

Welcome to



Fagor Automation S. Coop.

**the workshop on the
CNC 8055 MC**



This manual is part of the course for the **FAGOR CNC 8055MC**
which you can book at the company
FAGOR AUTOMATION.

It includes examples and explanations additional to
FAGOR documentation for this CNC system.

We also refer to these manuals
and to the additional manuals of the machine builder.

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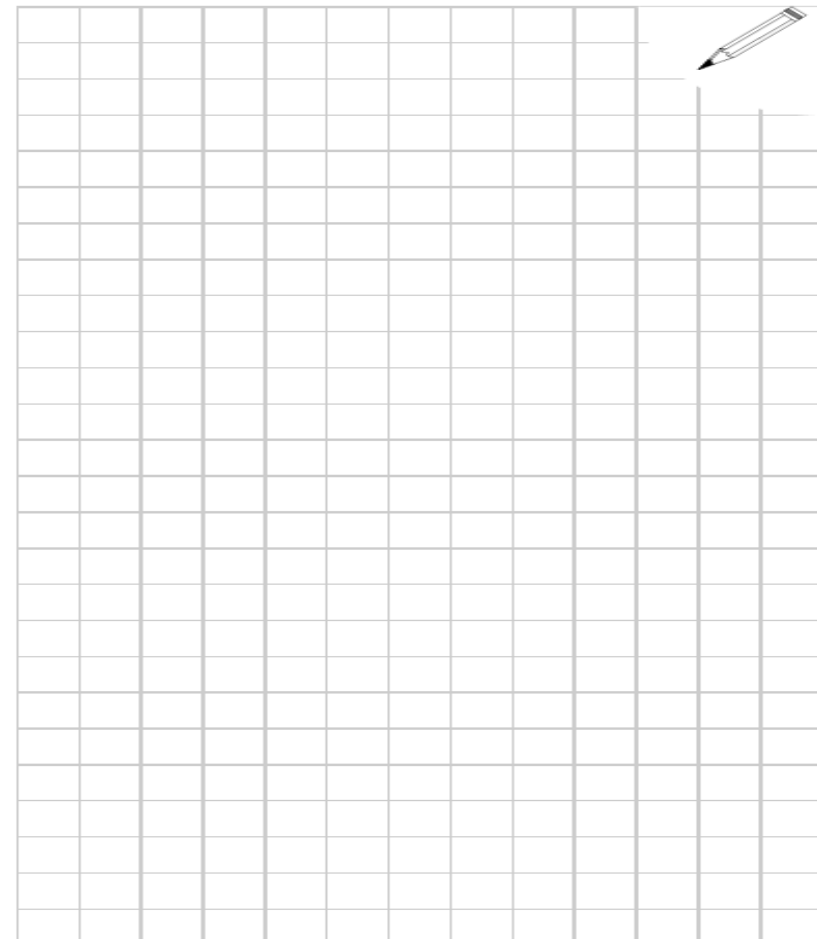
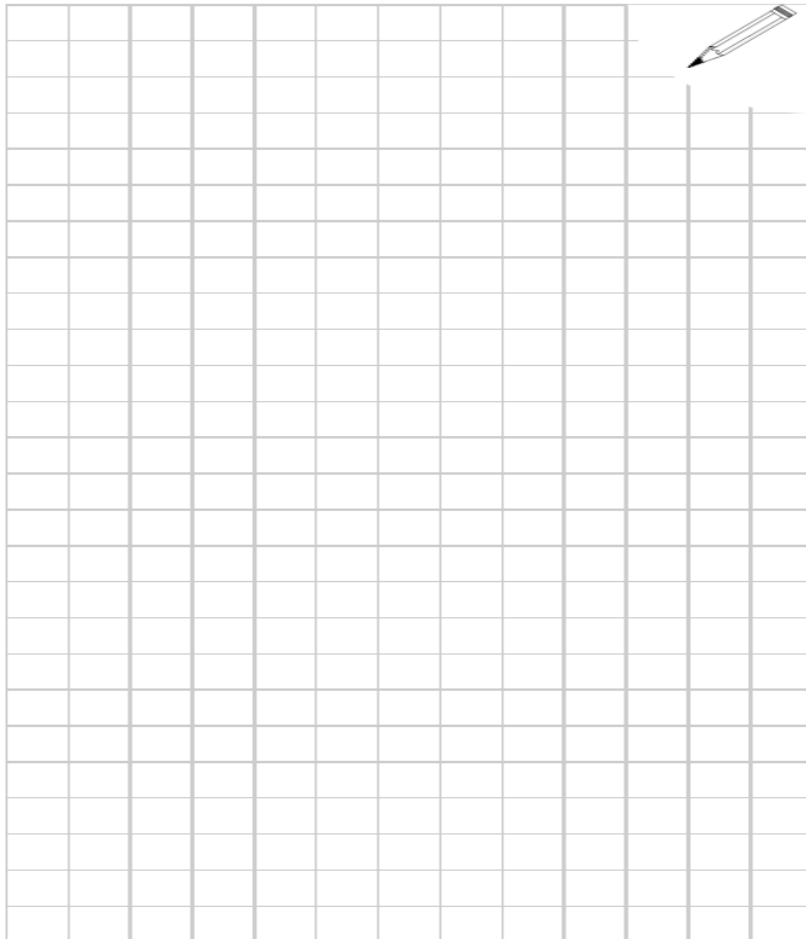
The content of this manual and its validity for the product described here has been verified. Even so, involuntary errors are possible, thus no absolute match is guaranteed. Anyway, the contents of the manual is periodically checked making and including the necessary corrections in a future edition.

The examples described in this manual are for learning purposes. Before using them in industrial applications, they must be properly adapted making sure that the safety regulations are fully met.

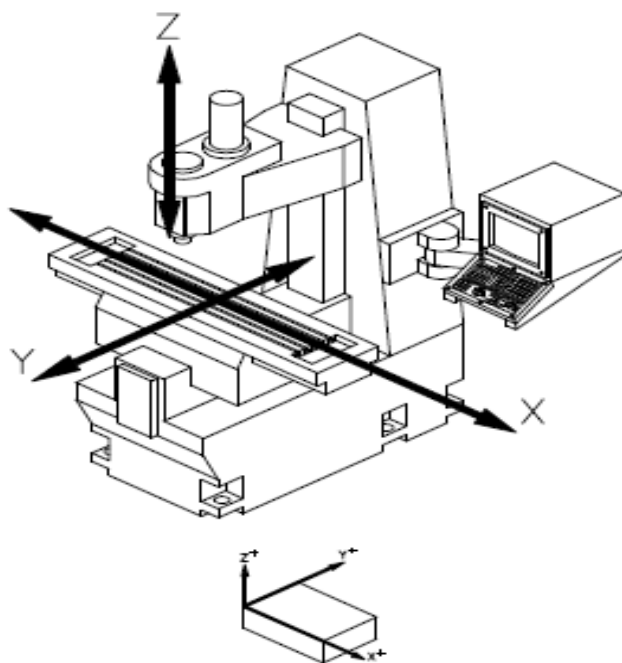
Overview seminar contents:

- **Theory on milling machines**
 - Defining the axes
 - Spindle
 - Axis feed rate
 - Tool changer
- **Zero points**
 - Home position
 - Machine reference zero
 - Part zero
- **Machine power up**
- **Operating panel CNC8055**
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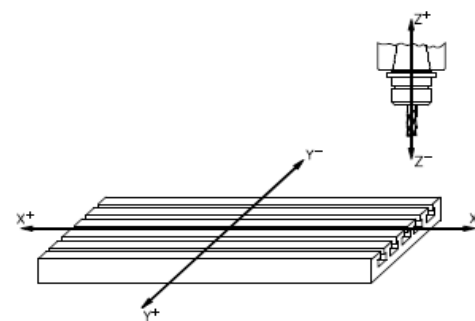
Notes



Milling machines – Definition of axes and coordinate systems

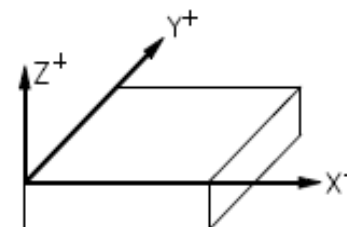


Typical 3-axis machine



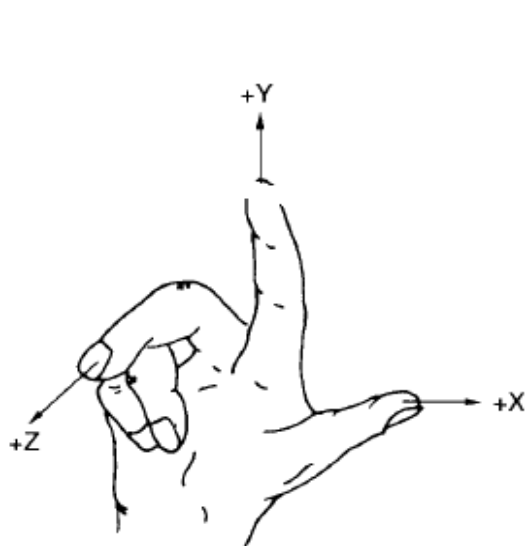
Basically , both the table and the tools can be moved.

Definition when programming:
the tool is moved !!

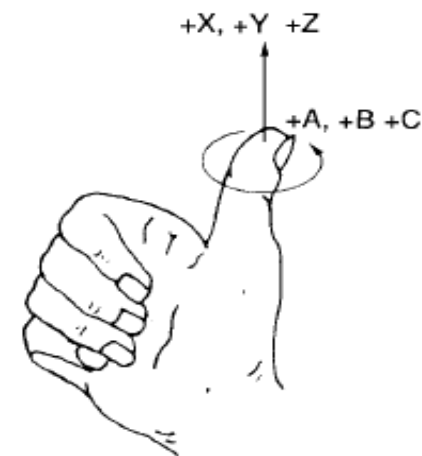
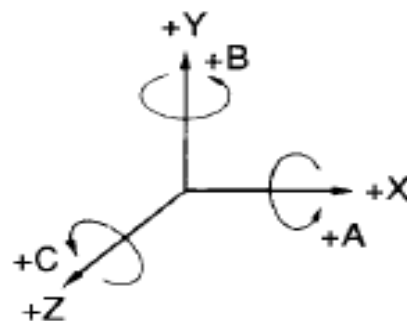


Orientation of the machine axes

The orientation of the axes depends on the type of machine.
"right hand rule"

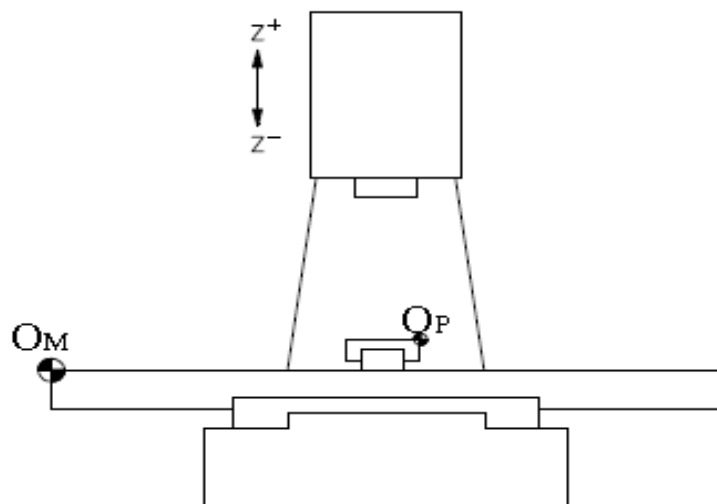


Linear axis orientation



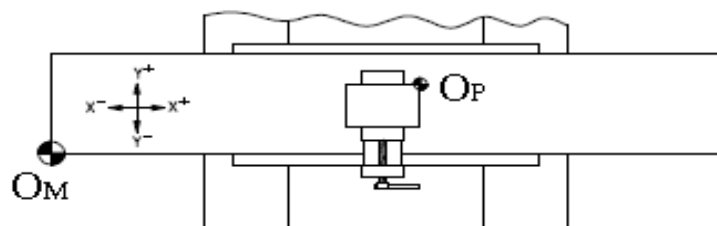
Rotary axis orientation

Machine zero and part zero



O_M – machine zero point

The machine builder defines the machine zero for all axes. This is the reference for all dimensions at the machine.

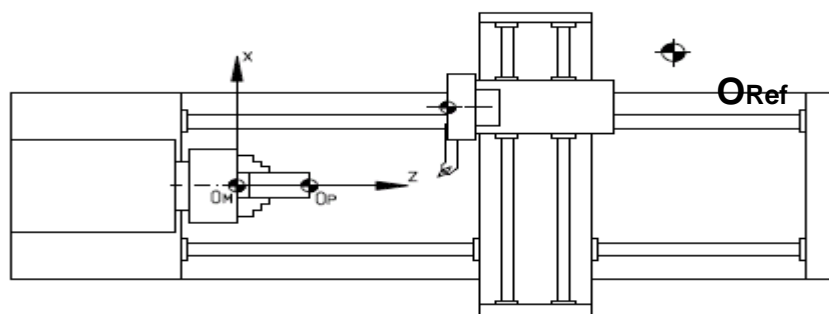


O_P – part zero point

The CNC sets the part zero. This can be anywhere on the part. He will normally use a point that relates to the blueprint.

Axis feedback

Each axis of the machine is equipped with a feedback system, so that the CNC can control the position and the speed of the axis.



The machine can be equipped with different feedback systems. The feedback systems of each axis must be homed after power-up ("HOME" key).

Incremental feedback system:

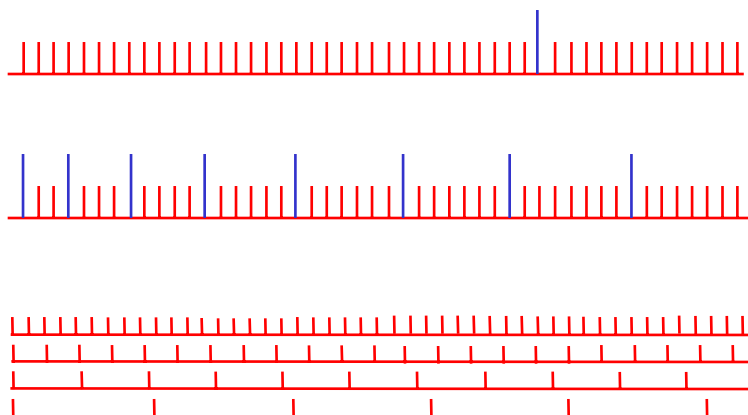
To initialize (home) the feedback system, the axis has to move over the reference point **0Ref**

Distance-coded feedback system:

The axis only has to move over two reference marks to find the initial reference position.

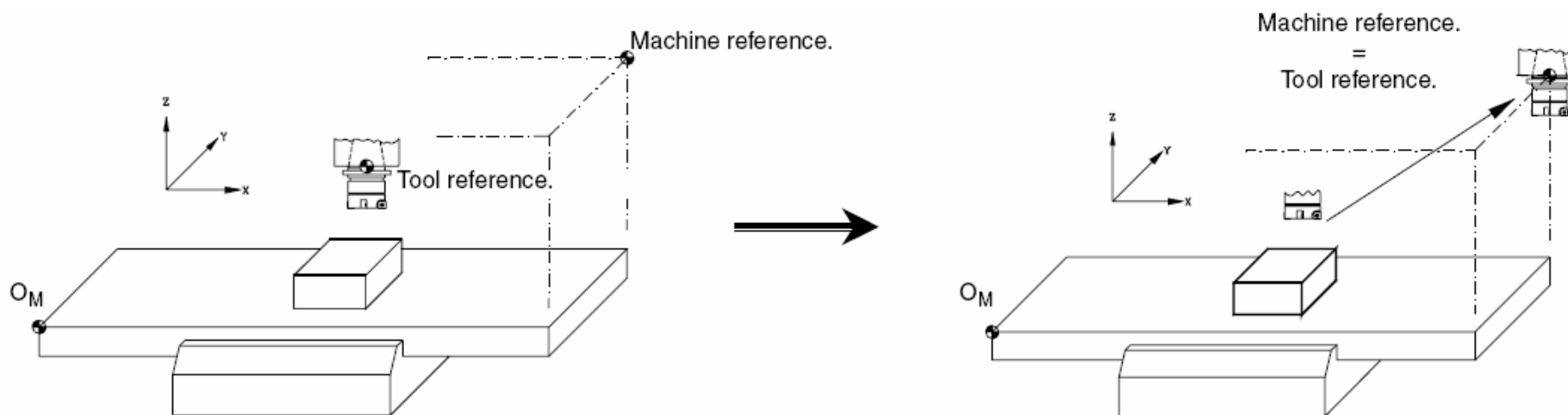
Absolute measuring system:

Multi-channel measuring system that indicates the exact position directly. No home search needed.



Home position

All axes that are not equipped with absolute feedback systems must be homed on power-up. For this, the axes are moved to a special point at the machine that the machine builder has defined as home position **ORef**. After this the CNC knows the exact position of the axis and can calculate the machine zero point **OM**. Then, the operator can define a part zero point **OP**.



Check on your machine how the homing will be carried out!!.

Milling machines – feedrate of the axes

The axis feedrate is defined by the manufacturer.

Each axis has its own rapid feedrate and maximum machining feedrate

Feedrate setting:

- mm/minute Axis feedrate is independent from the spindle speed.
(ISO code: G94)
- mm/rev Axis feedrate varies depending on the spindle speed.
(ISO code: G95)

The start-up condition is defined by the machine builder

Normally, milling machines start up in mm/minute

Feedrate is programmed with Fxxx.xx

Milling machines - main spindle

Depending on the requirements, the main spindle can have different configurations.

Main functions:

Open loop control – simplest variant

The CNC cannot react to spindle rpm changes because it does not have an encoder (no feedback)

Closed loop control – the most often used variant

The spindle motor is equipped with an encoder. The CNC can control the speed and the position of the spindle. This function is needed for spindle positioning and also for tapping.

Closed loop control with C axis functions

The spindle motor is equipped with a high resolution encoder and a high resolution servo drive. This allows exact control of the spindle position. In this case the spindle may be controlled like an axis. It is possible to interpolate the C axis with the X and Z axes.

Milling machines – tool changer

Machines may be equipped with a wide range of tool holders or tool changers.

Fagor CNC's can handle a lot of tool changers. The machine builder implements the right functionalities at the CNC and the PLC programs.

Manual tool changer:

The operator changes the tool manually like on a conventional machine.

Automatic tool changer:

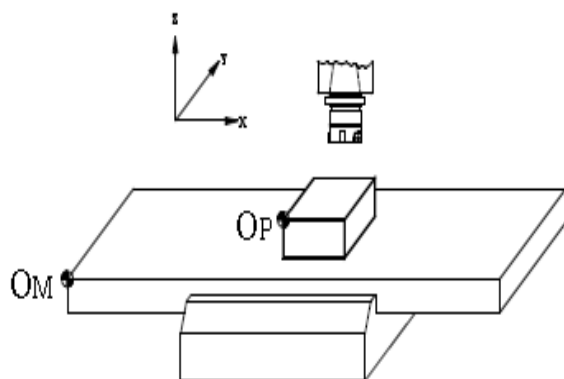
The tool is changed automatically.

Home position and machine zero

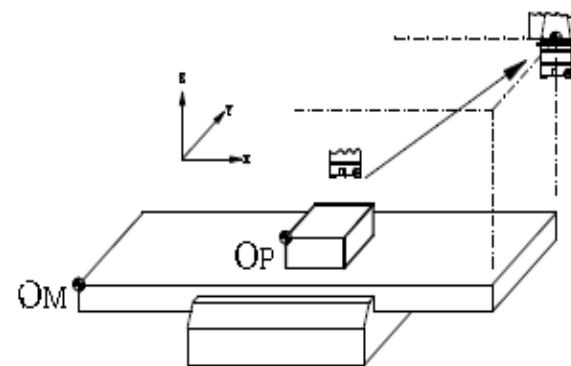
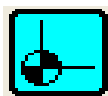
The feedback systems must be homed right after power-up.

There are two ways to do it.

1. Automatic home search



The position of the axes may be unknown on power-up



All axes move to the home position depending on a special subroutine defined by the machine builder.

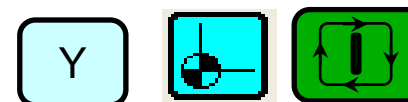
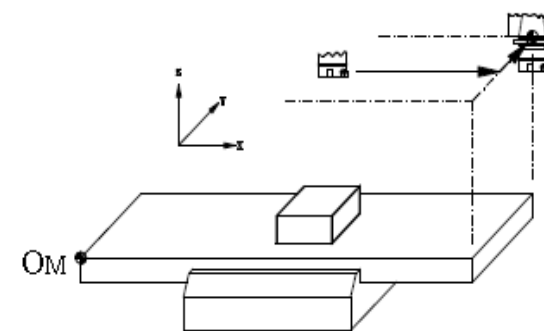
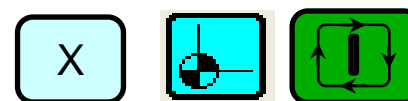
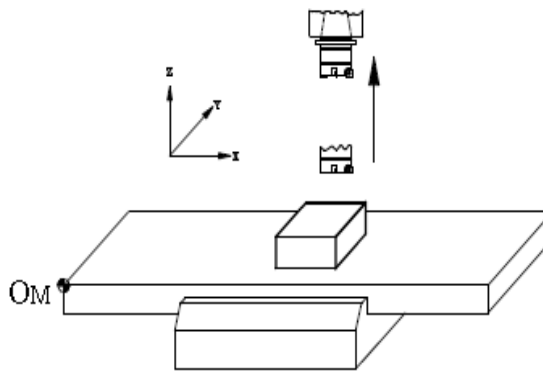
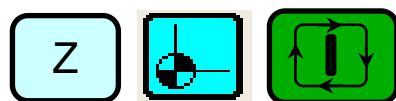
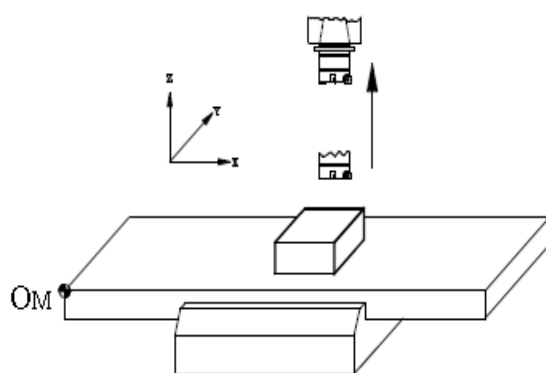


In this mode the CNC restores a part zero or zero offset that is active at the time.

Home position and machine zero

2. Manual home search

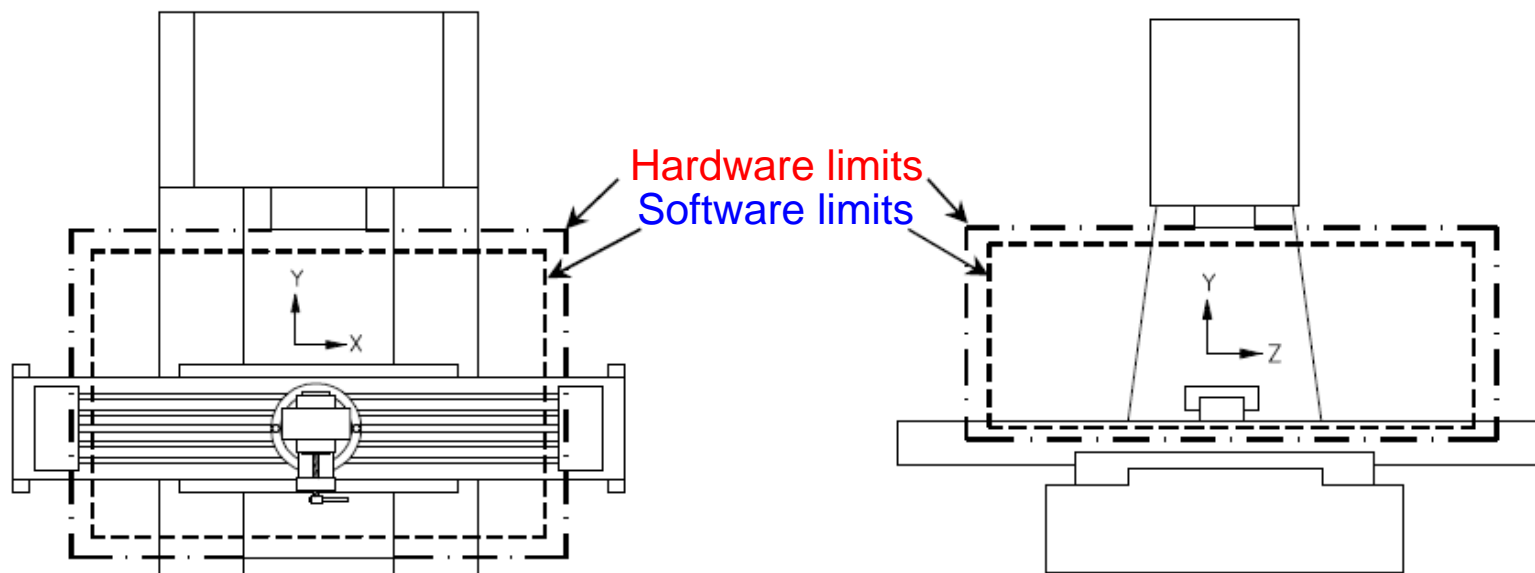
Homing is done axis per axis controlled by the machine operator.



In this mode, the CNC resets any active part zero or zero offset.

Travel limits

There are two types of travel limits to save the machine from collisions



Hardware limits: Electrical switches installed at the ends of the way to stop the table before mechanical collision.

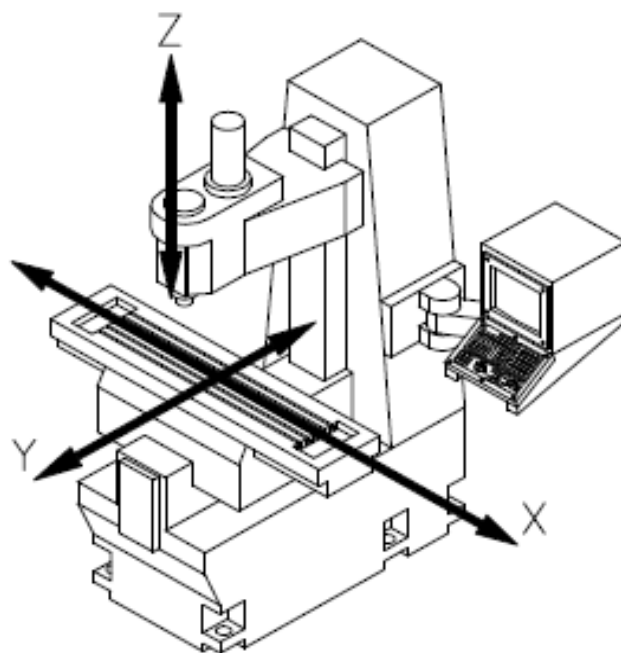
Software limits: CNC parameters, set by the manufacturer to prevent the table from running into the machine's hardware travel limits.
Soft limits are active after homing.

Machine power up

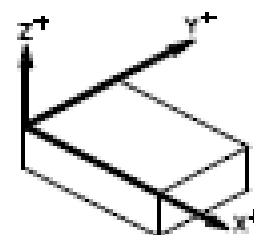
Power-up, maintenance and use of the machine must be done following the instructions of the machine builder.

Programs and examples of this course have to be carefully checked before using them on a real machine.

Coordinate system
of a 3-axis machine

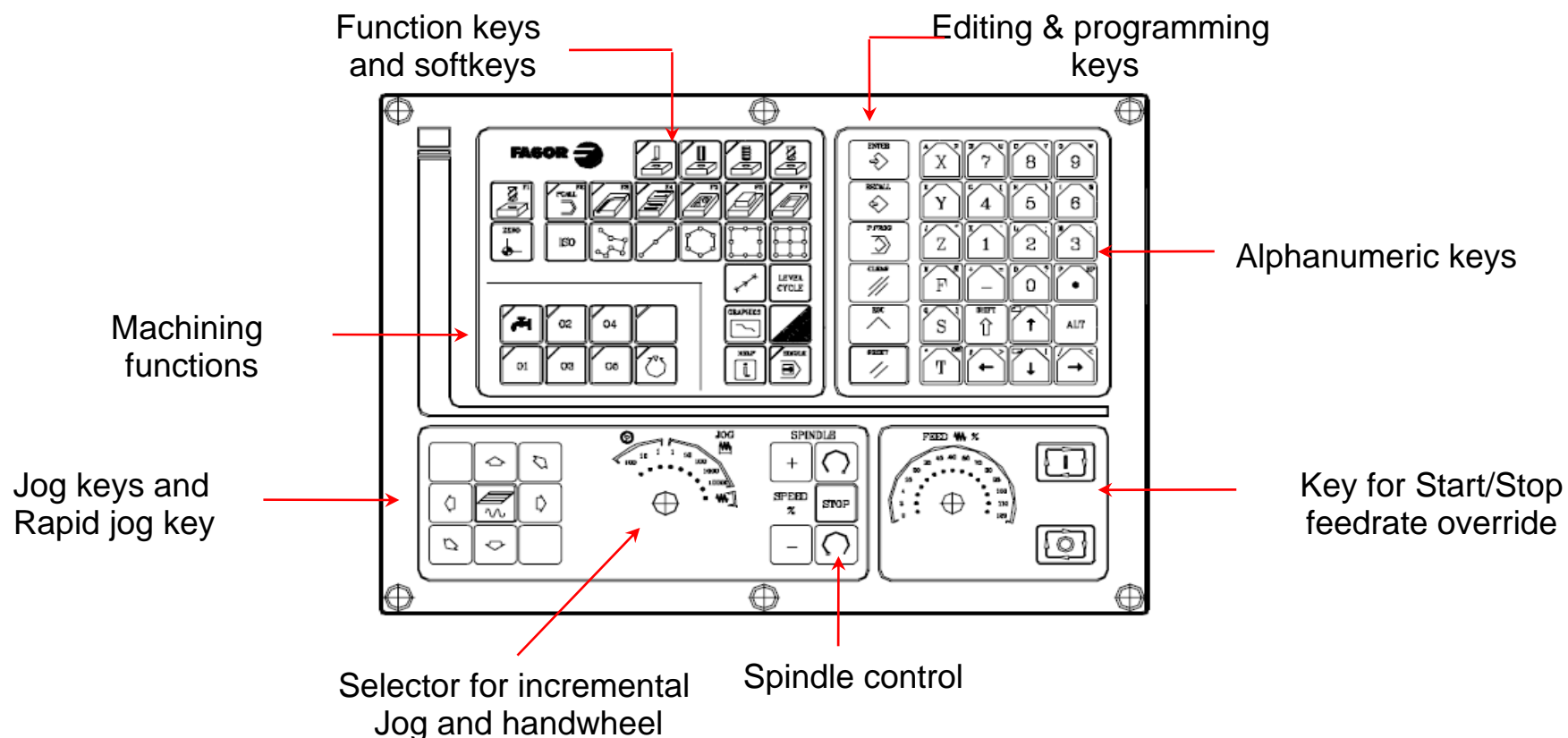


Part coordinates system



Operator panel 8055 MC

The CNC can be equipped with different operator panels.
In the course we use a panel with an "11" TFT monitor



HUMAN MACHINE INTERFACE - HMI

Two HMI's have been implemented in the CNC 8055MC

- **Basic HMI: M**

Offers full functionality to control complex milling machines and machining centers.

Maintenance, CNC programs, PLC program, parameters, servos, diagnosis and communication lines.

- **Conversational HMI: MC**

full functionality of the M HMI

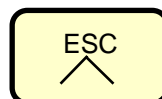


Intuitive operation and programming of milling machines.

Conventional operation of the machine.

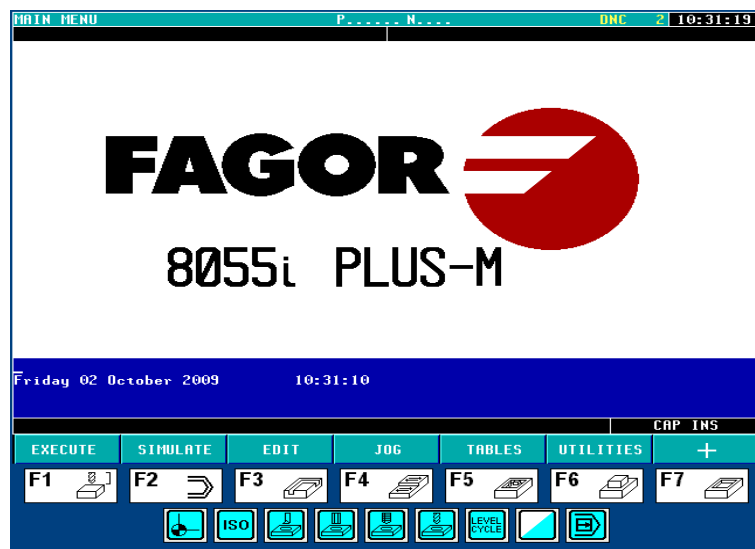
Programming with cycles without ISO knowledge.

To toggle between the HMI's press the keys

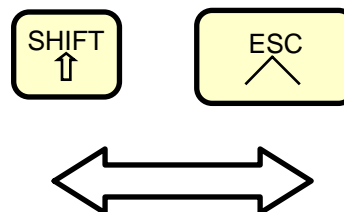


Displays of the M and MC type HMI's

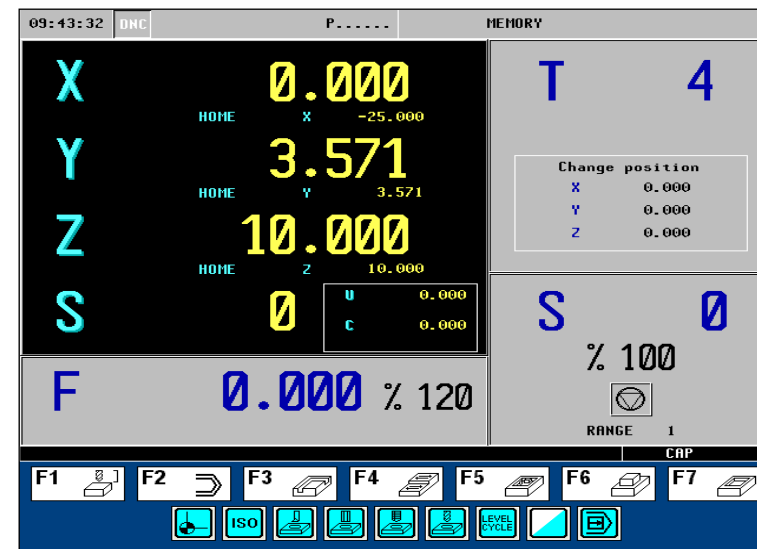
Basic system M



toggle



MC conversational mode

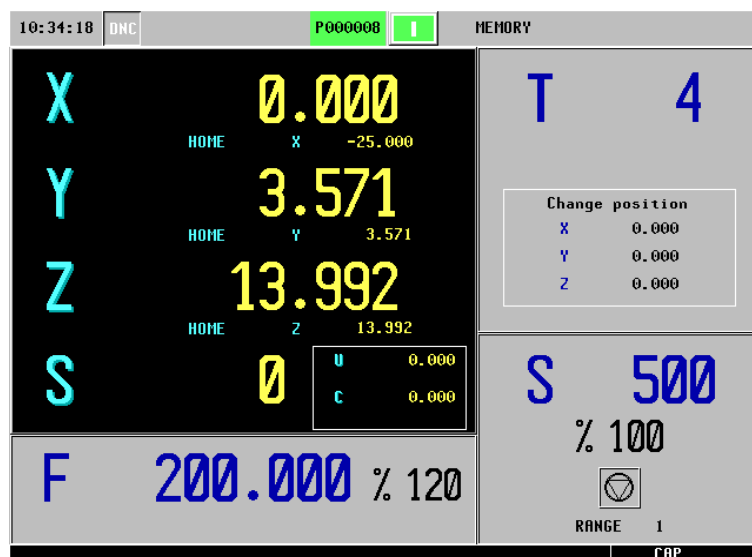


Screens of the MC mode

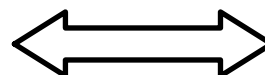
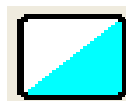
The TC mode shows two screens for displaying information

- Auxiliary screen
- Standard screen

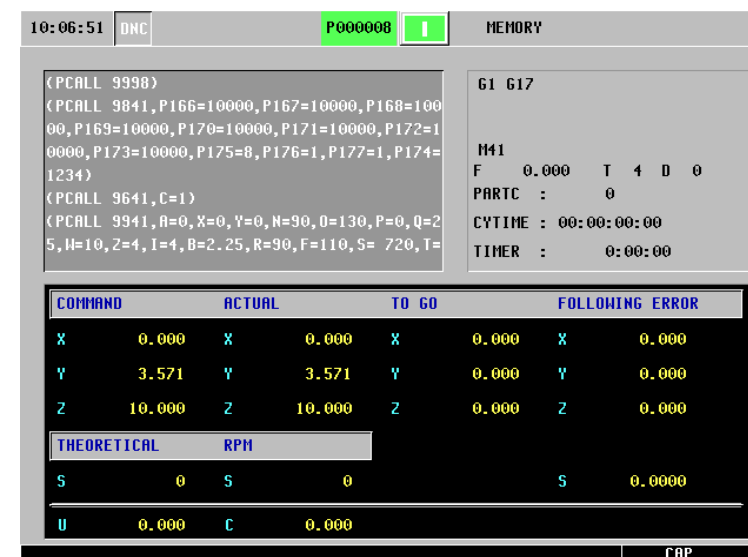
Standard screen



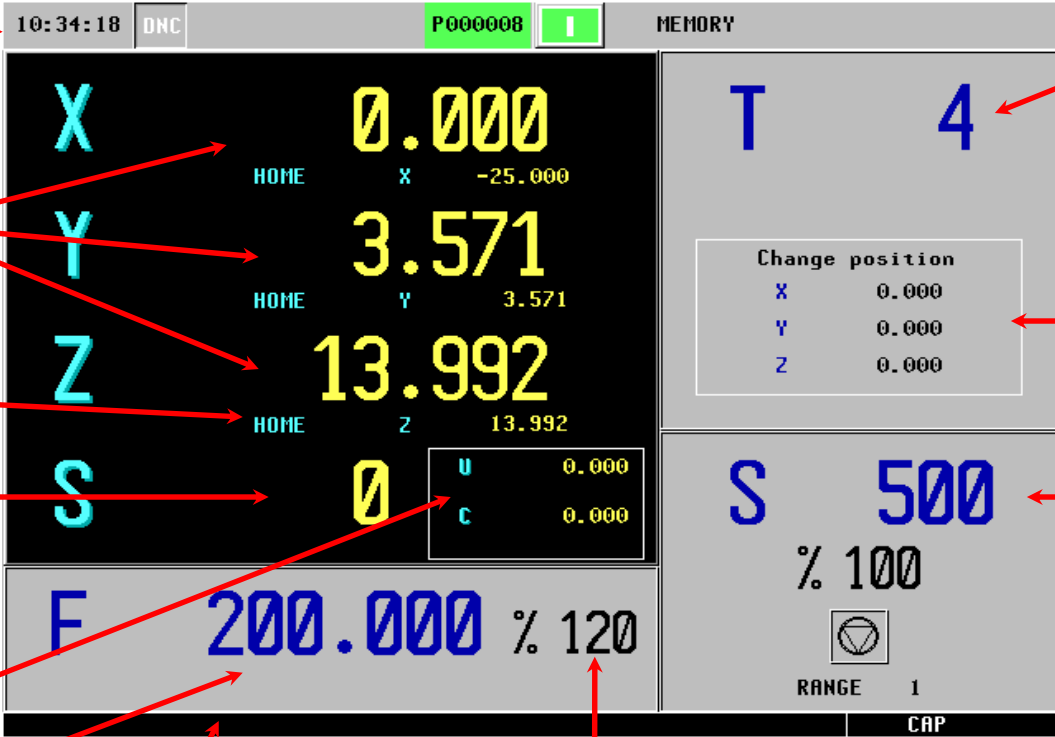
toggle



Auxiliary screen



Display: MC standard



The screenshot shows the standard MC display interface with the following elements and annotations:

- Status line:** 10:34:18 | DNC | P000008 | T | MEMORY
- Current axis position:**
 - X:** 0.000 (HOME X -25.000)
 - Y:** 3.571 (HOME Y 3.571)
 - Z:** 13.992 (HOME Z 13.992)
- Home position:** Indicated by 'HOME' labels next to the axis positions.
- Current spindle speed:** S 0 (U 0.000, C 0.000)
- Example of rotary axis and auxiliary axis:** F 200.000 % 120
- Current feedrate:** F 200.000
- info and messages:** % 120
- Feedrate override:** % 120
- Active tool:** T 4
- Tool change position:** Change position (X 0.000, Y 0.000, Z 0.000)
- Spindle parameters:**
 - Theoretical speed:** S 500
 - Turning direction:** % 100
 - Speed override:** % 100
 - Active gear:** RANGE 1

Display: auxiliary TC mode

Status line

Information on
current program

detailed axis
information

Spindle
information

10:06:51
DNC
P000008
I
MEMORY

```

(PCALL 9998)
(PCALL 9841,P166=10000,P167=10000,P168=100
00,P169=10000,P170=10000,P171=10000,P172=1
0000,P173=10000,P175=8,P176=1,P177=1,P174=
1234)
(PCALL 9641,C=1)
(PCALL 9941,A=0,X=0,Y=0,N=90,O=130,P=0,Q=2
5,W=10,Z=4,I=4,B=2.25,R=90,F=110,S= 720,T=
                    
```

G1 G17

M41

F 0.000 T 4 D 0

PARTC : 0

CYTIME : 00:00:00:00

TIMER : 0:00:00

COMMAND		ACTUAL		TO GO		FOLLOWING ERROR	
X	0.000	X	0.000	X	0.000	X	0.000
Y	3.571	Y	3.571	Y	0.000	Y	0.000
Z	10.000	Z	10.000	Z	0.000	Z	0.000
THEORETICAL		RPM					
S	0	S	0	S 0.0000			
U	0.000	C	0.000				

CAP

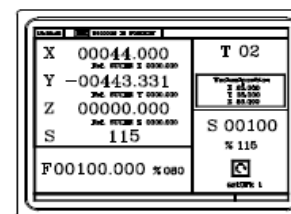
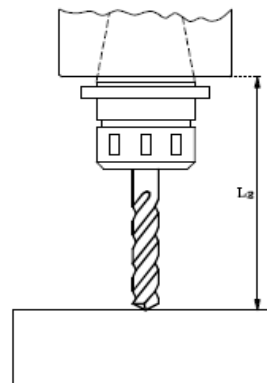
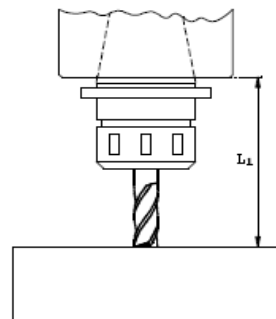
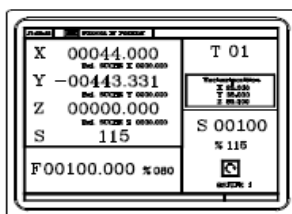
Active
G, M functions
Feedrate
Tool and offset

Counter and timer
functions

info and messages

Tool calibration

- Mainly the CNC program describes the profile of the part.
- The result must be the same regardless of the tool selected by the operator.
- For this reason, the CNC has to know the dimensions of the tool
- The operator has to calibrate the tools.
- The results of the calibration are stored in the tool offset table.



Different tools touch the part at the same point
Premise: all tools are exactly calibrated

Tool Offset table

The CNC can handle up to 255 tool offsets in the tool offset table.

Each tool T is assigned a D offset, by default with the same number.
Every D offset can be assigned to each tool T by CNC program.

TOOL OFFSET TABLE				P..... N....		DNC 2		10:33:50	
OFFSET		RADIUS		LENGTH		RADIUS WEAR		LENGTH WEAR	
D001	R	20.0000	L	0.0000	I	0.0000	K	0.0000	
D002	R	12.5000	L	0.0000	I	0.0000	K	0.0000	
D003	R	5.0000	L	0.0000	I	0.0000	K	0.0000	
D004	R	0.0000	L	0.0000	I	0.0000	K	0.0000	
D005	R	4.0000	L	0.0000	I	0.0000	K	0.0000	

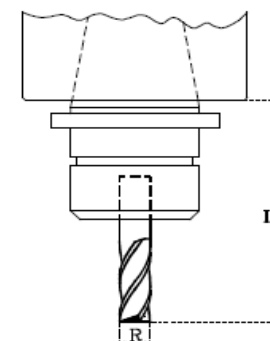
↑
tool offset D

↑
tool radius R

↑
tool length L

↑
radius offset L

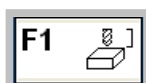
↑
length offset K



Tool calibration cycle

The CNC8055 MC makes it easy to calibrate tools directly on the machine

Call cycle with the F1 key



All axes must be homed

How does it work?

Touch a part with known dimension in Z.
Press the [Z] and [Enter] keys.



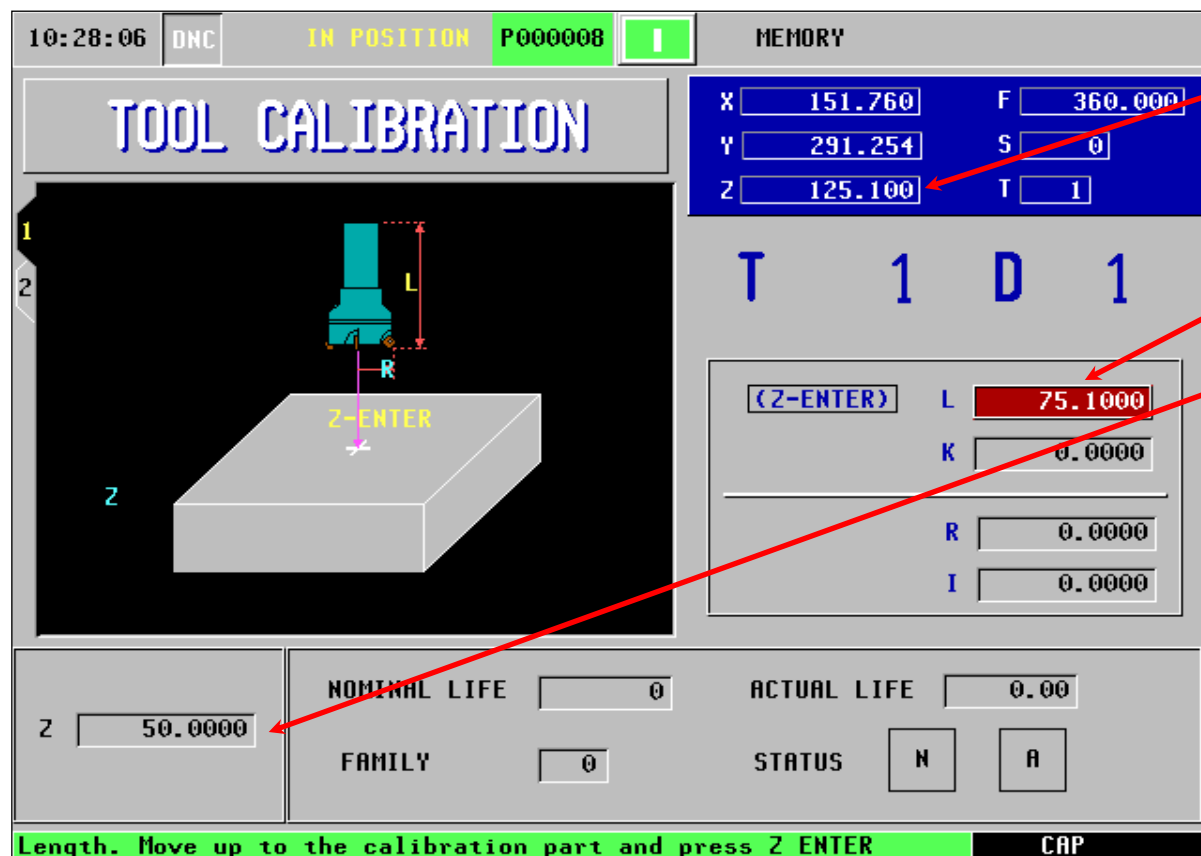
The CNC calculates the length of the tool and puts the value into the tool offset table.

Select the R field and insert the radius of the tool.

Select the other fields and insert the other values if necessary.

Tool calibration cycle

Example with tool T5



TOOL CALIBRATION

10:28:06 DNC IN POSITION P000008 I MEMORY

X 151.760 F 360.000
Y 291.254 S 0
Z 125.100 T 1

T 1 D 1

(Z-ENTER) L 75.1000
K 0.0000
R 0.0000
I 0.0000

NOMINAL LIFE 0 ACTUAL LIFE 0.00
FAMILY 0 STATUS N R

Z 50.0000

Length. Move up to the calibration part and press Z ENTER CAP

Tool holder reference point 125.1 mm

Tool length L 75.1 mm

75,1mm
Known part 50 mm

Z0

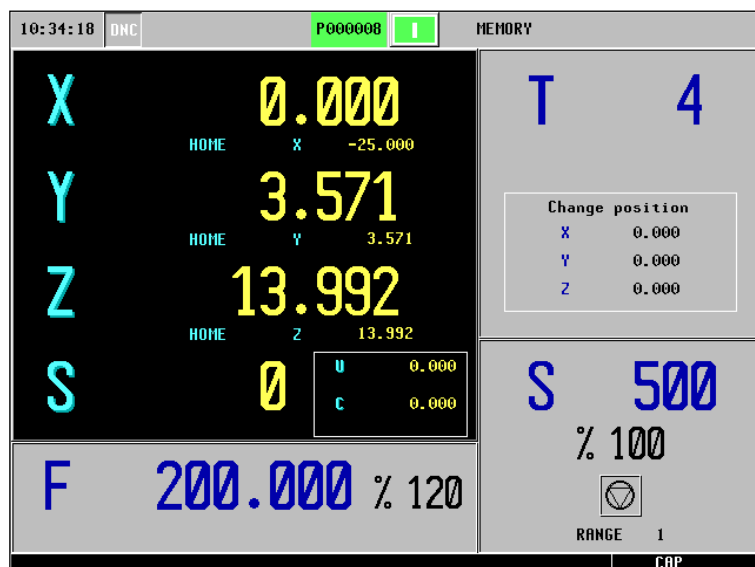
Touch known part 50mm.

Press the [Z] and [Enter] keys.
The CNC calculates tool length.

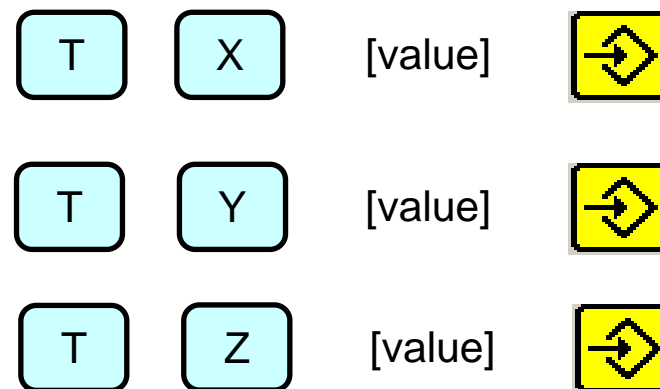
Insert Radius in field R.

Define tool change position

The machine builder defines the strategies of the tool change.
This feature allows tool change without collision with the part.
It depends on the machine builder.

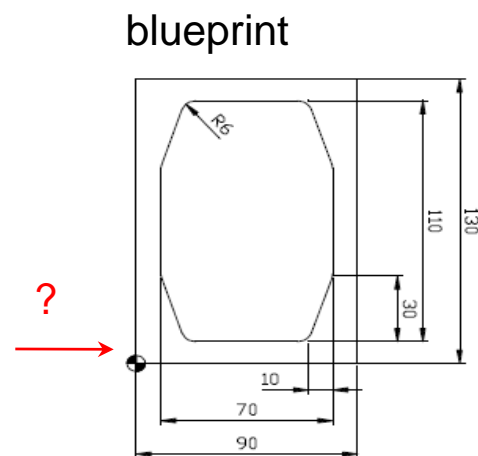


Tool change position

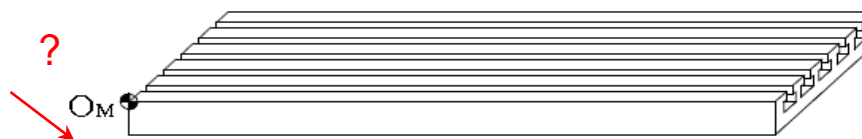


Define part zero

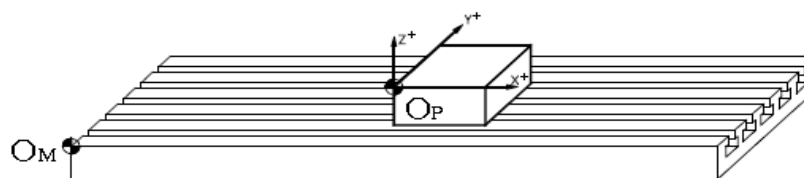
It means that the zero point of the blueprint and the zero point of the part are the same position.
It is easy to create a CNC program, because the values may be entered directly from the blueprint into the program.



machine with O_M



machine with part



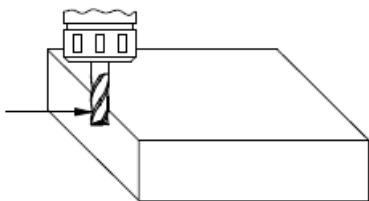
How can one connect the blueprint zero and the part zero?

Solution: preset the coordinates

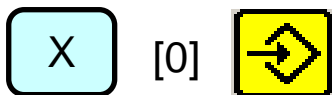
Setting part zero – different methods

Depending on how you use the machine you have different methods to set the part zero

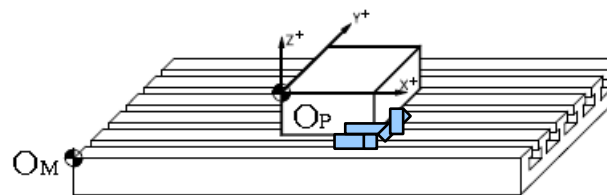
Single part production



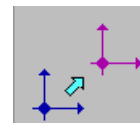
Set the part on the machine
Start the spindle
Touch the part with the tool
set part zero at this point



Series production

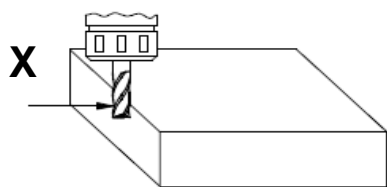


Install the part holder
Measure the fixture
write values in zero offset table
Call part zero in the program

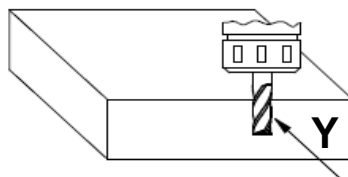


Define part zero through touching

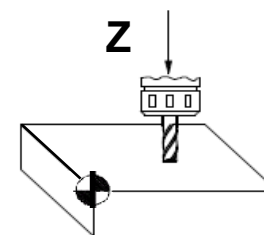
Touch the part in all 3 axes to set the zero points



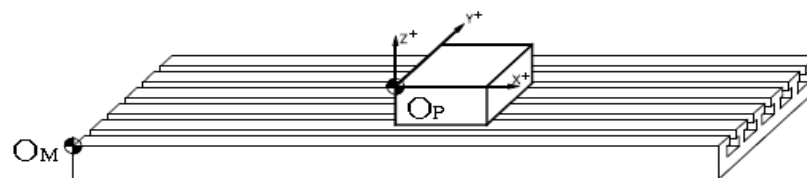
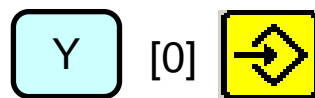
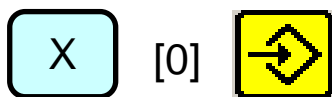
Touching on X



Touching on Y



Touching on Z



Now you have set the part zero on X0, Y0, Z0

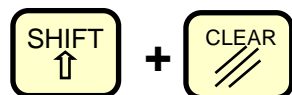
General description Normal keys and function keys



System start-up



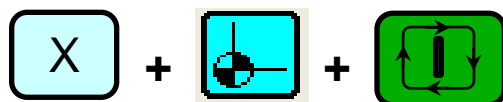
Toggle
MC < - > M mode



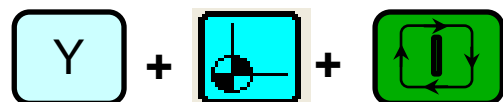
Screen saver



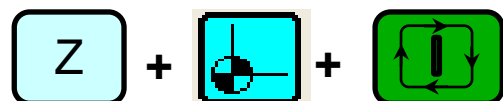
Homing all axes



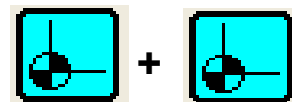
Home X axis



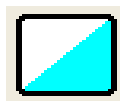
Homing axis Y



Home Z axis



Zero offset table



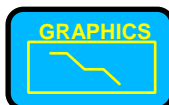
Change displayed symbols



Select cycle level



Program management



Simulation mode



Recall system data



Enter key

Cycles

Call the cycles with the function keys



Boring.



Reaming.



Tapping.



Drilling and center punching.



Profile milling.



Surface milling and slot milling.



Pocket with profile (2D and 3D).



Rectangular and circular boss.



Rectangular and circular pocket.



Positioning.

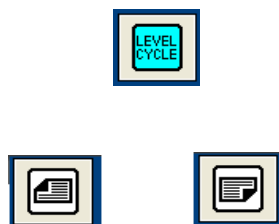
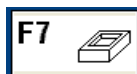


Call multiple execution of cycles

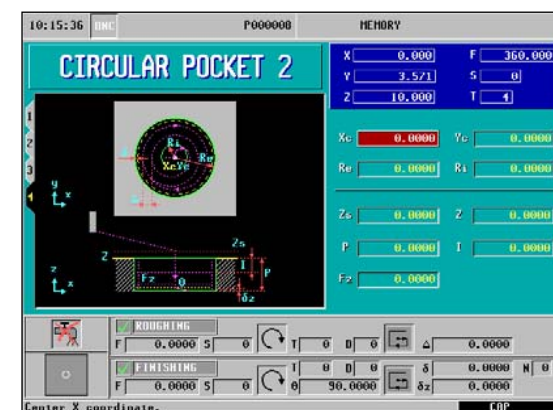
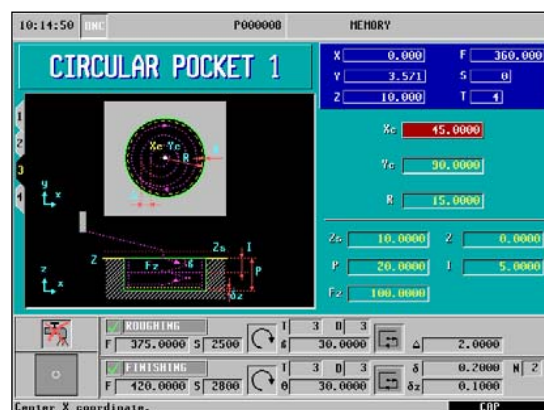
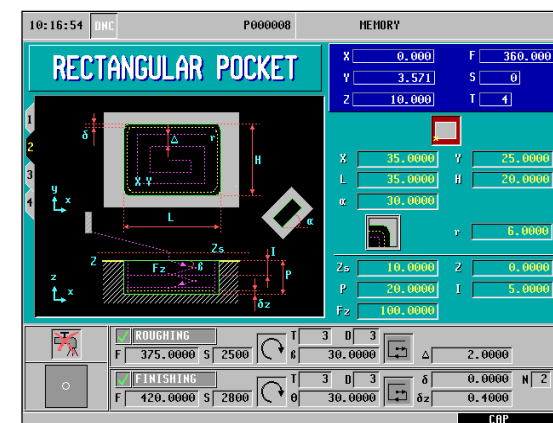
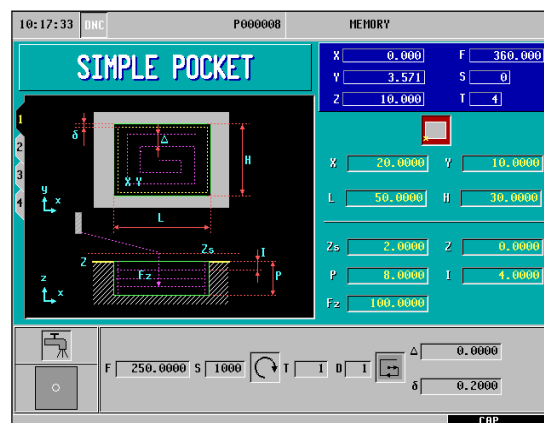
Cycles

Call the different cycles with function keys

Example pocket cycles



Select different
levels
with these keys



Basic functionality of the cycles

The screenshot displays the FAGOR CNC 8055 MC control interface for the 'BIDIR. MILLING ON X' cycle. The interface is divided into several sections:

- Status line:** Shows the time 07:34:56, the mode DNC, and the program name P.....
- Name of the active cycle:** BIDIR. MILLING ON X
- Active level:** Level 1 is active, with level 2 also visible.
- Drawing of the cycle function:** A 3D diagram showing the milling path on a workpiece. The path is defined by coordinates X1, Y1, Z, and L. The diagram also shows the tool tip, the workpiece, and the milling direction.
- Current CNC parameters:**
 - X: 0.000, Y: 3.571, Z: 13.992
 - F: 0.000, S: 0, T: 4
- Parameters of the cycle:**
 - X1: 0.0000, Y1: 0.0000
 - L: 90.0000, H: 130.0000
 - E: 25.0000, α : 0.0000
 - Zs: 10.0000, Z: 4.0000
 - P: 4.0000, I: 2.2500
 - Fz: 90.0000
- Spindle technical data:**
 - ROUGHING:** F 110.0000, S 720, T 1, D 1, Δ 15.0000
 - FINISHING:** F 150.0000, S 1000, T 1, D 1, Δ 10.0000, δz 0.2000
- Help text:** A button labeled CAP is located at the bottom right of the interface.

Basic functionality of the cycles

Function keys

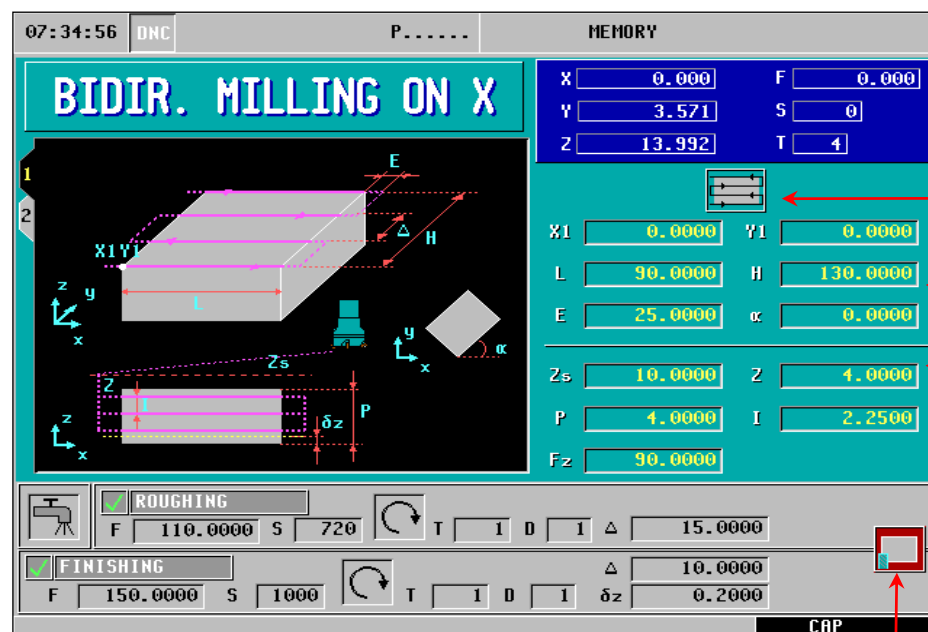
Select level
Back forth



Select
next level



Call cycle with function keys



Cursor
control



Select symbols



ENTER key



Restore CNC values



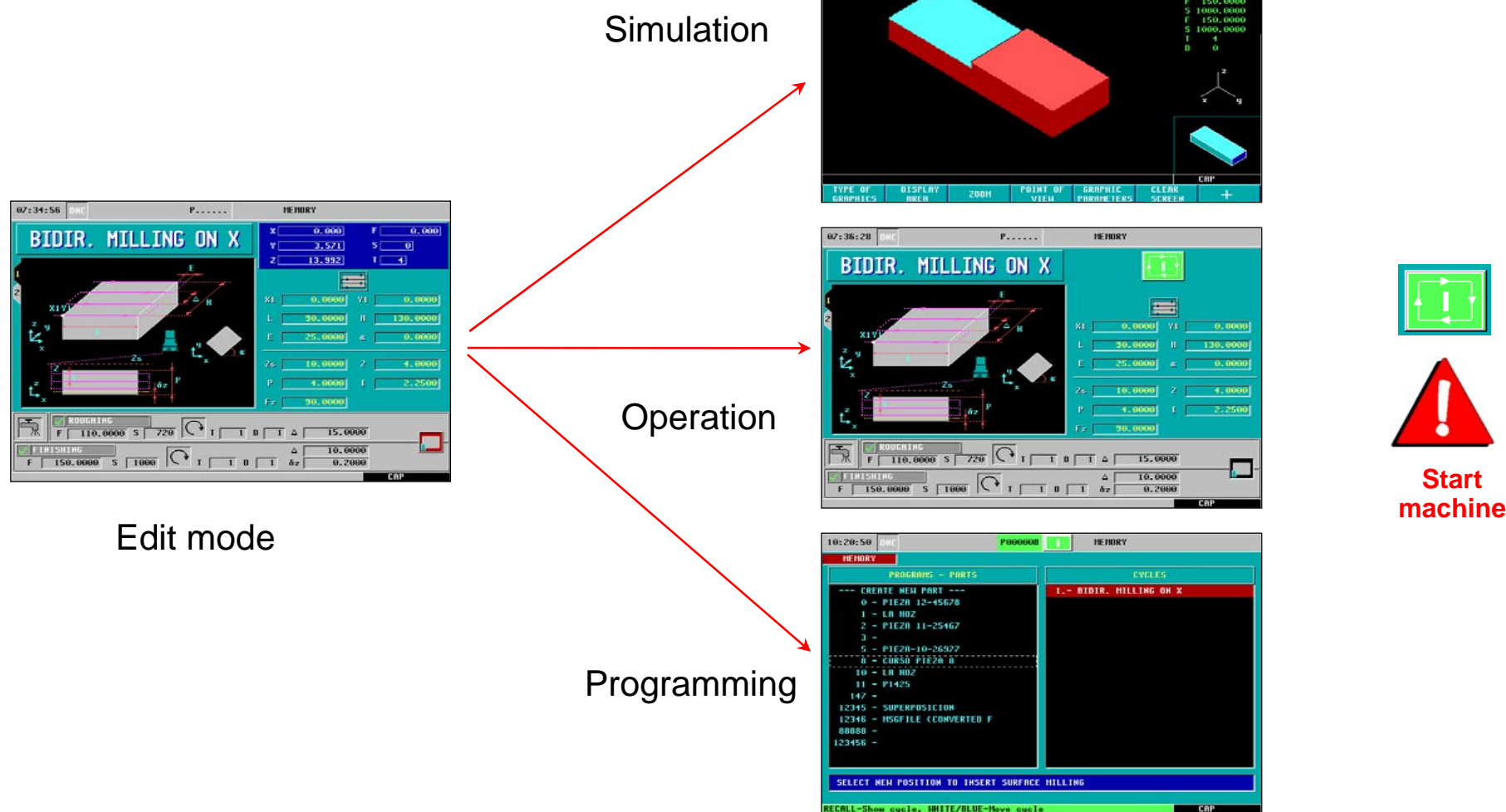
Escape



Select symbols



Execution modes of the cycles

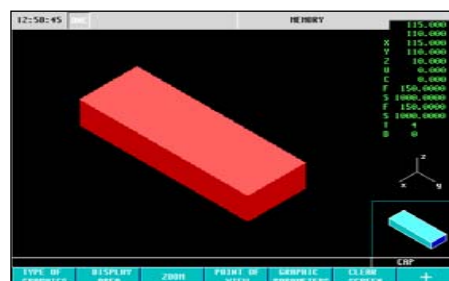


Execution modes of the cycles

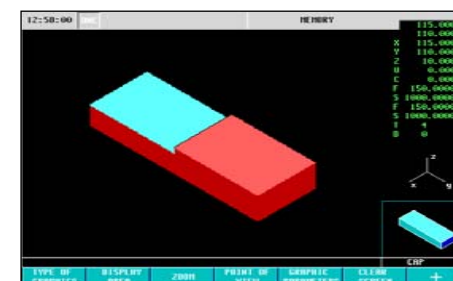
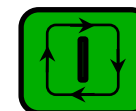
Simulation



Edit cycle

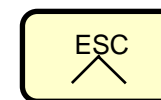


Call simulation



start simulation

- A cycle can be simulated independently
- Edit cycle
 - Press GRAPHICS key – call simulation
 - Press START key – start simulation
 - Press ESC key – back to edit mode



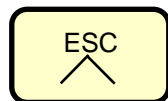
back to edit mode

Execution modes of the cycles

Operating mode



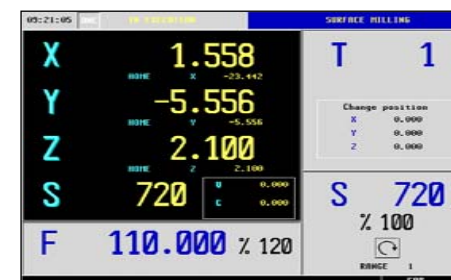
Edit cycle



Activate operation



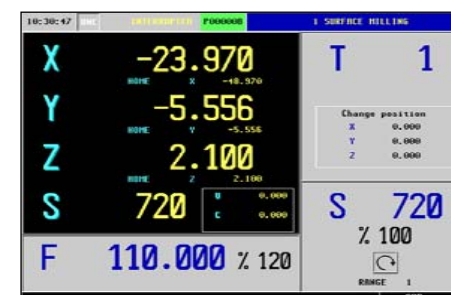
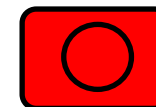
Start machine



start operation

A cycle can be executed independently in operation mode

- Edit cycle
- Press ESC key – activate operation
- Press START key – operation starts
- Press STOP key – operation stops
- Press RESET key – resets operation



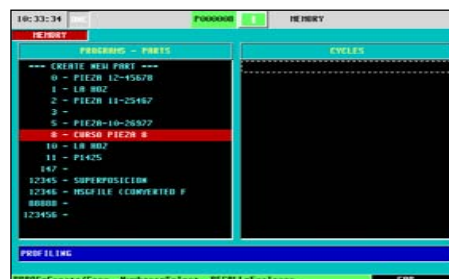
Stops operation

Execution modes of the cycles

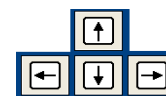
Programming mode



Edit cycle



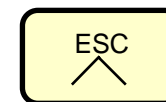
Call program manager



Save cycle

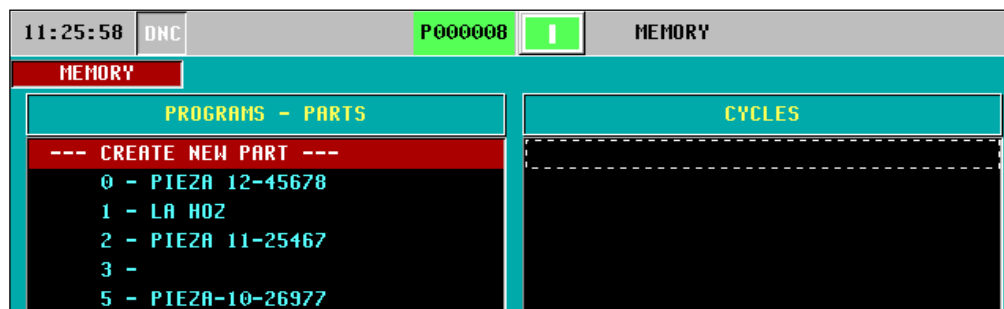
Store cycles in a cycle program

- Edit cycle
- Press P.PROG key – call program manager
- Cursor keys – select insert position
- Press ENTER key- save cycle in the program
- Press ESC – back to edit mode



back to edit mode

Open a new program



Cursor at
--- CREATE NEW PART---



8



PART 8 COURSE



New, empty program created

Save the last cycle edited

MEMORY	
PROGRAMS - PARTS	CYCLES
--- CREATE NEW PART ---	
0 - PIEZA 12-45678	
1 - LA H02	
2 - PIEZA 11-25467	
3 -	
5 - PIEZA-10-26977	
8 - COURSE PART 8	
10 - LA H02	

Place cursor at CYCLES column



MEMORY	
PROGRAMS - PARTS	CYCLES
--- CREATE NEW PART ---	1.- BIDIR. MILLING ON X
0 - PIEZA 12-45678	
1 - LA H02	
2 - PIEZA 11-25467	
3 -	
5 - PIEZA-10-26977	
8 - COURSE PART 8	
10 - LA H02	

Insert last cycle into the program



Recall the selected cycle

Program manager



Cursor control keys



Help and info line

11:46:01
DNC
P000008
I
MEMORY

MEMORY

PROGRAMS - PARTS	CYCLES
--- CREATE NEW PART ---	
0 - PIEZA 12-45678	1.- BIDIR. MILLING ON X
1 - LA H02	2.- PROFILE 1
2 - PIEZA 11-25467	3.- RECTANGULAR BOSS
3 -	4.- CIRCULAR POCKET 1
5 - PIEZA-10-26977	5.- RECTANGULAR POCKET
8 - COURSE PART 8	6.- CENTER PUNCH + RANDOM POSIT.
10 - LA H02	7.- CENTER PUNCH + RECTANGULAR POSI
11 - P1425	8.- DRILLING 2 + RANDOM POSIT.
147 -	9.- DRILLING 2 + RECTANGULAR POSIT.
12345 - SUPERPOSICION	10.- TAPPING + RECTANGULAR POSIT.
12346 - MSGFILE (CONVERTED F	
88888 -	
123456 -	

SURFACE MILLING

PPROG-Create/Copy, Numbers-Select, RECALL-Explorer

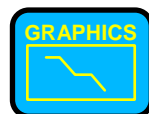
CAP

Graphic simulation

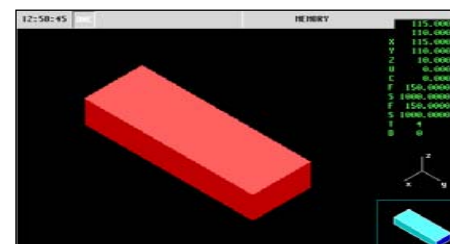
Edit cycle



Call graphic simulation

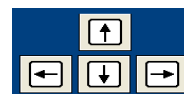


Control via softkeys



Change display area:

Select field with



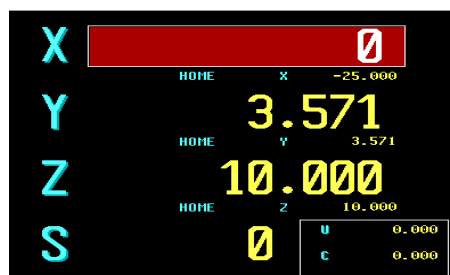
Put in values
confirm with



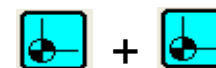
at the end

Part zero setting

Touch the part



Part zero preset by cycle



Edit part zero table

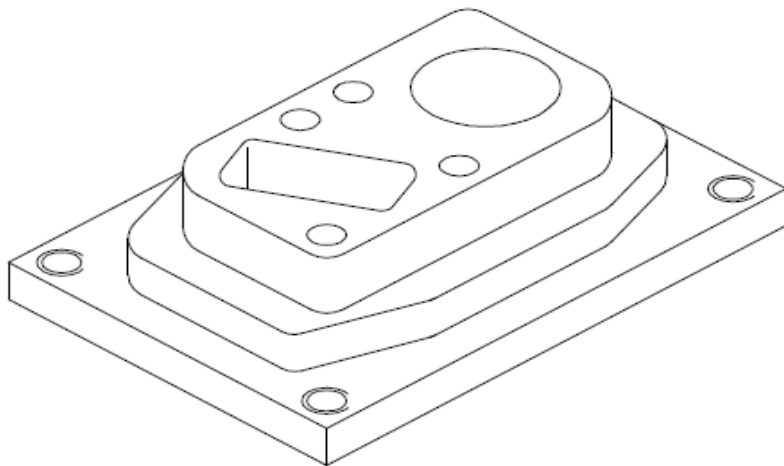


	X	Y	Z	U	V
PLC	0.0000	0.0000	0.0000	0.0000	0.0000
001	0.0000	0.0000	0.0000	0.0000	0.0000
054	0.0000	0.0000	0.0000	0.0000	0.0000
055	0.0000	0.0000	0.0000	0.0000	0.0000
056	0.0000	0.0000	0.0000	0.0000	0.0000
057	0.0000	0.0000	0.0000	0.0000	0.0000
058	0.0000	0.0000	0.0000	0.0000	0.0000
059	0.0000	0.0000	0.0000	0.0000	0.0000
G15067	0.0000	0.0000	0.0000	0.0000	0.0000
G15068	0.0000	0.0000	0.0000	0.0000	0.0000
G15069	0.0000	0.0000	0.0000	0.0000	0.0000
G15070	0.0000	0.0000	0.0000	0.0000	0.0000

Fagor high level language
With MDI or ISO

```
(ORGX54=0,ORGZ54=-64)
G54
```

Programming example



Tool listing

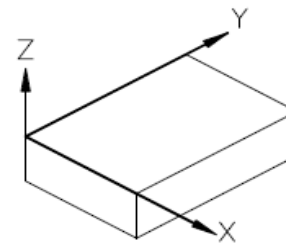
T1: End mill Ø40. T2: End mill Ø25.

T3: End mill Ø10. T4: Center
punching drill bit.

T5: Drill bit Ø8. T6: Drill bit Ø5.

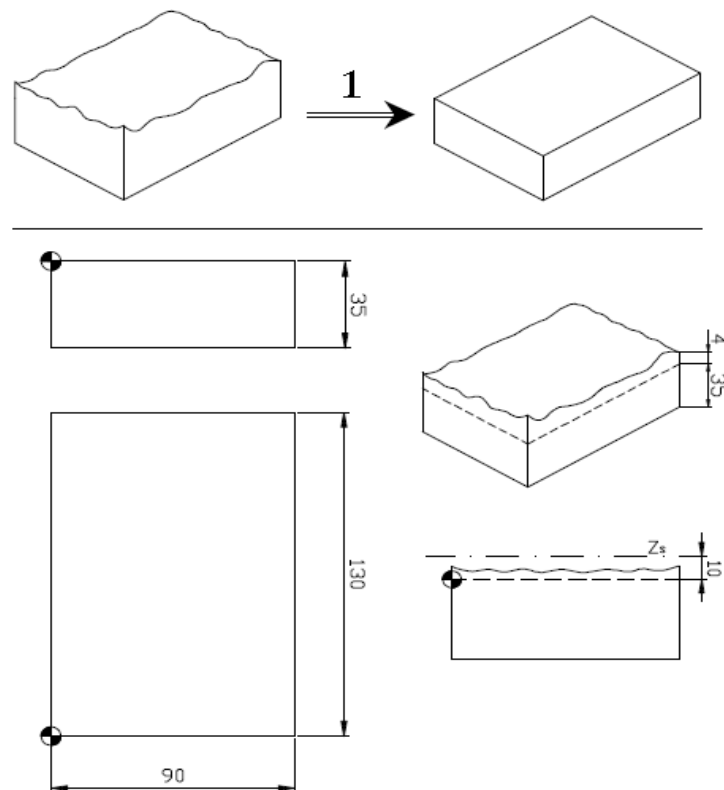
T7: Tap M-6.

Coordinate system

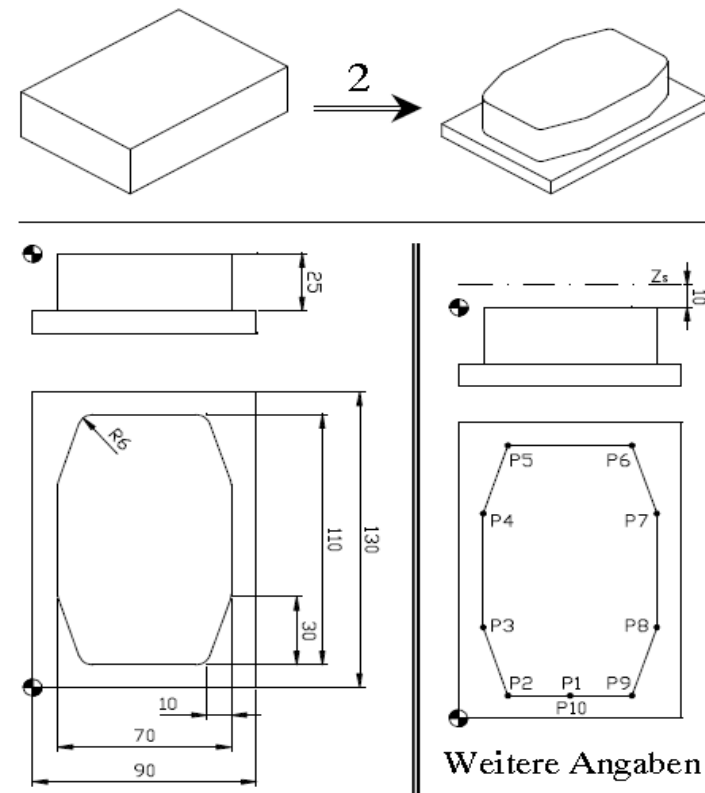


Programming example step by step

Step 1 surface milling



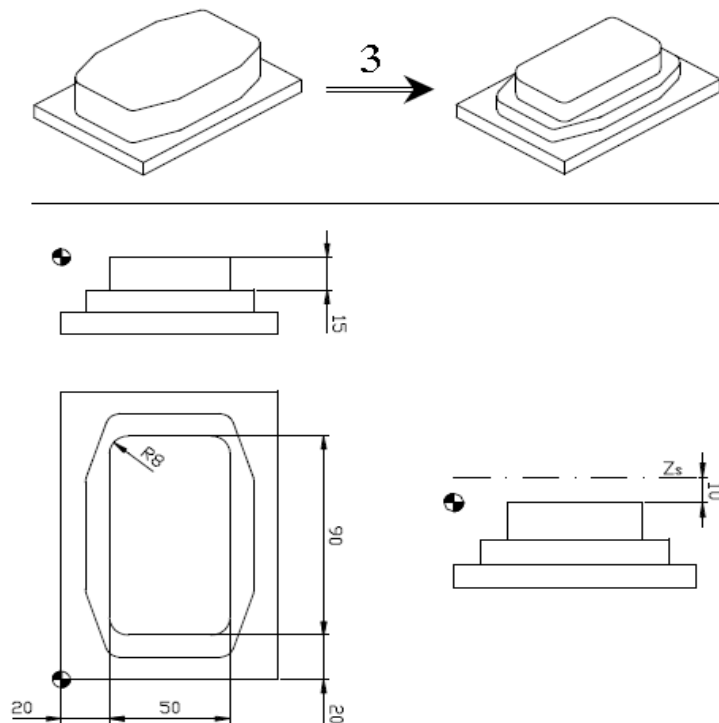
Step 2 profile milling



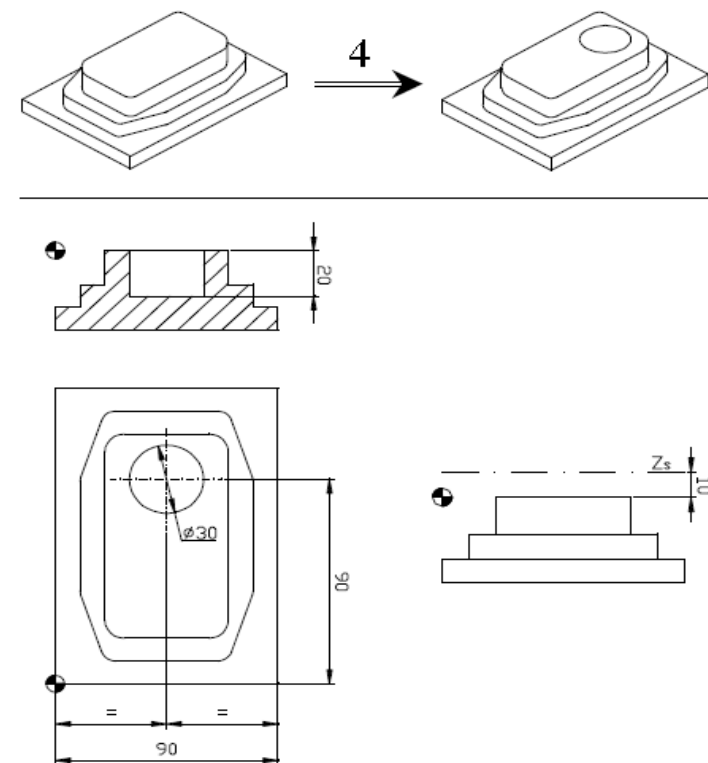
Weitere Angaben

Programming example step by step

Step 3 rectangular boss

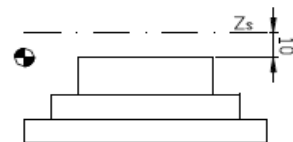
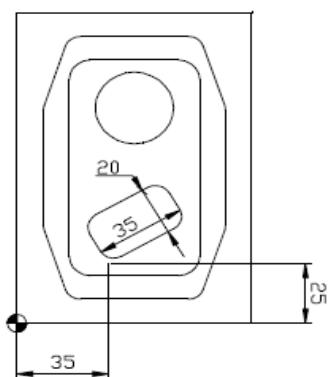
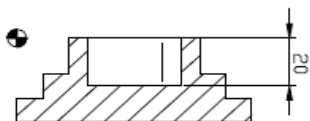
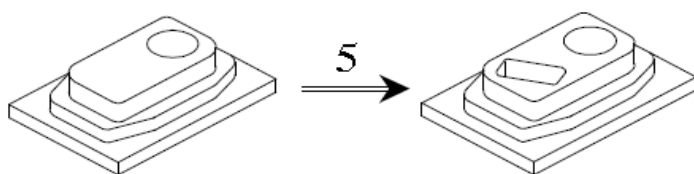


Step 4 circular pocket

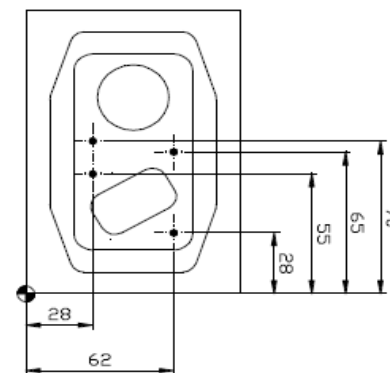
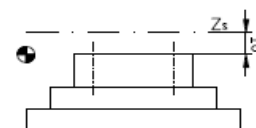
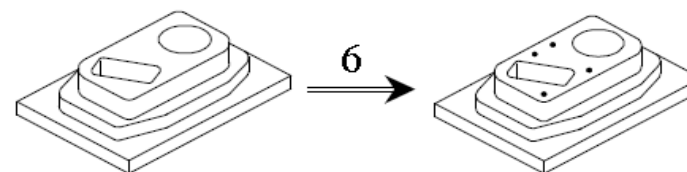


Programming example step by step

Step 5 rectangular pocket

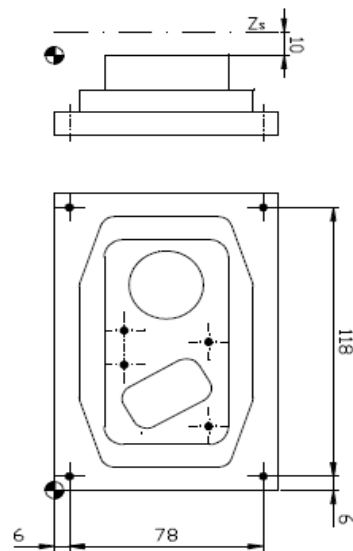
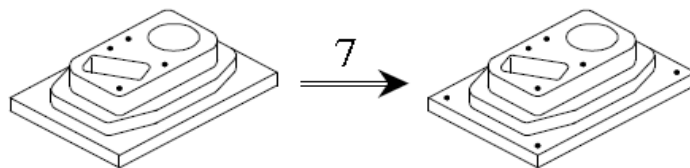


Step 6 center punching + multi-point positioning

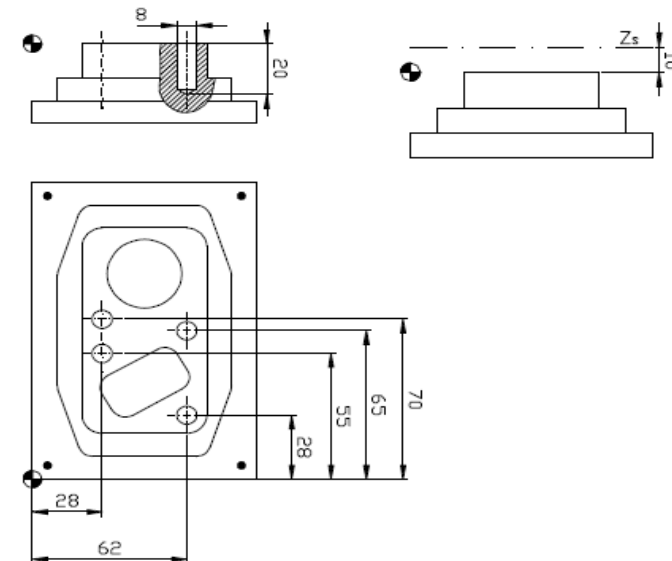
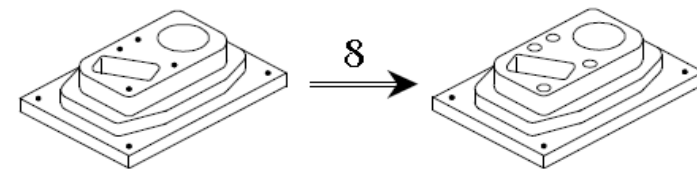


Programming example step by step

Step 7 center point + rectangular multi-point

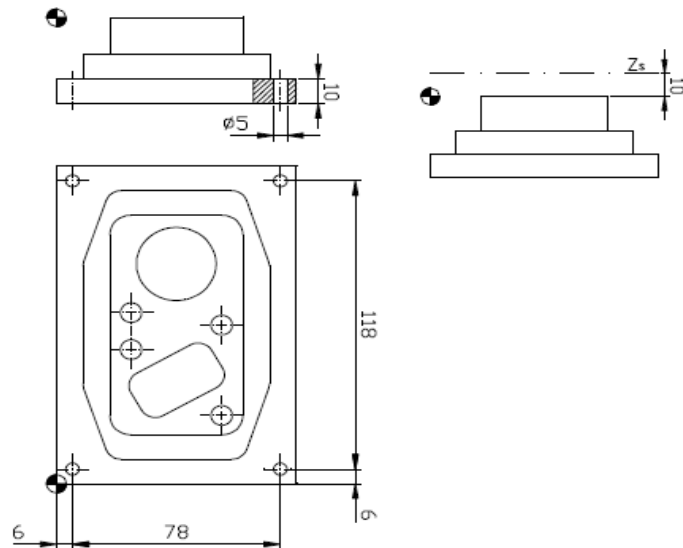
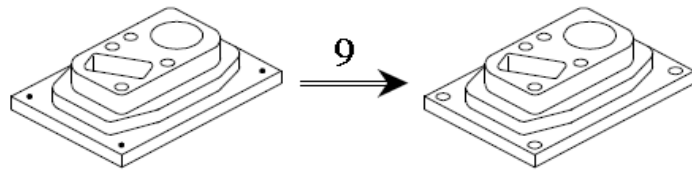


Step 8 drilling + multi-point positioning

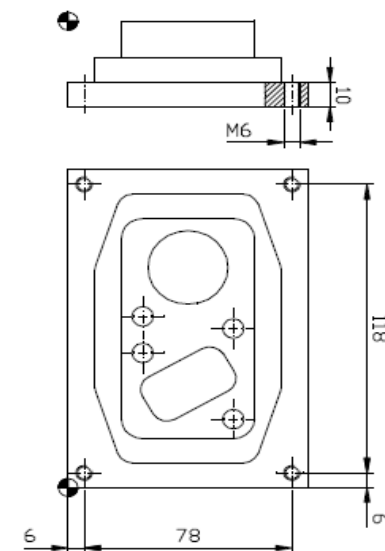
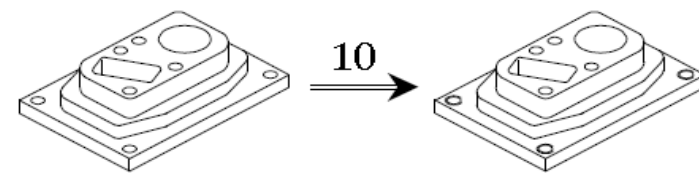


Programming example step by step

Step 9 drilling + rectangular multi-point



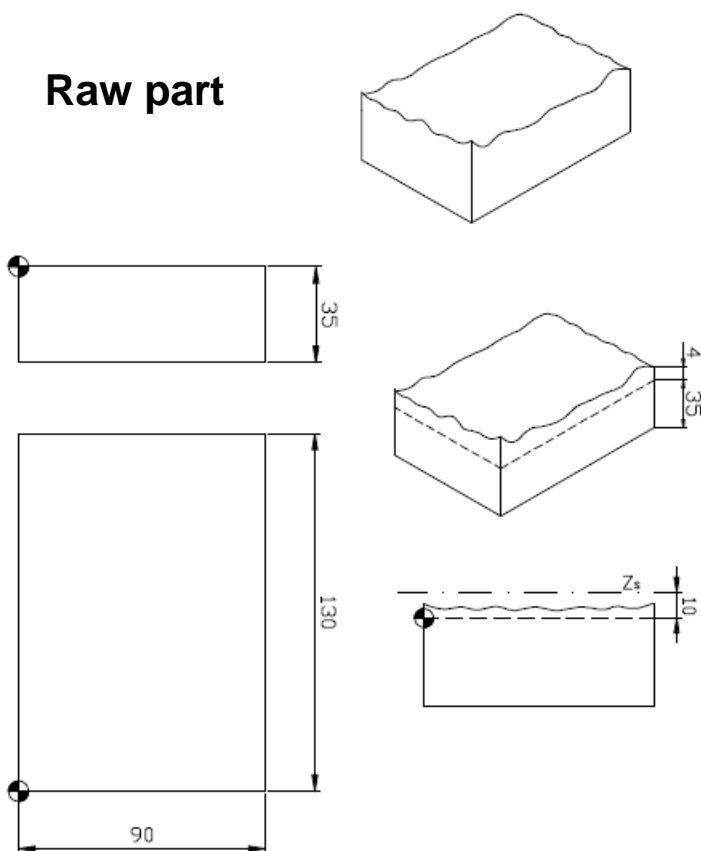
Step 10 tapping + rectangular multi-point



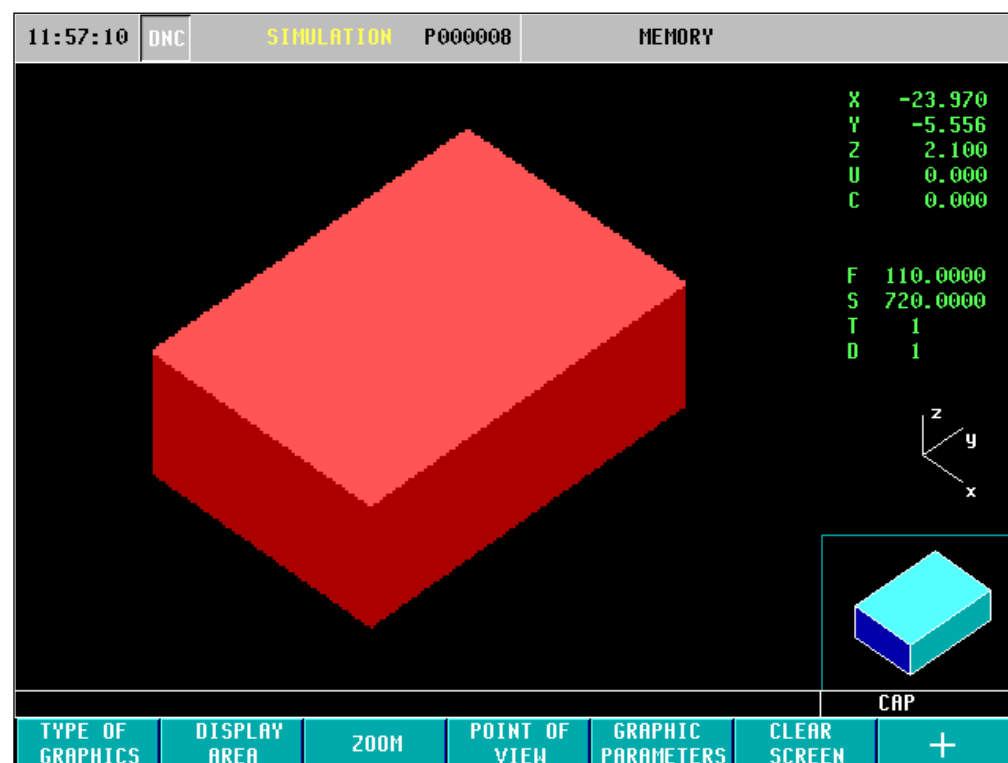
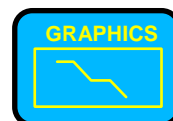
Programming example

Adjust display area for simulation

Raw part



X MIN	0.00
X MAX	90.00
Y MIN	0.00
Y MAX	130.00
Z MIN	-35.00
Z MAX	5.00

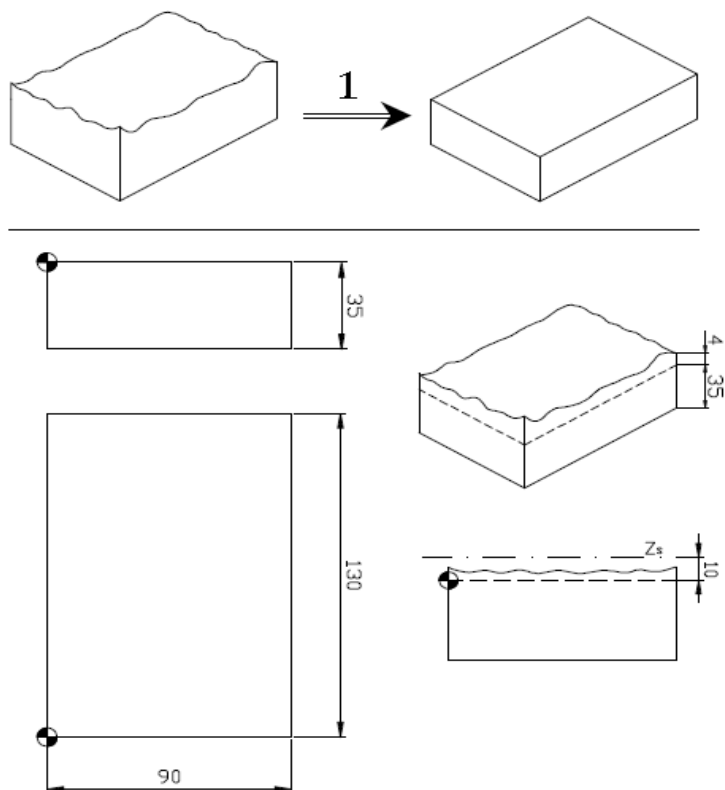


Select graphic type

Adjust display area

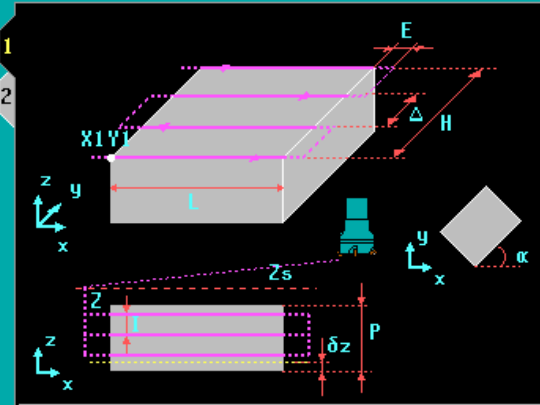
Programming example

Step 1 surface milling



07:34:56 DNC P..... MEMORY

BIDIR. MILLING ON X



X	0.000	F	0.000
Y	3.571	S	0
Z	13.992	T	4

X1	0.0000	Y1	0.0000
L	90.0000	H	130.0000
E	25.0000	α	0.0000

Zs	10.0000	Z	4.0000
P	4.0000	I	2.2500
Fz	90.0000		

☒ ROUGHING F 110.0000 S 720 T 1 D 1 Δ 15.0000

☒ FINISHING F 150.0000 S 1000 T 1 D 1 Δ 10.0000 δz 0.2000

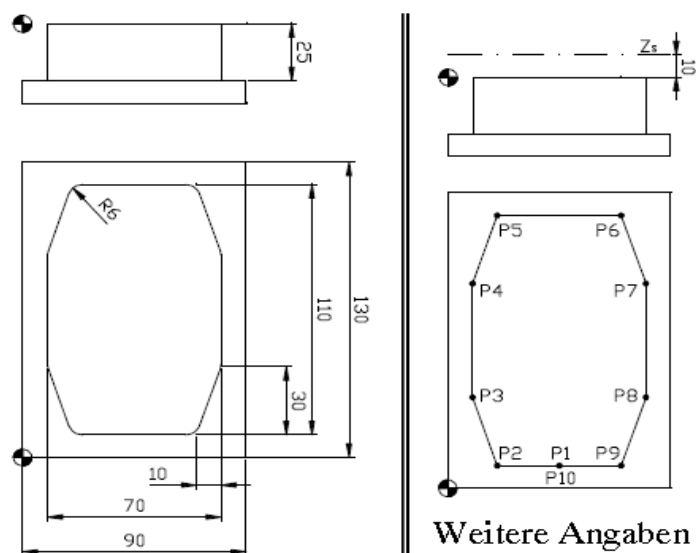
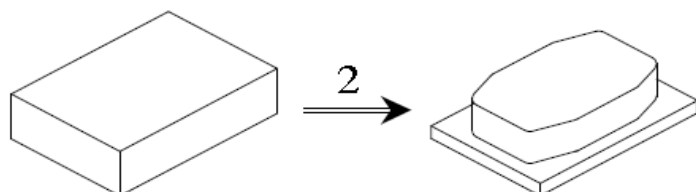
CAP




Save cycle

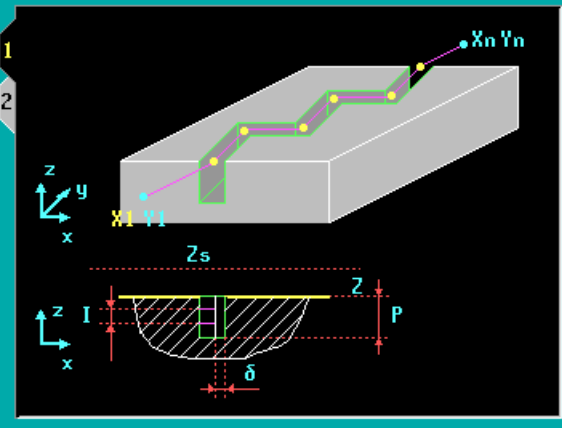
Programming example

Step 2 profile milling



Weitere Angaben



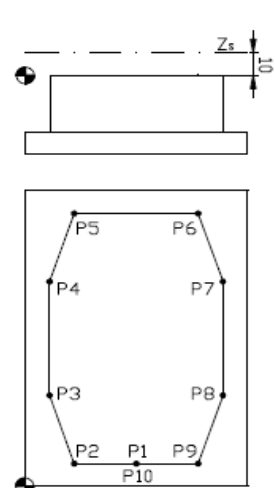
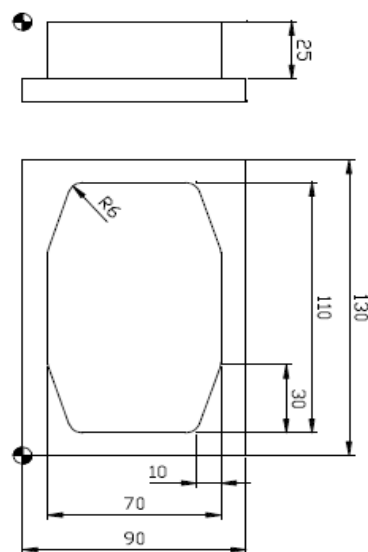
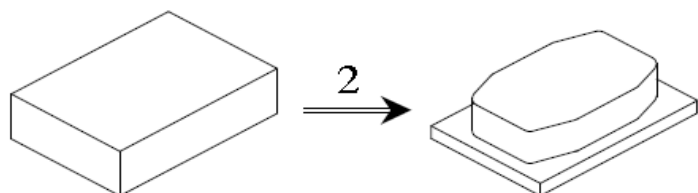
09:40:30		DNC		P000008		MEMORY	
PROFILE 1							
				X	44.749	F	300.000
				Y	-5.556	S	0
				Z	2.100	T	1
				X1	45.0000	Y1	-30.0000
				PROFILE DEF. (max.12 points)			
P1	X	45.0000	r	30.0000			
	Y	10.0000					
P2	X	20.0000	r	6.0000			
	Y	10.0000					
				Xn	45.0000	Yn	-30.0000
				Zs	10.0000	Z	0.0000
				P	25.0000	I	5.0000
				Fz	90.0000		
<div style="display: flex; justify-content: space-between;"> <div> <input checked="" type="checkbox"/> ROUGHING F 150.0000 S 800 </div> <div> <input checked="" type="checkbox"/> FINISHING F 150.0000 S 800 </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>T 2 D 2</div> <div>T 2 D 2 delta 0.2000</div> </div>							
X coordinate of the entering point.						CAP	



Save cycle

Programming example

Step 2 profile milling



Weitere Angaben

PROFILE DEF. (max.12 points)				
P1	X	45.0000	r	30.0000
	Y	10.0000		
P2	X	20.0000	r	6.0000
	Y	10.0000		
P3	X	10.0000	r	6.0000
	Y	40.0000		
P4	X	10.0000	r	6.0000
	Y	90.0000		
P5	X	20.0000	r	6.0000
	Y	120.0000		
P6	X	70.0000	r	6.0000
	Y	120.0000		
P7	X	80.0000	r	6.0000
	Y	90.0000		
P8	X	80.0000	r	6.0000
	Y	40.0000		
P9	X	70.0000	r	6.0000
	Y	10.0000		
P10	X	45.0000	r	6.0000
	Y	10.0000		
P11	X	45.0000	r	6.0000
	Y	10.0000		
P12	X	0.0000	r	30.0000
	Y	0.0000		

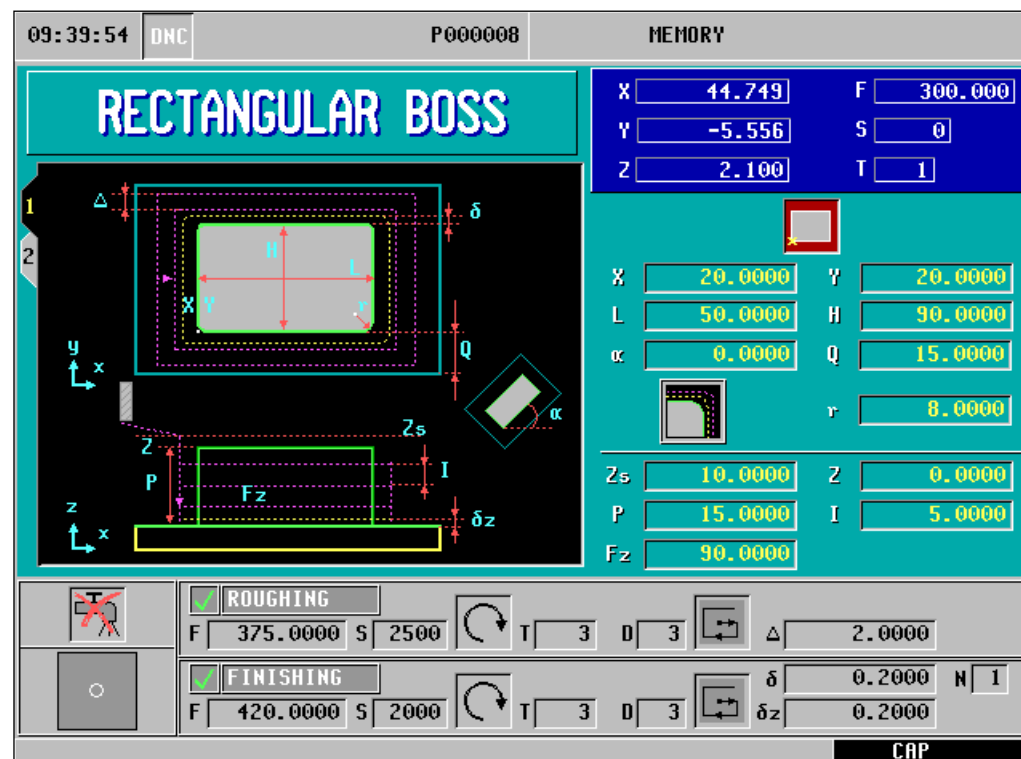
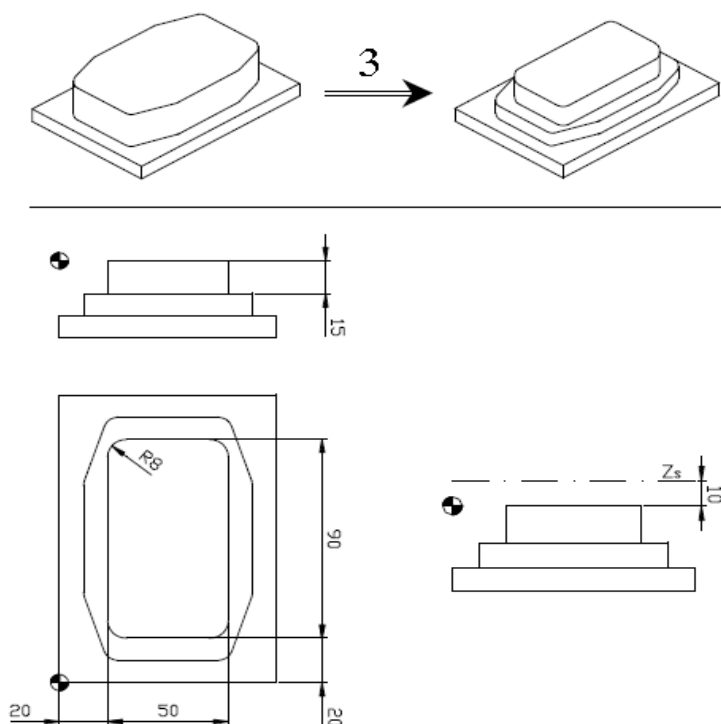
Tangential entry

Last point ?
Repeat point.

Tangential exit

Programming example

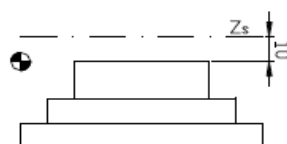
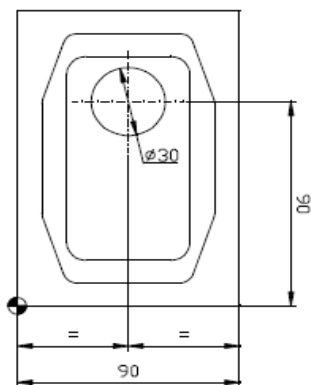
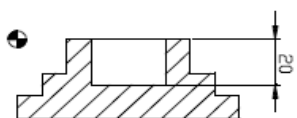
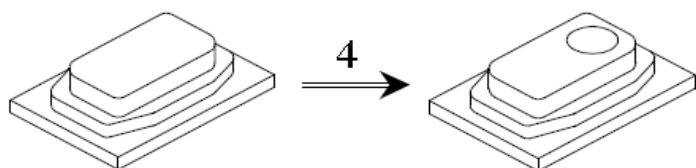
Step 3 rectangular boss



Save cycle

Programming example

Step 4 circular pocket



09:24:28 DNC RESET P000008 MEMORY

CIRCULAR POCKET 1

X	44.749	F	132.000
Y	-5.556	S	0
Z	2.100	T	1

Xc	45.0000
Yc	90.0000
R	15.0000

Zs	10.0000	Z	0.0000
P	20.0000	I	5.0000
Fz	100.0000		

ROUGHING	T	3	D	3	Δ	2.0000	
F	375.0000	S	2500	δ	30.0000		
FINISHING	T	3	D	3	δ	0.2000	
F	420.0000	S	2800	θ	30.0000	N	2
				δz	0.1000		

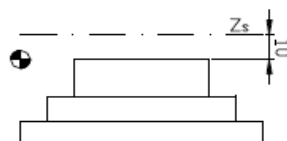
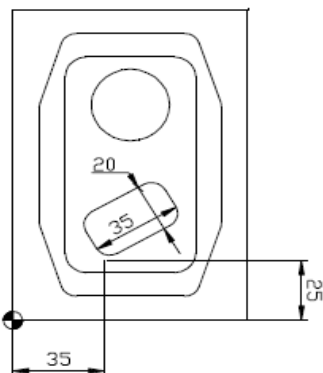
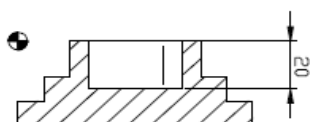
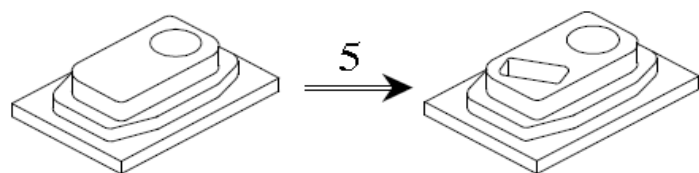
Center X coordinate. CAP



Save cycle

Programming example

Step 5 rectangular pocket



07:41:19
DNC
IN POSITION P.....
MEMORY

RECTANGULAR POCKET

X	0.000	F	180.000
Y	3.571	S	0
Z	10.000	T	1

X	35.0000	Y	25.0000
L	35.0000	H	20.0000
alpha	30.0000	r	6.0000

Zs	10.0000	Z	0.0000
P	20.0000	I	5.0000
Fz	100.0000		

ROUGHING

F 375.0000 S 2500

T 3 D 3

beta 30.0000

Delta 2.0000

FINISHING

F 420.0000 S 2800

T 3 D 3

theta 30.0000

delta 0.0000 N 2

delta z 0.4000

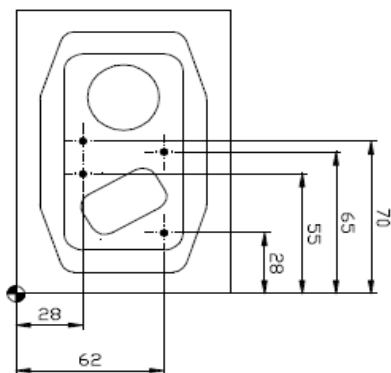
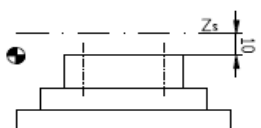
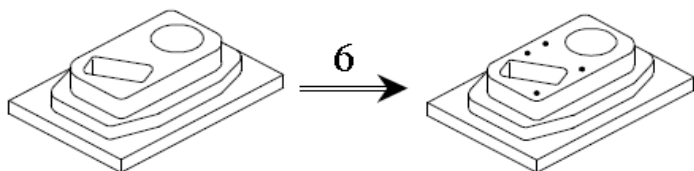
CAP



Save cycle

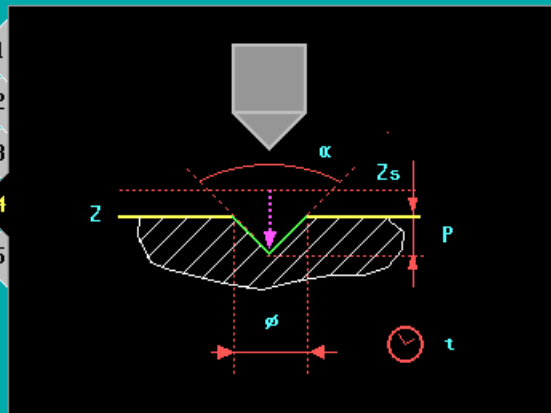
Programming example

Step 6 center punching + multi-point positioning



12:11:00
DNC
P000008
MEMORY

CENTER PUNCH





X	-23.970	F	132.000
Y	-5.556	S	0
Z	2.100	T	1

X	62.0000	Y	28.0000
Zs	10.0000	Z	0.0000
t	1.0000		


1
2

P

6.0000

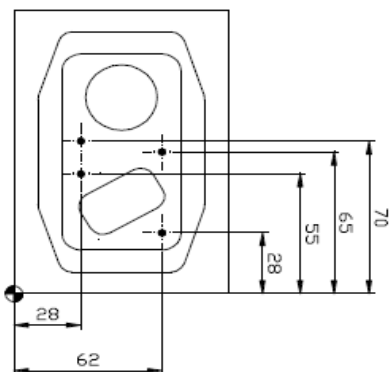
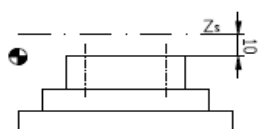
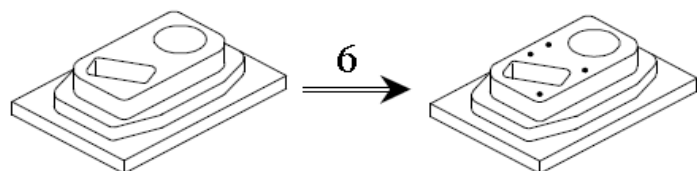
Penetration

F 125.0000
S 2100

T 4
D 4

CAP

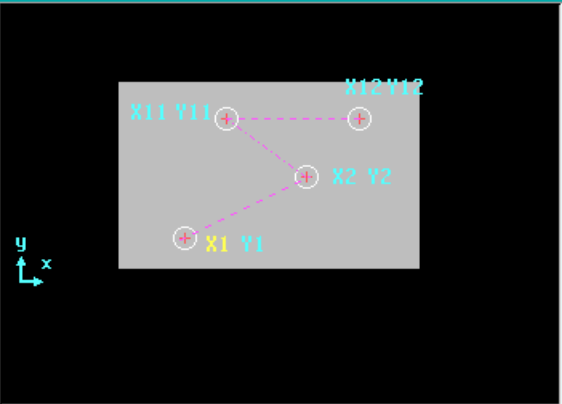
Programming example

Step 6 center punching + multi-point positioning



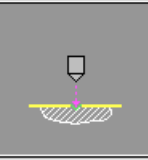
09:43:31
DNC
P000008
MEMORY

RANDOM POSIT.




X	44.749	F	300.000
Y	-5.556	S	0
Z	2.100	T	1

X1	62.0000	Y1	28.0000
X2	28.0000	Y2	55.0000
X3	28.0000	Y3	70.0000
X4	62.0000	Y4	65.0000
X5	62.0000	Y5	65.0000
X6		Y6	



CENTER PUNCH

Zs	10.000	Z	0.000	P	6.000	t	1.000
F	125.0000	S	2100			T	4 0 4

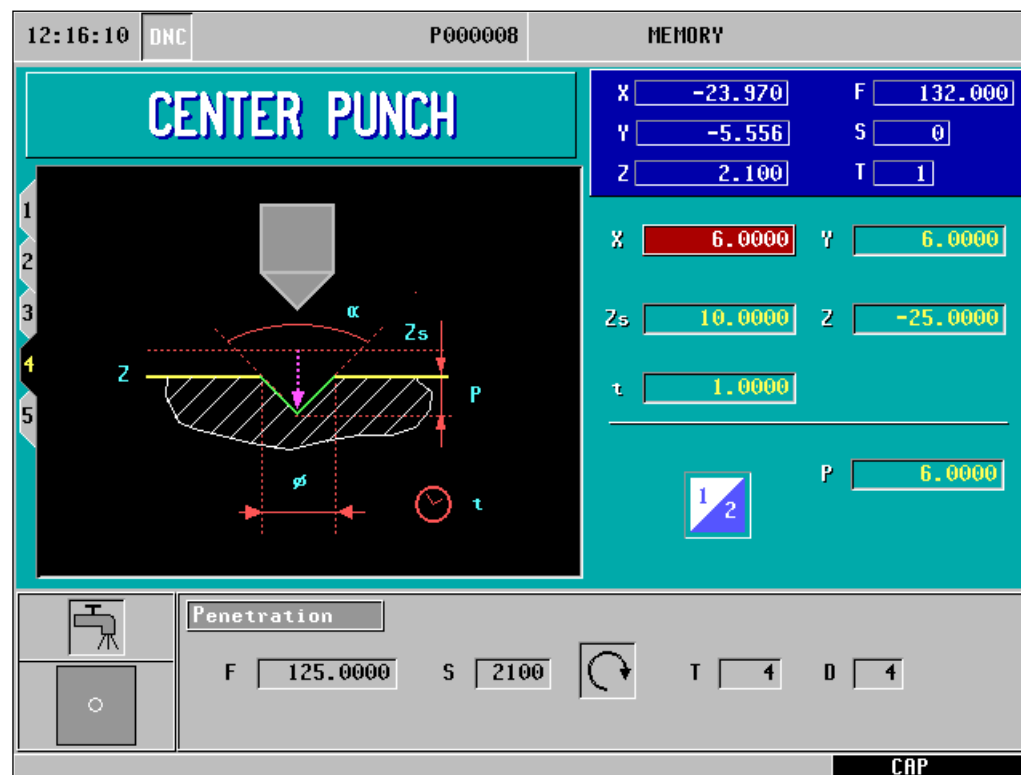
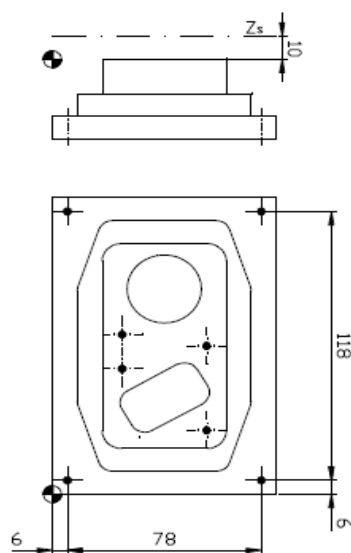
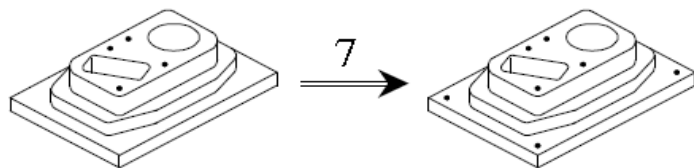
CAP



Save cycle

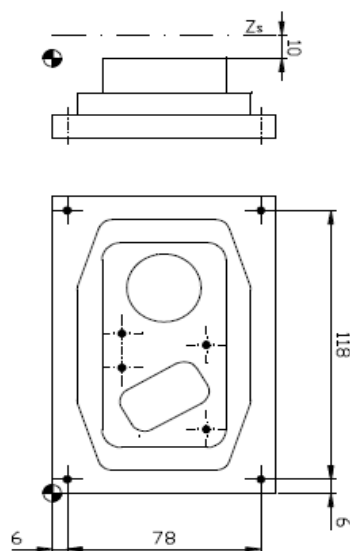
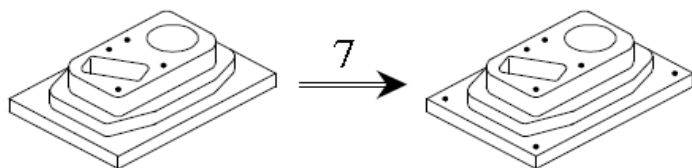
Programming example

Step 7 center point + rectangular multi-point



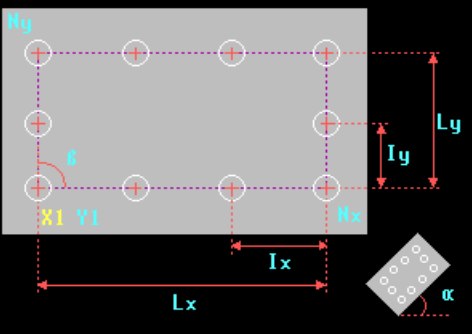
Programming example

Step 7 center point + rectangular multi-point




09:44:22
DNC
P000008
MEMORY

RECTANGULAR POSIT.




X	44.749	F	300.000
Y	-5.556	S	0
Z	2.100	T	1


X1	6.0000	Y1	6.0000
----	--------	----	--------



Lx	78.0000	Ly	118.0000
Hx	2	Hg	2

α	0.0000	β	90.0000
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CENTER PUNCH							
Zs	10.000	Z	-25.000	P	6.000	t	1.000
F	125.0000	S	2100			T	4 0 4

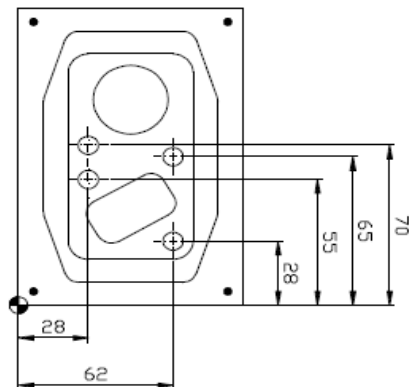
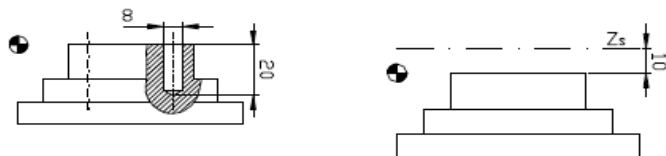
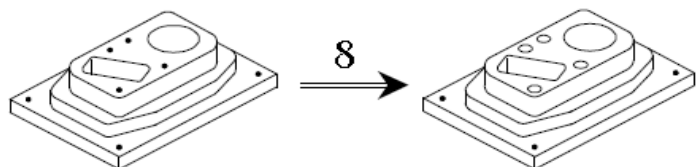
X coordinate of the starting point.Corner.
CAP



Save cycle

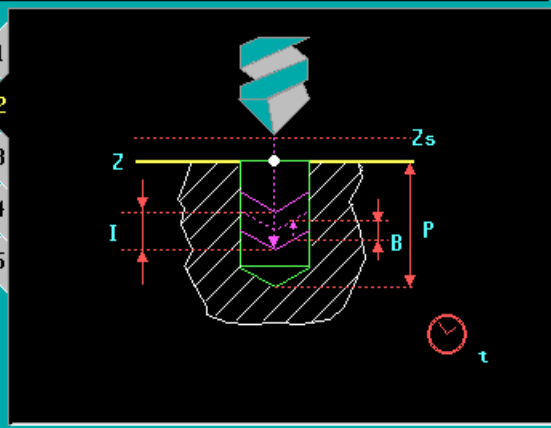
Programming example

Step 8 drilling + multi-point positioning





10:23:36
DNC
P000008
MEMORY

DRILLING 2



X	44.749	F	300.000
Y	-5.556	S	0
Z	2.100	T	1


X	62.0000	Y	28.0000
Zs	10.0000	Z	0.0000
P	20.0000	I	4.0000
t	1.0000	B	3.0000

Penetration

F 120.0000

S 1200



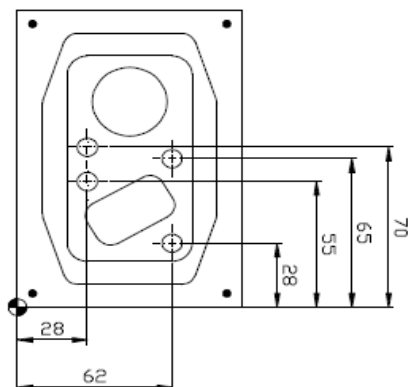
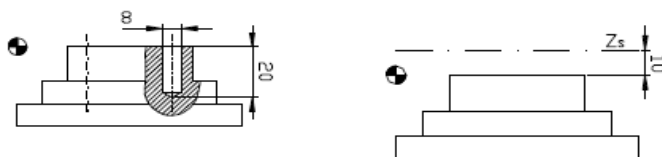
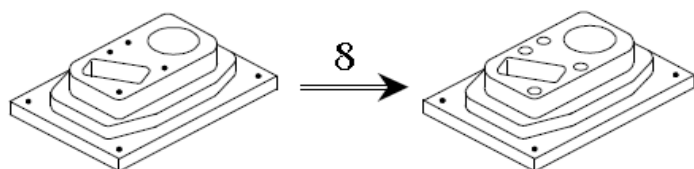
T 5

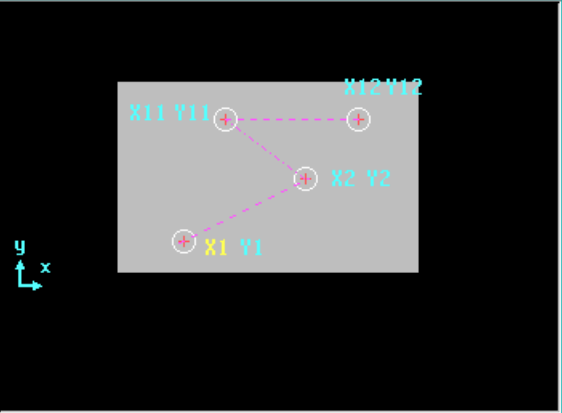
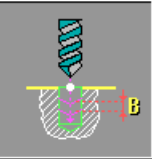
D 5

CAP

Programming example

Step 8 drilling + multi-point positioning



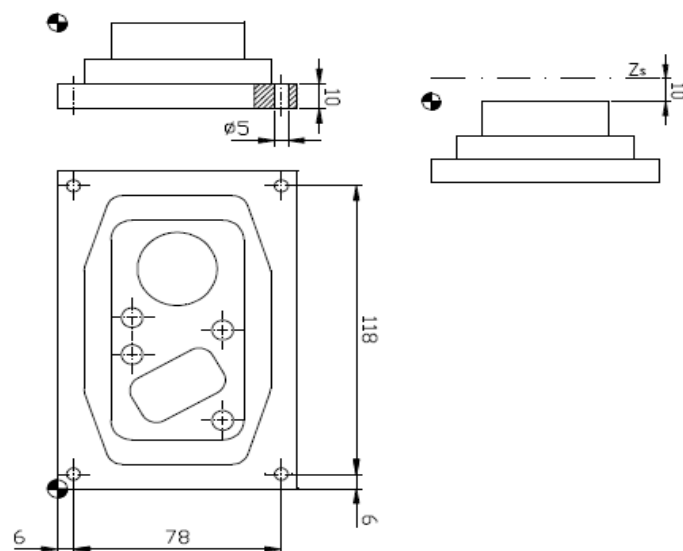
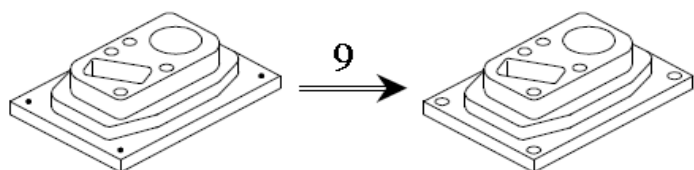
10:24:20		DNC		P000008		MEMORY																									
RANDOM POSIT.																															
				<table border="1"> <tr> <td>X</td> <td>44.749</td> <td>F</td> <td>300.000</td> </tr> <tr> <td>Y</td> <td>-5.556</td> <td>S</td> <td>0</td> </tr> <tr> <td>Z</td> <td>2.100</td> <td>T</td> <td>1</td> </tr> </table>				X	44.749	F	300.000	Y	-5.556	S	0	Z	2.100	T	1												
X	44.749	F	300.000																												
Y	-5.556	S	0																												
Z	2.100	T	1																												
X1	62.0000	Y1	28.0000	X2	28.0000	Y2	55.0000																								
X3	28.0000	Y3	70.0000	X4	62.0000	Y4	65.0000																								
X5	62.0000	Y5	65.0000	X6		Y6																									
 <table border="1"> <tr> <td colspan="4">DRILLING 2</td> <td colspan="4">B 3.000</td> </tr> <tr> <td>Zs</td> <td>10.000</td> <td>Z</td> <td>0.000</td> <td>P</td> <td>20.000</td> <td>t</td> <td>1.000</td> </tr> <tr> <td>F</td> <td>120.0000</td> <td>S</td> <td>1200</td> <td>T</td> <td>5</td> <td>D</td> <td>5</td> </tr> </table>								DRILLING 2				B 3.000				Zs	10.000	Z	0.000	P	20.000	t	1.000	F	120.0000	S	1200	T	5	D	5
DRILLING 2				B 3.000																											
Zs	10.000	Z	0.000	P	20.000	t	1.000																								
F	120.0000	S	1200	T	5	D	5																								
CAP																															



Save cycle

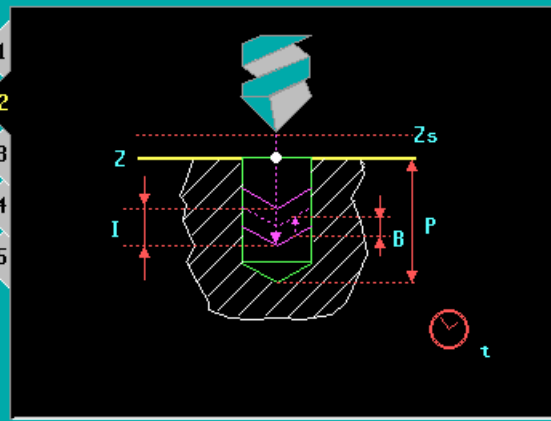
Programming example

Step 9 drilling +
rectangular multi-point





10:21:23
DNC
P000008
MEMORY

DRILLING 2



X 44.749	F 300.000
Y -5.556	S 0
Z 2.100	T 1

X 6.0000	Y 6.0000
Zs 10.0000	Z -25.0000
P 15.0000	I 4.0000
t 1.0000	B 3.0000

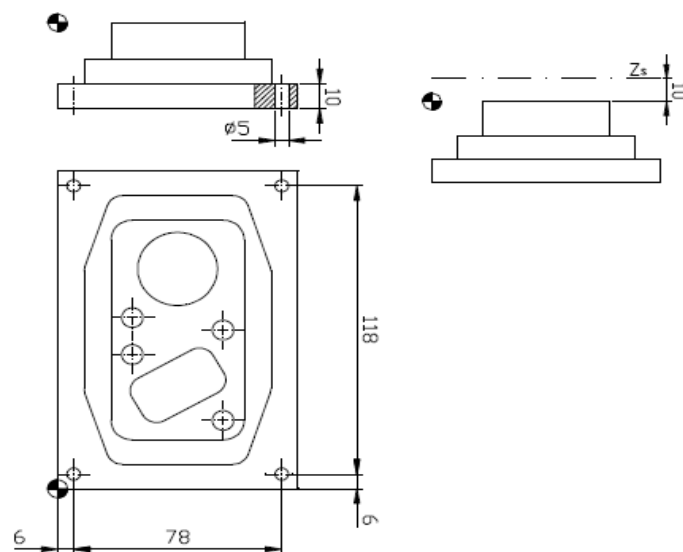
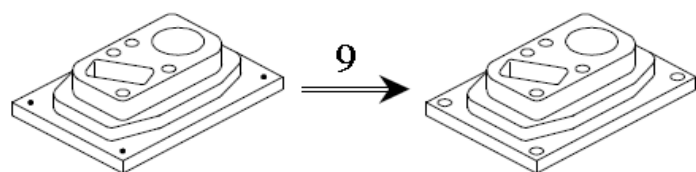
Penetration


F 120.0000	S 1200	↺	T 6	D 6
--	--	---	---	---

CAP

Programming example

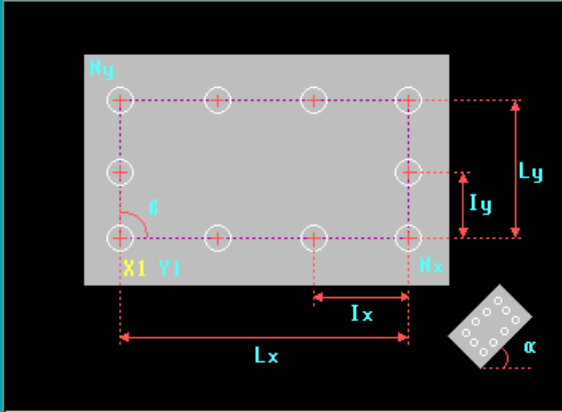
Step 9 drilling + rectangular multi-point





12:27:31
DNC
P000008
MEMORY

RECTANGULAR POSIT.



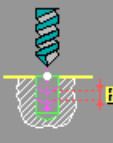
X <input type="text" value="-23.970"/>	F <input type="text" value="132.000"/>
Y <input type="text" value="-5.556"/>	S <input type="text" value="0"/>
Z <input type="text" value="2.100"/>	T <input type="text" value="1"/>

X1 <input style="background-color: red; color: white;" type="text" value="6.0000"/>	Y1 <input style="background-color: green; color: white;" type="text" value="6.0000"/>
---	---

1/3

Lx <input type="text" value="78.0000"/>	Ly <input type="text" value="118.0000"/>
Nx <input type="text" value="2"/>	Ny <input type="text" value="2"/>

α <input type="text" value="0.0000"/>	β <input type="text" value="90.0000"/>
---------------------------------------	--



DRILLING 2							
Zs	10.000	Z	-25.000	P	15.000	t	1.000
F	120.0000	S	1200	T	6	D	6

B 3.000	I 4.000
---------	---------

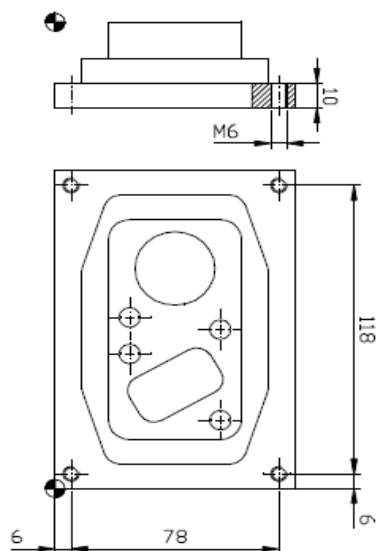
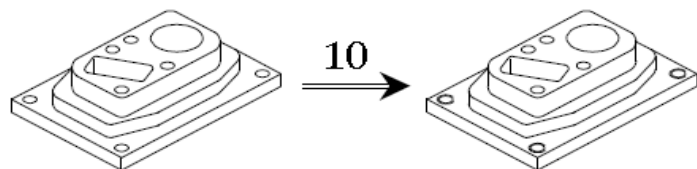
X coordinate of the starting point.Corner.
CAP



Save cycle

Programming example

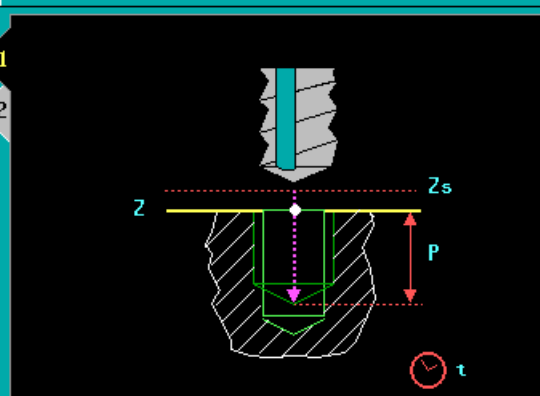
Step 10 tapping + rectangular multi-point




10:19:40
DNC
P000008
MEMORY

TAPPING

X	44.749	F	300.000
Y	-5.556	S	0
Z	2.100	T	1



X	6.0000	Y	6.0000
Zs	10.0000	Z	-25.0000
P	15.0000	t	1.0000



Penetration

F, S

F 250.0000

S 250

↺

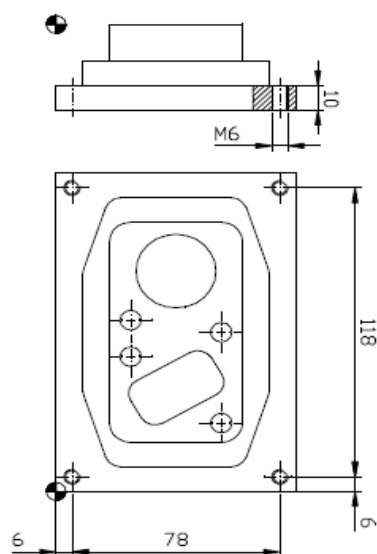
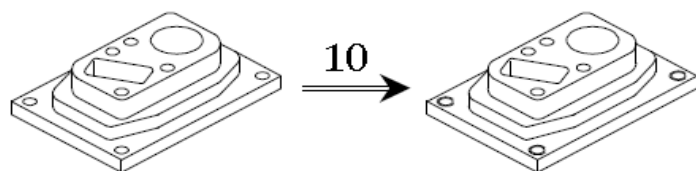
T 7

D 7

CAP

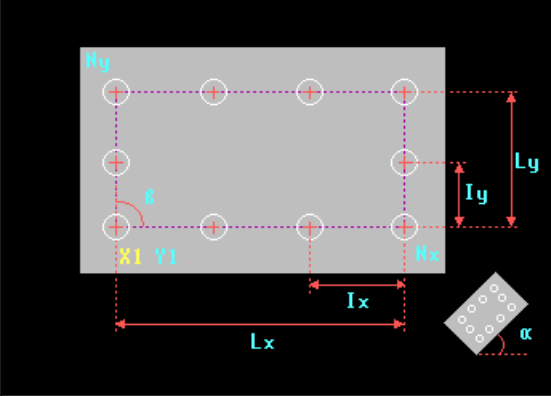
Programming example

Step 10 tapping + rectangular multi-point



10:25:10
DNC
P000008
MEMORY

RECTANGULAR POSIT.

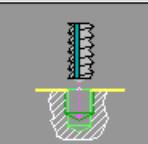


X	44.749	F	300.000
Y	-5.556	S	0
Z	2.100	T	1

X1	6.0000	Y1	6.0000
----	--------	----	--------


Lx	78.0000	Ly	118.0000
Hx	2	Hy	2

α	0.0000	β	90.0000
---	--------	---	---------



TAPPING

Zs	10.000	Z	-25.000	P	15.000	t	1.000
F	250.0000	S	250	T	7	D	7



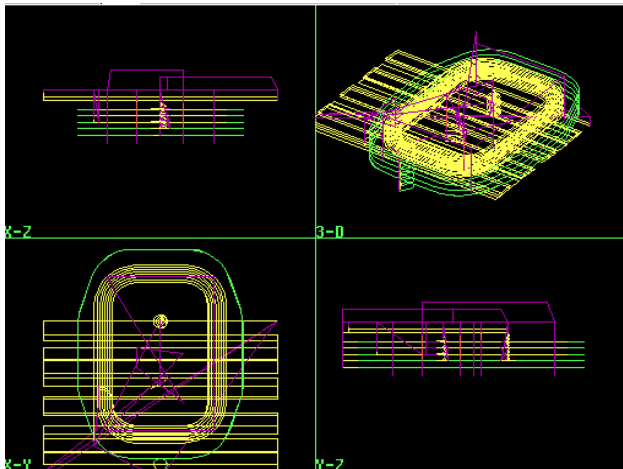
X coordinate of the starting point.Corner.
CAP



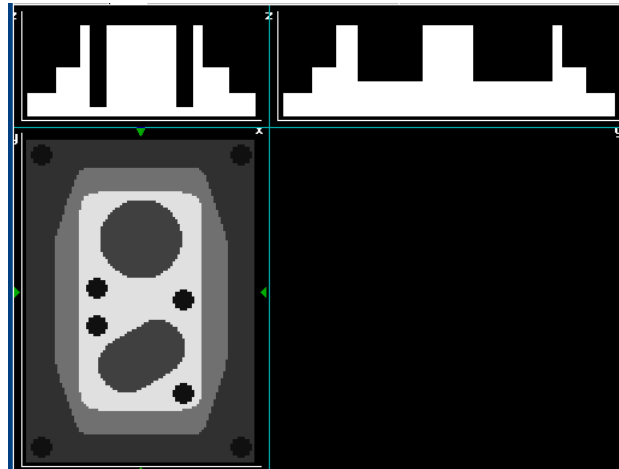
Save cycle

Screens of graphic simulation

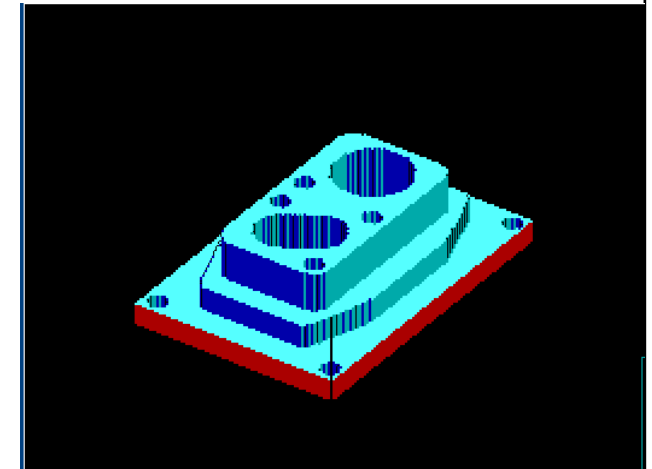
Line graphics



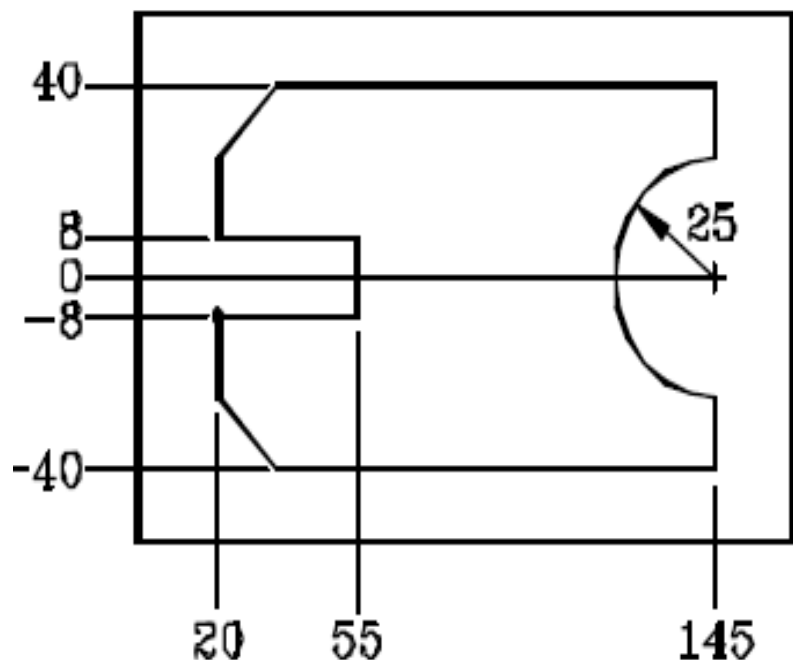
2D graphics



3D graphic



Exercise: Profile



Profile 100

Starting point	X20 Y -8	Validate
Straight	X20 Y -40	Validate
Straight	X145 Y -40	Validate
Straight	X145 Y -25	Validate
Clockwise arc	Xf145 Yf25 R25	Validate
Straight	X145 Y40	Validate
Straight	X20 Y40	Validate
Straight	X20 Y8	Validate
Straight	X55 Y8	Validate
Straight	X55 Y -8	Validate
Straight	X20 Y -8	Validate

Corners

Select the lower left corner
Select the upper left corner
Escape

Chamfer

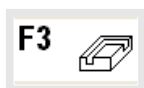
Chamfer 15 ENTER
Chamfer 15 ENTER

Finish

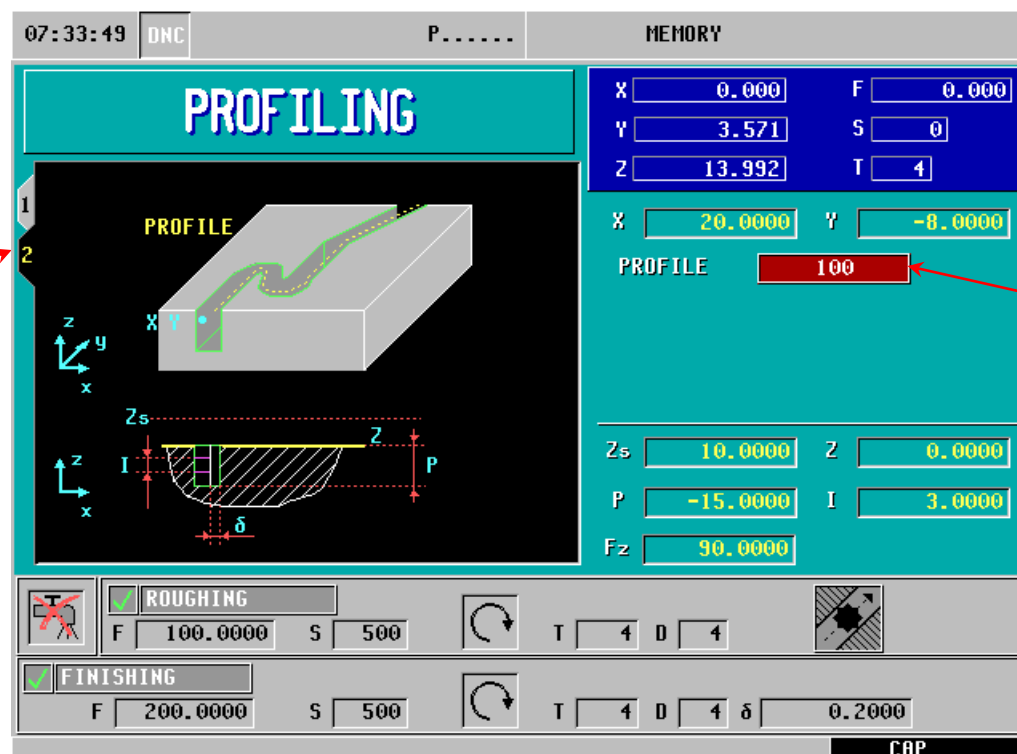
Save profile

Profile editor

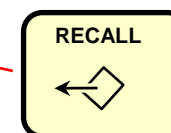
Define profiles with profile editor



Level 2



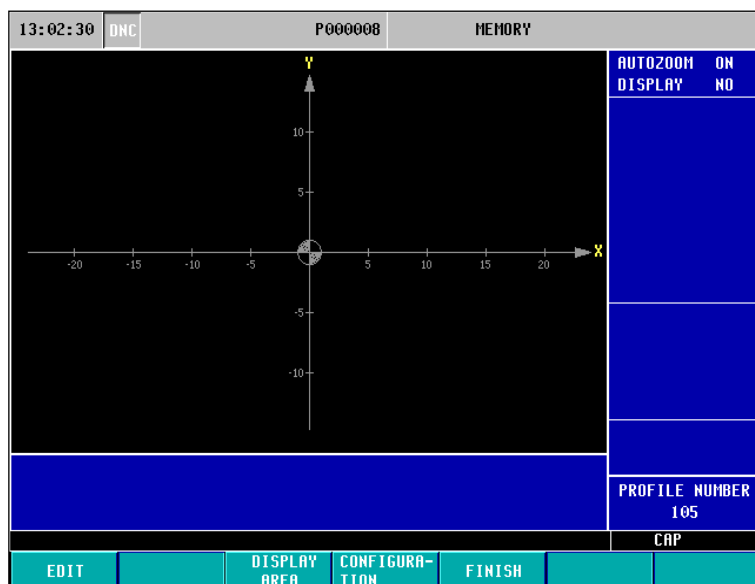
Entry point



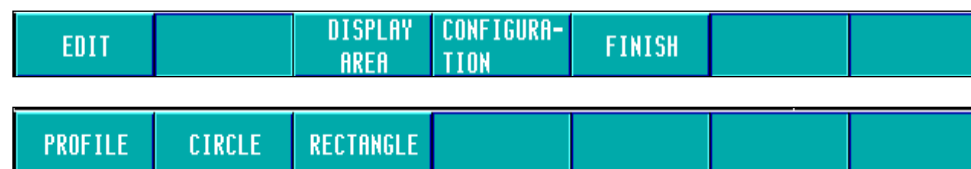
Entry into
profile editor

Profile editor

Use the softkeys to work with the profile editor



softkeys



AUTOZOOM	ON
DISPLAY	NO
INITIAL POINT	
X1	0.0000
Y1	0.0000
PROFILE NUMBER 105	

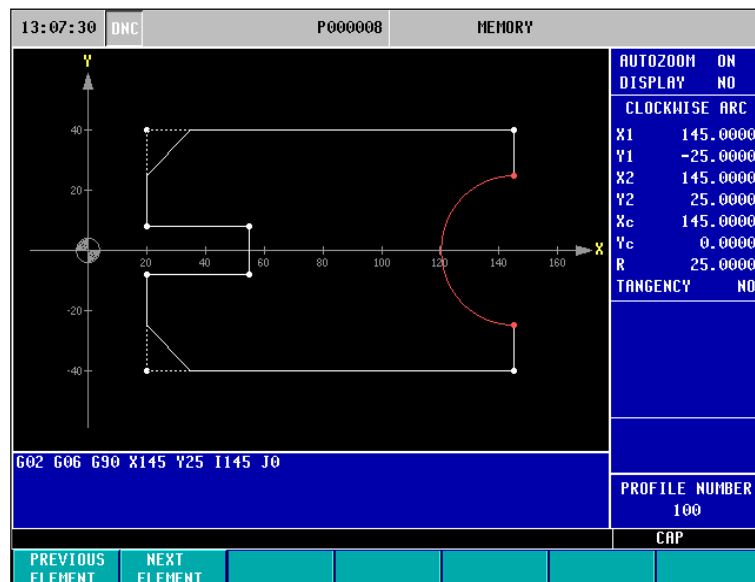
Windows for coordinates

After inputting all values
Press [Validate]

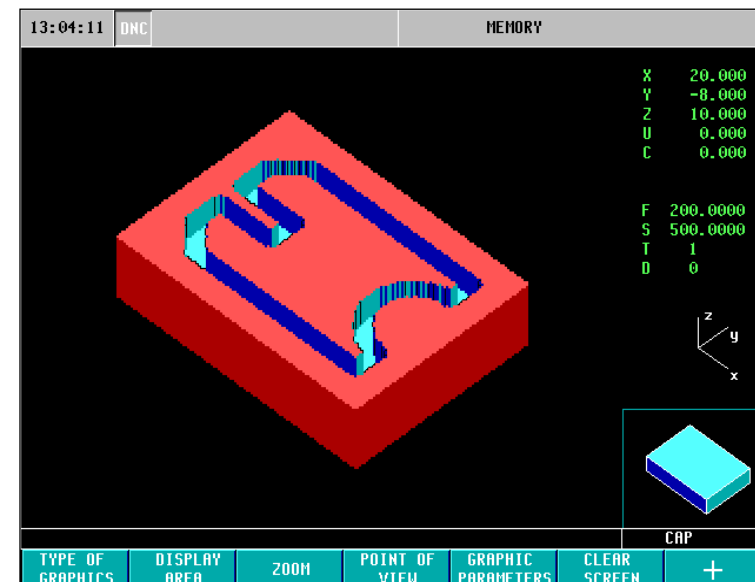


Exercise: Profile

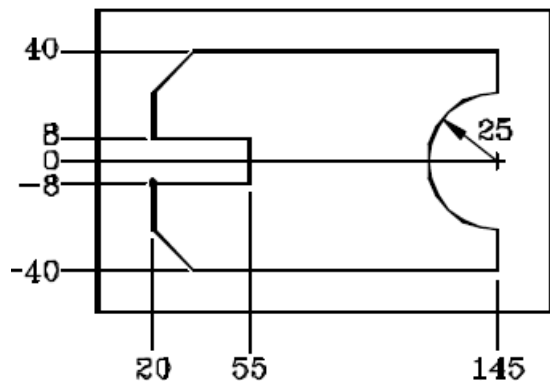
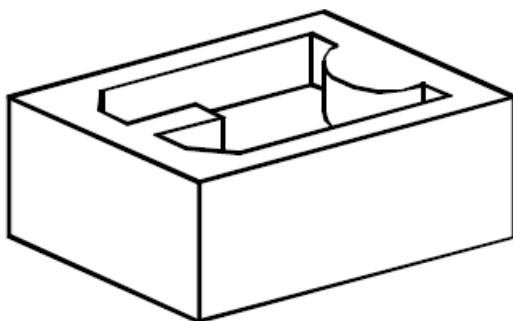
Edit screen



3D simulation screen



Exercise: Profile 2D pocket



Profile 101

Starting point	X20 Y -8	Validate
Straight	X20 Y -40	Validate
Straight	X145 Y -40	Validate
Straight	X145 Y -25	Validate
Clockwise arc	Xf145 Yf25 R25	Validate
Straight	X145 Y40	Validate
Straight	X20 Y40	Validate
Straight	X20 Y8	Validate
Straight	X55 Y8	Validate
Straight	X55 Y -8	Validate
Straight	X20 Y -8	Validate

Corners

Select the lower left corner
Select the upper left corner
Escape

Chamfer

Chamfer 15 ENTER
Chamfer 15 ENTER

Finish

Save profile

Profile 2D pocket

F5 

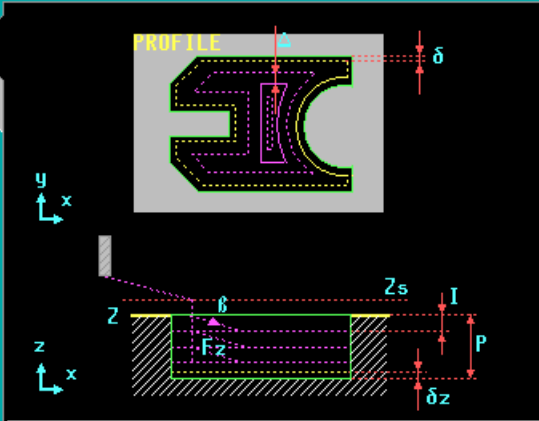
10:11:22

DNC

P000008

MEMORY

PROFILE POCKET 2D



X 0.000

F 300.000

Y 3.571

S 0

Z 10.000

T 4

PROFILE 101

X 20.0000

Y -8.0000

Zs 10.0000

Z 0.0000

P 20.0000

I 3.0000

Fz 90.0000

ROUGHING

F 250.0000

S 1000

T 4

D 4

delta 30.0000

Delta 4.0000

FINISHING

F 300.0000

S 1200

T 4

D 4

delta 0.1000

N 1

theta 30.0000

delta z 0.1000

CAP

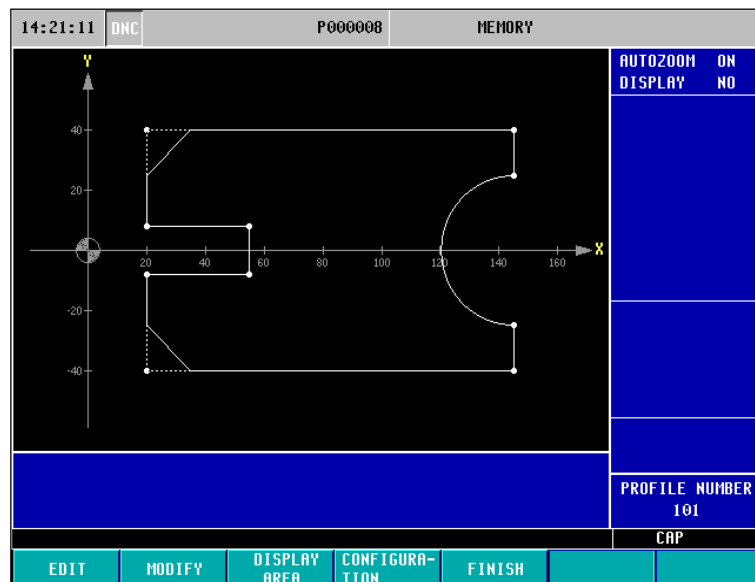


Enter the
profile editor

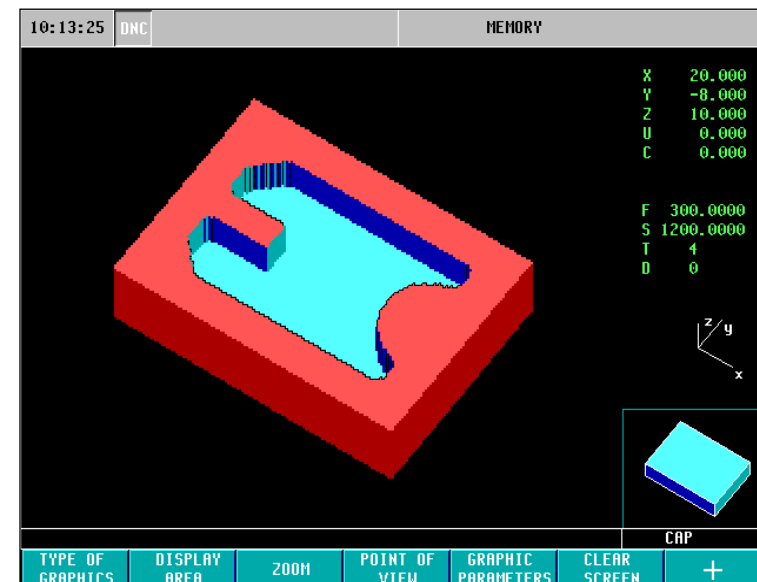
Entry point

Exercise: Profile 2D pocket

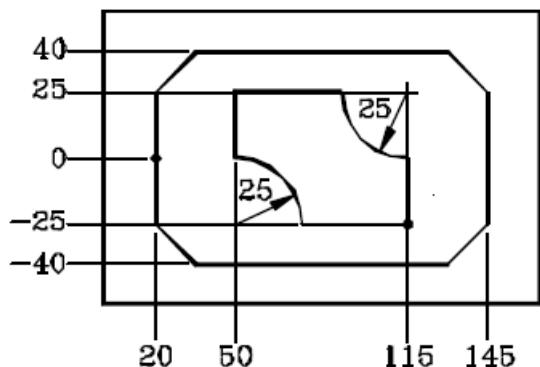
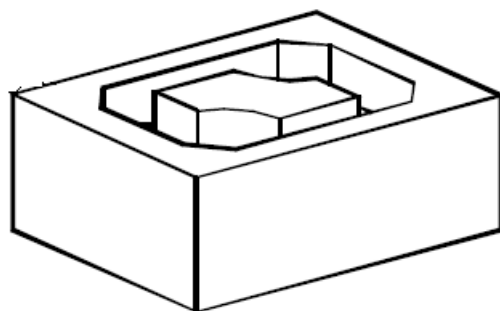
Edit screen



3D simulation screen



Exercise: Profile 2D pocket with island



Profile 102

Starting point	X20 Y0	Validate
Straight	X20 Y -40	Validate
Straight	X145 Y -40	Validate
Straight	X145 Y40	Validate
Straight	X20 Y40	Validate
Straight	X20 Y0	Validate

Corners

Chamfer

Select the lower left corner	Chamfer 15 ENTER
Select the lower right corner	Chamfer 15 ENTER
Select the upper right corner	Chamfer 15 ENTER
Select the upper left corner	Chamfer 15 ENTER
Escape	

New profile

(Island)

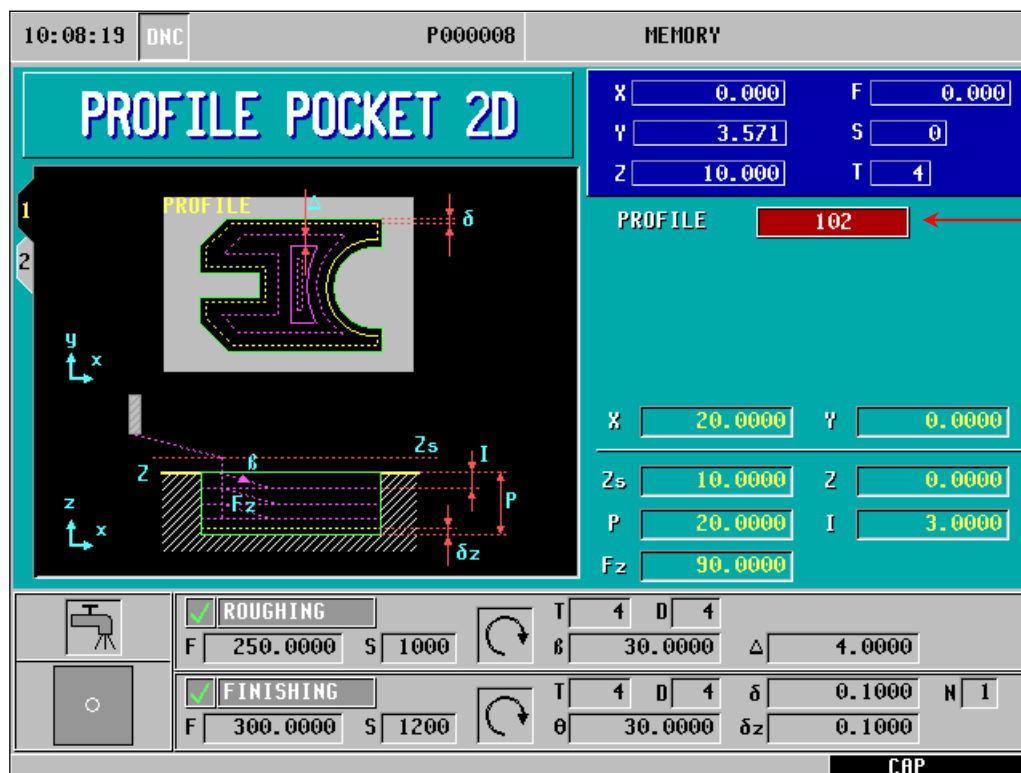
Starting point	X115 Y -25	Validate
Straight	X115 Y0	Validate
Clockwise arc	Xf90 Yf25 XR25	Validate
Straight	X50 Y25	Validate
Straight	X50 Y0	Validate
Clockwise arc	Xf75 Yf -25 XR25	Validate
Straight	X115 Y -25	Validate

Finish

Save profile

Profile 2D pocket with island

F5 



10:08:19 DNC P000008 MEMORY

PROFILE POCKET 2D

1 PROFILE

2

X 0.000 F 0.000
Y 3.571 S 0
Z 10.000 T 4

PROFILE 102

X 20.0000 Y 0.0000
Zs 10.0000 Z 0.0000
P 20.0000 I 3.0000
Fz 90.0000

ROUGHING
F 250.0000 S 1000
FINISHING
F 300.0000 S 1200

T 4 D 4
β 30.0000 Δ 4.0000
T 4 D 4 δ 0.1000 N 1
θ 30.0000 δz 0.1000

CAP

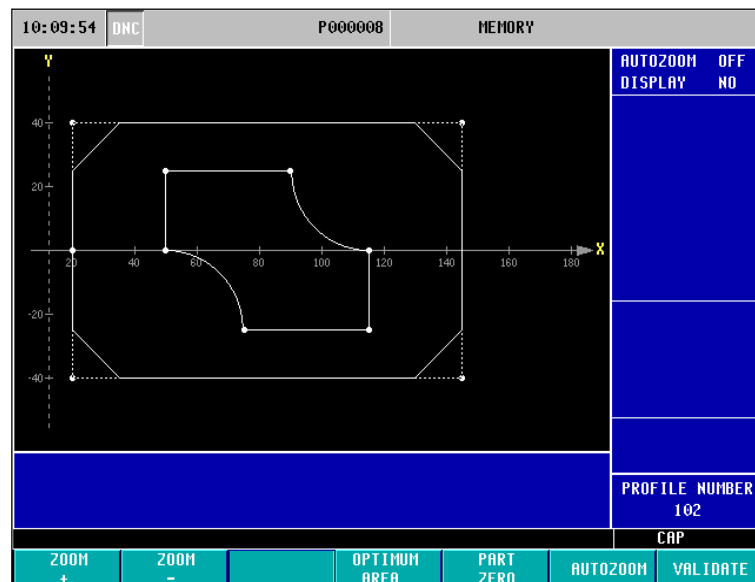


Enter the
profile editor

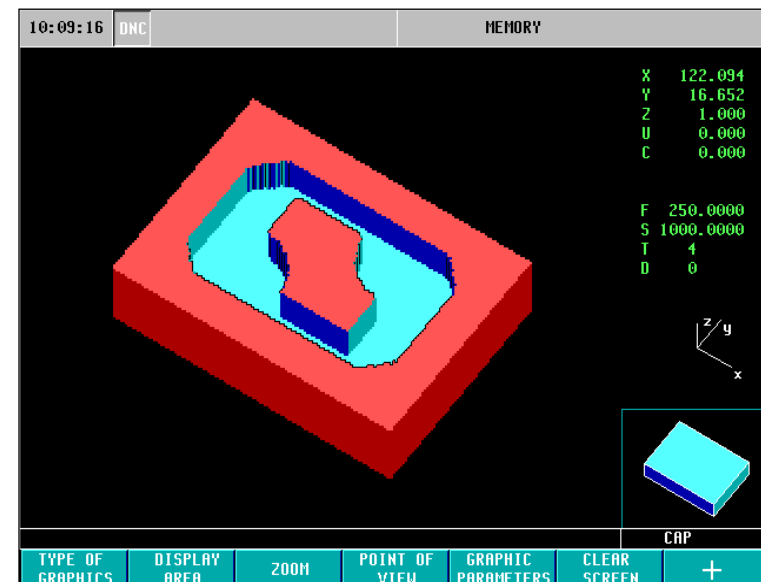
Entry point

Profile 2D pocket with islands

Edit screen



3D simulation screen



Profile 3D pocket

F5



Number for the new part program (0 -999)
This will create a program 995xxx in the CNC memory

Number of the XY profile
Creates program 998xxx in the CNC memory

- Number of the Z profile for the XY contour
- Creates program :996xxx in the CNC memory

- Number of the Z profile for the first island
Creates 9996xxx in the CNC memory

Z profile for more islands

- Creates the new program

10:14:00 DNC P000008 MEMORY

PROFILE POCKET 3D

1
2

POC. 3D 1 P. XY 3
P. Z1 3 P. Z2 0
P. Z3 0 P. Z4 0

X 0.0000 Y 0.0000
Zs 10.0000 Z 0.0000
P 20.0000 I1 3.0000
Fz 90.0000 I2 0.0000

ROUGHING
F 150.0000 S 800
FINISHING
F 180.0000 S 1200

T 4 D 4
R 60.0000 Delta 0.5000
T 4 D 4
R 0.0000 Delta 0.3000
epsilon 0.1000

Set of 3D pocket profiles. CAP

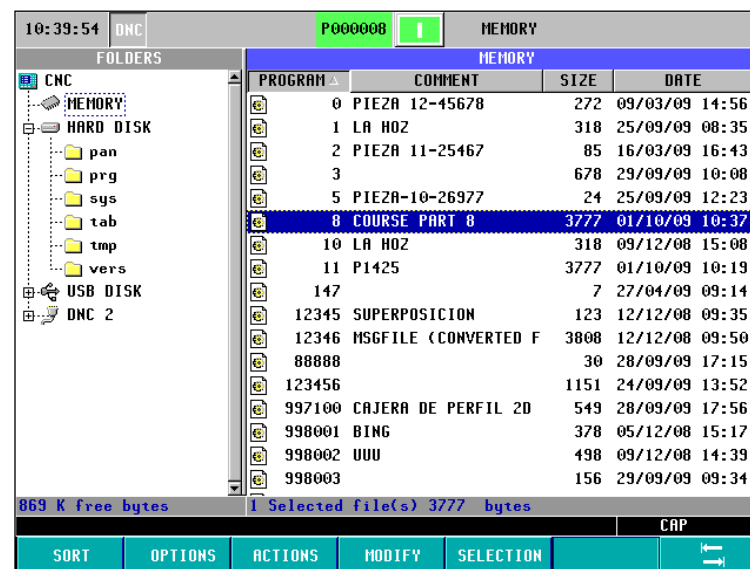
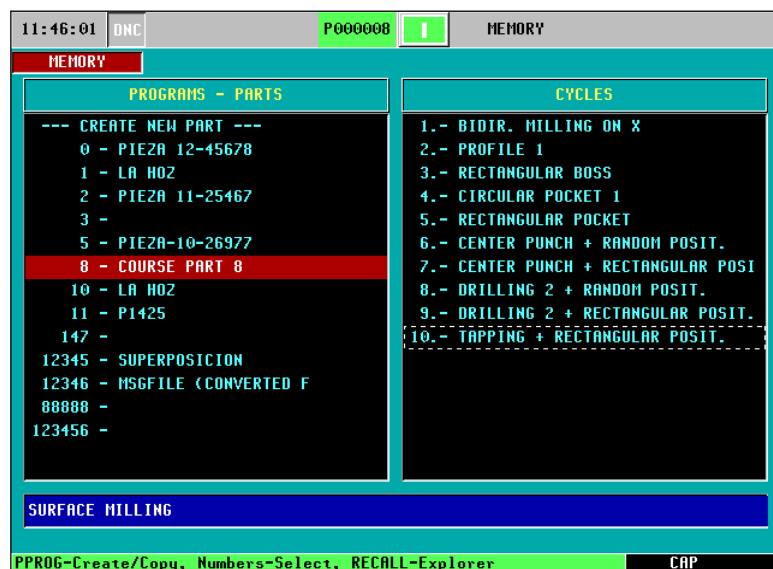
Expanded program manager - explorer



Select PROG screen



Press RECALL to open the explorer



Expanded program manager - explorer

Main programs:

0 – 999 999

0 – 899 999

user area

900 000 – 999 999

Fagor- and OEM-area

Saved user cycles:

995 xxx

3D pocket programs

996 xxx

Z profiles of 3D pockets

997 xxx

???

998 xxx

2D pockets with islands

} These programs are created
through user cycles.
They must be saved separately

Subroutines: SUB0 – SUB9999

0 – 8999

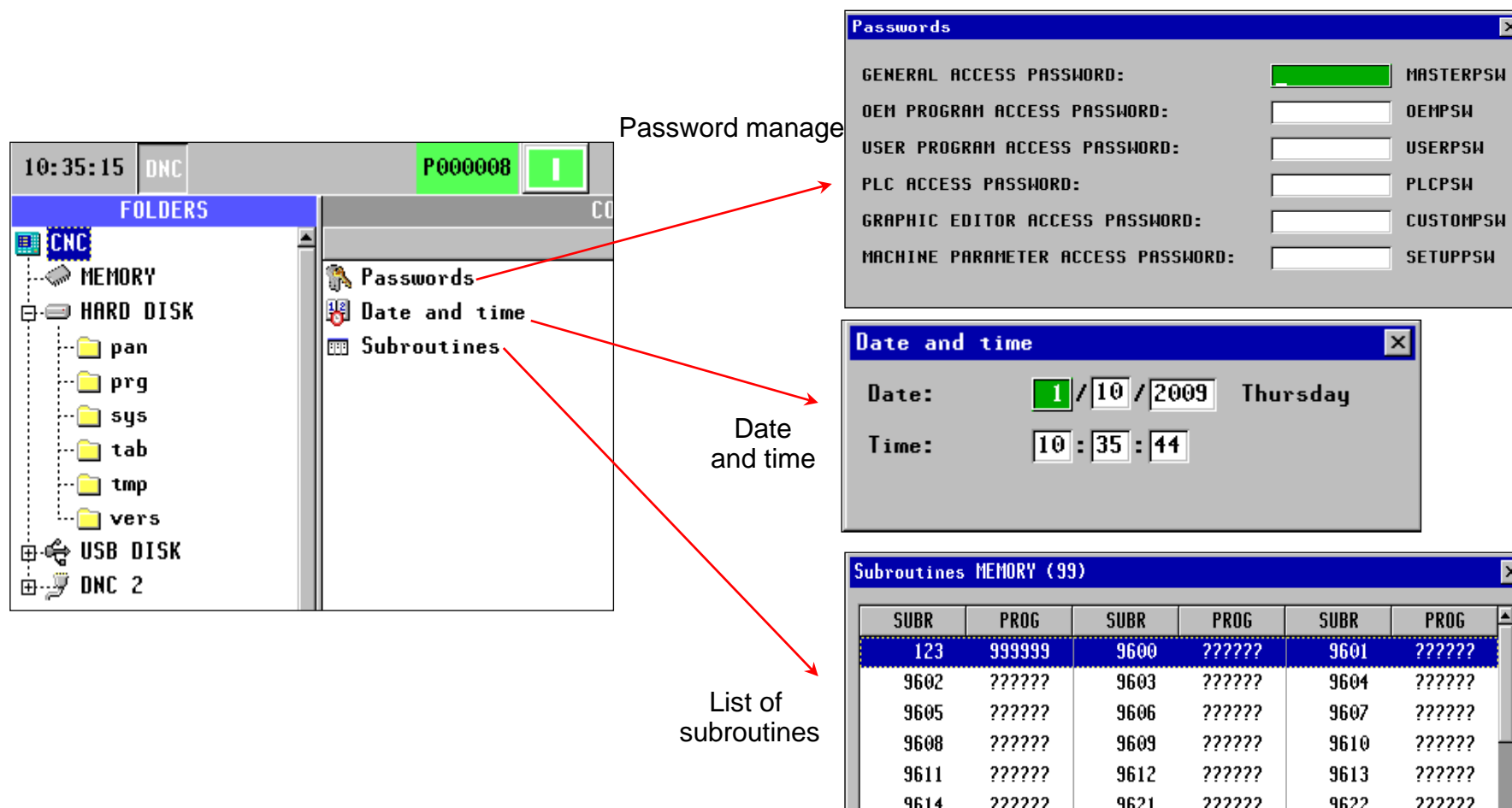
User area

9000 – 9999

Fagor- and OEM-area

User defined subroutine in reserved main programs
See also “list of subroutines” at the explorer

Expanded program manager - explorer



The screenshot shows the 'Expanded program manager - explorer' interface. The left pane displays a tree view of folders: MEMORY, HARD DISK (containing pan, prg, sys, tab, tmp, vers), USB DISK, and DNC 2. The right pane shows a list of items: Passwords, Date and time, and Subroutines. Red arrows point from these items to their respective dialog boxes on the right.

Passwords

GENERAL ACCESS PASSWORD: MASTERPSW
 OEM PROGRAM ACCESS PASSWORD: OEMPSW
 USER PROGRAM ACCESS PASSWORD: USERPSW
 PLC ACCESS PASSWORD: PLCPSW
 GRAPHIC EDITOR ACCESS PASSWORD: CUSTOMPSW
 MACHINE PARAMETER ACCESS PASSWORD: SETUPPSW

Date and time

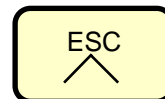
Date: 1 / 10 / 2009 Thursday
 Time: 10 : 35 : 44

Subroutines MEMORY (99)

SUBR	PROG	SUBR	PROG	SUBR	PROG
123	999999	9600	??????	9601	??????
9602	??????	9603	??????	9604	??????
9605	??????	9606	??????	9607	??????
9608	??????	9609	??????	9610	??????
9611	??????	9612	??????	9613	??????
9614	??????	9621	??????	9622	??????

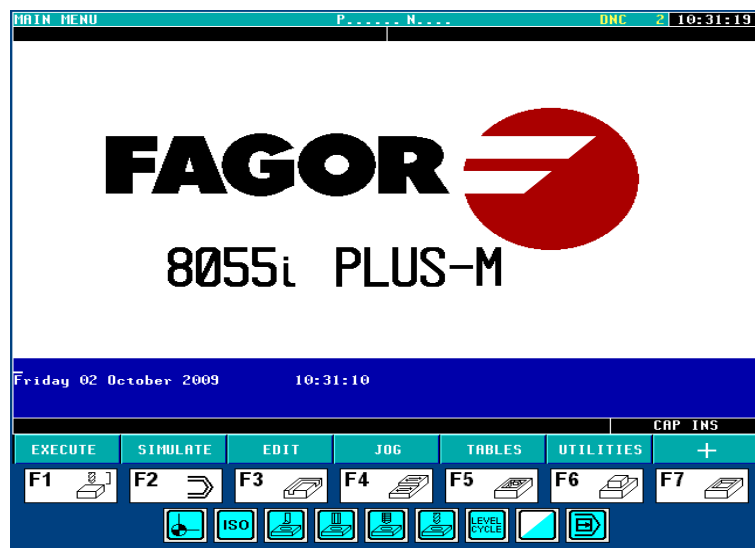
Operation in M mode

Change the HMI's with

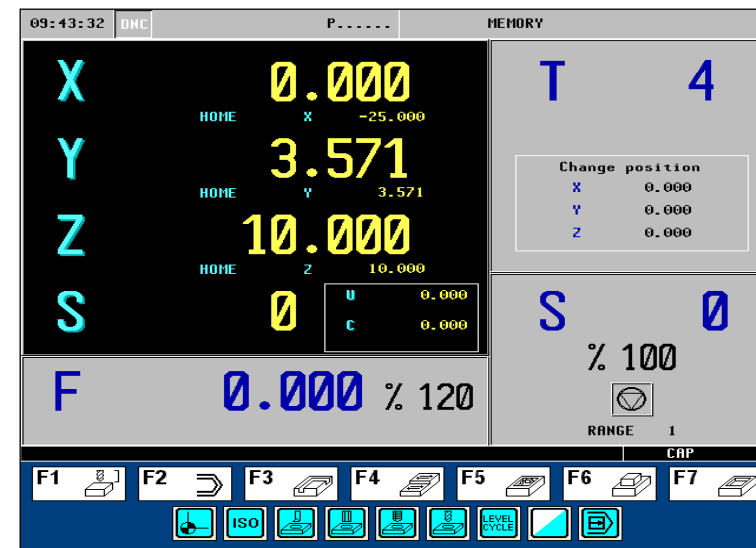
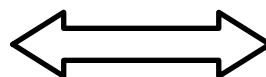
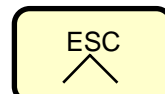


MC, conversational HMI

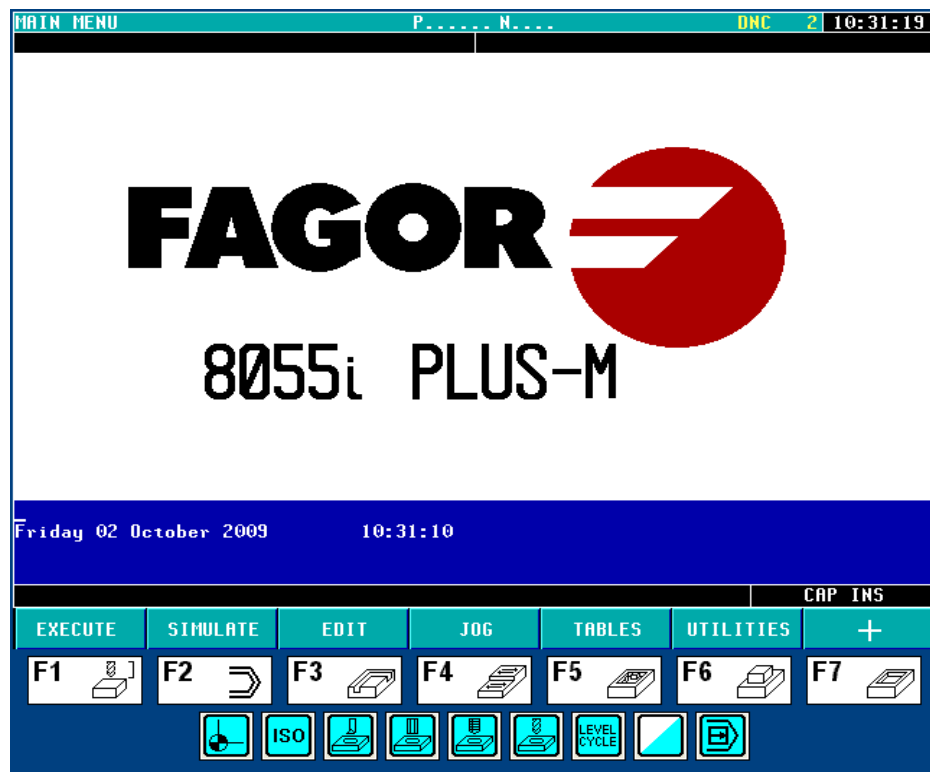
M basic HMI



toggle



Operation in M mode

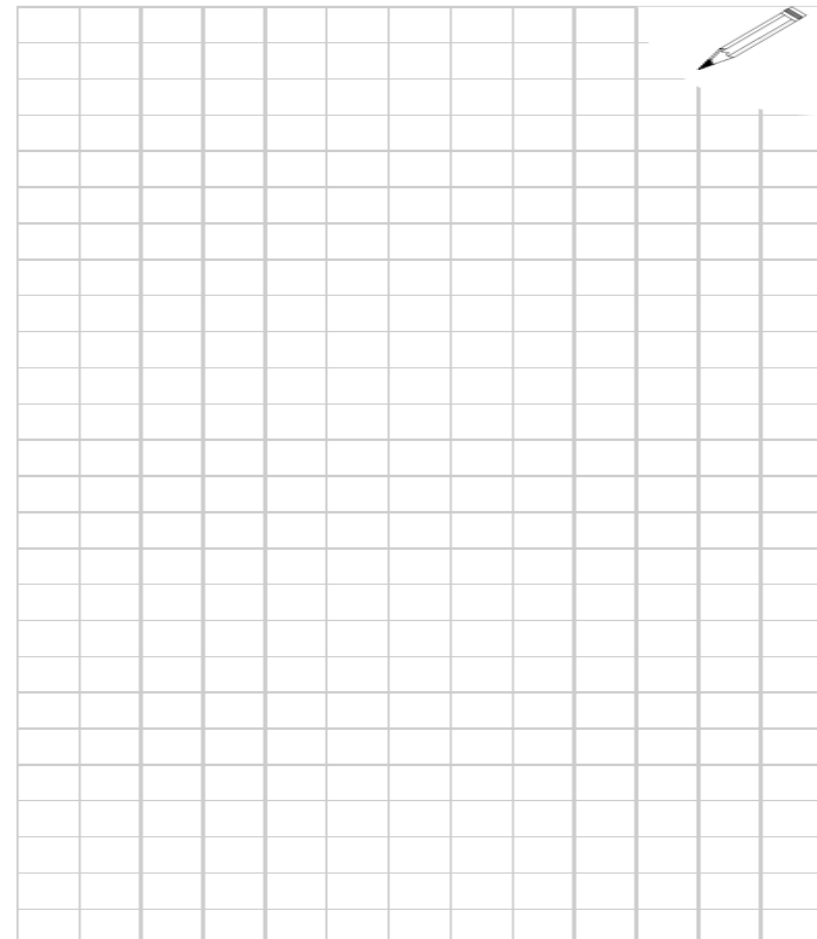
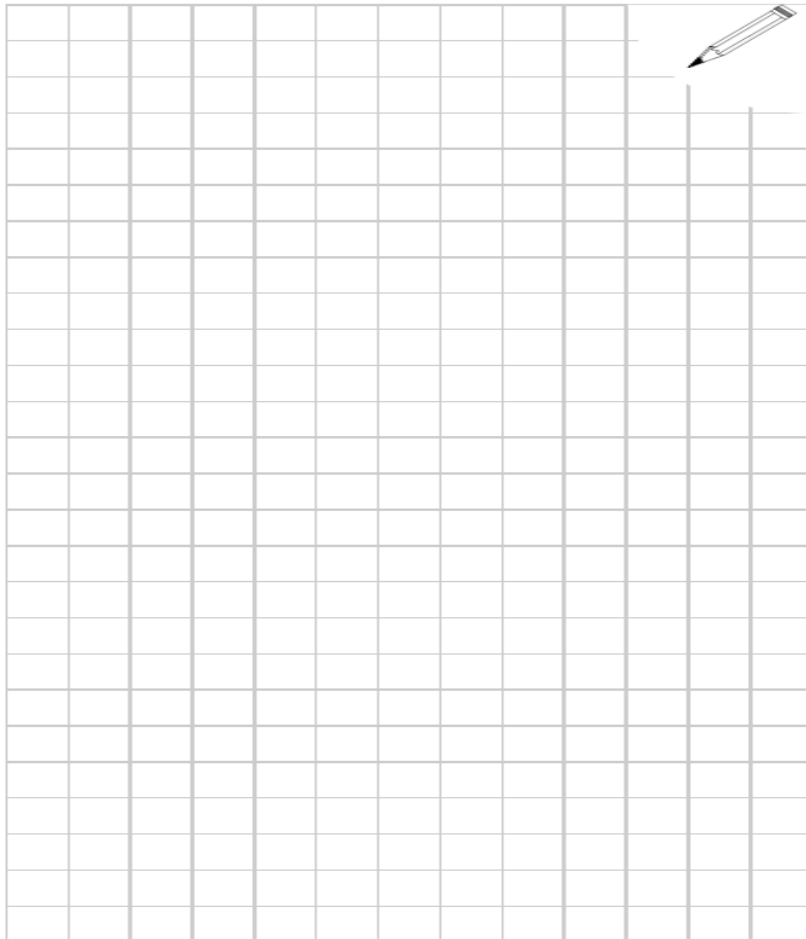


To work with the T HMI, you have to use the functions of the softkeys.

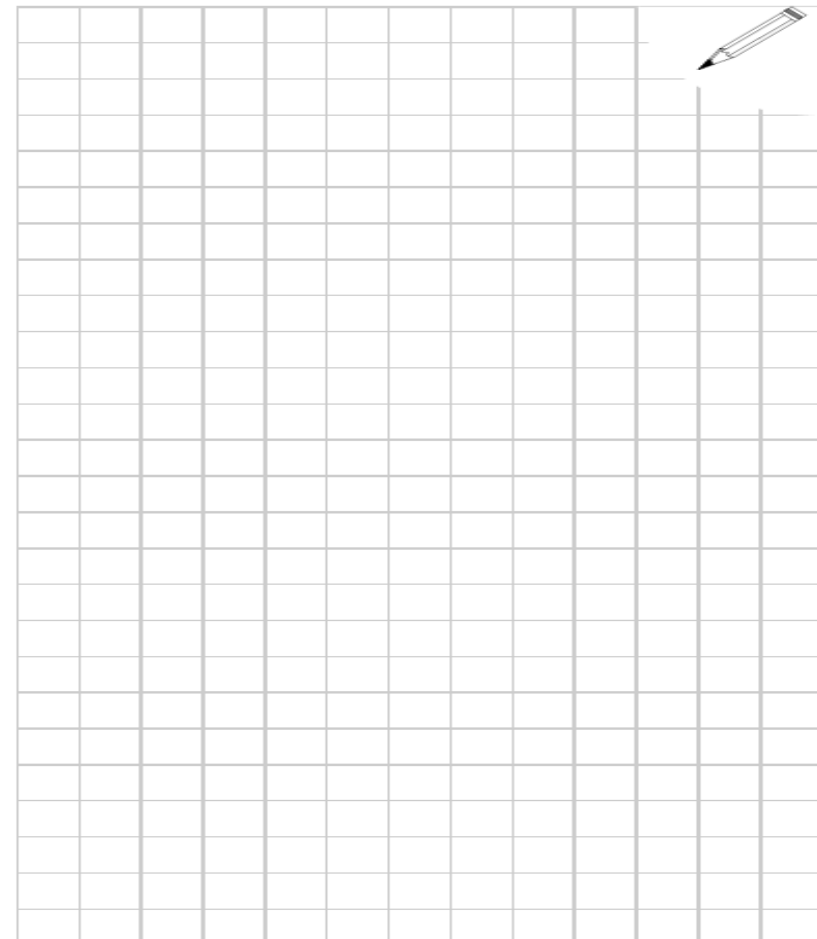
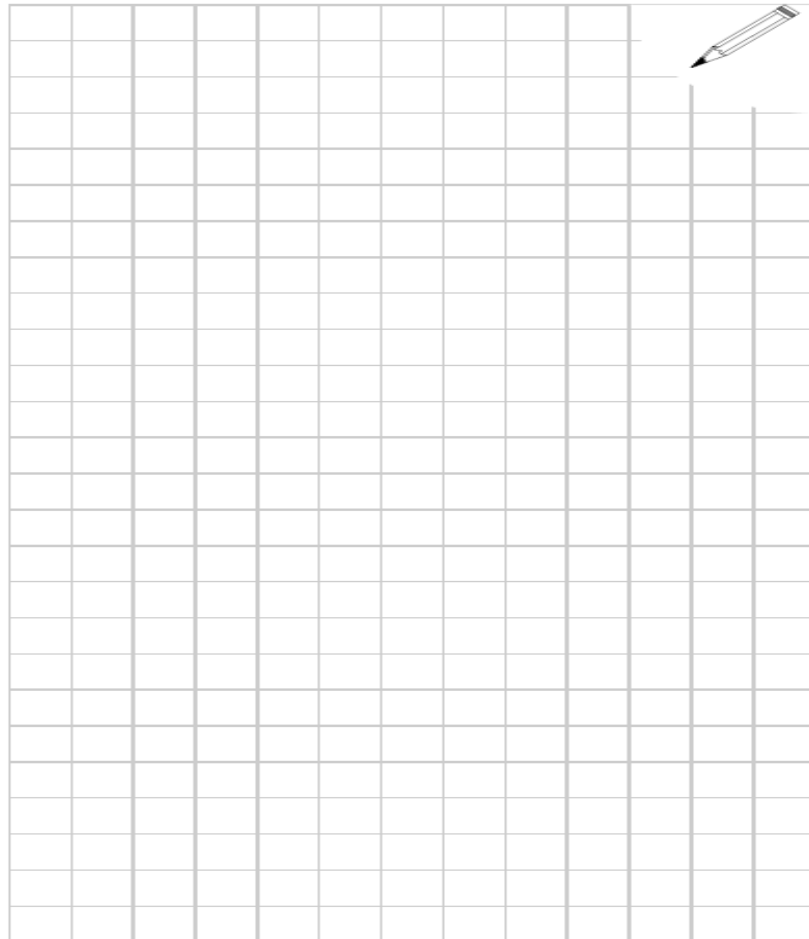
You can control all functions inside the CNC system like edit CNC programs, simulation, tool table, parameters, PLC diagnosis etc.

Softkeys to use and control the M HMI

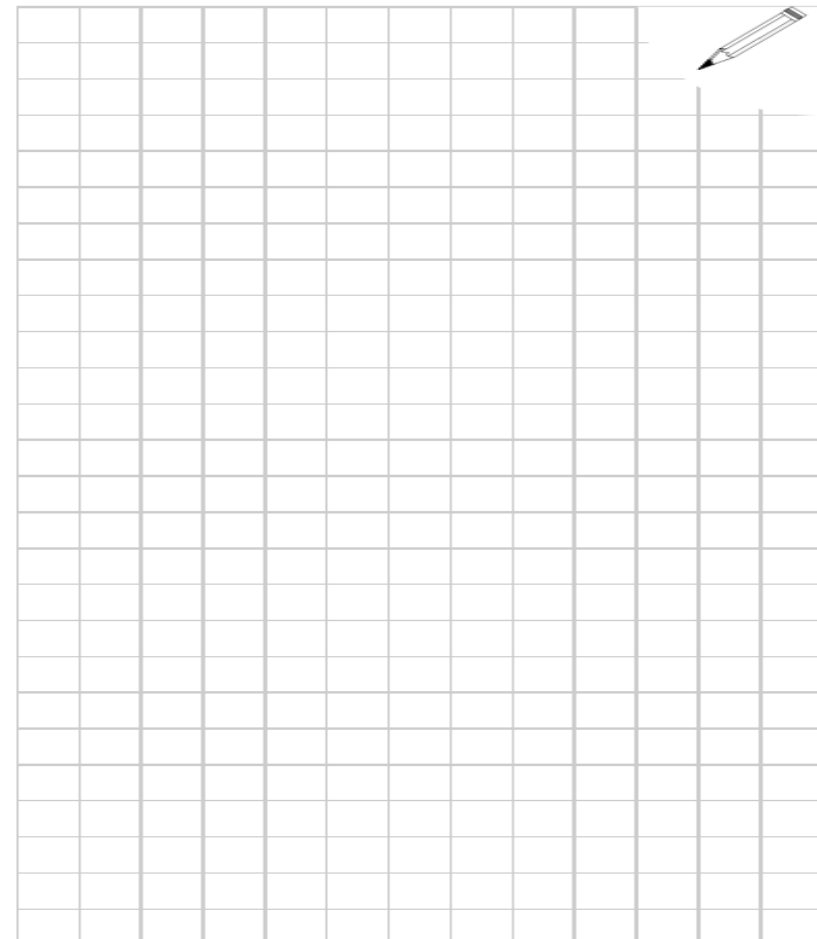
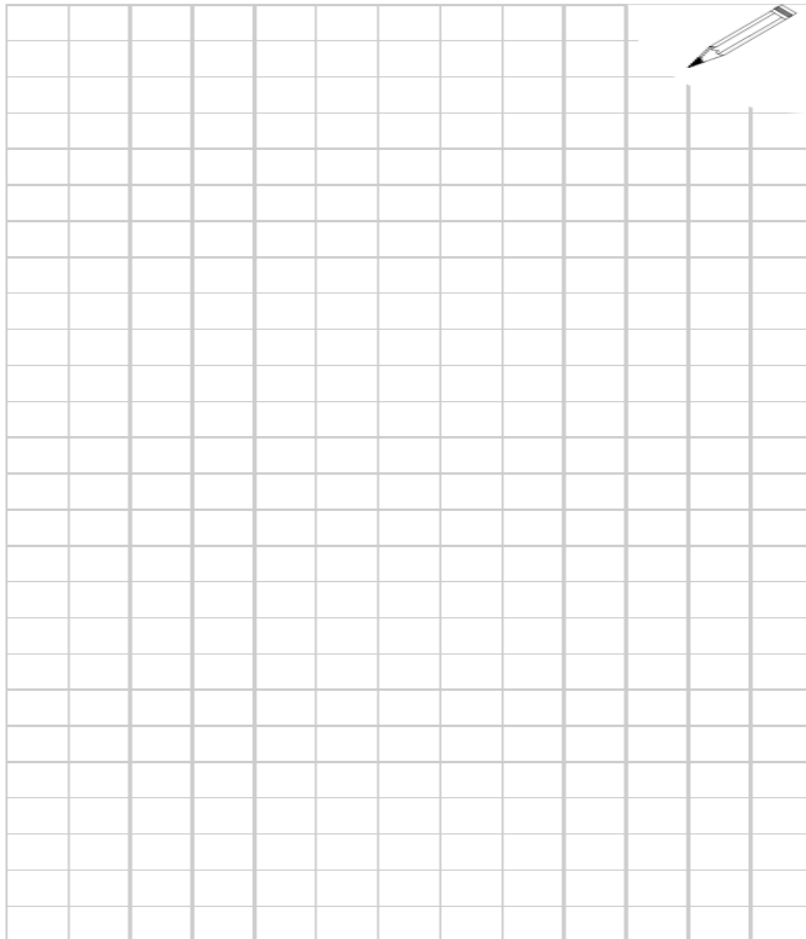
Notes



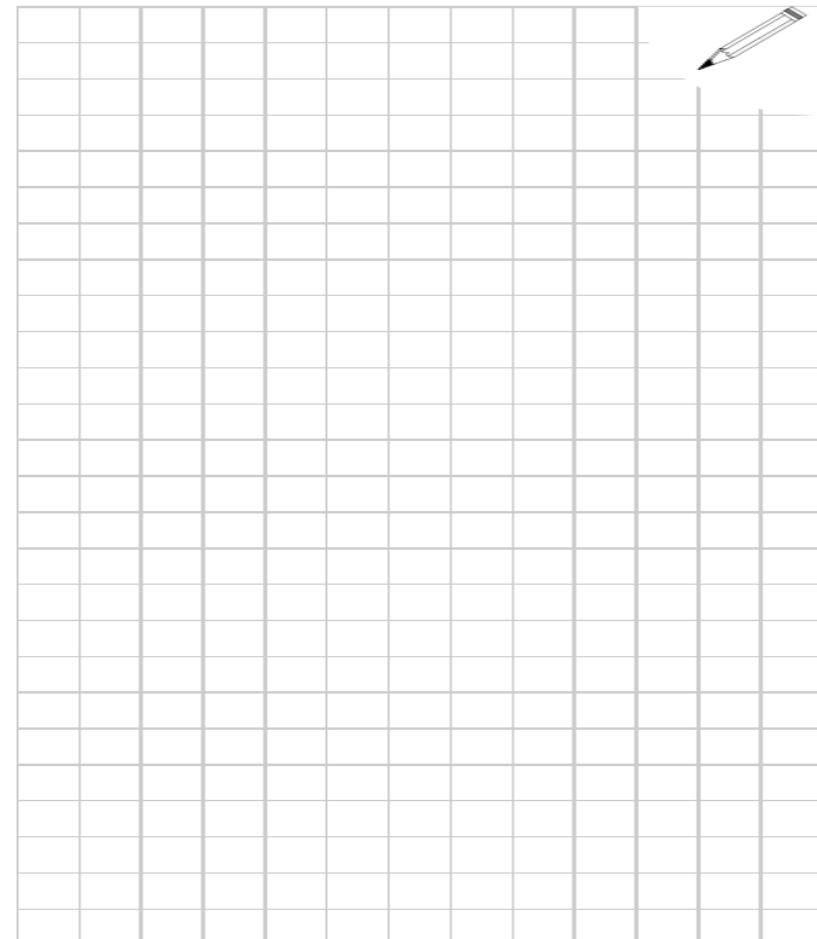
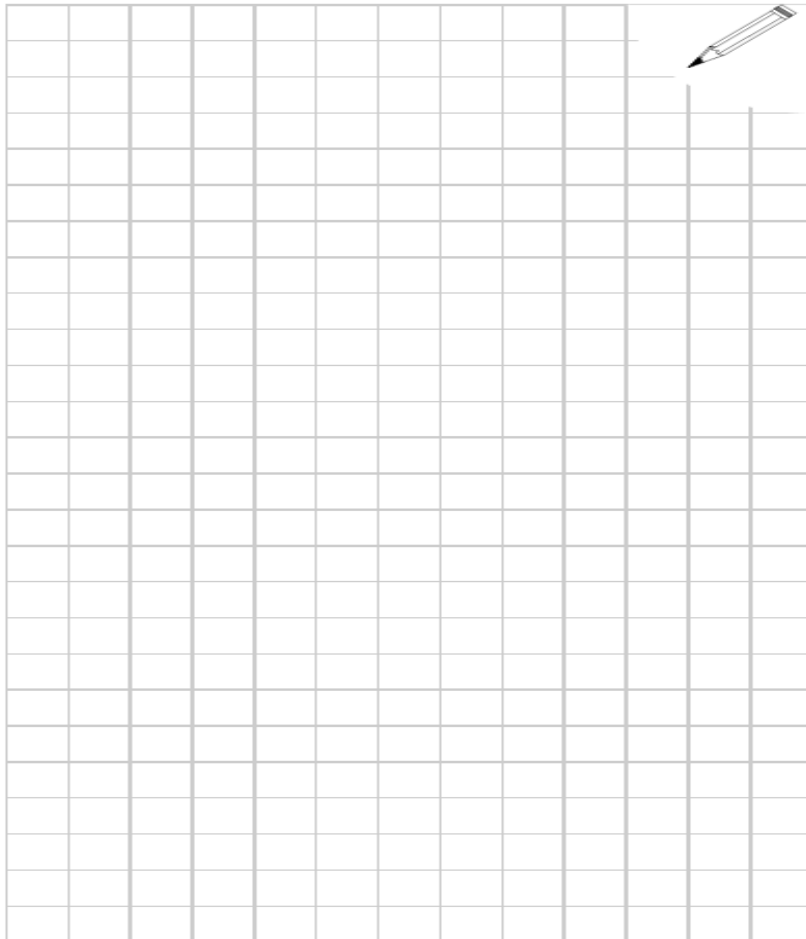
Notes



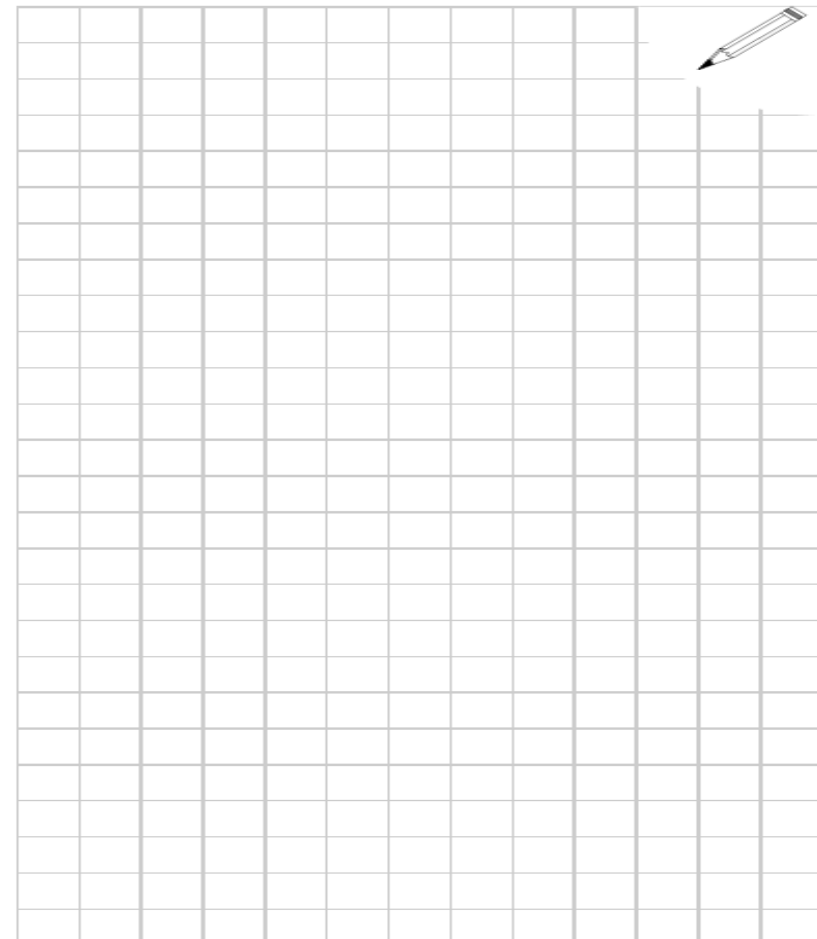
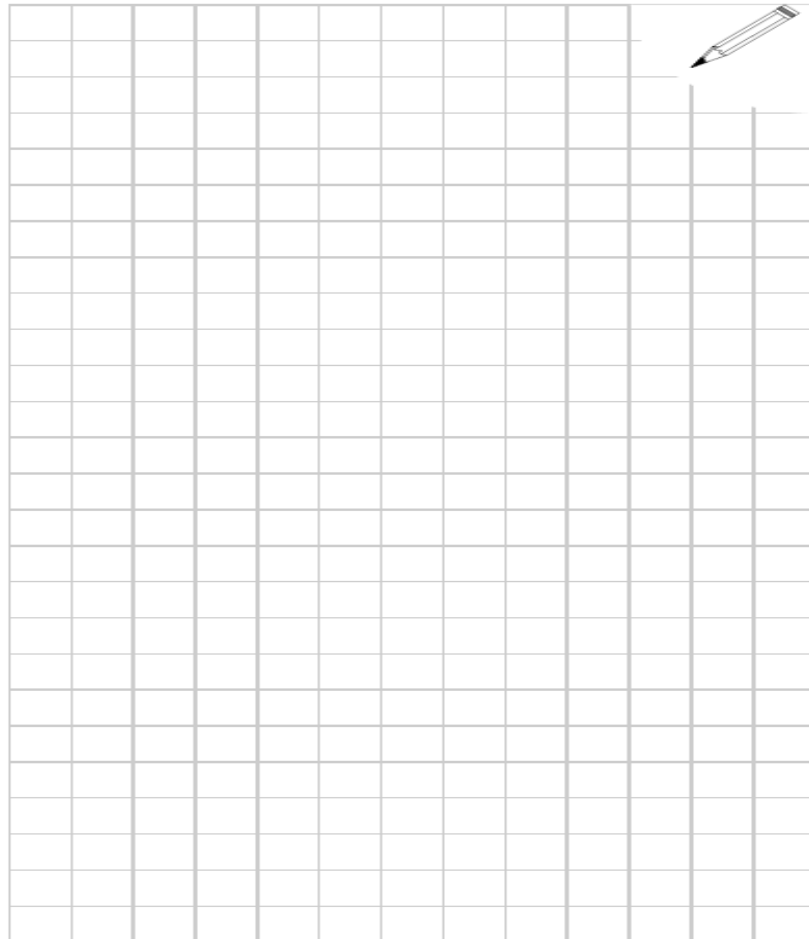
Notes



Notes



Notes



Notes

