



**ΑΝΩΤΑΤΟ ΤΕΧΝΟΛΟΓΙΚΟ
ΕΚΠΑΙΔΕΥΤΙΚΟ ΙΔΡΥΜΑ
ΚΡΗΤΗΣ**

**ΣΧΟΛΗ ΤΕΧΝΟΛΟΓΙΚΩΝ ΕΦΑΡΜΟΓΩΝ
ΤΜΗΜΑ ΜΗΧΑΝΟΛΟΓΙΑΣ**

Πτυχιακή εργασία:

**Εγχειρίδιο χρήσης ψηφιακά καθοδηγούμενου
τόρνου και φρέζας τεσσάρων αξόνων**

Ζαχαριάδης Τίτος

Επιβλέποντες:

Δρ. Πετούσης Μάρκος

Ηράκλειο 2014

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Summary Thesis

The aim of this thesis is the involvement and contact of the student with modern design methods. During this dissertation, the student will deal with the procedures in using digitally driven machine-tools, but particularly with a lathe of two plus two axes and a four axes mill established in the Department of Mechanical Engineering, Technological Institute of Crete.

The main part of the thesis is the detailed description of the procedures for using digitally driven machine-tools. This description will be based on the manuals provided by the machine tool manufacturer.

Subsequently, a prime example of the machine tool (lathe) usage, is going to be designed and built.

Briefly, the steps for the successful completion of the dissertation by the student are:

- 1 Search the bibliography information for the guidance of digital technology.
- 2 Familiarization with the use of digital machine-tools, particularly driven by the functions of the machine tool auditor.
- 3 The development of the user's manual for the digital driven lathe Department.
- 4 The development of the user's manual for the digital mill driven Department.
- 5 The development of the user's manual for the rotary tailstock driven Department.
- 5 The design of a prime example for the use of digitally driven lathe.
- 6 The implementation of the example in machine tool.
- 7 Writing and presentation of the thesis.

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1. μ CNC 4

1.1 - 4

1.2 - μ CAD/CAM 6

1.3 - μ μ 7

1.4 - CNC μ 8

1.5 - CNC μ 9

2. μ CNC HAAS 11

2.1 - 11

2.1.1 - 11

2.2 - 12

2.4 - μ 12

2.4.3 - 13

2.5 - μ 14

2.5.1 - 14

2.5.2 - 15

2.5.3 - μ 15

2.5.4 - 15

2.6 - μ ; 16

2.6.1 - 16

2.6.2 - μ μ 17

2.6.3 - - μμ μ 17

2.6.4 - 18

3. HAAS 19

3.1 - 19

3.2 - 19

3.3 - μ 19

4. μ μ - μ 20

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4.1 - μ CNC HAAS 20

4.2 - 22

4.3 - μ μ 22

4.4 - 23

4.5 -				23	
4.5 -				26	
4.6 -		-		27	
4.7 -	μ	μμ	CAD.	28	
4.7 -		CNC		μ	29
4.8 -	μ			31	
5.	μ	μ	-	34	
6.			μ	μ	36

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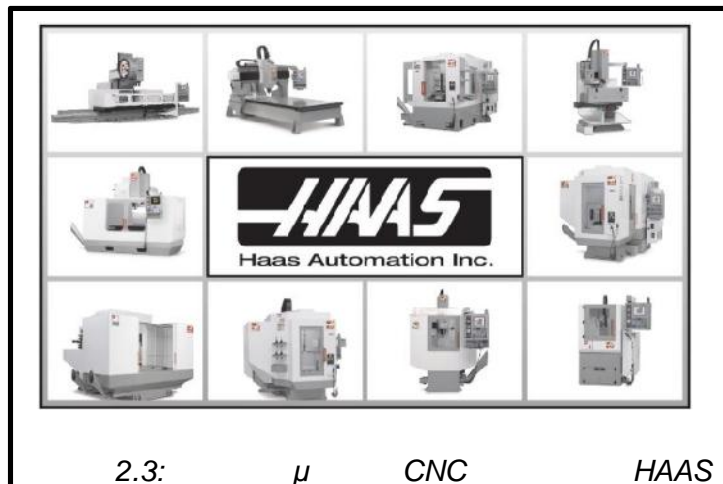
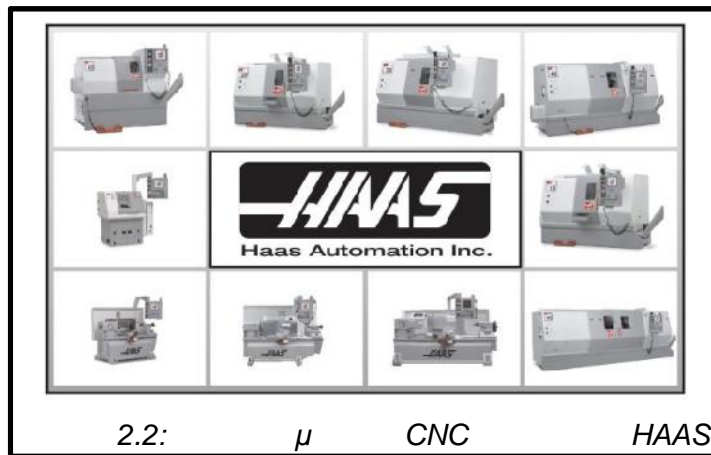
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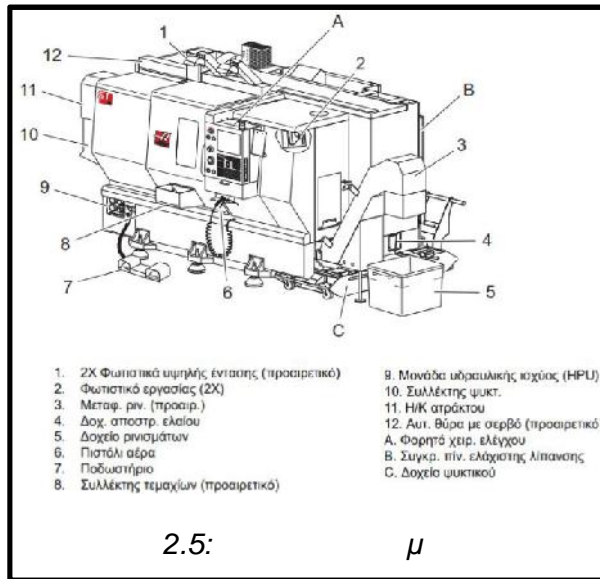
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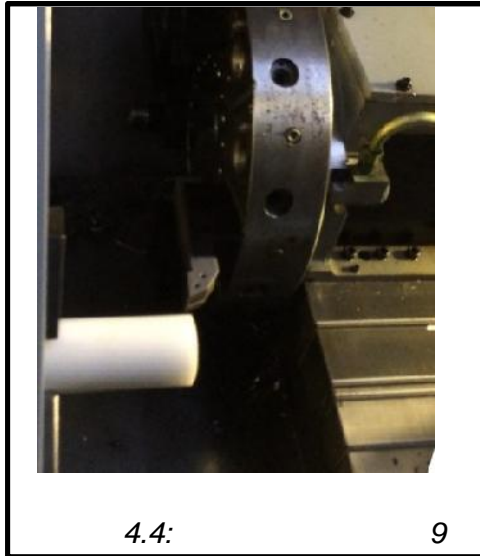
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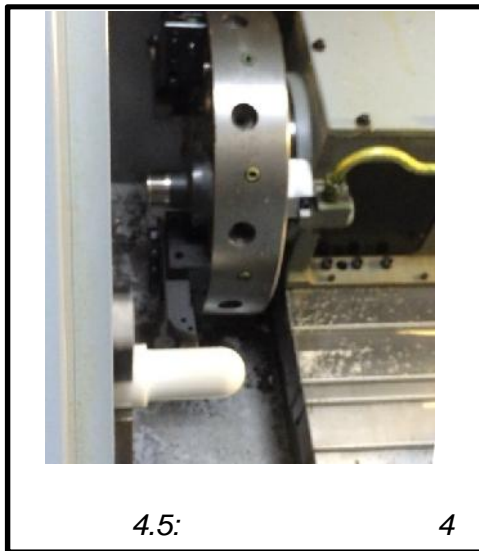




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Grades	Composition	Characteristics & Applications	Recommended Cutting Conditions: V _{min} , f _{min} , t _{min} /rev								
			Grey cast iron (HB180-220)	Ductile cast iron (HB200-240)	Chilled cast iron (HB400-700)	H.S.S. Roll	Sintered metal	Hardened steel (HRC48-55)	Aluminum Alloy	Ni-Based super alloy	
KP300 PCD	PCD + Binder	<ul style="list-style-type: none"> For general use on aluminum alloy Excellent combination of wear resistance and toughness 								600-3000 0.05-0.3	
TB610 CBN	CBN + Binder	<ul style="list-style-type: none"> Excellent wear resistant grade with low CBN content Continuous cutting at high cutting speeds on hardened steels 								100-250 0.05-0.2	
TB650 CBN	CBN + Binder	<ul style="list-style-type: none"> High wear resistant grade with moderate fracture toughness Can be applied to light interrupted cutting applications 			80-150 0.1-0.2	50-100 0.2-0.6	100-300 0.05-0.2		80-200 0.05-0.2		
TB670 CBN	CBN + Binder	<ul style="list-style-type: none"> Excellent combination of wear resistance and toughness For general use on hardened steel For continuous and interrupted cutting 			80-150 0.1-0.25	30-80 0.2-0.6	100-300 0.1-0.3		80-180 0.1-0.3		
TB730 CBN	CBN + Binder	<ul style="list-style-type: none"> Excellent toughness with high CBN content For high speed machining of cast iron Can be applied to interrupted cutting on hardened steel and other materials 	500-1000 0.1-0.3	300-800 0.1-0.3	80-150 0.1-0.3			80-250 0.1-0.25	60-150 0.1-0.3		
KB90A CBN	CBN + Binder	<ul style="list-style-type: none"> Solid CBN with excellent impact resistance For high speed machining of cast iron Can be applied to rough to medium machining of hardened steel 	500-1000 0.1-0.3	300-700 0.1-0.3	80-150 0.1-0.3						
AW120 CERAMIC	Al ₂ O ₃ + ZrO ₂	<ul style="list-style-type: none"> Excellent wear resistant grade with chemical stability and temperature resistance For high speed continuous turning of cast iron For finishing applications on hard materials 	400-1000 0.1-0.5	300-600 0.1-0.2							
AB2010 COATED CERAMIC	(Al ₂ O ₃ + TiCN) + TiN PVD Coating	<ul style="list-style-type: none"> Excellent wear resistance and tool life Very good combination with improved wear and fracture resistance Finishing operations on hardened steels and hardened cast irons 			50-200 0.05-0.2				80-300 0.05-0.2		
AB20 CERAMIC	Al ₂ O ₃ + TiCN	<ul style="list-style-type: none"> High wear resistant grade with excellent cutting edge stability For high speed continuous turning of hardened steel and other hard materials For finishing applications on cast iron. 	300-800 0.1-0.3		50-200 0.05-0.2	50-100 0.2-0.5			50-250 0.05-0.2		
AB30 CERAMIC	Al ₂ O ₃ + TiC	<ul style="list-style-type: none"> Mixed ceramic with good toughness and wear resistance For general use on hardened steel, cast iron and hard materials Can be applied to interrupted cutting conditions 	300-800 0.1-0.5	250-500 0.1-0.3	50-150 0.05-0.2	50-80 0.2-0.5			50-200 0.1-0.25		
TC430 CERAMIC	Whisker	<ul style="list-style-type: none"> SiC whisker reinforced ceramic grade General turning and milling For Ni-base superalloy, inconel, waspaloy and rene 				50-100 0.2-0.7				150-400 0.1-0.3	
AS500 CERAMIC	SiAlON	<ul style="list-style-type: none"> For roughing to finishing cast iron applications For higher cutting speeds compared to AS10 Wet and dry cutting 	400-1000 0.2-0.6	200-600 0.1-0.5		20-60 0.2-0.7					
SC10 COATED CERAMIC	AS10 + CVD	<ul style="list-style-type: none"> Wear resistant grade with excellent toughness and thermal shock resistance For high speed turning of cast iron Wet and dry cutting 	300-1000 0.2-0.8	250-600 0.2-0.6							
AS10 CERAMIC	SiAlN	<ul style="list-style-type: none"> High wear resistant grade with excellent toughness and thermal shock resistance For general use on cast iron Wet and dry cutting 	400-800 0.2-0.8	200-500 0.2-0.6							
AS20 CERAMIC	SiAlN	<ul style="list-style-type: none"> Very tough SiAlN ceramic grade with high cutting edge stability For roughing to finishing applications with high temperature nickel based alloys Wet and dry cutting 								100-300 0.1-0.3	

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V=500m/min

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S=2.610 rpm

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V=300m/min

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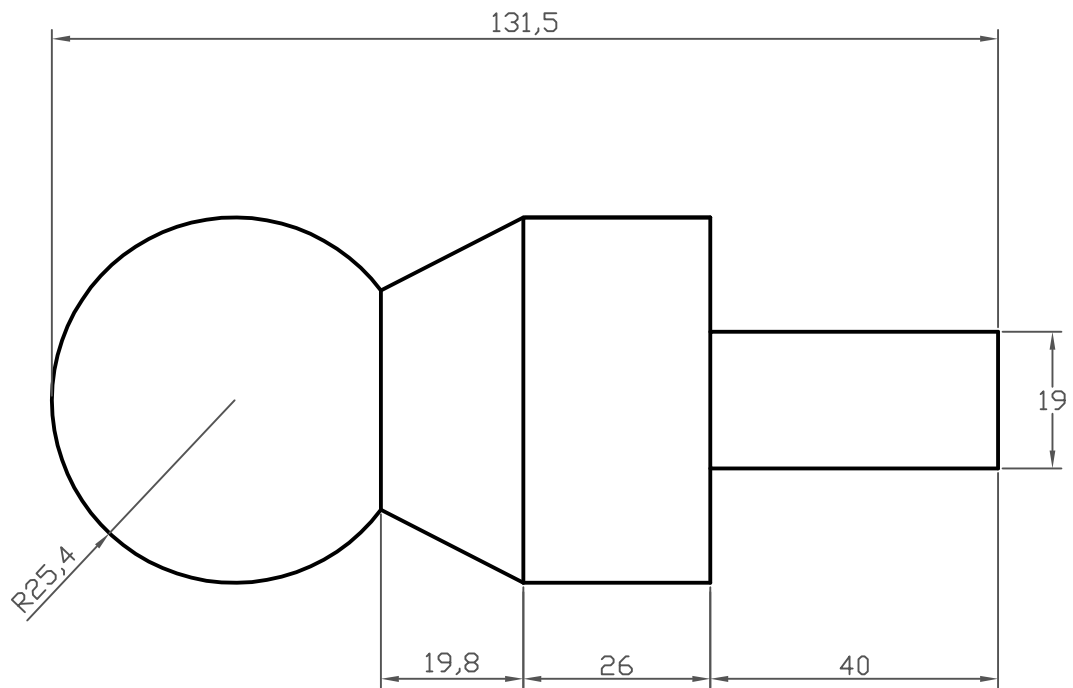
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G00 Z0.;

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G03 X-10.23 Z-25.4 R25.4;

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x,z(-10.23,-25.4) μ

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G00 X0. Z50.;

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x,z(0,50))

T4; (4)

G42 X0. Z0.; (μ μ)

G00 Z-64.; (μ μ z(-64))

G01 X-20.8 Z-44. F0.15; (μμ μ μ
x,z(-20,8,-44) μ 0,15mm/rev)

G02 X0. Z-25.4 R25.4; (μ μ
x,z(0,-25.4) μ μ r 25,4mm)

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G99 S1000 M03; (- 1000rpm-

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T9; (9)

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G00 X0. Z0.; (μ μ x,z(0,0))

G00 X-10.23; (μ μ x(-10.23))

G01 Z-50. F0.1; (μμ μ μ z(-50)
μ 0,1mm/rev)

G00 X0. Z0.; (μ μ x,z(0,0))

G00 X-20.23; (μ μ x(20.23))

G01 Z-50. F0.1; (μμ μ μ z(-50)
μ 0,1mm/rev)

G00 X0. Z0.; (μ μ x,z(0,0))

G00 X-30.23; (μ μ x(30.23))

G01 Z-50. F0.1; (μμ μ μ z(-50)
μ 0,1mm/rev)

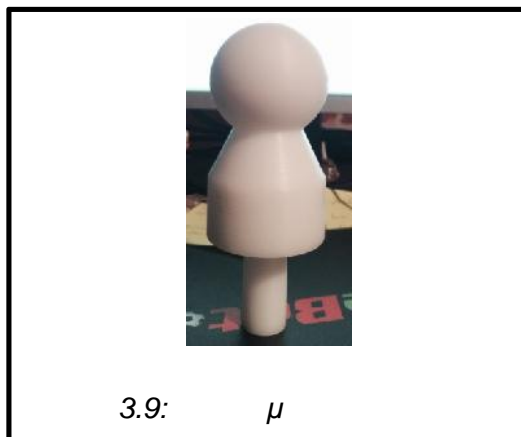
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G00 X0. Z0.;           ( μ μ x,z(0,0))
G00 X-42.;             ( μ μ x(-42))
G01 Z-50.5 F0.1;      ( μμ μ μ z(-50.5)
                       μ 0,1mm/rev)
G01 X0.;               ( μμ μ μ x(0))
G00 X0. Z0.;           ( μ μ x,z(0,0))
G01 Z-15. F0.15;      ( μμ μ μ z(-15)
                       μ 0,15mm/rev)
G01 X-61.03;           ( μμ μ μ
                       X(-61.03))
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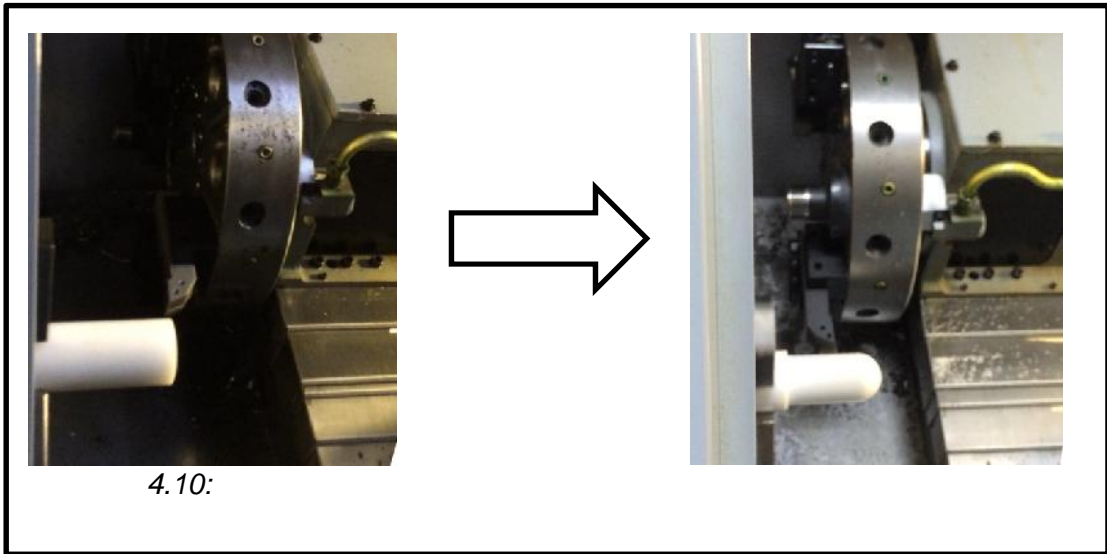
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- www.secotools.com
- <http://www.takayama-shoji.co.jp/>
- <http://int.haascnc.com/>
- <http://www.taegutec.com/>