

Designation	Horizontal Lathe	Type	KVH 4 - CNC	Inv.-No.
Manufacturer	Maschinenfabrik Ravensburg AG Postfach 18 80 • Georgstraße 24 D-88212 Ravensburg / W-Germany Tel. 0751/377-0 • Telex 732 874	Ser. No.	9387/88	Location
		Year of constr.	1993	
		Machine features		
Principal dimensions		Carrriages with hydrostatic guideways		
Max. turning diameter over carriage (B-E)	90.5 "	Carriage traverse (Z-axes)	apprx. 300 "	
Center height over floor	65 "	Cross slide traverse (X-axes)	48.4 "	
Distance between centers	236 "	Feed speed (X/Z-axes)	0.04 - 315 IPM	
Min. Distance between centers	apprx. 39 "		0.002 - 2 IPR	
Admissible workpiece weight	35 200 lb	Rapid traverse	315 IPM	
unsupported (s = 300 mm)	9 900 lb	Thread pitches (X/Z-axes)	0.0004 - 78.75 IPR	
Headstocks (left and right) with hydrostatic spindle bearing		Feed power (X/Z-axes)	14 600 lbf	
Main spindle diameter at front bearing	19.68 "	Swivel feature round table (B-axis)	260 °	
4 spindle speeds (left headstock)	1 - 300 RPM	Max. speed	4 RPM	
4 spindle speeds (right headstock)	1 - 350 RPM	Outside grinding unit (GRIN 2b)		
max. drive capacity (D.C. motor)	158 hp / 1 240 RPM	Diameter of grinding spindle	apprx. 12.6 "	
max. torque at faceplate (step 1)	44 300 ft lbf	Grinding wheel diameter	23.6 - 36 (50) "	
Diameter of faceplate (left and right)	78.7 / 43.3 "	Width and hole of grinding wheel	3 / 12 "	
C - Axis with spindle brake		max. spindle speed	1 590 RPM	
Main spindle speed	0,003 - 2.8 RPM	Drive capacity (A.C. motor)	40.2 hp / 1 500 RPM	
Max. torque at hollow spindle	7 380 ft lbf	Thermal oil stabilisation Recooling unit TMO/L 24.0		
Headstock slides (Q1 / Q2 axes)		Chip conveyor Type	300 S-2	
Headstock traverse	98.4 "	Coolant device Paper wep filter	PF 450 / 3500	
Feed	0.04 - 118 IPM	Pump capacity	21 gal/min at 123 psi	

Space requ.	10 m x 4,5 m	Height o. floor	3,5 m	Weight	150 000 kg	Date	30.09.93
Voltage	460 V / 60 Hz	Three-phase current		Total capacity required	150 kW		
More details see electrical parts list				Control	Siemens SINUMERIK 880 T		
Milling unit (MILL 3)				Deep hole boring unit (DRILL 3)			
Diameter of milling spindle (front bearing)	6.3 "		Nominal boring depth	39.4 "			
2 milling spindle speeds	7 - 2 000 RPM		Boring range (in St 60)	ø 3.15 "			
Drive capacity (A. C. motor)	40.2 hp / 1 500- 6000 RPM		Drive capacity (A.C. motor)	40.2 hp / 800 - 3 600 RPM			
Height adjustment vertical (Y1-Axis) downward	+4 "		Feed speed	0 - 39.8 IPM			
upward	-13.8 "		Rapid traverse	275.6 IPM			
Feed speed	0.04 - 200 IPM		Quill grinding unit (GRIN 1a)				
Rapid traverse	200 IPM		Diameter of quill	7.87 "			
Number of tool places at the own disc magazine	12		Displacement of quill (W1-Axis)	apprx. 20 "			
Sword turning unit (TURN 4a) for inside operation				Feed speed of quill (W1-Axis)	0.04 - 200 IPM		
Height and width of sword	13.78 x 3.07 "		Grinding wheel diameter	10 / 12.6 "			
Displacement of sword (W1-axis)	15.75 "		Width / Bore of grinding wheel	2.36 / 3/5 "			
Feed speed of sword (W1-axis)	0.04 - 200 IPM		Spindle speed	3 600 min ⁻¹			
Rapid traverse	200 IPM		Drive capacity (D.C. motor)	27 hp / 2 000 min ⁻¹			
Number of tool holding fixtures (KM 63)	2		Steady rest bottom part				
Number of tool places at the own chain mag.	30		Displacement of steady (Q8-Axis)	236 "			
Quill turning unit (TURN 5a)				Feed speed Q8 - axes	0.04 - 118 IPM		
Diameter of quill	9 "		Steady rest station				
Displacement of quill (W1-axis)	15.75 "		Displacement of steady transport car	181 "			
Feed speed of quill (W1-axis)	0.04 - 200 IPM		Feed speed Q9 - axes	0.04 - 118 IPM			
Rapid traverse	200 IPM		Number of steady places	3			
Number of tool holding fixtures (KM 63)	4		3-fold steady rest upper part				
(2 automatic changing 2 manual)			Weight capacity	13 500 lbf			
Number of tool places at the own disc magazine	12		Supporting diameter of steady I	4 - 20 "			
Tools for magazine of TURN 4a and TURN 5a				Supporting diameter of steady II	15 - 36 "		
max. Diameter of tools	4 "		Supporting diameter of steadys III	32 - 53 "			
max. length of tools	8 "		Diameter supporting sleeves	5.5 "			
max. weight of tools	22 lb		Diameter and width of rollers	4.92 / 2.56 "			

1.4 Technical Data**1.4.1 Main Dimensions**

Turning diameter over bed cover	2 300 mm	90.5 "
Turning diameter over carriage	1 800 mm	70.87 "
Center height over floor	1 650 (2 300) mm	65 (90.5) "
Center height over bedways	1 520 mm	59.84 "
Distance between centers	6 000 mm	236 "
Min. Distance between centers	1 000 mm	apprx. 39 "
Admissible workpiece weight unsupported (s = 300 mm) between centers	4 500 kg 16 000 kg	9 900 lb 35 200 lb
Weight of the machine	150 000 kg	330 000 lb
Width of beds	1 450 mm	57 "
Height of beds	670 / 750 mm	26.37 / 29.52 "
Control	Siemens SINUMERIK	880 T
Operating voltage	460 V / 60 Hz	
Total capacity required (switch cabinet)	400 kW	536 hp
for two chillers of main hydraulic units	2 x 19 kW	2 x 25.5 hp
for coolant unit	7 kW	9.4 hp
for deep hole drilling unit	52 kW	70 hp

1.4.2 Headstock (left and right) with hydrostatic spindle bearings

Main spindle diameter at front bearing	500 mm	19.68 "
Spindle head acc. DIN 55 026, Type A	size 28	
4 spindle speeds	1 - 32 min ⁻¹	1 - 32 RPM
	2 - 69 min ⁻¹	2 - 69 RPM
	5 - 160 min ⁻¹	5 - 160 RPM
	11 - 350 (300) min ⁻¹	11 - 350 (300) RPM
max. drive capacity (D.C. motor)	118 kW / 1 250 min ⁻¹	158 hp
max. torque at faceplate (step 1)	60 000 Nm	44 300 ft lbf
Diameter of faceplate left	2 000 mm	78.7 "
faceplate speed limitation	300 min ⁻¹	300 RPM
Diameter of faceplate right	1 100 mm	43.3 "

C - Axis with spindle brake with spindle brake

Spindle speed	0,003 - 2,8 min ⁻¹	0,003 - 2.8 RPM
Max. torque at faceplate	32 000 Nm	7 380 ft lbf
angular measuring system	ROD 1750	

Headstock slide (Q1/Q2 axes)

Headstock traverse	2 500 mm	98.4 "
Feed	1 - 3 000 mm/min.	0.04 - 118 IPM
longitudinal measuring system	LB 326	
Slide clamping	hydraulic	

1.4.3 Support with hydrostatic guideways

Carriage traverse (Z-axis)	7 600 mm	apprx. 300 "
Cross slide traverse (X-axis)	1 230 mm	48.4 "
Feed speed (X/Z-axes)	1- 8 000 mm/min	0.04 - 315 IPM
	0,05 - 50 mm/U	0.002 - 2 IPR
Rapid traverse	8 000 mm/min	315 IPM
Thread pitches (X/Z-axes)	0,01 - 2000 mm/U	0.0004 - 78.75 IPR
Feed power (X-axes)	55 kN	12 360 lbf
Feed power (Z-axes)	60 kN	13 500 lbf
Swivel feature round table (B-axis)	260 °	
max. speed	2 min ⁻¹	
Longitudinal measuring system Z - Axis	LB 326.01	
Longitudinal measuring system X - Axis	LS 704	
Longitudinal measuring system W1 - Axis	LS 704 / LS 4 3	
Longitudinal measuring system Y1 - Axis	LS 704	

1.4.4 Sword turning unit (TURN 4a) with tool magazine

Height of sword	350 mm	13.78 "
Width of sword	78 mm	3.07 "
Displacement of sword (W1-Axis)	400 mm	15.75 "
Feed speed of sword (W1-Axis)	1- 5 000 mm/min	0.04 - 200 IPM
Rapid traverse	5 000 mm/min	200 IPM
Feed power W1-Axis	54 kN	12 000 lbf.
Tool holding fixture	KM 63	
Number of tool holding positions for inside operation	2 automatical changing	
Clamping tool and sword	hydraulic	

Tool changer at pallet chain magazine

Number of grippers	2 (for right and left side)	
Tool holding fixtures	KM 63	
Number of tool places	30	
max. Diameter of tools	100 mm	4 "
max. length of tools	200 mm	8 "
max. weight of tools	10 kg	22 lb

1.4.5 Deep hole boring unit (DRILL 3) with oil tank

Nominal boring depth	1 000 mm	39.4 "
Boring range (in St 60)	ø 80 mm	ø 3.15 "
Displacement of boring spindle	400 mm	15.75 "
Drive capacity (A.C. motor)	30 kW / 800 - 3 600 min ⁻¹	40.2 hp
Spindle head acc. DIN 55 021	short cone size 6	
max. feed power	25 kN	5 620 lbf
Feed speed	0- 1 000 mm/min	0 - 39.8 IPM
Rapid traverse	7 000 mm/min	275.6 IPM

1. 4. 6 Milling unit (MILL 3)

Tool clamping		automatically
2 Tool holding fixtures acc. DIN 2079	ISO SK 50	
Tool clamping force	24 kN	5 400 lbf
Diameter of milling spindle (front bearing)	160 mm	6.3 "
2 milling spindle speeds	7 - 720 min ⁻¹	7 - 720 RPM
	20 - 2 000 min ⁻¹	20 - 2 000 RPM
Drive capacity (A.C. motor)	30 kW / 1 500 - 6500 min ⁻¹	40.2 hp
Gear shifting		hydraulic
Height adjustment vertical (Y1-Axis)		
downward	+100 mm	apprx. +4 "
upward	-350 mm	-13.78 "
Feed speed (Y1-Axis)	1- 5 000 mm/min	0.04 - 200 IPM
Rapid traverse	5 000 mm/min	200 IPM
min. distance to steady I and II (in Z dir.)	200 mm	7,8 "
min. distance to steady III (in Z direction)	330 mm	13 "

Tool changer at pallet disc magazine

Number of grippers	2 (for both spindle sides)
Tool holding fixtures acc. DIN 2079	ISO SK 50
Number of tool places	12

1. 4. 7 Outside grinding unit (GRIN 2b) with hydrodynamic bearing

Diameter of grinding spindle	320 mm	apprx. 12.6 "
Grinding wheel diameter	600 - 914 mm	23.6 - 36 "
Max. grinding wheel diameter	1 270 mm	50 "
Width of grinding wheel	76,2 mm	3 "
Width of grinding wheel fixture	50,8 mm	2 "
Bore of grinding wheel	304,8 mm	12 "
max. spindle speed	1 590 min ⁻¹	1 590 RPM
Drive capacity (A.C. motor)	30 kW / 1 500 min ⁻¹	40.2 hp
3-fold dressing unit with coolant		

1. 4. 8 Quill grinding unit (GRIN 1a)

Diameter of quill	200 mm	7.87 "
Displacement of quill (W1-Axis)	500 mm	apprx. 20 "
Feed speed of quill (W1-Axis)	1- 5 000 mm/min	0.04 - 200 IPM
Rapid traverse	5 000 mm/min	200 IPM
Feed power W1-Axis	54 kN	12 000 lbf
Clamping of quill		hydraulic
Grinding wheel diameter	250 / 320 mm	10 / 12.6 "
Width of grinding wheel	60 mm	2.36 "
Bore of grinding wheel	76,2 / 127 mm	3 / 5 "
Spindle speed	3 600 min ⁻¹	
Drive capacity (D.C. motor)	20 kW / 2 000 min ⁻¹	27 hp

1. 4. 9 Quill turning unit (TURN 5a)

Diameter of quill	230 mm	9.055 "
Displacement of quill (W1-Axis)	400 mm	15.75 "
Feed speed of quill (W1-Axis)	1- 5 000 mm/min	0.04 - 200 IPM
Rapid traverse	5 000 mm/min	200 IPM
Feed power W1-Axis	54 kN	12 000 lbf
Tool holding fixture	KM 63	
Number of tool holding positions for inside operation	2	automatical changing
Number of tool holding positions for outside operation	2	manual changing
Clamping tool and quill		hydraulic

Tool changer at pallet disc magazine

Number of grippers	2	(for right and left side)
Tool holding fixtures	KM 63	
Number of tool places	12	
max. Diameter of tools	100 mm	4 "
max. length of tools	200 mm	8 "
max. weight of tools	10 kg	22 lb

1. 4. 10 Boring Bar Holder (BORE 2)

Diameter of Boring Bar Hole	152,4 mm	6 "
Clamping	manually	

1. 4. 11 Steady rest bottom part (Q8-Axis)

Displacement	6 000 mm	236 "
Feed speed	1- 3 000 mm/min	0.04 - 118 IPM

1. 4. 12 Steady rest station

Displacement of steady transport car	4 600 mm	181 "
Feed speed	1- 3 000 mm/min	0.04 - 118 IPM
Number of steady places	3	

1. 4. 13 3-fold steady rest upper part

Supporting diameter steady I	100 - 505 mm	4 - 19.9 "
Supporting diameter steady II	380 - 915 mm	15 - 36 "
Supporting diameter steady III	810 - 1 350 mm	32 - 53 "
Weight capacity	60 kN	13 500 lbf
Diameter supporting sleeves	140 mm	5.5 "
Diameter of rollers	125 mm	4.92 "
Width of rollers	65 mm	2.56 "

1. 4. 14 Pallet Station

Displacement of shuttle wagon (Q3-Axis)	8 800 mm	apprx. 346 "
Feed speed of shuttle wagon (Q3-Axis)	1- 22 000 mm/min	0.04 - 866 IPM
Rapid traverse	22 000 mm/min	866 IPM
Number of pallet storage places	6	
Feed speed of pallets (chain drive)	2 200 mm/min	86.6 IPM

Thermal stabilisation of lubricant for headstock and milling unit

Recooling unit	TMO/L 24.0	
Cooling capacity	27,9 kW	37.4 hp
Pump capacity	160 l/min	42 gal/min

Lubricating oil tank for deep hole boring (for both machines)

Oil Tank capacity	5 000 Litre	1 325 gal
Pump capacity	2 x 5 - 240 l/min.	2 x 1 - 63 gal/min
at	26 bar	377 psi
Drive capacity	2 x 18 kW	2 x 24 hp
max. passage capacity gravity filter	700 l/min	185 gal
filter degree	< 10 µm	< 0.000 4 "

Chip conveyor

Type	300 S-2	
Width of belt	300 mm	11.8 "
Drive capacity	0,55 kW	0.75 hp

Coolant device

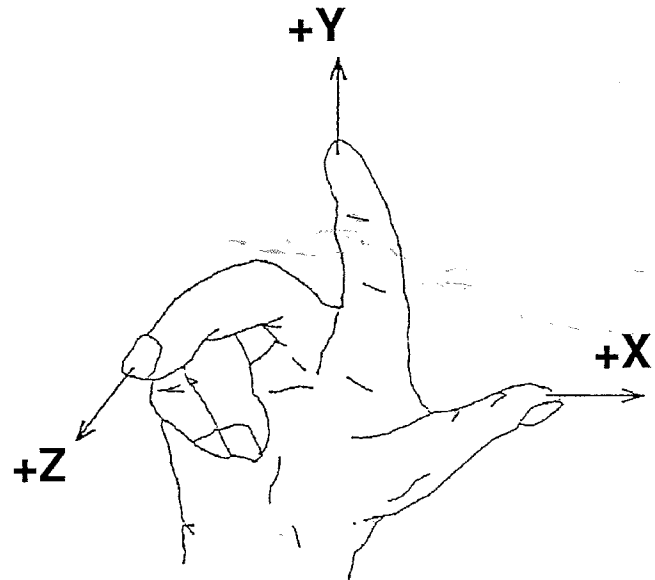
Tank capacity	1 600 Litre	423 gal
Pump capacity	80 l/min.	21 gal/min
at	8,5 bar	123 psi
Paper wep filter with paper	PF 210 / 1600 Type V 30 / 1020	
floating capacity	450 l/min	120 gal/min

1.5 Geometrical Information

1.5.1 General information

Coordinates as well as traversing direction numerically controlled working machines are specified acc. to DIN 66 217 or ISO 841-1974.

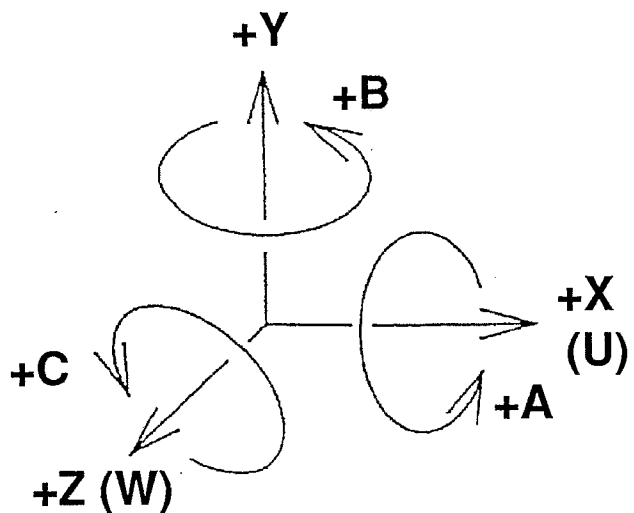
In order to simplify programming, the programmer always assumes that the tool is moving in relation to the coordinate system of the workpiece which is considered stationary.



Geometrical description is based on a right-handed, right-angled coordinate system with axes X, Y and Z.

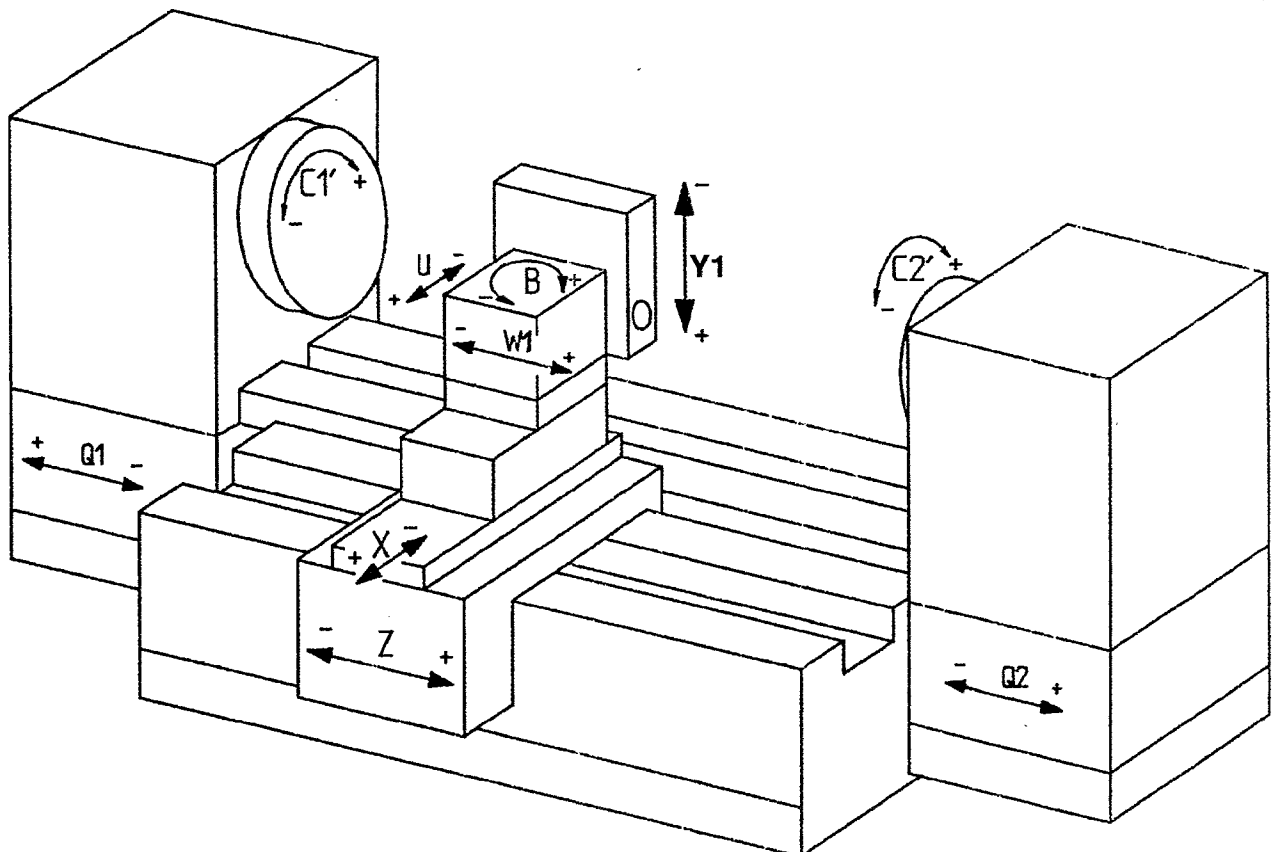
The parallel second axis for X is U- and for Z is the W-axis.

Rotations around the coordinate axes are described by A, B and C.



1.5.2 Geometrical Information on the Machine
Coordinates

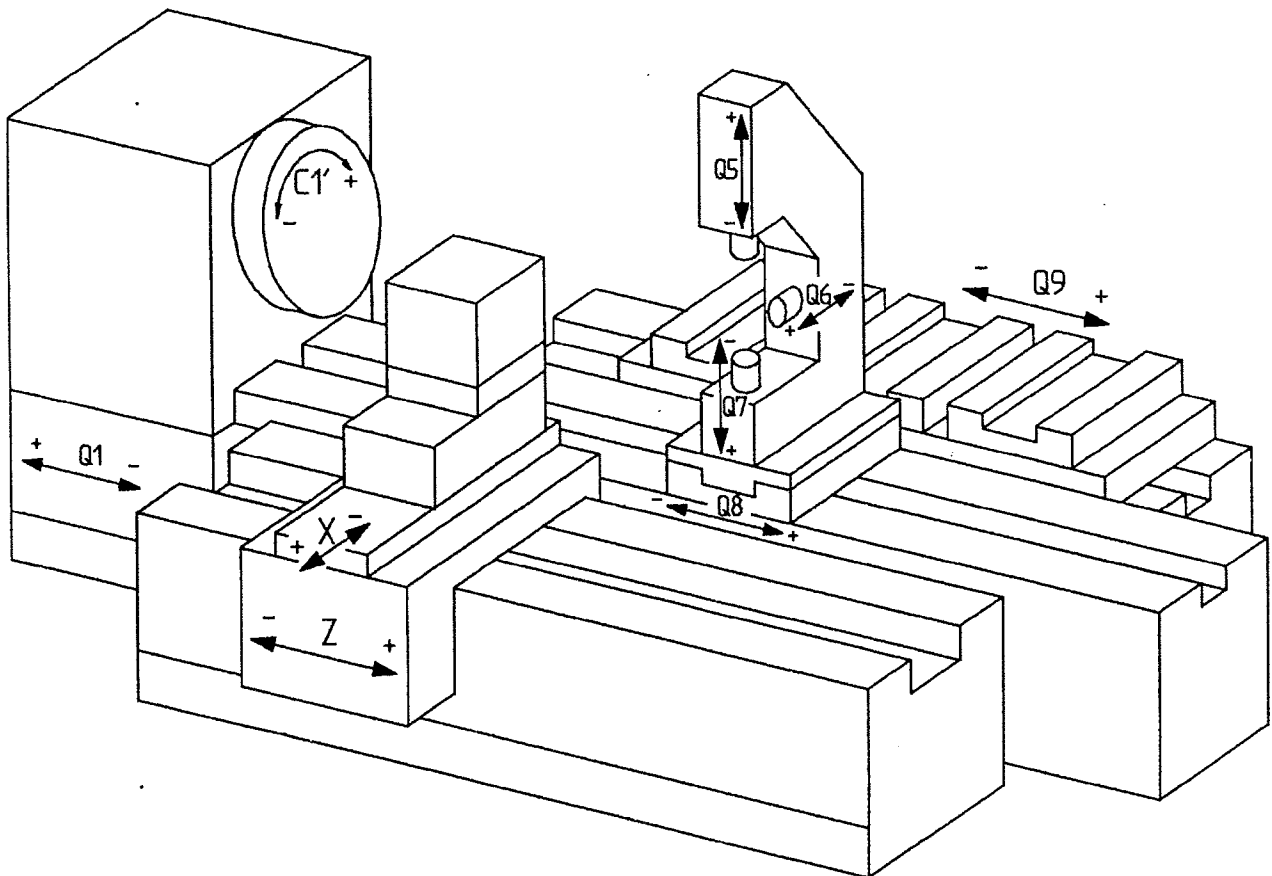
- Z** Z - axis = carriage longitudinal direction (slide) in turning axis
X X - axis = carriage cross direction
B B - axis = turning axis round table on the slide
C1 C1 - axis = turning axis spindle left headstock (for programming C1')
C2 C2 - axis = turning axis spindle right headstock (for programming C2')
W1 W1 - axis = longitudinal direction quill turning unit
Y1 Y1 - axis = vertical direction milling unit
Q1 Q1 - axis = left headstock longitudinal direction in turning axis
Q2 Q2 - axis = right headstock longitudinal direction in turning axis
Q3 Q3 - axis = pallet shuttle wagon cross direction (behind right headstock)



1.5.3 Geometrical Information on the Machine - Steady Rest

Coordinates

- Z** Z - axis = carriage longitudinal direction (slide) in turning axis
- X** X - axis = carriage cross direction
- C1** C1 - axis = turning axis main spindle of left headstock
- Q1** Q1 - axis = left headstock longitudinal direction in turning axis
- Q5** Q5 - axis = steady rest upper supporting sleeve in vertical direction
- Q6** Q6 - axis = steady rest posterior supporting sleeve in vertical direction
- Q7** Q7 - axis = steady rest lower supporting sleeve in vertical direction
- Q8** Q8 - axis = steady rest longitudinal direction in turning axis
- Q9** Q9 - axis = steady rest station car longitudinal direction



1. 5. 4 Description to the Scheme of Working Range

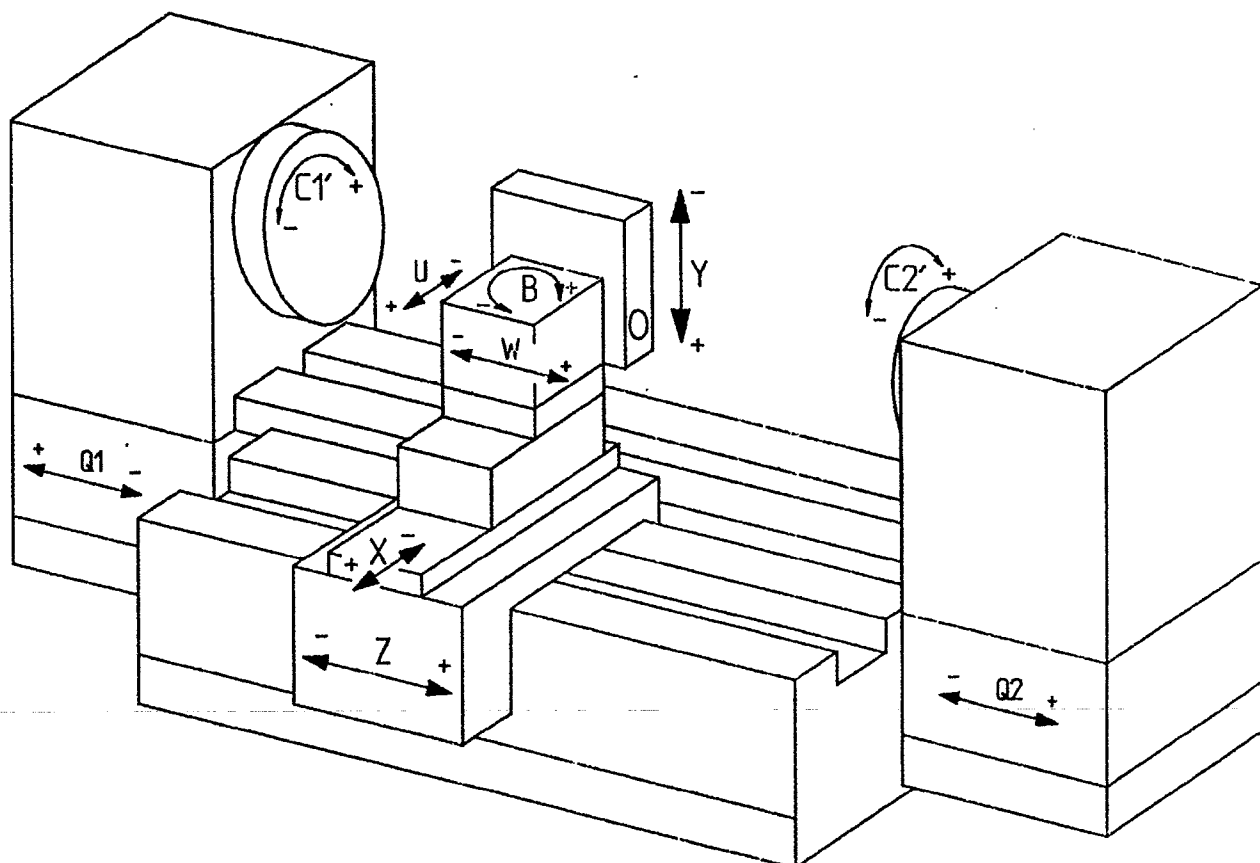
☞ technical enclosures

- M** – Machine zero specified by the machine tool manufacturer for each axis (VDI 3255).
It is determined by the measuring system and cannot be altered.
- P** – Point of tool adjustment
- MR** – Reference point determined for each axis by limit switches and by a signal of the measuring circuit (path measuring system).
It is the first point to move at after switching on the control.
Only then, automatical operation may start.
- F** – Carriage reference point defined on the tool or workpiece post.
Positioning of the slides in the machine coordinate system is referred to it taking into account the adjusting values at the tool.
- T** – Tool post reference point. It specifies position of the tool post on the carriage. Mostly F and T coincide.
- ZMMR** – Reference point coordinate in Z
- XMMR** – Reference point coordinate in X
- BMMR** – Reference point coordinate in B
- WMMR** – Reference point coordinate in W
- YMMR** – Reference point coordinate in Y
- ZFP** – Distance between T and P in Z
- XFP** – Distance between T and P in X

The exact machine data are determined when starting operation.

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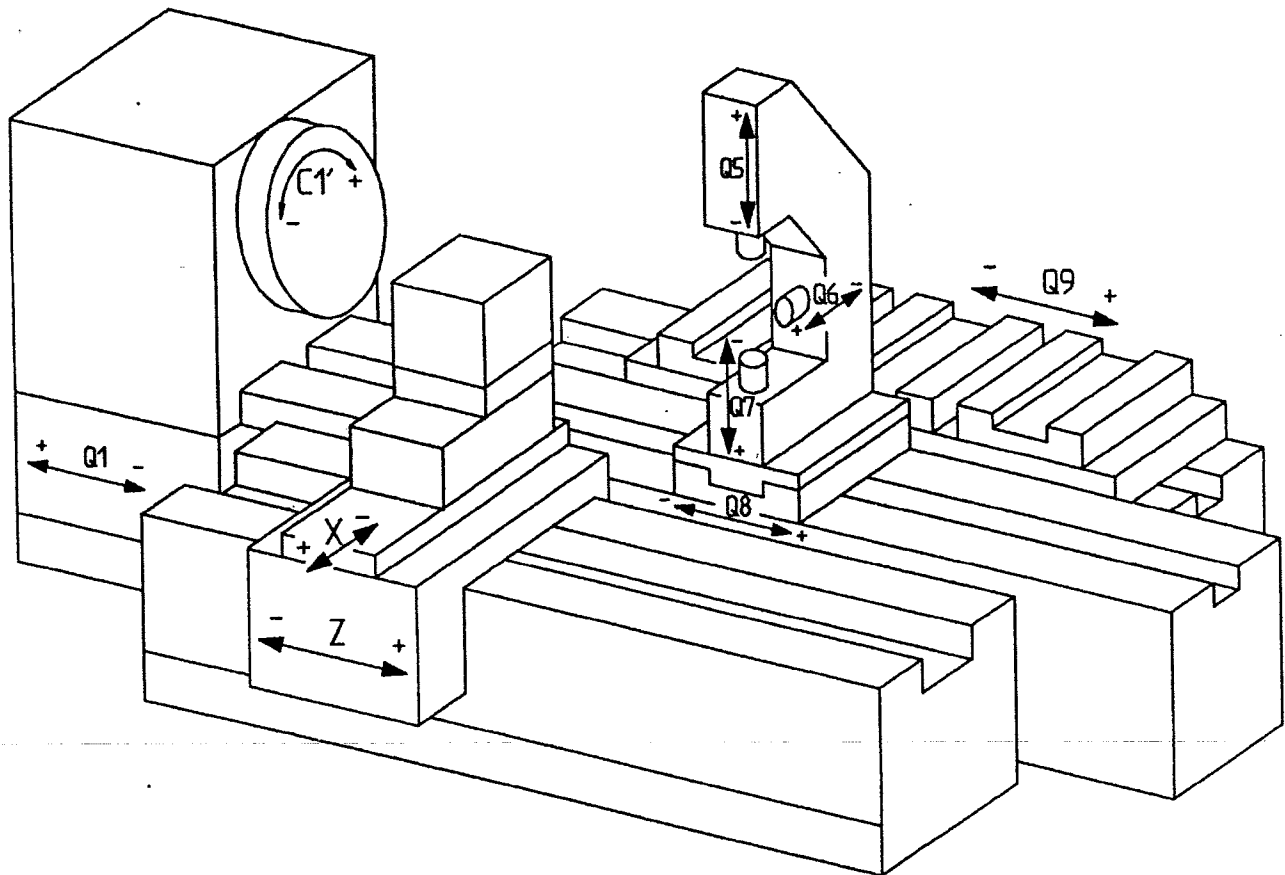
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X	X - axis	= carriage cross direction
B	B - axis	= turning axis round table on the slide
C1	C1 - axis	= turning axis spindle left headstock (for programming C1')
C2	C2 - axis	= turning axis spindle right headstock (for programming C2')
W	W - axis	= longitudinal direction quill turning unit
U	U - axis	= cross direction sword turning unit
Y	Y - axis	= vertical direction milling unit
Q1	Q1 - axis	= left headstock longitudinal direction in turning axis
Q2	Q2 - axis	= right headstock longitudinal direction in turning axis



1.5.3 Geometrical Information on the Machine - Steady Rest

Coordinates

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- Q6** Q6 - axis = steady rest posterior supporting sleeve in vertical direction
- Q7** Q7 - axis = steady rest lower supporting sleeve in vertical direction
- Q8** Q8 - axis = steady rest longitudinal direction in turning axis
- Q9** Q9 - axis = steady rest station car longitudinal direction

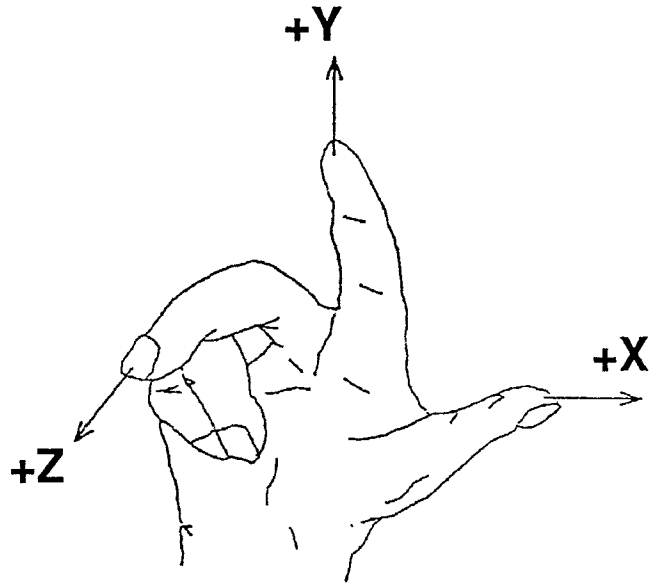


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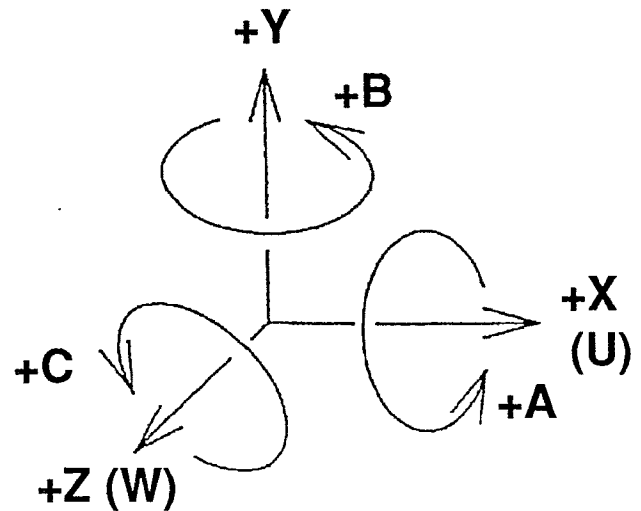
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The exact machine data are determined when starting operation.