

TECHNICAL SPECIFICATION

SYSTEM 2-6 SERIES

Schmoll Maschinen GmbH
Odenwaldstraße 67
D-63322 Rödermark-Oberroden
Tel.: +49 (6074) 8901-0
Fax: +49 (6074) 890158

2. TECHNICAL SPECIFICATIONS SYSTEM 2-6

2.1 MACHINE SPECIFICATIONS

- 2.1.1 Machine-specific data
- 2.1.2 Thermal radiation of periphery units
- 2.1.3 Floor load and evenness
- 2.1.4 Noise level
- 2.1.5 Room temperature, humidity
- 2.1.6 Exhaust power
- 2.1.7 Machine finish
- 2.1.8 Accident prevention regulations

2.2 INSTALLATION SPECIFICATIONS

- 2.2.1 Electrical specifications
- 2.2.2 Pneumatic specifications

2.3 MACHINE STRUCTURE

2.4 WORKING TABLE

2.5 Z-AXIS

2.6 WORKING SPINDLES

2-7 TOOL CHANGE

2.8 MACHINE ACCESSORIES

2.9 OPTIONS

2.10 CNC CONTROLLER

2.11 PROGRAMMING FUNCTION (OPTION)

2.12 ACCURACY

2.1 Machine specifications

2.1.1 Machine-specific data

SYSTEM		1	2	3	4	5	6
Machine weight approx.		1900 kg	4000 kg	5500 kg	7300 kg	8800 kg	9500 kg
Loader weight (empty) approx.		400 kg	600 kg	800 kg	1000 kg	1200 kg	1300 kg
Weight of separate controller		ca. 160 kg (S&M) / ca, 60 kg (X-30)					
Machine dimensions in mm (w/o motor projection and loader) *	Width	1080/1500	1700	2380	2S30	3360	3560
	Height	1650	1800	1800	1800	1800	1800
	Depth	1680	1970	1970	1970	1970	1970
Machine dimensions in mm with loader (w/o motor projection) *	Width	1080/1500	1840	2380	2830	3360	3560
	Height	1650	1800	1800	1800	1800	1800
	Depth	ca. 2400	ca. 3100	ca. 3100	ca. 3100	ca. 3100	ca. 3100
Controller dimensions in mm	Width	600					
	Height	1850 (S&M) / 1100 (X-30)					
	Depth	800					
Thermal radiation in W approx. (average, w/o periphery units)		1200	1800	2300	2600	2800	2800

* see machine implantation plan

2.1.2 Thermal radiation of periphery units

Water recoler at flow temperature 18°C room temperature 22 °C	PHK 450 PHK 1000, LNG 1000, T129, 220 LNG 2000, KUS 2000, T131, 221 LNG 3000, KUS 3000, T132, 222 TYP 243	appr. 650 Watt app. 1400 Watt app. 2900 Watt app. 4600 Watt app. 6000 Watt
Air dryer	HD 22 S HD 33 S HD 55 HD 75 HD 105 HD 150	app. 400 Watt app. 750 Watt app. 970 Watt app. 1050 Watt app. 1150 Watt app. 1250 Watt
Exhaust	GS-F 80 DS 1000, DS 1022	app. 1000 Watt app. 2200 Watt

2.1.3 Floor load and evenness

The floor must be **vibrationfree** and must have a **load capacity of min. 1500 kg/m²**. There is no need for anchoring the machine nor the controller. However, for machines equipped with automatic loading system, we recommend to anchor the loader.

For a loader with mobile containers, an even floor surface without holes or elevations in ground is required. In the area of the docking station, **the admissible unevenness is max. 2 mm/m²**.

2.1.4 Noise level

The machine is equipped with a protection cover which, amongst others, protects the operator against noise . The noise level of the machine is

approx. 72 -75 dBA with closed machine cover

approx.75 - 80 dBA with open machine cover and
machines with autoloader where be opened on backside
(or higher depending on machine type and equipment).

2.1.5 Room temperature, humidity

see machine implantation plan

2.1.6 Exhaust power

On input of the machine we need:

0,8 - 1,3 m³ / min / spindle quantity of air

70-120 mbar vacuum for drilling

80-120 mbar vacuum for routing

the higher values are required for drilling small holes in 3 or 4 stacks or

for routing small slots in 2 or 3 stacks.

Notice: by long delivery pipes you have a drop in pressure of appr. 5 mbar / 10 m pipe,

2.1.7 Machine finish

grey-white RAL 9002 (other colours on request)

2.1.8 Accident prevention regulations

Our machines correspond to the accident prevention regulations valid in Germany as well as to the guidelines of local authorities or industrial associations -JEC, VDE, VDI, VDMA,DIN etc.

2.2 Installation specifications

2.2.1 Electrical specifications

Electrical connection: standard: 3/N/PE AC 50 Hz, 380 V, 2,5 mm²
 fuses: 3 x 25A (SYSTEM 1) or 3 x 40A (SYSTEM 2-5)
 option: other voltages and frequencies

Voltage fluctuations: admissible: ± 10% approx.

Current interruptions: admissible: 1 ms max.

Max. power consumption

Equipment	Number of spindles					
	1	2	3	4	5	6
Basic machine	1,0 KVA	1,0 KVA	1,0 KVA	1,0 KVA	1,0 KVA	1,0 KVA
DC drive, approx.	0,8 KVA	1,0 KVA	1,3 KVA	1,6 KVA	1,85KVA	2,1 KVA
AC drive, approx.	2 KVA	2 KVA	2 KVA	2,6 KVA	3,3 KVA	4 KVA
Frequency converter	1,5(2) KVA	3 (5) KVA	5 (8) KVA	3 (10) KVA	10 KVA	10 KVA
Water re cooler	0,7 KVA	1,0 KVA	1 (1,6)KVA	2,2KVA	2,2KVA	2,8KVA
Air dryer	0,3 KVA	0,3 KVA	0,3 KVA	0,5 KVA	0,5 KVA	0,7 KVA
Exhaust system	1 KVA	(1)2,2 KVA	2,2 KVA	2,2 KVA	2,2 KVA	2,2 KVA

all figures are average values and can be higher or lower depending on machine type and equipment

2.2.2 Pneumatic specifications

Air pressure: machine inlet pressure min. 6.5 bar, max. 8 bar (check air flow!)

Compressed air quality: - air temperature = room temperature
 - humidity = pressure dew point approx. 3°C
 - residual oil content = inferior to 0.01 mg/m³
 - solid matters = inferior to 0.01 urn

Air supply: for consumption up to
 600 nl/min = 1/2" R
 600 - 1400 nl/min = 3/4" R
 1400 - 2000 nl/min = 1" R

Air consumption: Number of spindles	Drill head with individual drive, AC or DC motors, averages figures, figures in nl/min.							
	SC 53/63 (L)		W 320		W 1331		ASC 3063	
	DC	AC	DC	AC	DC	AC	DC	AC
1	295(180)	145(30)	425(310)	275(160)	335(250)	185(100)	395(280)	245(130)
2	395(250)	195(50)	655(510)	455(310)	475(390)	275(190)	595(450)	395(250)
3	490	240	880	630	610	360	790	540
4	590	290	1118	810	750	450	990	690
5	685	335	1335	985	885	535	1185	835
6	780	380	1560	1160	1020	620	1380	980
7	880	425	1785	1335	1155	700	1575	1125

Values in brackets are valid for ball bearing series SYSTEM 1.

With laser control stations, an additional 100 nl/min per spindle is needed for tool cleaning every tool change 2 x a appr. 4 sec.

2.3 Machine structure

SYSTEM 2 - 6

CONSTRUCTIONAL CONCEPTION	rigid granite foundation with split axes guided on precision air bearings with air gap compensation
MACHINEBASE	granite plate mounted on granite ledges
MACHINE STRUCTURE	X-axis: traverse slide on granite guide beam Y-axis: rigid, top-mounted machine table Z-axis: drill head with individual or central drive
TRAVELLING RANGE X	650 mm (SYSTEM 2 = 550mm)
TRAVELLING RANGE Y	835 mm
GUIDANCE X-, Y-AXIS	precision air bearings with air gap compensation
DRIVE X-, Y-AXIS	preclamped precision ball screws with AC or air-cooled DC servo-motors
MEASURING SYSTEM X-, Y-AXIS	linear measuring system Heidenhain LIDA 190/40

2.4 Working table

SYSTEM 2 - 6

TABLE SIZE (TOOLING PLATES)	SYSTEM 2	: max. 1240 x 650 mm
	SYSTEM 3	: max. 1780 x 650 mm
	SYSTEM 4	; max. 2230 x 650 mm
	SYSTEM 5	: max. 2760 x 650 mm
	SYSTEM 6	: max. 2980 x 650 mm

FORMAT TABLE

SYSTEM	Stations	drill head distance w/o mushrooms	drill head distance with mushrooms	max. format with mushrooms	max. format with loader
2	2	550 (21,6")	550 (21,6")	550 (21,6")	533 (21")
	3	406 (16")	381 (15")	356 (14")	346 (13,6")
3	2	765 (30")	765 (30")	765 (30")	765 (30")
	3	550 (22")	560 (22")	542 (21,3")	533 (21")
	4	432 (17")	432 (17")	414 (16,3")	406 (16")
4	3	650 (22,6")	650 (22,6")	632 (24,8")	615 (24,2")
	4	550 (21,6")	536 (21,1")	518 (20,4")	508 (20")
	5	432 (17")	432 (17")	414 (16,3")	406 (16")
5	4	650 (22,6")	650 (22,6")	632 (24,8")	615 (24,2")
	5	550 (21,6")	536 (21,1")	518 (20,4")	508 (20")
	6	460 (18,1")	432 (17")	414 (16,3")	406 (16")
	7	394 (15,5")	383 (15")	365 (14,3")	356 (14")
6	5	560 (22")	560 (22")	542 (21,3")	533 (21")
	6	483 (19")	483 (19")	465 (18,3")	457 (18")
	7	406 (16")	406 (16")	388 (15,2")	381 (15")

format Y = 650mm (25,5"), Option: Y = 765mm (30")

TOOLING SYSTEM prism-slot or custom-specific
 options: -mushroom pressure foot
 -depth clamber for pinless clamping
 -ML tooling with soft tool inserts

STACKING PINS Ø on request, 3.0 to 5.0 mm, centered or custom-specific

SLOT DEPTH standard 10,5 mm with automation 12,5mm, the stacking pin
 must look out of the panel between 8 and 12 mm.

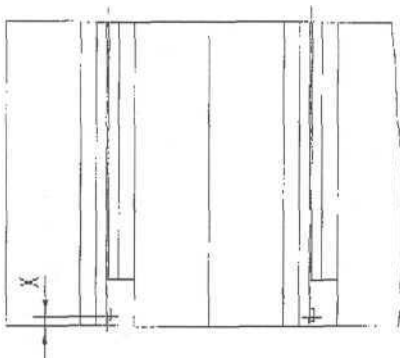
MACHINE ZERO standard right rear

PROGRAM ZERO standard left rear or custom-specific

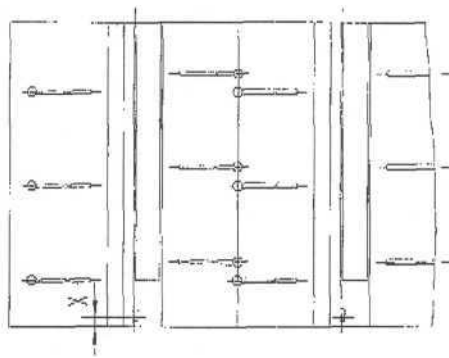
TOOLING PLATE

- VERSION 2 Tooling plate with pneumatic prism clamping and fixed slot
- VERSION 3 Tooling plate with pneumatic prism- and slot clamping-.....
- VERSION 5 Tooling plate with pneumatic prism- and slot clamping provided with lateral mushroom clamps
- VERSION 6 Tooling plate with depth fixing facility and lateral mushroom pressure feed for pinless clamping
- VERSION 7 Multilayer tooling system with soft-tooling inserts to be combined with version 3, 4, 5, or 6

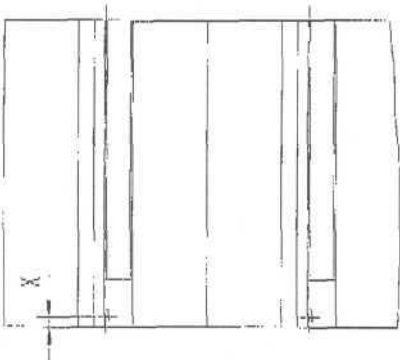
Version 2



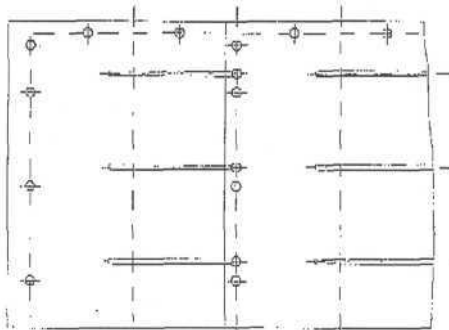
Version 5



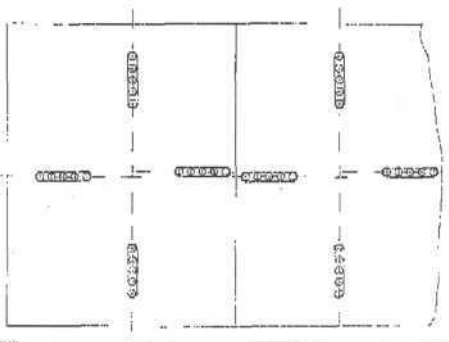
Version 3



Version 6



Version 7



Measure X=2Qmm (50mm with finish pressure foot and LASER measurement station)

2.5 Z - axis

CONSTRUCTIONAL CONCEPTION	<p>Individual drive</p> <p>The Z-axis is guided directly along the outer sleeve of the drilling spindle in a high-precision spindle air bearing, free from wear and nearly friction-less.</p> <p>The up and down movement is carried out by means of a preclamped, precision lead screw equipped with AC motor or air-cooled DC-servo motor.</p>
WORKING TRAVEL	<p>Infinitely variable and freely programmable via the CNC</p> <p>0-25 mm for standard spindle 0-22 mm for micro-drilling spindle W1201-8 and 1331-17</p>
DRILLING DEPTH	<p>Max. 10 mm (limited by the pressure foot)</p>
DRILLING/ROUTING PERFORMANCE	<p>See chapter 2.6 "Working spindle"</p>
CUTTING CHARACTERISTICS	<p>See specifications of the tool manufacturer, rough values in chapter 3</p>
PRESSURE FOOT FORCES	<p>Two separately adjustable pressure foot forces can be selected via the program:</p> <p>Drilling: 50 - 240 N Routing 5 - 50 N</p>
STANDARD PRESSURE FOOT	<p>Compact design, with exhaust tube leading to central or individual exhaust. Exchangeable pressure foot insert, available in different versions</p>
ROUTING PRESSURE FOOT	<p>On option</p> <ul style="list-style-type: none"> - for webless contour routing - centrally locked when drilling or routing - for finish routing, evasion possibility to any direction of ± 5 mm - with firm pressure ring and extendable brush (add. option) - with individually controllable stop valves (add. option) - with exhaust tube to central or individual exhaust
MEASURINGSYSTEM	<p>The standard equipment for the main measuring system is</p> <ul style="list-style-type: none"> - linear potentiometer T 50 a 502 - resolver Heidenhain ROD 420/1250 - integrated resolver for AC servo motors <p>With option depth drilling or blind via drilling, as additional linear measuring system Heidenhain MT 25 Oder MT 60 is used.</p>

Options

DEPTH DRILLING WITH LASER	<p>(Blind via drilling) programmable drilling depth measured from the panel surface independent of stack height or unevenness.</p> <p>Accuracy : $\pm 25\mu\text{m} / 3\sigma$ with 2nd measuring system $\pm 15\mu\text{m} / 3\sigma$ with CBT function</p>
QUICK-DRILL	<p>Programmable free travel of Z-axis measured from the panel surface, independent of stack height or unevenness</p>
LASER MEASUREMENT	<p>Dynamic measurement of tool diameter, length and truth at working speed and broken drill bit detection after drill cycle</p>
BROKEN DRILL BIT DETECTION	<p>Detection of broken drill bit after every drill hit up to dia. of 0.2mm (REAL-TIME)</p>
LENGTH CHECKER	<p>Detection of drill bit length between an programmable tolerance and detection of broken drill bit after drill</p>

2.6 Working spindles

Make	PRECISE			WESTWIND		
Type	SC 63	SC 63L	SC 53 H	W320	W1331	W1331
RPM[1000 l/min]	15 - 60	6 - 40	20 - 80	15 - 80	20 - 110	20 - 125
Rated power [watt] with rpm:	1100 60.000	700 40.000	500 80.000	550 72.000	750 80.000	750 80.000
Drive motor	2-phase	2-phase	2-phase	3-phase	3-phase	3-phase
Power for acceleration and braking 10 sec.	2,5 KVA	2,5 KVA	2 KVA	2 KVA	1,7 KVA	1,7 KVA 2,2 KVA ^{<1)}
Drilling performance [mm]	0,8-6,35	0,8-6,35	0,21-4 (6,35) ⁽²⁾	0,2-4 (6,35) ⁽²⁾	0,1 -4 (6,35) ⁽²⁾	0,1 -4 (6,35) ⁽²⁾
Routing performance [mm]	bis 3	bis 3	bis 2,4	bis 2,4	bis 2,4 ⁽³⁾	bis2,4 ⁽³⁾
Bearing	ball bearing	ball bearing	ball bearing	air bearing	air bearing	air bearing
Temperature [°C]	13-25	18-25	18-25	16-25	16-20	16-20
Heat transfer to cooling water [watt] ⁽⁴⁾	200	200	200	475	400	580
Coolant flow [l/min]	0,35	0,35	0,35	0,8	0,8	0,8
Air consumption [nl/min]	—	—	—	126	56	56
Air pressure [bar]	—	—	~	5,6	5,6	5,6
Axial load [N]	no inform.	no inform.	no inform.	186	250	250
Radial load [N]	no inform.	no inform.	no inform.	95	118	118
Axial stiffness [N/p.m]	35	35	25	no inform.	no inform.	no inform.
Radial stiffness [N/μm]	20	20	10	no inform.	no inform.	no inform.
Weight [kg]	5,1	5,1	4,8	5,8	3,25	3,25
Speed setting	static frequency converter, infinitely adjustable via CNC					
Tool clamping system	direct via collet					
Tool change	manual and automatic, locked as long as spindles rotate					
Tool diameter	3 mm or 3.175 mm (1/8")					
Tool length	standard 38 mm, 50 mm for drilling in soft tools					
Spindle cooling	closed cooling circuit with electronically controlled cooling unit					
Speed control	by means of built-in Hall generator					
Overload control (motor)	via built-in thermistor, automatic spindle shut-off					

⁽¹⁾ for 6 sec., but only with braking card (Option) ⁽³⁾ with reduced feed rate, max. 0,5 m/min

⁽²⁾ with pre drilling, recommended ⁽⁴⁾ at max. RPM

2.7 Tool change

The tool change unit consists of the magazine change system (KWS) and the tool gripper. The magazine change system is mounted to the traverse slide (X-axis), whereas the tool gripper is mounted to the machine table (Y-axis).

The tools to be used have to have a shaft diameter of 3 mm or 3.175 mm (1/8"). Tools used for the standard version have to be equipped with stop rings. On option, tools without stop rings can be implemented as well.

NUMBER OF MAGAZINE CASSETTES	1 or 2 per working station
NUMBER OF TOOLS (per cassette)	50, 100, 200, 300, 600, 840
EUROMAGAZINE (per cassette)	20, 30, 60, 84 bare with 10 tools (11 positions) each
MAGAZINE	Freely selectable with standard tool fitting T1 to T50, T100, T200 EUROMAGAZINE: choice between standard (individual) fitting and bar fitting on option: custom-specific tool fitting
TOOL CHANGE TIME	Approx. 12-25 sec. depending on spindle speed, position, performance of frequency converter and use of process control equipment as e.g. laser monitoring station
TOOL CHANGE MONITORING	Monitoring tool gripper: up and down position

OPTIONS

RINGLESS TOOL FITTING	Stop rings are no longer needed (only in combination with mechanical length check or laser measuring station)
BROKEN DRILL BIT DETECTION(BBD)	The tool is monitored when returned or picked up by the spindle
MECHANICAL LENGTH CHECK(TLC)	Checking the free-clamping length of ringless tools, in particular. If there is no BBD available, tool breakage can be detected after the drilling process.
LASER-MEASURING STATION	Measuring length, diameter and truth of the tool collected. If there is no BBD available, tool breakage can be detected after the drilling process.
MAGAZINE AVAILABILITY CHECK	Indicates optically that a tool magazine is loaded.
MAGAZINE IDENTIFICATION	Assigns an individual code to every magazine

2.8 Machine equipment

EXHAUST TUBE	The connection for the exhaust tube on the machine cover is optionally on the top or at the rear. SYSTEM 2 or higher versions offer connection at right or left hand side. The inner diameter to be connected is 40 mm for SYSTEM 1 and 70 mm for SYSTEM 2 and higher versions
TOOL STOP RINGS	With option "ringless tools" no stop rings are needed, otherwise 1 set of stop rings per spindle is supplied, (outer diameter 7.55 mm, height: 4.5 mm), OPTION; stop rings from other manufacturers.
OPERATING MANUAL	Standard 2-fold, German or English
HIT COUNTER	Standard 1 hit counter per machine
FREQUENCY CONVERTER	Static frequency converter for adjusting the spindle speed via CMC. Reaching the rated RPM within 10-15 sec. is standard. More powerful converters for reducing the accelerating and braking times are available on option.
NOISE PROTECTION COVER	For noise reduction and accident prevention standard: manually openable machine cover OPTION: pneumatically openable cover with electronic security strip
AIR BUFFER FOR AIR BEARING SPINDLE	To prevent damage on the spindle which might be caused bearing spindle by sudden loss of air pressure at the air inlet opening. Depending on the number of spindles and air consumption, one or two air buffers are installed.
MACHINE ACCESSORIES	Comprise levelling elements, corrosion protections means for the cooling water, granite cleaner, grease for lead screw, cleaning set for working spindle, collet key (if needed), miscellaneous tools and small parts.
PANAL-MANAGER	Standard for machines with automatic loading facility
SPINDLE HOUR COUNTER	Standard per working spindle
SPINDLE MONITORING	Standard per spindle: RPM and temperature
PLC	Signal processing of the machine functions and transfer to the loader controller
WATER RECOOLER	For cooling the working spindle: standard, closed recirculating system with air-heat-exchanger option: closed recirculating system with water-heat-exchanger for exploiting the processing heat

4-COLOUR LAMP	Optical indication of machine status
EXHAUST	1 kW for 1-2 spindles, 2,2 kW for up to 6 spindles
AC DRIVES	Highly dynamic, brushless drives with travelling speed of up to 25m/min
LOADING FACILITY	Preparation for automatic loading and unloading of the PCB stacks into and out of the processing area
TOOL-FITTING STATION	Holding device for the magazine cassette for fitting the tools
FILTER	To filter out oil, water and solid matters
HIGH-TECH PACKAGE	Installation of AC drives, 1 µm resolution in X- and Y-axis, implementation of heat-technical measures, reduced run up time for working spindles.
COMPRESSOR	For air supply of the machine
AIR BUFFER	Installed at the air inlet of the machine in order to compensate for short-term insufficiencies in pressure of air supplied
AIR DRYER	To reduce humidity of compressed air
MACHINE COVER	Pneumatically activated machine cover with security strip
MEASURING SYSTEM	Resolution 1µm in X- and Y-axis
PROGRAMMING	Programming station with keyboard and CRT, hand wheels or joystick. Imaging via projector with 10-fold magnification. Option: camera, printer, marking device, plotter.
FLOW CONTROL DEVICE	An electronic flow control device monitors the coolant flow of the working spindle. The spindle stops working with insufficient coolant flow.
DEPTH MEASURING DEVICE	Drilling and routing with high depth accuracy
TRANSFORMER	Necessary if other input voltages than 380V are supplied.
VACUUM CONTROL DEVICE	Monitors the low pressure of the exhaust system. With lack of vacuum, the machine stops.
TOOL BOX	To carry up to 6 magazine cassettes for transport purposes
CENTERING DEVICE	Device with dial gauge to measure the position of the working spindle with reference to the tooling system.

2.10 CNC-Controller

CONTROLLER TYPE	CNC- X30	CNC 44.00	CNC 46.00
MANUFACTURER	SCHMOLL-Maschinen GmbH	SIEB & MAYER Elektronik GmbH	
PROCESSOR	CPU 80486 DX	MC 68302	2 X MC 68000
NO, OF AXES	X,Y, 10 DZ	X,Y,2DZ or 6 analog	X,Y,6DZ or 8 analog
MAGNETIC TAPE	Option	Option	Standard
MAIN MEMORY	4 MB	512 K Option: 1 MB, 2 MB	
HARD DISK	40MB or more	—	
DISK DRIVES	1 x 3 ½" MS-DOS Option 1 x 5¼" MS-DOS	2 x 3 ½" Option 2 x 5¼"	
CRT	14" colour	9" monochrome / option: 12" colour 14" colour in own housing	
DNC INTERFACE	RS 232, ETHERNET	AUX or RS 232	
PROGRAM FORMATS	S&M 1000, 3000 Excellon 1+2 Posalux (Option) Wessel (Option) RETAB (Option) General Elektric (Option)	S&M 1000, 3000, 5000 Excellon 1+2 Posalux (Option) Wessel (Option) Trudrill (Option)	
PLAIN TEXT	German, English	German, English, French, Italian	
INTERFACES	paper tape reader, punch, joystick, handwheel, printer, barcode		
AXIS SPEED	DC drive: max 15 m/min AC drive: max 25 m/min		
RESOLUTION	min.0.001 mm		
INPUT FORMAT	metric or inch		
COOLING SYSTEM	overpressure ventilation		
PECK DRILLING SOFTWARE	standard		
EXPANSION	standard		
TRAVEL OPTIMIZER	option		
GRAPHICS DISPLAY	option		
PAPER TAPE READER	option		
PAPER TAPE PUNCH	option		
OPERATIONAL DATA LOGGING	option		

2.11 Programming functions

CONTROLLER TYPE CNC-X 30

EDITING FUNCTION	A program can be edited while another program is being processed
EXPANSION AND COMPRESSION	Expanding and filtering drilling programs (resolving special functions into individual drilling coordinates) and compressing drilling programs (option).
FINISH-ROUTING FUNCTION	For webless finish-routing of outer contours. Command is combined with the coordinate of the routing travel
ROUTER-RADIUS CORRECTION	Standard for automatic corner-rounding and travel-optimization when routing pointed angles; any overlength between straight line/circle and circle/circle is possible,
CASSETTE TOOL CHANGE AND PARAMETER INPUT	Standard via program and keyboard, separate tool and parameter file can be programmed for different cutting parameter input specifications with different diameters and materials -Automatic management of "sister" tools -Operator can easily define magazines and change the definition. -The cassette data (hit counter) can be exchanged between magazine fitting station and CNC for easy refitting with tools.
LINEAR AND CIRCULAR INTERPOLATION	Standard in 2 axes (X and Y) with linear Z-axis feed, interpolation. 2½ D routing is possible.
PROGRAM CODE	ISO, ASCII, EIA, with automatic code recognition and parity control
PROGRAM ZERO	Freely selectable within the machine travelling range (floating zero) -Offset-values can be entered (even out of the machine travelling range) -Offset addition, mirroring and exchanging axes of programs in the memory -Automatic artwork adjustment for programming stations or for machines with programming equipment -Searching for coordinates, tool commands etc.
GRID PROGRAMMING	Standard, freely selectable, even in μ -grid
STEP-REPEAT	Max. number is determined by the memory , up to 8 levels -Tool sequencing for Excellon 1/2, Posalux

CONTROLLER TYPE CNC-X 30

T- DEPENDENT COUNTER

Standard: total with counter

Hit count and router life travel are displayed for each tool number individually on the CRT. After the preset hit number or routing distance is reached, automatic tool change is carried out.

SIMPLIFIED PROGRAMMING

Any dual-in-line 1C in 1/10" grid

- Row of any number of holes
- Subroutine technique for Excellon 1/2 and Posalux
- Copy function for transfer of programs, program parts and data sets within a program, or between programs
- Automatic corner-rounding for S&M 3000, Excellon 1/2, Posalux
- Feed reduction for small radii
- Plain text drilling for S&M 3000, Excellon 1/2, Posalux
- Barcode drilling for S&M 3000, Excellon 1/2, Posalux (option)
- Graphic display of programs in any scale
- Expansion and contraction with separate input for X and Y in 0.01 %.

CONTROLLER TYPE CNC 44.00 und 45.00

EDITING FUNCTION	A program can be edited while another program is being processed
EXPANSION AND COMPRESSION	Compressing a drilling program for minimum memory requirements, decompressing is possible as well
FINISH-ROUTING FUNCTION	For webless finish-routing of outer contours
ROUTER-RADIUS CORRECTION	Standard as e.g. including connection circles and moving around pointed angles with minimum travel, random circular/linear contour transitions, automatic corner-rounding, finish-functions (disc, circle, rectangle)
CASSETTE TOOL CHANGE AND PARAMETER INPUT	<p>Standard via program and keyboard</p> <ul style="list-style-type: none"> -Flexible tool management: 99 tool numbers can be assigned to 1000 magazines. -Access via diameter table -Freely programmable assignment -Flexible tool parameters are battery-buffered and are maintained after switching off the controller
LINEAR AND CIRCULAR INTERPOLATION	<p>Standard in 2 axes (X and Y) with linear Z-axis feed, 2½ D routing is possible.</p>
PROGRAM CODE	ISO, EIA, with and without parity control, switchable between metric and inch
PROGRAM ZERO	<ul style="list-style-type: none"> -Freely selectable within the machine travelling range (floating zero) -Offset-values can be entered (even out of the machine travelling range) -Offset addition, mirroring and exchanging axes of programs in the memory -Automatic artwork adjustment for programming stations or for machines with programming equipment. -Searching for the program block which corresponds to the actual machine position,
GRID PROGRAMMING	Standard, freely selectable
STEP-REPEAT	Up to 5 levels, copy S+R by key stroke
T-DEPENDENT COUNTER	<p>Standard: total with counter</p> <p>Hit count and router life travel are displayed for each tool number individually on the CRT. After the preset hit number or routing distance is reached, automatic tool change is carried out.</p>

CONTROLLER TYPE CNC 44.00 and 45.00

SIMPLIFIED PROGRAMMING

- Ready functions for any IC hole sequence programming
- Rows of up to 55,000 holes
 - Subroutine technique
 - Copy function for transfer of programs, program parts and data sets within a program or between programs
 - Automatic corner-rounding
 - Plain text drilling
 - Graphic display of programs in 1:20 scale
 - Expansion and contraction with separate input for X and Y in 0.01%
 - Calculation of intersections

2.12 Accuracy

RESOLUTION OF MEASURING SYSTEM X- AND Y-AXIS	standard	0,002 mm
	option:	0,001 mm
RESOLUTION OF MEASURING SYSTEM Z-AXIS	DC-drive:	0,002 mm
	AC-drive:	0,0025 mm
POSITIONING ACCURACY X- AND Y-AXIS (ACC. TO VDI/DGQ 3441)		
POSITIONAL UNCERTAINTY (P)		0,010 mm (0,006 mm ⁽¹⁾)
DEVIATION OF POSITION (PA)		0,006 mm
POSITIONAL VARIATION (PS)		0,006 mm
REVERSAL ERROR (U)		0,003 mm
REPEATABILITY		± 0,002 mm
STRAIGHTNESS X AND Y ACC. TO DIN 8601		± 0,0025 mm (± 0,0012 mm ⁽¹⁾)
RECTANGULARITY OF X RELATED TO Y ACC. TO DIN 8601 / 500 MM		< 0,01 mm (< 0.005 mm ⁽¹⁾)
RECTANGULARITY OF DRILLING SPINDLE RELATED TO TABLE SURFACE		± 0,02 mm / 100mm
DRILLING REGISTRATION ⁽²⁾		± 0,015 mm (± 0,012 mm ⁽¹⁾) ⁽³⁾
DRILLING DEPTH ACCURACY (STANDARD DRILLING)		± 0,05 mm ⁽³⁾ , 3σ
(DEPTH DRILLING)		± 0,025 mm ⁽³⁾ , 3σ
CONTOUR ROUTING ACCURACY STANDARD:		± 0,05 mm ⁽³⁾ , 3σ
INCREASED ACCURACY		± 0,03 mm ⁽³⁾ , 3σ
ROUTING DEPTH ACCURACY (STANDARD ROUTING)		± 0,10mm ⁽³⁾
(DEPTH ROUTING)		± 0,04 mm ⁽³⁾

⁽¹⁾for ultra precision with resolution of 0.001 mm possible

⁽²⁾ with	drilling diameter	2,0	mm
	speed	32.000	rpm
	feed rate	2,0	m/min
	retact rate	10,0	m/min
	material	1	FR4 panel
	cover plate	1	hard tissue coverplate
	temperature	22°C	± 2°C
	rel. humidity	50 %	± 5%

⁽³⁾ SCHMOLL Standardtest

When determining the drilling accuracy the measuring uncertainty of the measuring machine has to be taken into account (DIN 6601).