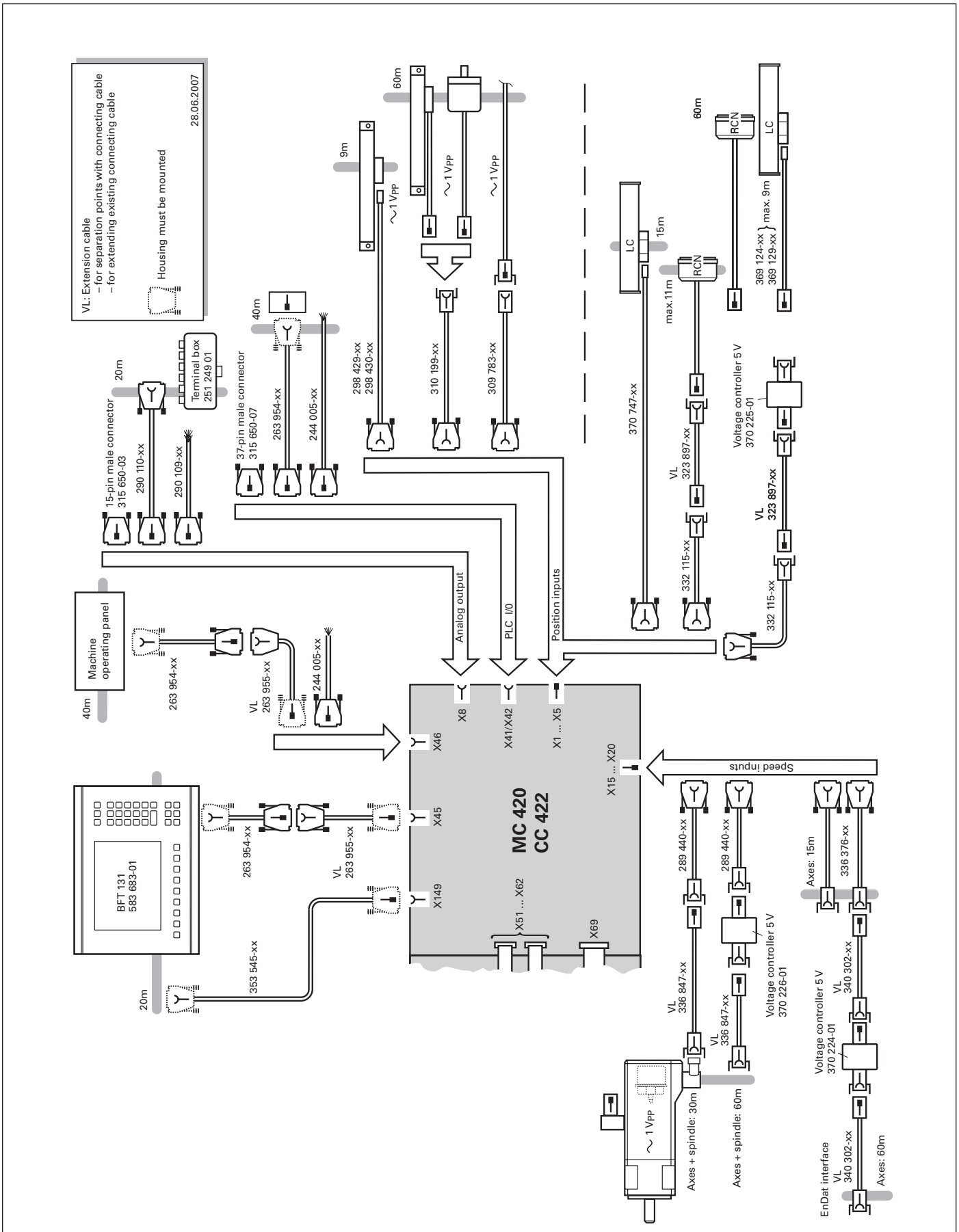
	ID 330 816-08		ID 330 816-40	0	(red) ID 330 816-47		ID 330 816-48
	ID 330 816-09		ID 330 816-41	1	(green) ID 330 816-46		

Other keys

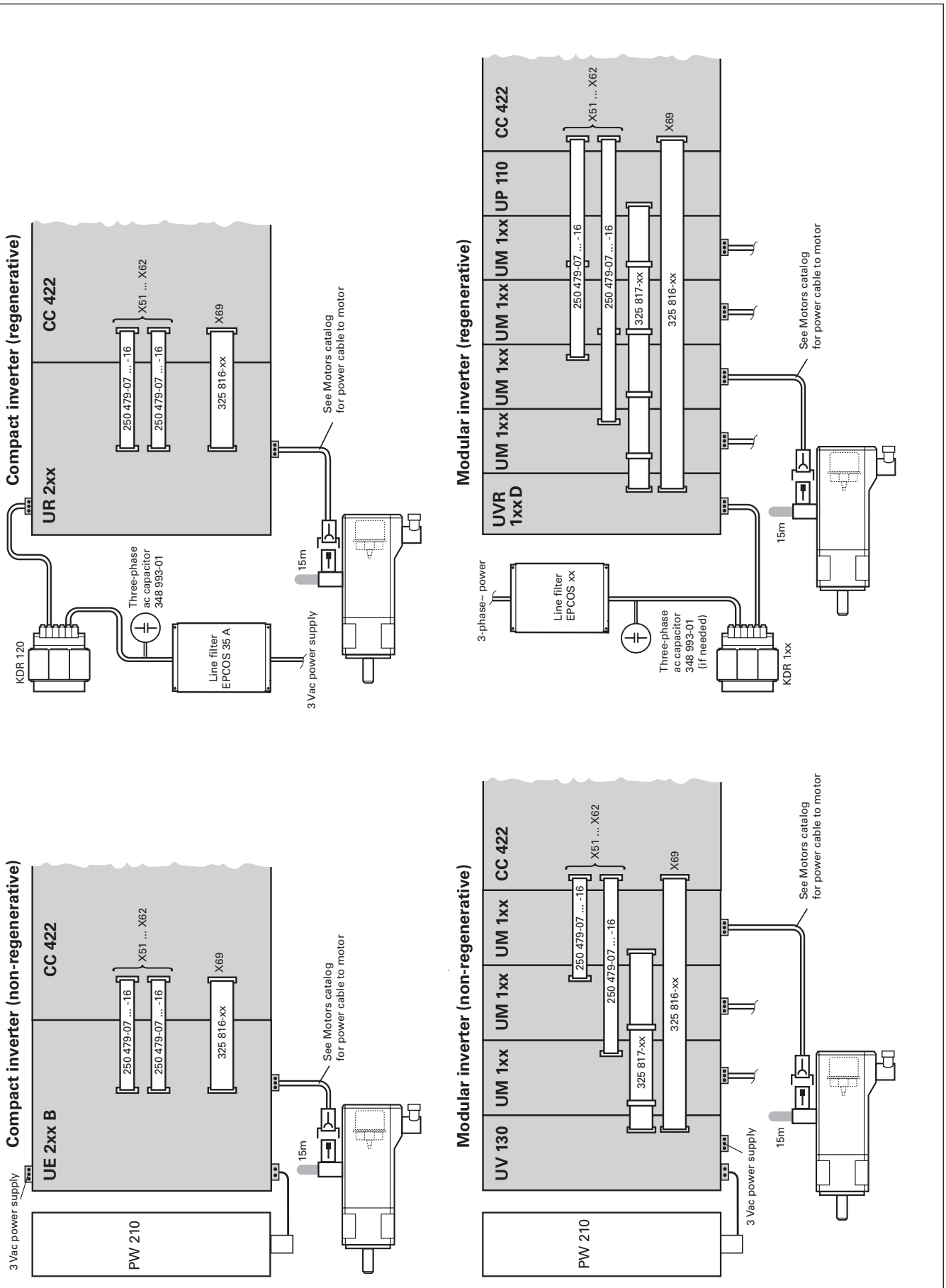
	ID 330 816-01		ID 330 816-50		ID 330 816-90		ID 330 816-93
	ID 330 816-61		ID 330 816-33		ID 330 816-27	0	ID 330 816-0Y
NC I	(green) ID 330 816-11		ID 330 816-34		ID 330 816-28		ID 330 816-4M
NC 0	(red) ID 330 816-12		ID 330 816-35		ID 330 816-29		
	ID 330 816-49		ID 330 816-22		ID 330 816-92		

Cable Overview

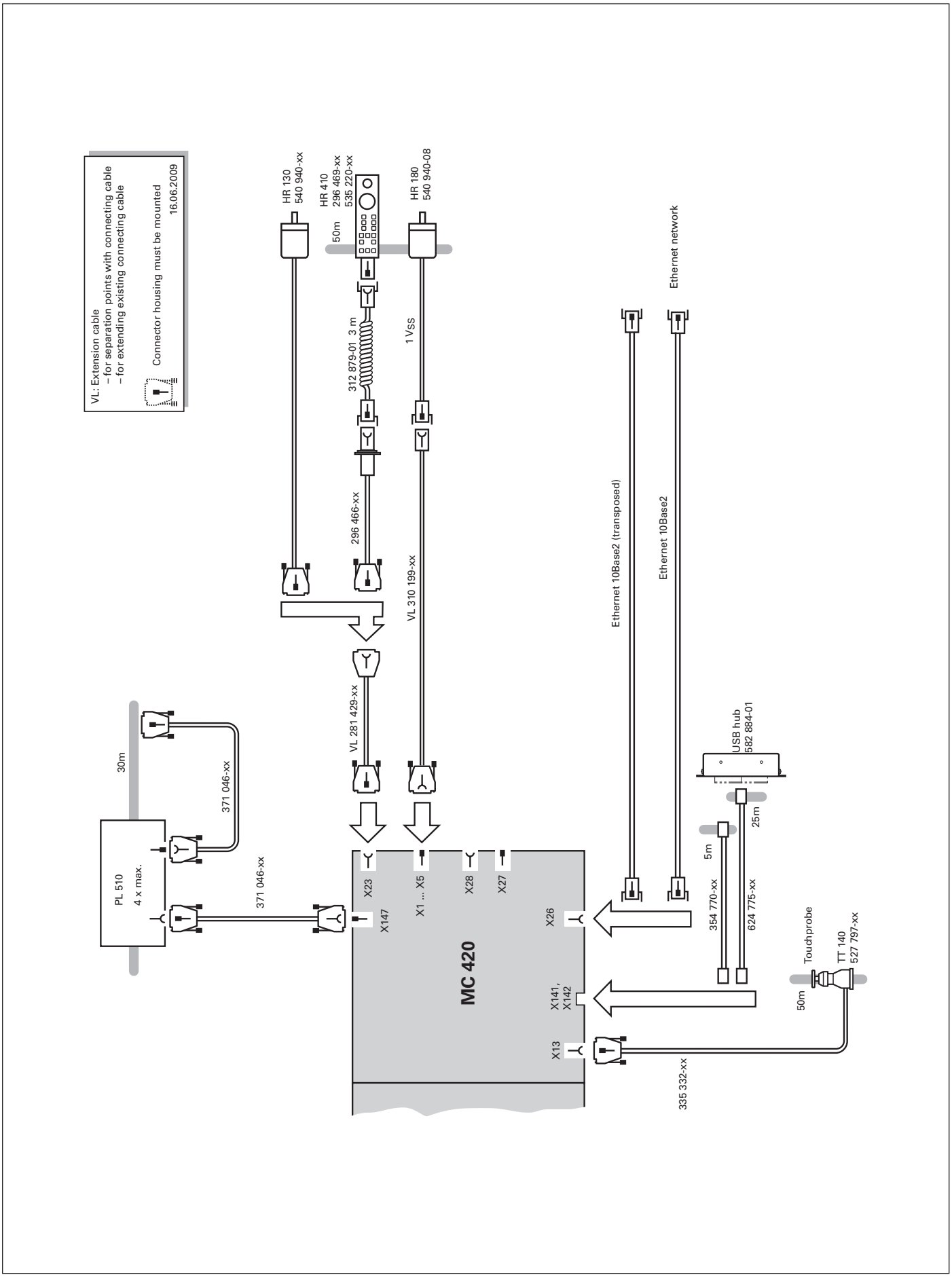
Control Systems



Inverter Systems



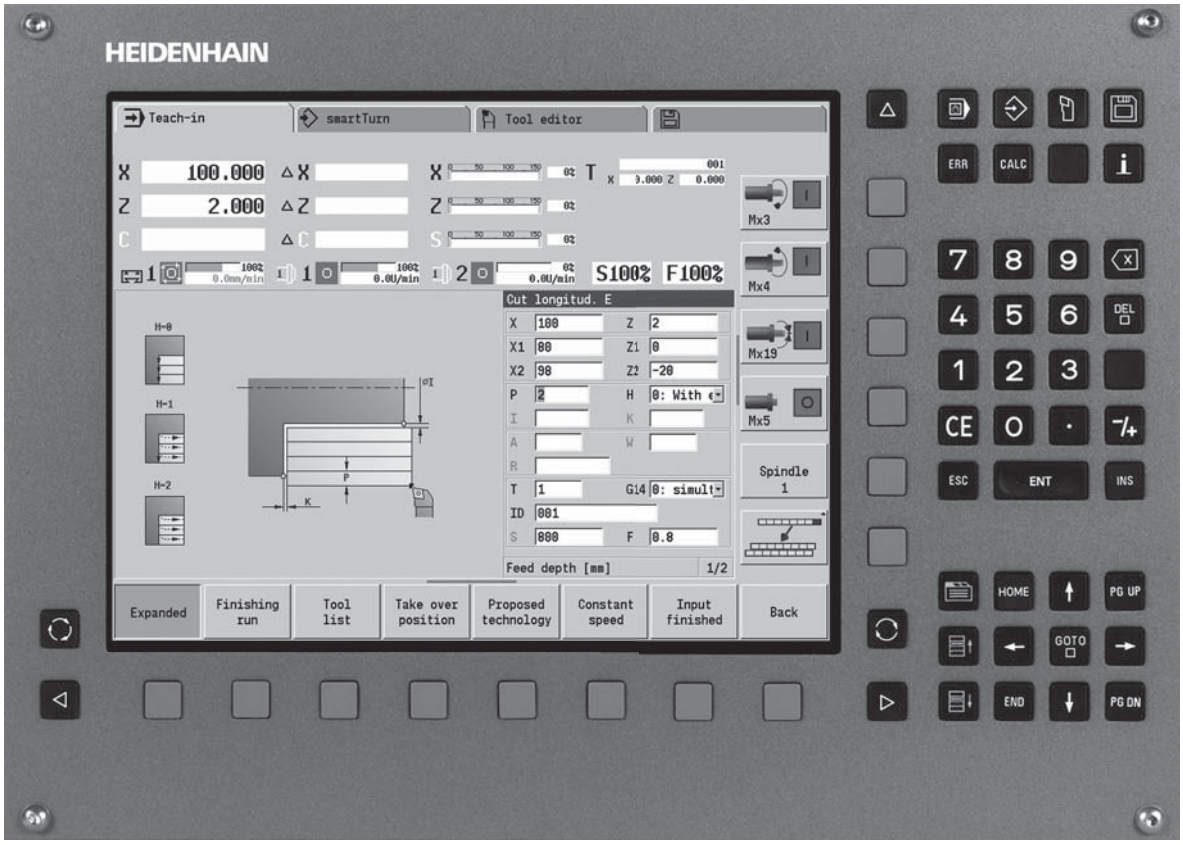
Accessories



MANUALplus 620
The Contouring Control for CNC Lathes 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

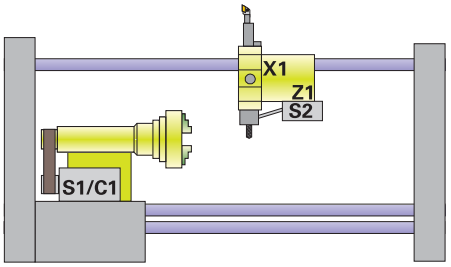
The MANUALplus 620 for CNC lathes
- Conceived for medium-sized and large production runs
- Programming via smart.Turn and/or DIN PLUS
- smart.Turn is quickly learned and requires very little training time
- Supports boring, drilling and milling operations on the face and lateral surface
- Features a 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.

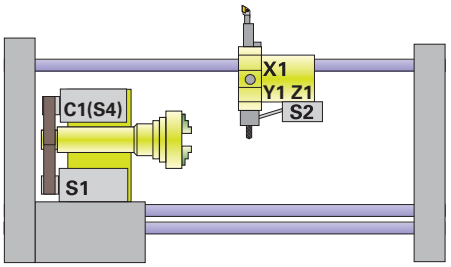


Display and programming

Feed rate in

- mm/min
- mm/revolution
- Feed rate override: 0 to 150%
- Maximum feed rate at f_{PWM} = 5000 Hz:

$$\frac{60000\ \text{min}^{-1}}{\text{No. of pole pairs in motor}} \cdot \text{screw pitch [mm]}$$

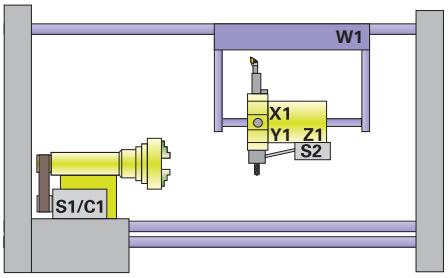


Traverse range

–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 carriers

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%

Maximum speed

$$n_{max} = \frac{f_{PWM} \cdot 60000\ \text{min}^{-1}}{NPP \cdot 5000\ \text{Hz}}$$

f_{PWM} = PWM frequency in Hz
NPP = Number of pole pairs

Speed limiting

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

Gear stages

A specific parameter 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°

Live 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.

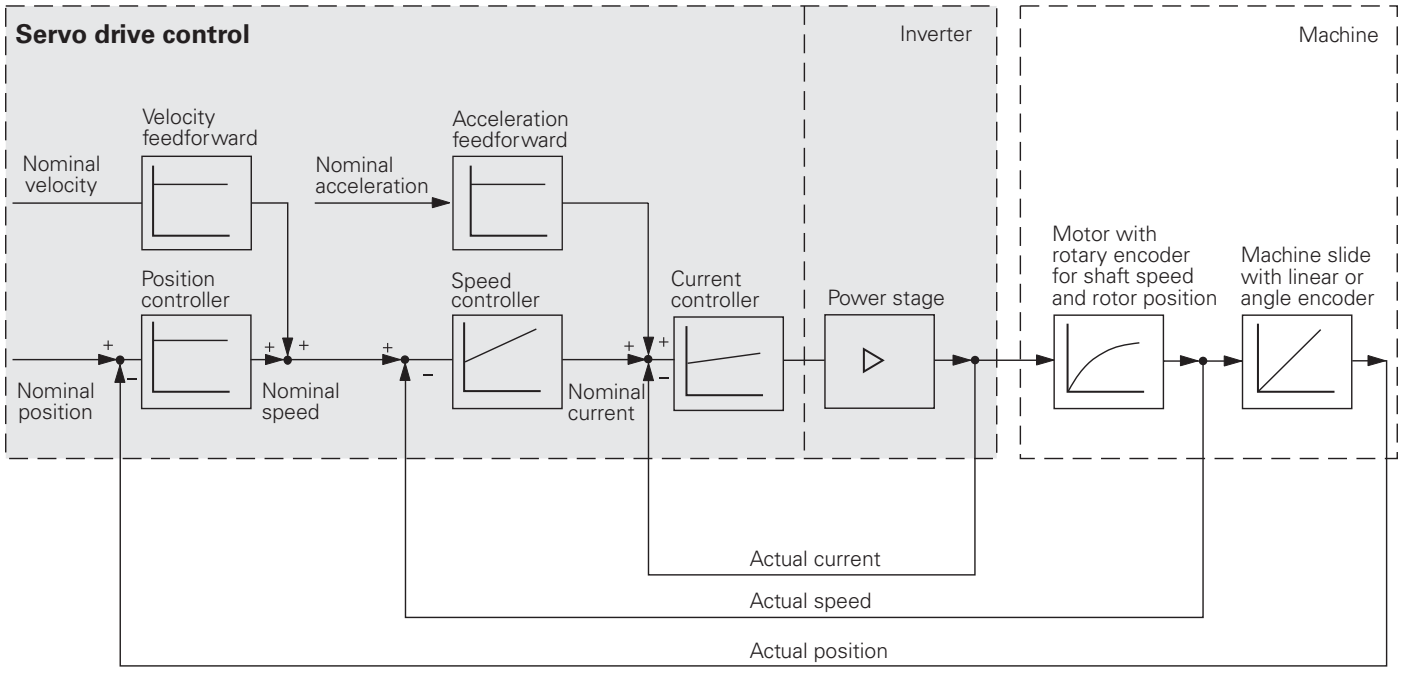
Analog Control

The MANUALplus 620 can be used for analog drive control (see the *UV 106B* product information sheet on www.heidenhain.de/docu).

Digital Control

Integrated inverters

Position controllers, speed controllers, current controllers and inverters are integrated in the control. HEIDENHAIN synchronous and asynchronous motors are connected to the MANUALplus 620.



Axis feedback control

The MANUALplus 620 operates with feedforward control.

Operation with following error (servo lag)

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

Operation with feedforward control

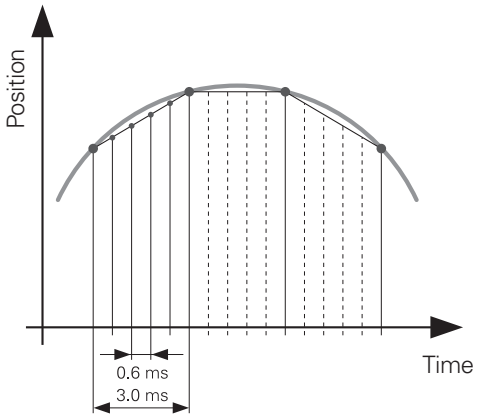
Feedforward control means that a velocity and acceleration input is adapted to the machine while taking the jerk limiting into account. Together with the values calculated from the following error, it forms the nominal value. This greatly reduces the following error (to within a few µm). The feedforward is adjustable from 0 to 100 % via a machine parameter.

Control loop cycle times

The cycle time for the **position controller** is defined as the time interval in which the actual position value is compared to the calculated nominal position value.

The cycle time for the **speed controller** is defined as the time interval during which the actual speed value is compared to the calculated nominal speed value. The cycle time for the **current controller** is defined as the time interval during which the actual current value is compared to the calculated nominal current value.

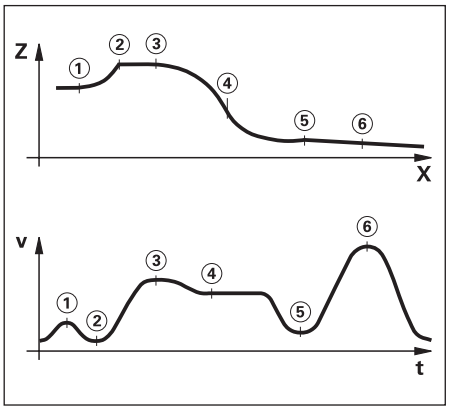
	Position controller	Speed controller	Current controller
MC 420 CC 422	3 ms	0.6 ms	0.1 ms



Fast Machining

Look-ahead

The MANUALplus 620 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

Jerk

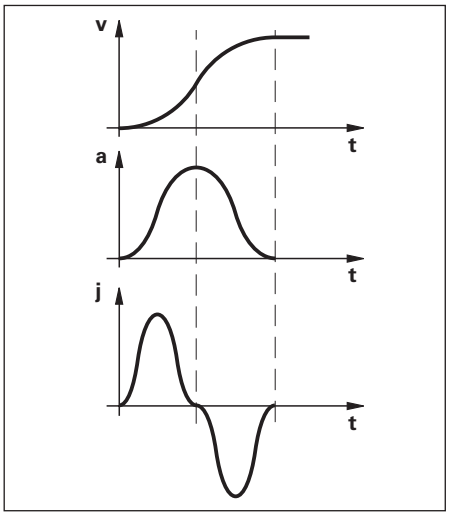
The derivative of acceleration is referred to as jerk. A linear change in acceleration causes a jerk step. This jerk causes oscillations that result in contour damage.

Jerk limiting

To prevent machine oscillations, the jerk is limited to attain optimum path control. The MANUALplus 620 machines smooth surfaces at the highest possible feed rate, and yet keeps the contour accurate. The machine manufacturer sets the permissible tolerance via parameter.

Jerk smoothing

The jerk is smoothed by a nominal position value filter. The MANUALplus 620 machines smooth surfaces at the highest possible feed rate. The machine manufacturer sets the permissible tolerance via parameter.

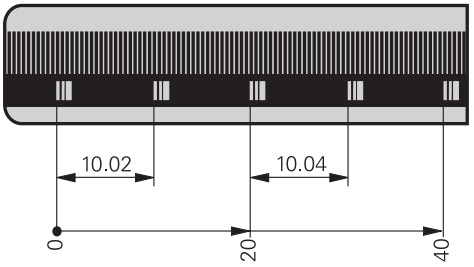


Measuring Systems

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

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.

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

Incremental and absolute linear, angle or rotary encoders from HEIDENHAIN can be connected to all **position encoder** inputs of the MC.

Incremental and absolute rotary encoders from HEIDENHAIN can be connected to all **speed encoder** inputs of the CC 42x.

Inputs	**Signal level/ Interface**[1]	**Input frequency**[1]	
		Position	Spindle speed
Incremental	$\sim$ 1 V_{PP}	33 kHz/350 kHz	350 kHz
Absolute	EnDat 2.1 $\sim$ 1 V_{PP}	– 33 kHz/350 kHz	– 350 kHz

[1] Switchable

Types of Error Compensation

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

Linear error

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

Nonlinear error

The MANUALplus 620 compensates for axis errors and errors that result from other axes (spindle-pitch error, sagging, misaligned axes, etc.).

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.

Hysteresis

The hysteresis between table movement and motor movement is also compensated in length measurements. In this case the hysteresis is within the controlled system.

Reversal peaks

In circular movements, reversal spikes can occur at quadrant transitions due to mechanical influences. The MANUALplus 620 can compensate for these reversal peaks.

Stick-slip friction

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.

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 MANUALplus 620. The PLC evaluates the temperature information and transfers the compensation value to the NC.

Integrated 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.

PLC expansion

If the PLC inputs/outputs of the MC 420 do not suffice, the external PL 510 PLC input/output system can be connected.

Rated operating current per output

Logic unit: 0.15 A
(For PL 5xx see *PLC Inputs/Outputs*)

PLC programming

Format: Statement list

Memory:
- PLC program: on hard disk
- Process memory: 512 KB RAM
- Data memory: 124 KB RAM

Cycle time: 18 ms, adjustable

Instruction set:
- Bit, byte and word commands
- Logical operations
- Arithmetical commands
- Comparisons
- Nested calculations (parentheses)
- Jump commands
- Subprograms
- Stack operations
- Submit programs
- 999 timers
- 48 counters
- Comments
- PLC modules
- 100 strings

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 through 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.

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:
- Operating system Windows 98/NT/2000/ME/XP
- Compatible computer, Pentium 133 or higher
- At least 32 MB RAM
- At least 20 MB free memory on the hard disk
- At least VGA
- Serial interface; Ethernet interface recommended
- Internet Explorer 4.01 or higher

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 following functions are covered by the PLC basic program:
- Controlling all axes
- Positioning the axes after the reference run
- Clamped axes
- Homing the axes, reference end positions
- Temperature compensation of the axes
- 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[1)]
- PLC soft keys
- Displaying and managing PLC error messages
- Hydraulic control[1)]
- Hydraulic chuck[1)]
- Electronic handwheels
- Controlling the coolant system[1)]
- Handling of M and G functions
- Lubrication[1)]
- Chip conveyor[1)]
- Door control[1)]
- Tool change for multipoint tools[1)]
- Positioning of the tool turret with three-phase motor[1)]

[1)] Basic functions are implemented

Commissioning and Diagnostic Aids

The MANUALplus 620 provides internal commissioning and diagnostic aids.

Oscilloscope

The MANUALplus 620 features an integrated oscilloscope. Both X/t and X/Y graphs are possible. The following characteristic curves can be recorded and saved in six channels:

- 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)
- IpoLogik (X)

TNCscopeNT (accessory)

PC software for transferring the oscilloscope files to the PC. Note: The trace files are saved in the TNCscopeNT data format.

Table function

The current conditions of the markers, words, inputs, outputs, counters and timers are displayed in tables. The conditions can be changed through the keyboard.

Trace function

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.

Log

For the purposes of error diagnosis, there is one log for all error messages and one for all keystrokes.

TeleService (accessory)

PC software for remote diagnosis, remote monitoring, and remote control of the MANUALplus 620. For further information, ask for the *Remote Diagnosis with TeleService* Product Overview.

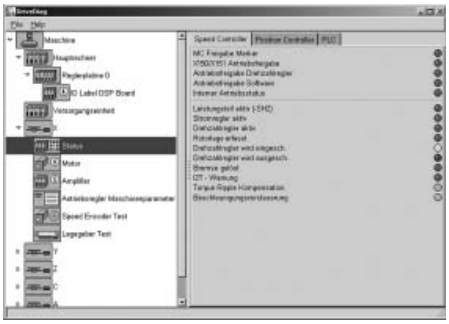
TNCopt (accessory) PC software for commissioning digital control loops

Functions:
- Commissioning the current controller
- (Automatic) commissioning of the speed controller
- (Automatic) optimization of sliding-friction compensation
- (Automatic) optimization of the reversal-spike compensation
- (Automatic) optimization of k_V factor

Requirements:
- Operating system Windows 95/98 or NT 4.0 or 2000
- At least VGA—XGA recommended
- At least 16 MB RAM
- At least 15 MB of free hard-disk space
- Ethernet interface

DriveDiag (accessory)

The DriveDiag software for PCs enables the service technician to make a simple and fast diagnosis of the drives. It also makes it possible to display and evaluate the electronic ID labels.



The following diagnostic functions are available:
- Reading and displaying the electronic ID labels of QSY motors with EQN 1325 or ECN 1313
- Reading and displaying the electronic ID labels of the UVR 1xxD and UM 1xxD inverter modules
- Displaying and evaluating the internal control conditions and the status signals of the inverter components
- Displaying the analog values available to the drive controller
- Automatic test for proper function of motors and inverters
- Automatic test of position and speed encoders

OLM
Online monitor

The online monitor (OLM) supports the commissioning and diagnosis of control components through:
- Display of control-internal variables for axes and channels
- Display of controller-internal variables
- Display of hardware signal states
- Various trace functions
- Activation of spindle commands
- Enabling control-internal debug outputs

The online monitor is a component part of the control and is called over a code number.

Monitoring Functions

During operation, the MANUALplus 620 monitors a number of parameters:

- 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
- Nominal speed value
- Checksum of safety-related functions
- Supply voltage
- Buffer battery voltage
- Operating temperature of the MC and CPU
- Running time of the PLC program
- Motor current
- Motor temperature
- Temperature of power module
- DC-link voltage

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.

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

RS-422/V.11

Data interface according to EIA standard RS-422.
Maximum transmission distance: 1 km

The V.24 and V.11 interfaces can be addressed only by the PLC.

USB

The two USB interfaces are available for connecting standard storage media. They must not be loaded with a total supply current greater than 0.5 A. The maximum cable length for external USB devices is 5 m without an amplifier. For lengths of 6 m and greater, USB connecting cables with integrated amplifiers are required.

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– / max. 300 mA
ID 582884-01

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

TNCremoNT
(accessory)

This PC software package helps the user to transfer data between the PC and the MANUALplus 620. The software is available free of charge on the HEIDENHAIN home page in the Services/Software area.

Functions:
- Data transfer
- File management
- Data backup
- Reading out the log
- Reading out the screen content
- Managing more than one machine

Requirements:
- Operating system Windows 95/98/ME/NT/2000/XP
- At least 10 MB free hard-disk space
- Ethernet interface

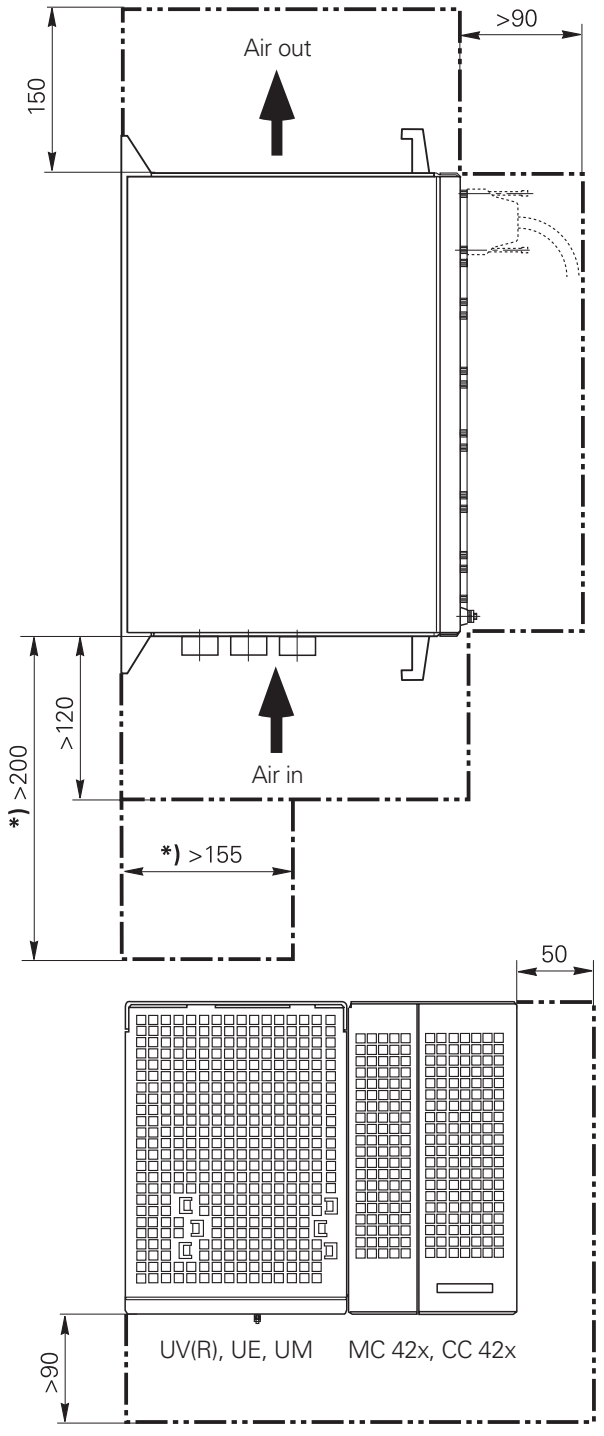
TNCremoPlus
(accessory)

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 Instructions

Mounting attitude When installing the **MC 420, CC 422, UV(R) 1xx, UM xxx, UE 2xx B** take note of the minimum spacing, space needed for servicing, and the appropriate length and location of the connecting cables.



Leave space for air circulation! Temperatures of > 150 °C may occur with the UE 21x B with integrated braking resistor; do not mount any temperature-sensitive parts!

Leave space for servicing!

Leave space for air circulation and servicing!

*) Leave space for exchanging the HDR hard disk

Leave space for servicing and 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):
- Visual display unit (when properly installed)
- Keyboard unit (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

Noise 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 MC, CC and its leads to devices that carry interference signals.
- Keep a minimum distance of 10 cm from the MC, CC 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 mm^2
- Use only genuine HEIDENHAIN cables, connectors and couplings.

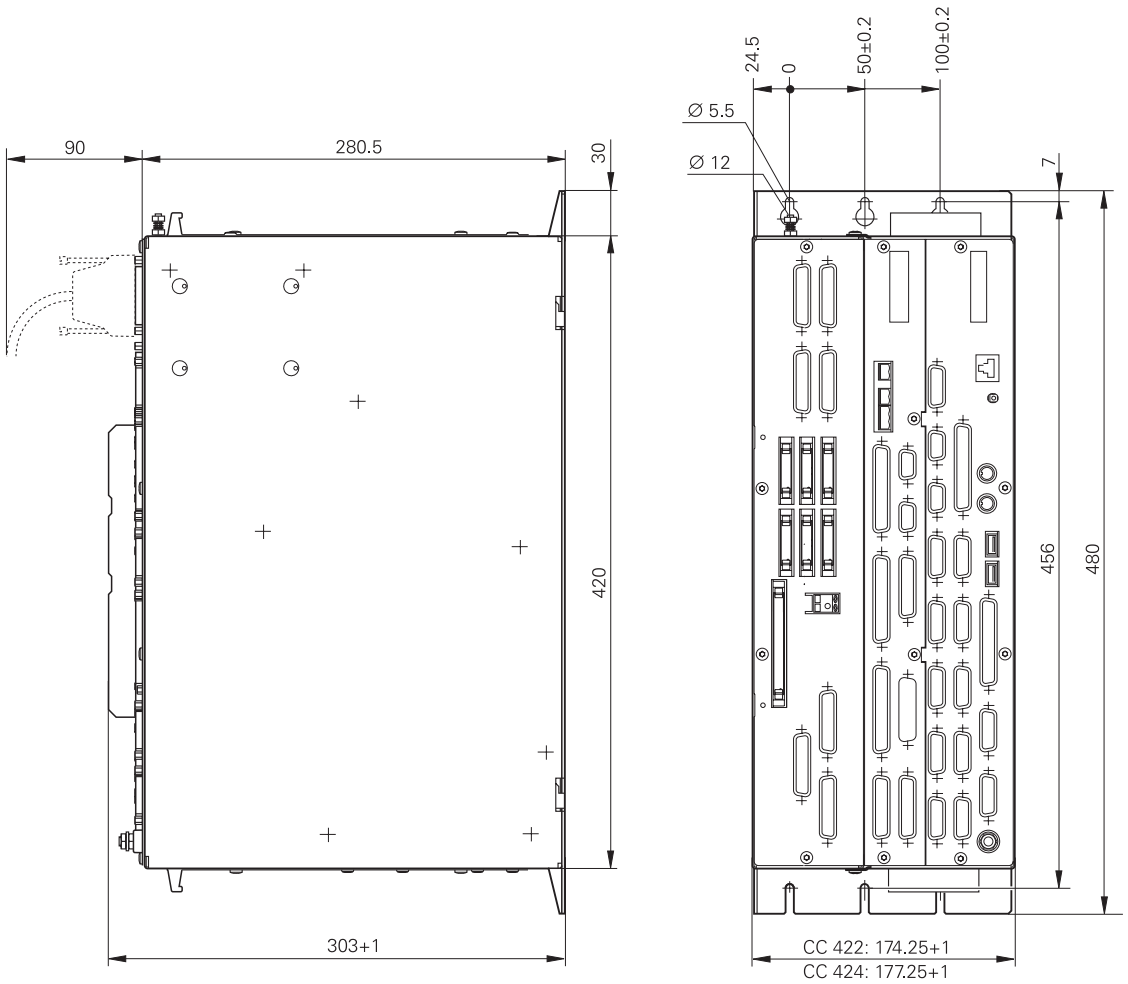
Overall Dimensions

MC 420
CC 422

Dimensions in mm

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

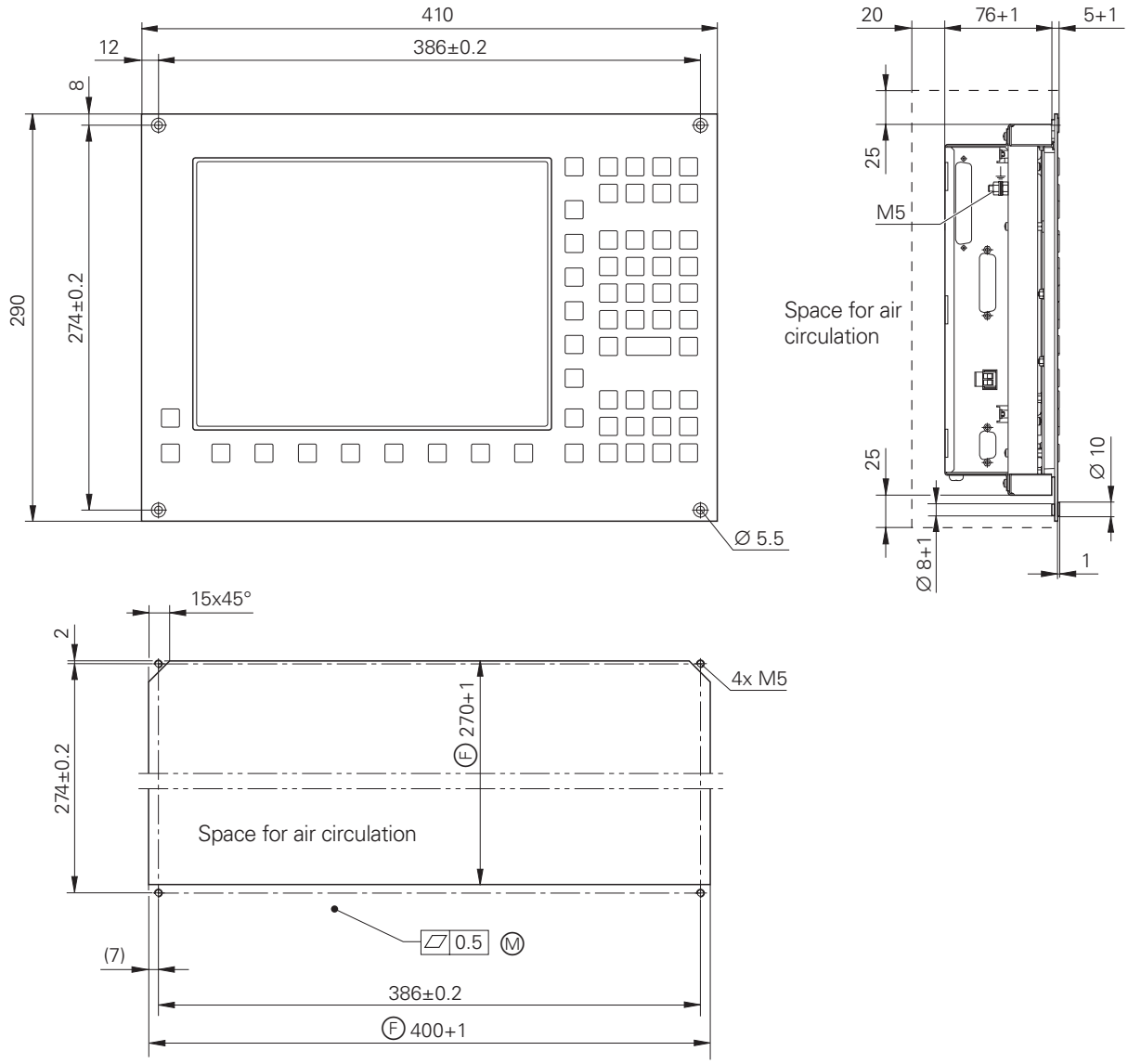
MC 420 / 5 position encoder inputs
CC 422 / 6 control loops



BFT 131

Dimensions in mm

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

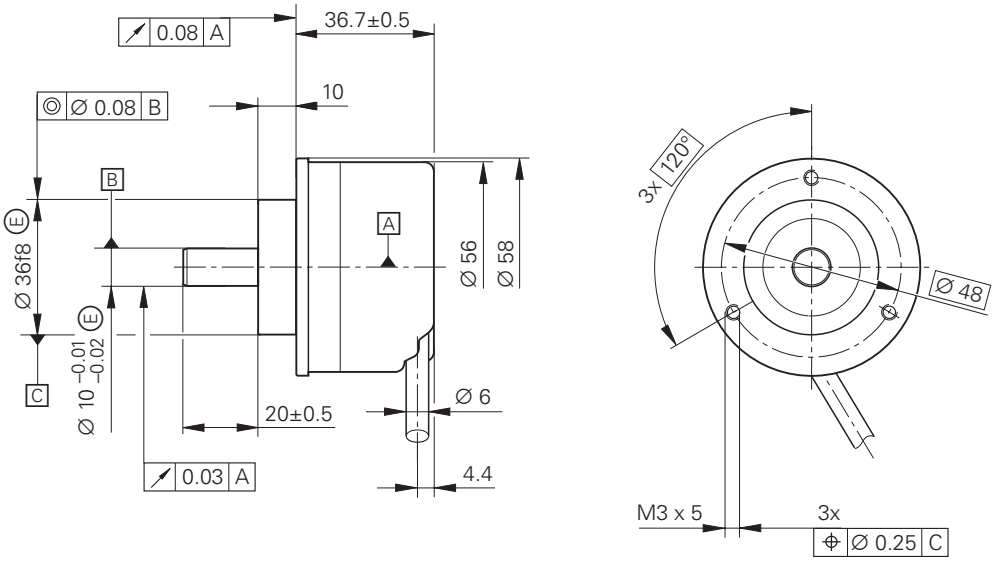


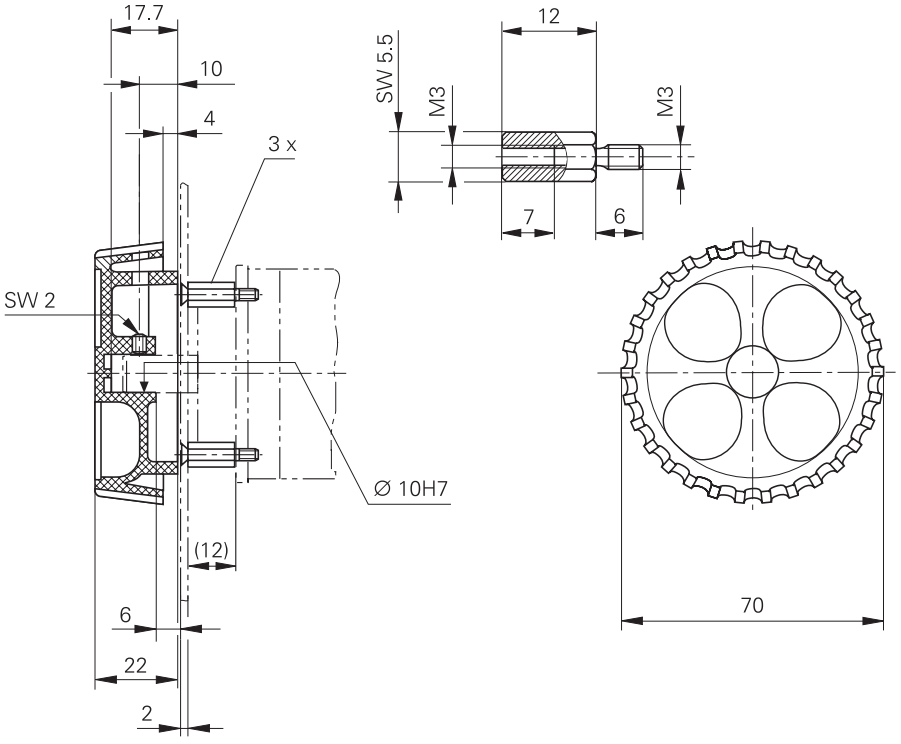
Ⓕ = Cutout in machine panel
Ⓜ = Mounting surface

HR 130, HR 150, HR 180 with Control Knob

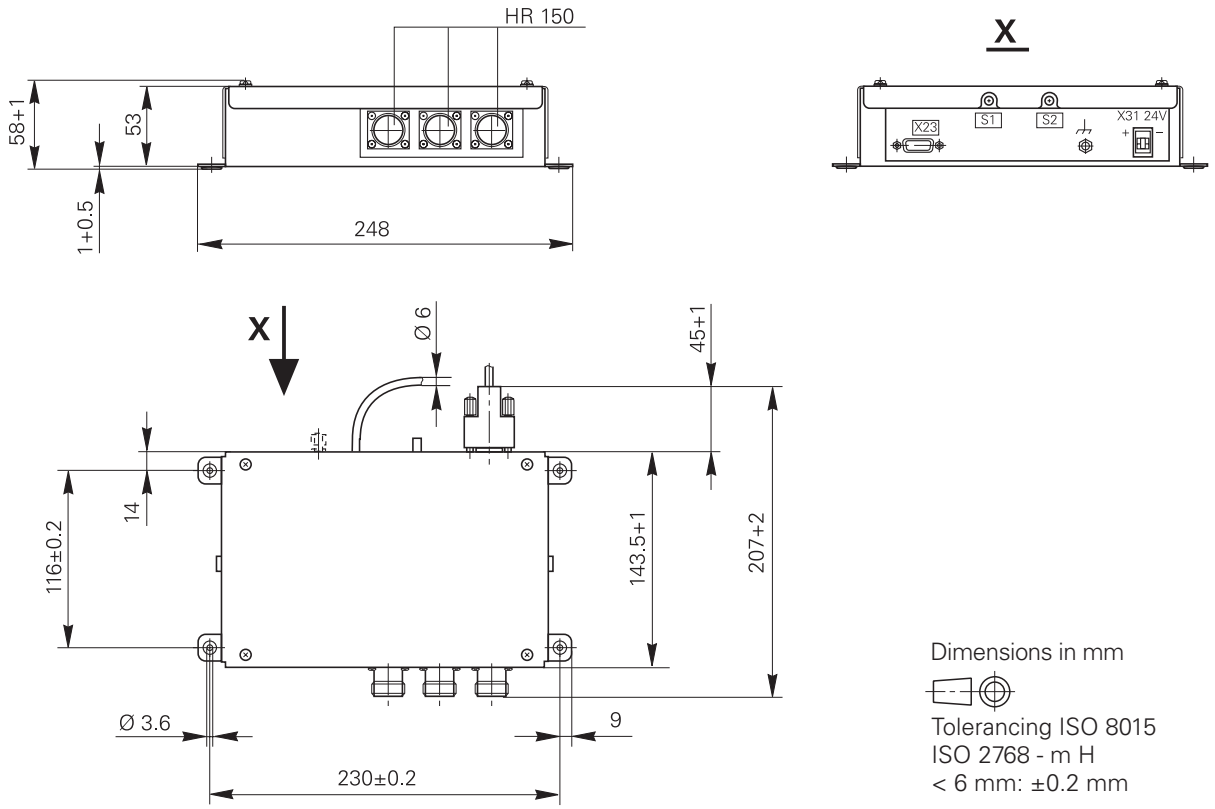
Dimensions in mm

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





HRA 110



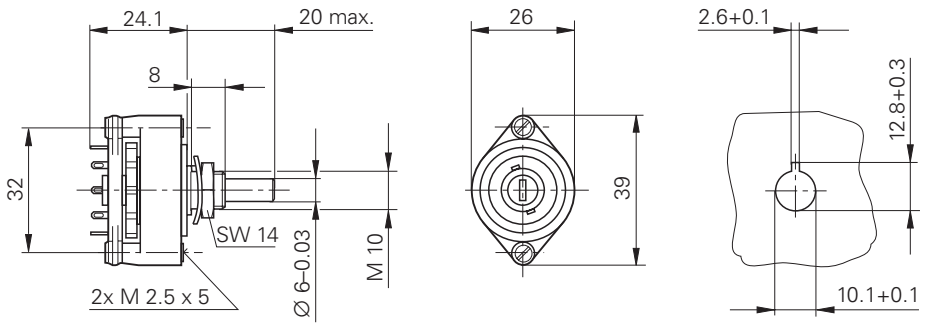
Dimensions in mm

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

Handwheel Selection Switch

Dimensions in mm

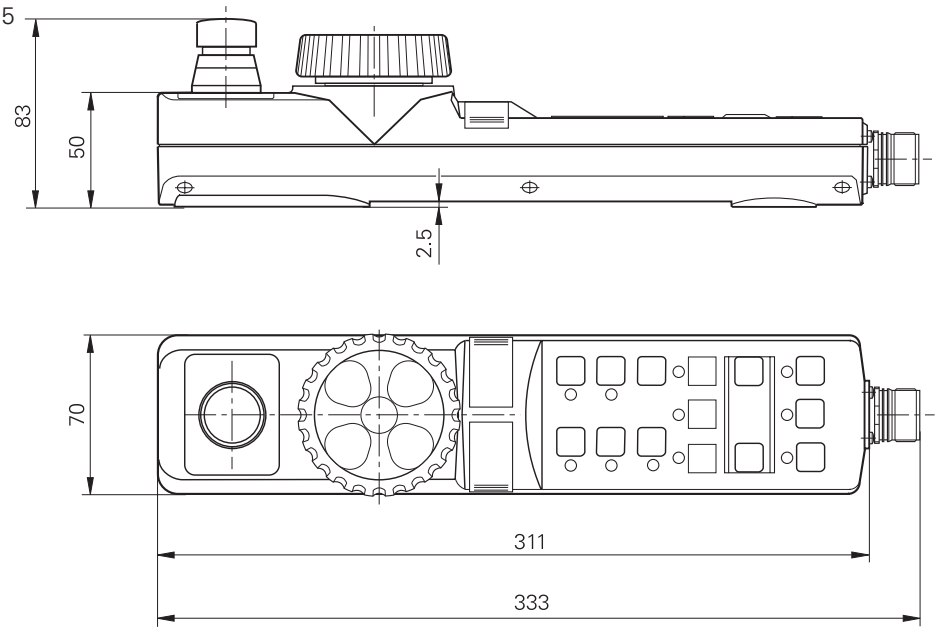
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



HR 410

Dimensions in mm

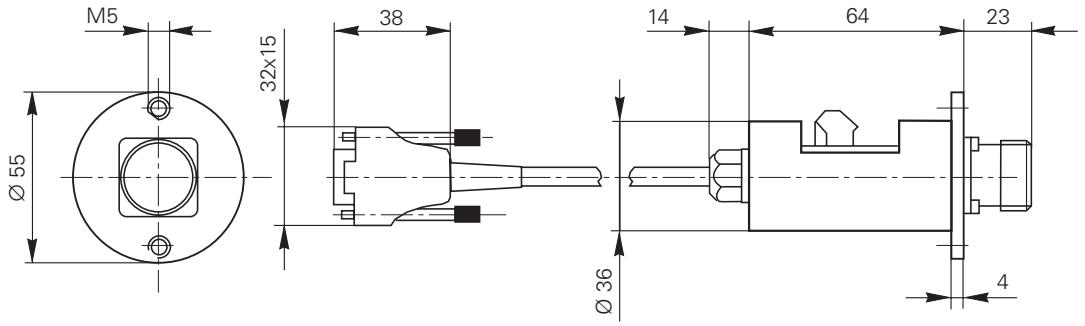
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



Adapter Cable for HR 410

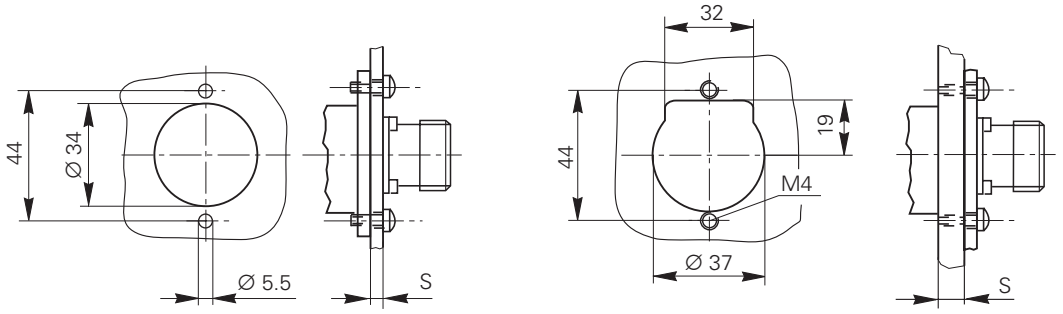
Dimensions in mm

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

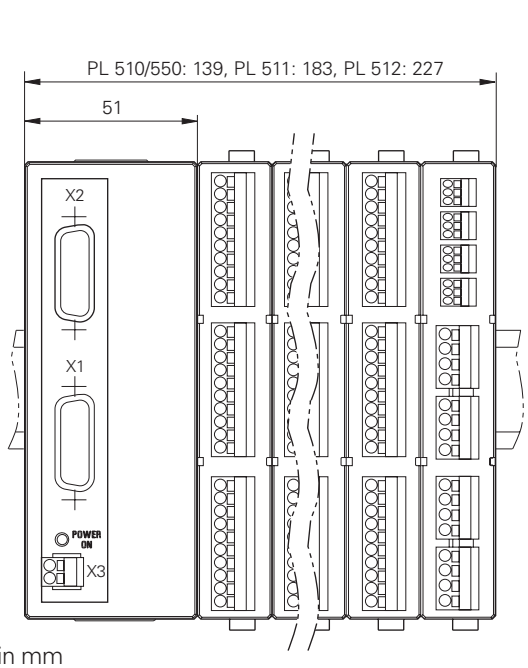


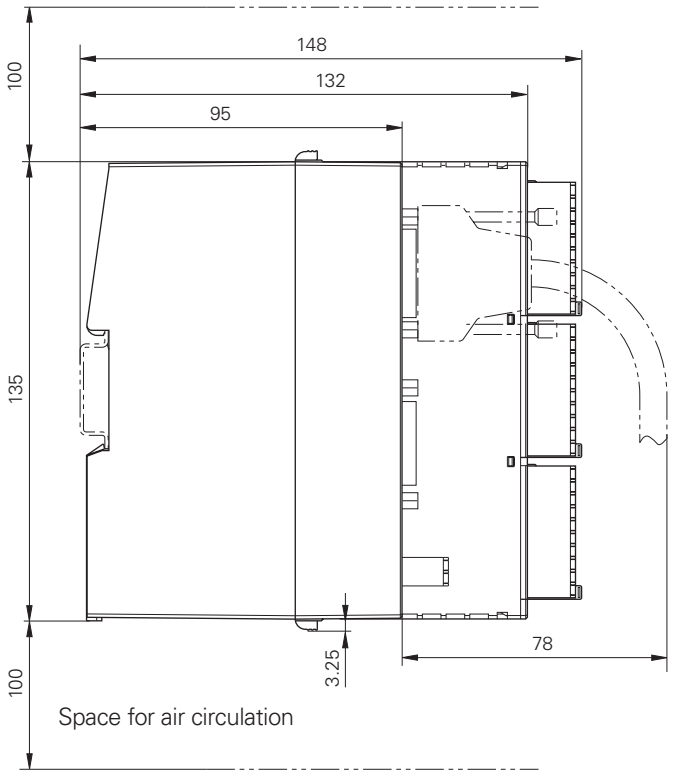
Mounting opening for wall thickness S≤4

Mounting opening for wall thickness S>4



PL 510



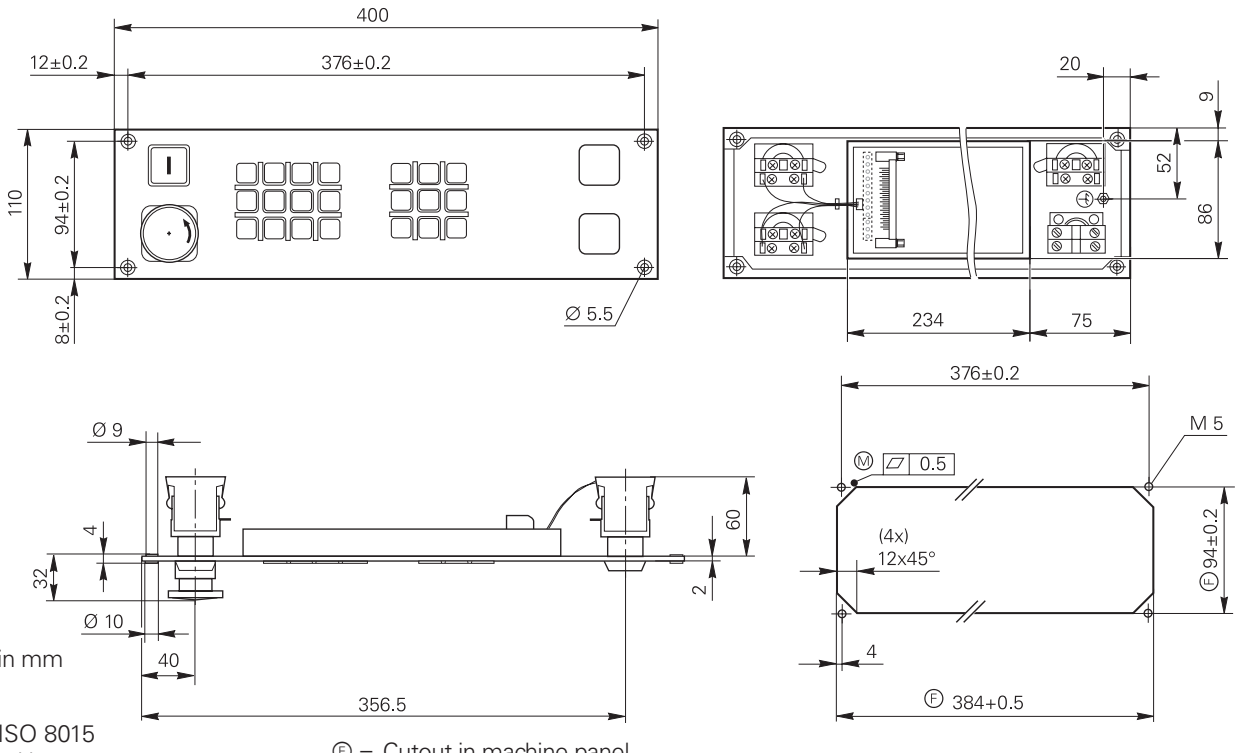


Dimensions in mm

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

Space for air circulation

MB 420



Dimensions in mm

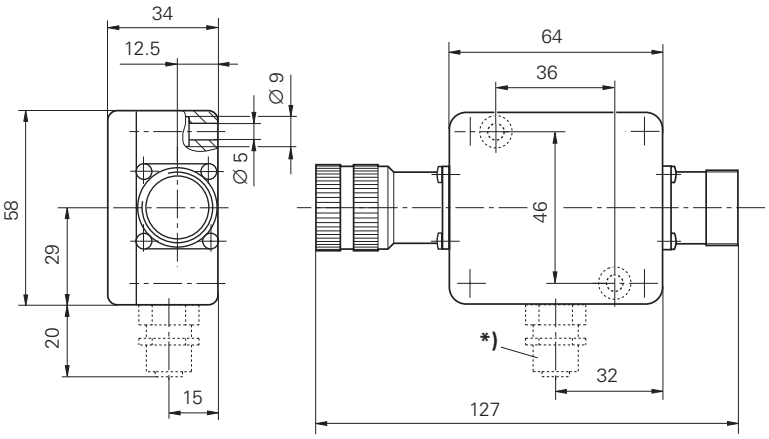
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

Ⓕ = Cutout in machine panel
Ⓜ = Mounting surface

Voltage Controller For Encoders with EnDat Interface

Dimensions in mm

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

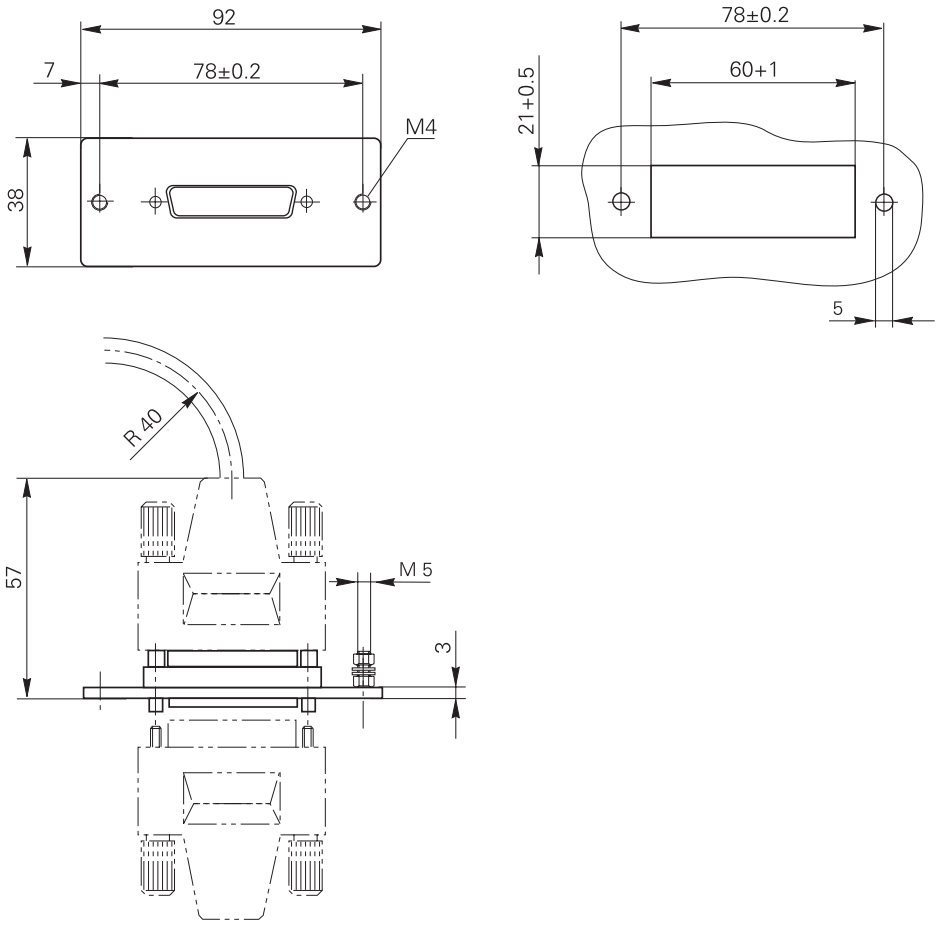


*) Connection to KTY

RS-422/RS-232-C Adapter

Dimensions in mm

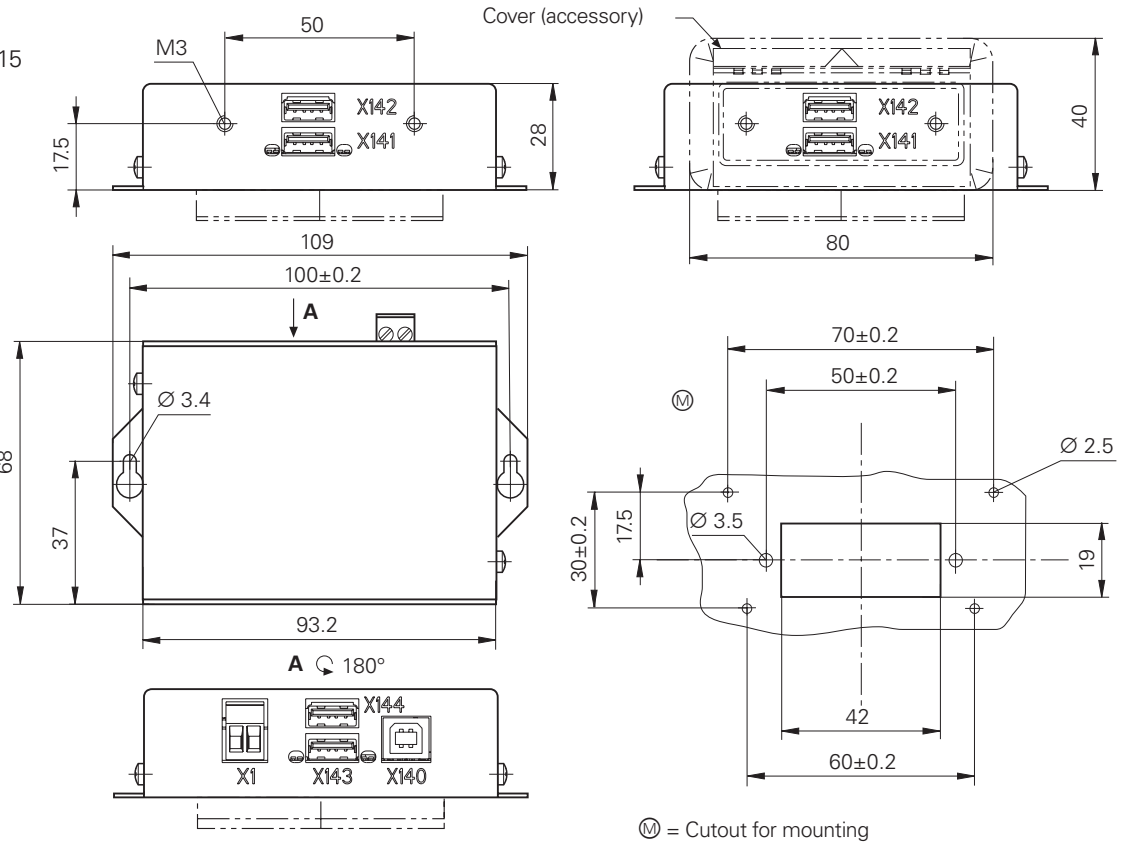
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



USB Hub

Dimensions in mm

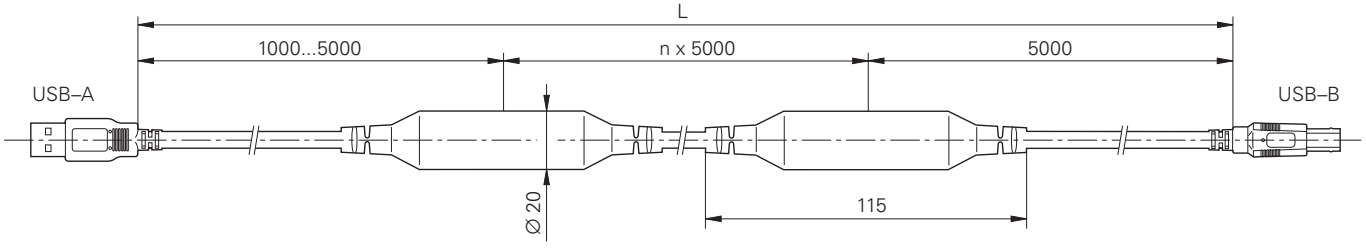
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm



USB Extension Cable with Hubs

Dimensions in mm

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

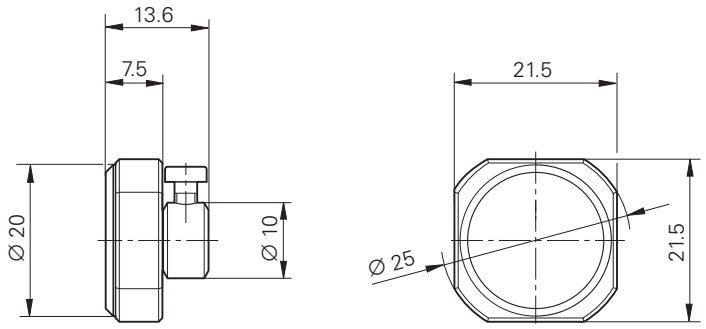


n = 0 to 4
L = Ordering length

Cuboid Probe Contact for TT 140

Dimensions in mm

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



Documentation

Items supplied with the control include:
- One MANUALplus 620 User's Manual
- One MANUALplus 620, smart.Turn and DIN programming User's Manual

This documentation must be ordered separately in the language required.
Further documentation is available from HEIDENHAIN.

Technical documentation	• Technical Manual for **MANUALplus 620** in English or German	ID 634863-xx
	• Technical Manual for **Inverters and Motors**	ID 208962-xx
User documentation	• User's Manual for **MANUALplus 620**	ID 634864-xx
	• User's Manual for **MANUALplus 620 smart.Turn and DIN programming**	ID 685556-xx
	Miscellaneous	
	• User's Manual for **TNCremo**	As integrated help and in PDF format
	• User's Manual for **TNCremoNT**	As integrated help and in PDF format
	• User's Manual for **TNCremoPlus**	As integrated help and in PDF format
	• User's Manual for **PLCdesign**	As integrated help and in PDF format
Other documentation	• **MANUALplus 620** brochure	ID 634865-xx
	• **Touch Probes** brochure	ID 208951-xx
	• **Inverter Systems** brochure	ID 622420-xx
	• **Motors** brochure	ID 208893-xx
	• **Remote Diagnosis with TeleService** Product Overview	ID 348236-xx
	• **Touch Probes** CD-ROM	ID 344353-xx
	• **DataPilot MP 620** demo version CD-ROM	ID 662178-01

HEIDENHAIN Service

Technical support

HEIDENHAIN offers the machine manufacturer technical support to optimize the adaptation of the MANUALplus to the machine—including on site.

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
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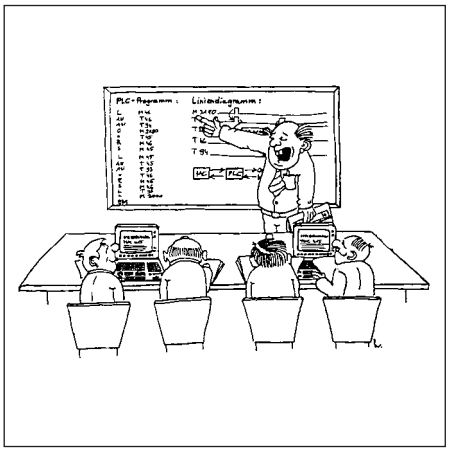
NC programming	☏ +49 (8669) 31-3103 E-mail: service.nc-pgm@heidenhain.de
Measuring systems	☏ +49 (8669) 31-3104 E-mail: service.ms-support@heidenhain.de
Lathe controls	☏ +49 (8669) 31-3105 E-mail: service.lathe-support@heidenhain.de

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 in Germany:
☏ (08669) 31-2293 or 31-1695
FAX (08669) 31-1999
E-mail: mtt@heidenhain.de
www.heidenhain.de



Subject Index

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www.heidenhain.ro

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Zum Abheften hier falzen! / *Fold here for filing!*

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