

**Operating Instructions
Universal Machining Centre
HPM 1150U
Heidenhain iTNC 530**



Version April 2007

valid as from serial-N° 84.40



Mikron AG Nidau, Ipsachstrasse 16, CH-2560 Nidau/Schweiz
Telefon +041(0)32 332 75 75; Fax +041(0)32 332 75 76; E-mail mikron@mikron-ac.com
www.mikron-ac.com

Agie Charmilles Group

+GF+

I.1 Contents

I.1	Contents	I-1
1	Introduction	1-1
1.1	Layout of documentation provided	1-2
1.2	Safekeeping and duplication	1-2
1.3	Target group and purpose	1-3
1.3.1	Target group	1-3
1.3.2	Purpose	1-3
1.4	Customer training	1-3
1.5	Service life	1-4
1.6	Warranty terms	1-4
1.7	User evaluation	1-4
2	Safety	2-1
2.1	Warning notices and hazard symbols	2-2
2.2	Proper use of the machine	2-4
2.3	Improper use	2-4
2.4	Fundamental safety regulations	2-4
2.4.1	Safety regulations for the owner/operator	2-4
2.4.2	Protective clothing	2-7
2.4.3	Safety regulations for the operating and maintenance staff	2-8
2.5	Procedure in an emergency situation	2-10
2.5.1	EMERGENCY STOP	2-10
2.5.2	Freeing persons from entrapment	2-11
2.5.3	Fire protection	2-12
2.6	Particular hazards	2-13
2.6.1	Dangers from electrical energy	2-13
2.6.2	Dangers from hydraulic and pneumatic energy	2-13
2.6.3	Dangers from operating and auxiliary materials	2-14
2.6.4	Dangers when dry machining or when using minimum quantity lubrication	2-14
2.6.5	Dangers from gases and vapors	2-15
2.6.6	Dangers from noise	2-15
2.6.7	Dangers when machining magnesium	2-16
2.6.8	Dangers when machining titanium	2-18
2.6.9	Dangers from using carbon-dioxide fire extinguishing systems	2-19
2.6.10	Dangers from laser radiation	2-19
2.6.11	Dangers from magnetic fields	2-20
2.7	Maintenance	2-20
2.7.1	Safety measures	2-20
2.7.2	Cleaning the machine	2-21
2.7.3	Hydraulics, pneumatics and coolant supply	2-22
2.7.4	Electrical equipment	2-23
2.7.5	Inspection of safety equipment	2-23
2.7.6	Aging of cabin windows	2-23
2.8	Transport of the machine and its components	2-24
2.9	Safety instruction	2-25
3	Construction and mode of function	3-1
3.1	Brief description	3-1

3.2	Subassemblies	3-3
3.2.1	Operator console	3-3
3.2.2	Electric cabinet / enclosure	3-3
3.2.3	Lubrication	3-4
3.2.4	Coolant/Lubricant system	3-4
3.2.5	Pneumatic equipment	3-4
3.2.6	Hydraulic equipment	3-4
3.2.7	Functional description of the tool changer	3-5
3.2.8	Tool magazine	3-5
3.2.9	Feed drives, ball screw	3-5
3.2.10	Measuring systems	3-5
3.2.11	Motor spindle	3-6
3.2.11.1	Step-Tec spindle tools	3-6
3.2.11.2	Tilting of swivel spindle- parking position	3-8
3.2.11.3	Additional locking swivel spindle	3-9
3.2.11.4	Collision points HPM 1150U	3-10
3.2.11.5	Loading capacity of swivelling spindle	3-11
3.2.12	Coolant circuit with through spindle coolant (TSC)	3-11
3.2.13	Tool air cooling	3-12
3.2.14	Machine table	3-12
3.2.15	High-speed circular table	3-12
3.3	Milling and drilling	3-13
3.3.1	NC-controlled machining	3-13
3.3.2	The axes of machine	3-13
3.4	Data and energy interfaces	3-14
3.5	Documents and technical data	3-15
3.5.1	Documents	3-15
3.5.1.1	Manuals	3-15
3.5.1.2	Machine number	3-16
3.5.2	Technical data	3-17
3.5.2.1	Performance data / machine	3-17
3.5.2.2	Tool changer	3-18
3.5.2.3	Weight	3-19
3.5.2.4	Space requirements	3-19
3.5.3	Conditions with regard to connection and the environment	3-20
3.5.3.1	Ambient conditions	3-20
3.5.3.2	Electrical supply data	3-20
3.5.3.3	Main requirements**	3-20
3.5.3.4	Voltage stabilizer	3-21
3.5.3.5	Pneumatic connection data	3-21
3.5.3.6	Quality characteristics	3-21
3.5.3.7	Installation plan and working ranges	3-22
3.6	Options	3-23
3.6.1	Scraping chip conveyor and CS with ICS	3-24
3.6.1.1	Chip conveyor	3-24
3.6.1.2	Coolant system	3-25
3.6.2	Scraping chip conveyor without ICS	3-26
3.6.3	Oil mist extraction	3-27
3.6.4	Oil separator	3-27
3.6.5	Minimum quantity lubrication	3-28
3.6.5.1	External feed	3-28
3.6.5.2	Internal feed	3-28

3.6.6	Cooling / Coolant	3-30
3.6.7	Tool measuring with table touch probe system	3-31
3.6.7.1	Calibrating the table scanning system	3-32
3.6.7.2	Calibrating the table touch probe system.	3-33
3.6.8	NC rotary table DA 630FV	3-34
3.6.9	Tool presetter unit	3-36
3.6.10	3-D touch probe system for probing the workpieces	3-37
3.6.10.1	Function and procedure	3-37
3.6.10.2	Radio touch probe model RMP60 (Renishaw	3-38
3.6.11	Graphite extraction system for RT	3-39
3.6.12	Rotoclear	3-41
3.6.13	Ethernet connection	3-42
4	Transport and machine installation	4-1
4.1	Packing	4-2
4.2	Precautionary measures	4-2
4.3	Handling device	4-2
4.4	Intermediate storage	4-3
4.5	Scope of delivery	4-3
4.5.1	Suspension for transporting the HPM 1150U	4-4
4.5.2	Protection of the swivelling arm of the TC magazine during transport	4-6
4.6	Erection of machine	4-7
4.6.1	Demands on ground and environment	4-7
4.6.2	Alignment of the machine	4-7
4.6.3	Ambient climat	4-8
4.7	Electric connection of the machine	4-9
5	Commissioning	5-1
5.1	First commissioning	5-1
5.2	Cleaning of the new machine	5-1
5.3	Checklist	5-2
5.4	Putting the machine out of operation	5-2
6	Operation and attendance	6-1
6.1	Control elements	6-2
6.1.1	Operating panel	6-2
6.1.2	Machine control panel (M)	6-4
6.1.3	Manual operating unit HR 410	6-15
6.1.4	Key for the tool release (S460)	6-16
6.1.5	Tool magazine operating unit	6-16
6.1.6	Master switch at switch cabinet	6-17
6.2	Putting into operation / Shutdown	6-18
6.2.1	Turning-on	6-18
6.2.2	Switch-off	6-18
6.2.3	Initialize door locking	6-19
6.2.4	Approach reference points	6-19
6.2.5	Spindle lubrication	6-20
6.2.6	Cutting spindle warm-up	6-20
6.3	Modes of operation (Survey)	6-21
6.4	Manual modes : MAN. MODE and EL. HANDW. Mode	6-22
6.4.1	Traversing of axis	6-22
6.4.1.1	Axis direction keys	6-22

6.4.1.2	Feed	6-22
6.4.1.3	Incremental positioning	6-23
6.4.1.4	Traversing with crank in mode ELECTRONIC HAND WHEEL	6-23
6.4.2	Machining spindles	6-25
6.4.2.1	Warming-up of milling spindle	6-25
6.4.2.2	Lubrication of milling spindle	6-26
6.4.3	M-functions	6-26
6.4.4	Special mode SETTING- UP	6-27
6.4.5	Special mode SETTING- UP extended	6-28
6.4.6	Touch probe cycles in the operating modes	6-29
6.4.7	Chip conveyor and chip augers	6-29
6.5	Program run	6-30
6.6	Programming	6-34
6.6.1	Programming : Tools	6-34
6.6.2	Coolant programming	6-35
6.6.3	Circular axis	6-36
6.6.3.1	Swivel axis A	6-36
6.6.3.2	Circular axis C	6-36
6.6.3.3	„Free rotation“ of C-axes	6-37
6.6.4	Travel areas and reference points	6-38
6.6.5	Special cycles	6-38
6.6.5.1	Spindle orientation (cycle 13)	6-38
6.6.5.2	Rigid tapping (cycles 17 and 207)	6-39
6.6.5.3	Tapping (cycle 18)	6-39
6.6.5.4	Special drilling cycle	6-39
6.6.5.5	Tilting the work plane (cycle 19)	6-40
6.6.5.6	Tolerance (cycle 32)	6-40
6.6.5.7	Free rotation (cycle 324)	6-40
6.6.6	Smart module	6-41
6.6.6.1	APS basic (Advanced Process System)	6-41
6.6.6.2	APS extended (cycle 303)	6-42
6.6.6.3	Technical data and application of the 303 cycle	6-44
6.7	M-functions	6-46
6.7.1	Special M-functions	6-51
6.7.2	Available spare outputs	6-51
6.8	Machine parameters	6-53
6.8.1	General	6-53
6.8.2	General machine parameters	6-53
6.8.3	Machine- specific user parameter	6-54
6.8.4	Description of individual parameters	6-55
6.9	Tool change	6-57
6.9.1	Table management	6-57
6.9.2	Tool change commands	6-58
6.9.3	Tool table	6-59
6.9.4	Cutting data tables	6-60
6.9.5	Pocket table	6-60
6.9.6	Manual tool change	6-62
6.9.7	Automatic tool change	6-64
6.9.8	Tool magazine	6-65
6.9.8.1	Operating device for the tool magazine	6-67
6.9.8.2	Loading the magazine	6-68
6.9.8.3	Position assignment of the tools	6-68

6.9.9	Fault elimination of tool changer	6-69
6.9.9.1	General information	6-69
6.9.9.2	Non-monitored trouble shooting	6-69
6.9.9.3	Mechanical default position of tool changer	6-70
6.9.9.4	Guideline: procedure after a failure	6-71
6.9.9.5	Fault elimination function	6-72
6.9.9.6	Movements	6-75
6.9.9.7	Symbolism of the status display	6-75
6.10	Control system messages	6-77
6.10.1	Error diagnostics, procedure	6-77
6.10.2	NC-Messages	6-77
6.10.3	PLC messages	6-78
6.11	Feed axes	6-95
6.12	Endposition limits	6-95
7	Servicing and Maintenance	7-1
7.1	Safety advices	7-2
7.2	Utilities and units	7-2
7.2.1	General lubrication schedule	7-3
7.2.2	Lubricants	7-5
7.2.3	Coolant-lubricants	7-6
7.2.4	Coolant-lubricant system (option)	7-6
7.2.4.1	Cutting oils	7-6
7.2.4.2	Emulsions	7-7
7.2.4.3	Maintenance of web filter	7-8
7.2.4.4	Maintenance of monitoring filter	7-8
7.2.5	Compressed air	7-9
7.2.6	Hydraulic power pack	7-9
7.2.7	Central oil lubrication unit	7-11
7.2.8	Spindle cooling	7-12
7.3	Mechanical maintenance jobs	7-13
7.3.1	General maintenance schedule	7-13
7.3.2	Tool changer	7-15
7.3.3	Tool magazine maintenance	7-15
7.3.4	Chip removal auger conveyors	7-16
7.3.5	Maintenance of the overall protection enclosure	7-16
7.3.6	Milling spindle	7-16
7.3.7	Swiveling axis of the milling spindle	7-17
7.3.8	Options and add-on devices	7-17
7.3.9	Maintenance of the water cooling units	7-17
7.3.10	Maintenance of the telescopic protections of the X- axis	7-17
7.3.11	Maintenance of the protection door and loading door guides	7-17
7.4	Electrical maintenance jobs	7-18
7.4.1	General maintenance schedule	7-18
7.4.2	Safety switch check	7-19
7.4.3	Maintenance of operating panel	7-19
7.4.4	Electric cabinet cooling unit	7-20
7.4.5	Illumination	7-20
7.4.6	Service concept iTNC 530	7-20
7.4.6.1	Data protection:	7-20
7.4.6.2	Data protection procedure:	7-20
7.5	Waste disposal	7-21

8	Decommissioning and disposal	8-1
8.1	Safety instructions	8-2
8.2	Prerequisite qualifications for decommissioning personnel	8-2
8.3	Machine shutdown	8-3
8.4	Storage conditions	8-3
8.5	Decommissioning	8-3
8.6	Disposal	8-4
8.6.1	Instructions for disposal	8-4
8.6.2	Disposal locations	8-4
10	Glossary	10-1
10.1	Display of programming code	10-2
10.2	Abbreviations	10-2
10.3	Terminology	10-3
11	Appendix	11-1
11.1	Water miscible coolants (Emulsions)	11-1
11.2	Cutting oils	11-2
11.3	Lubricants	11-3
11.4	Service information	11-3
11.4.1	Locking brake of the feed drive	11-3
11.4.2	Retrofitting the claw coupling	11-4
11.4.3	Mounting guideline tool changer in transport position	11-4
11.4.4	Double tool changer mounting instructions	11-5
11.4.5	Tooth belt pretension	11-5
11.4.6	Trunk tension measurement unit: WF-tension meter	11-6
11.4.7	Expansion value chart	11-7
11.4.7.1	Expansion value chart	11-7
11.4.7.2	Remarks concerning scraping of the bearing blocks	11-7
11.5	Diagram for admissible feed force	11-8