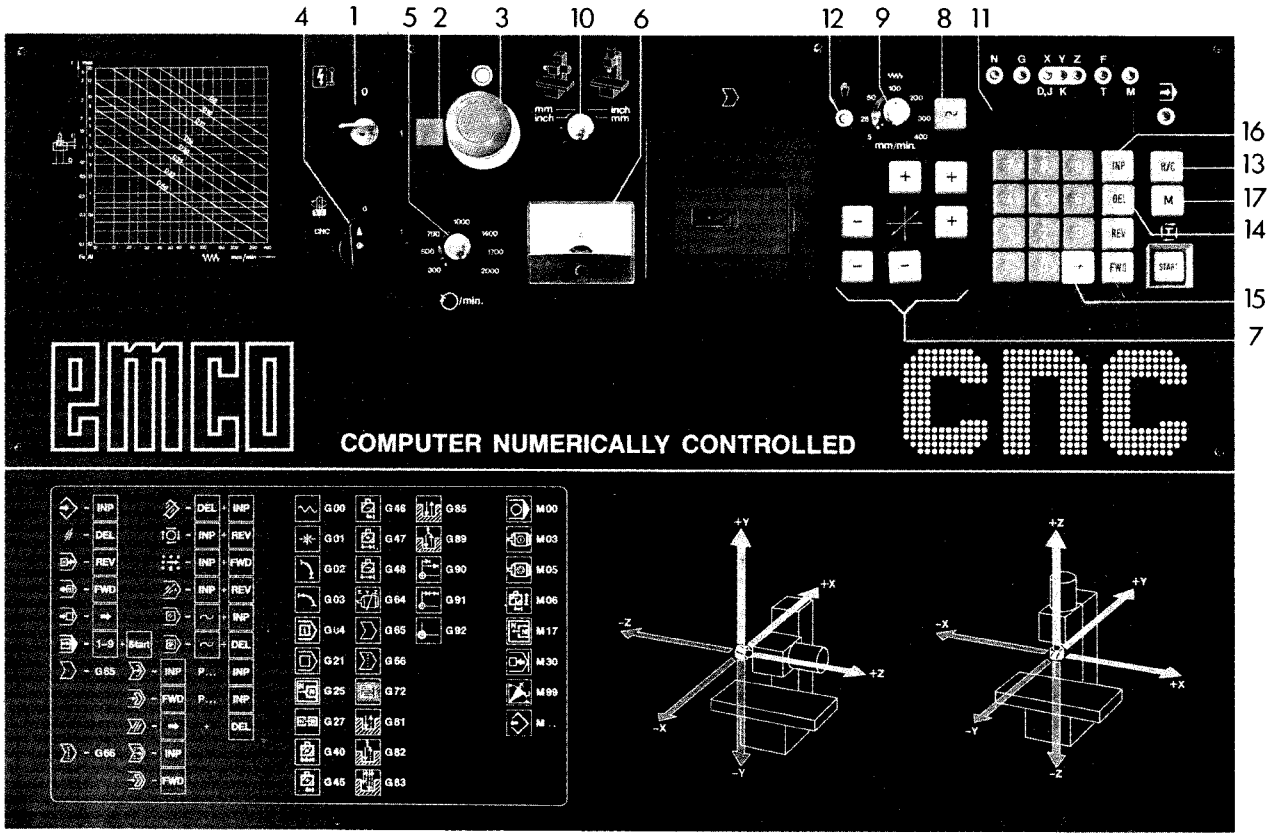
# Operating Elements
# Control Elements
# Hand Operation




1. Main switch

Turn key to the right. Machine and control are under power unless emergency stop button is pressed.

2. Indicator lamp main power switch

When main switch is on, lamp is on.

3. Emergency stop button

Control, feed motors and main motors are cut off from power by pressing emergency stop button: turn button to the left - it will jump back to original position. Main motor switch has to be switched on again.

4. Switch for main spindle

Turn switch to the right.

5. Adjusting knob for speed control of main spindle - calibrated in RPM

6. Ammeter

Shows power consumption of main spindle motor. In order to protect motor against overload, the power consumption should not surpass 4 A with 110 V.

7. Feed keys for longitudinal, cross and vertical slide

8. Rapid traverse key

If keys for feed and rapid traverse are pressed together, then the relative slide will move with rapid traverse speed.

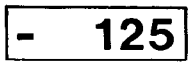
9. Adjusting knob for setting the feed rate

10. Inch/metric switch and switch for changing the axis system

11. Digital read-out for slide movement

± X, ± Y, ± Z are shown in 1/100 mm or 1/1000 inch.

Plus movement without sign
Minus movement by a light
to left of numbers




X -1,25 mm or - .125 inch

12. Indicator lamp for hand operation

13. [H/C] switch key: hand operation/CNC operation

If you press the [H/C] key the light of the control lamp hand operation will jump to CNC operation (operation mode: CNC). By pressing the key once again the light will jump back (operation mode: hand operation).

14. [DEL] key

**The X,Y,Z values are set to zero when this key is pressed.**

15. The [→] key

With the [→] key you can switch from X to Y to Z without movement of slides.

16. The [INP] key

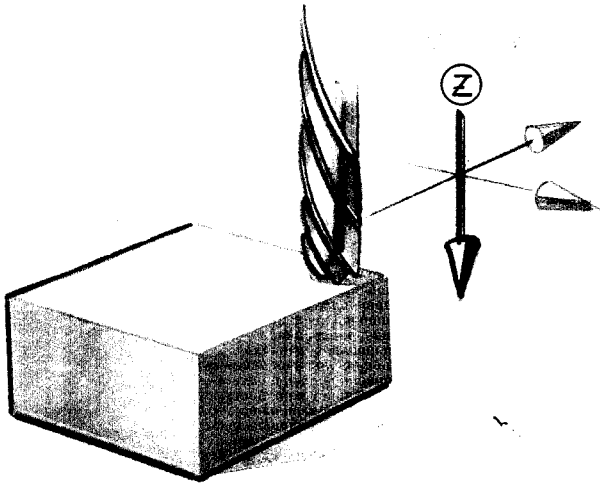
With the [INP] key you enter the values for slide movements.

17. M-key

Activates switching exits.

# Hand Operation F1-CNC

## Positioning of the Milling Cutter




### 1. Scratching front sides and top side

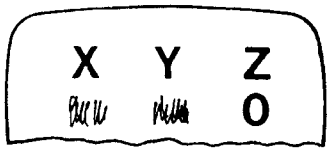
With milling most measurements refer to outer edges. In order to use the measurements of the technical drawing you have to "zero-set" the display and use as reference/starting point the outer edges.

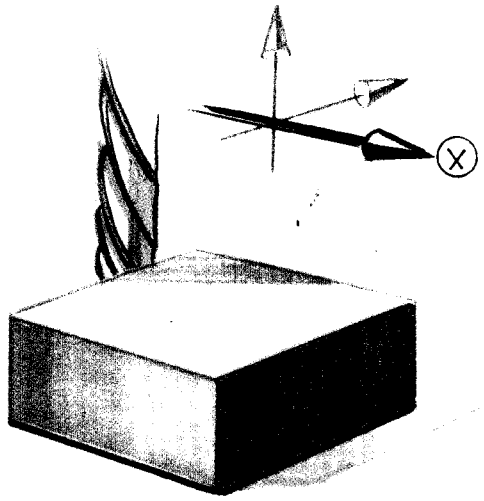
### Example

Milling cutter with dia. 1/4".

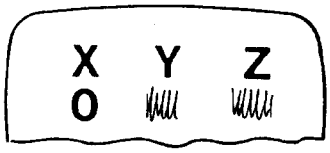
Move milling cutter in Z-direction until you scratch surface slightly.

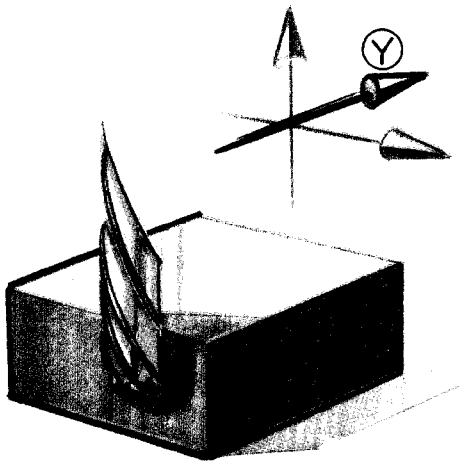
Set Z-display to zero (press key DEL).



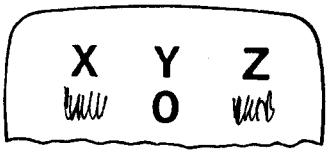




- Scratch front side in X-direction.
- Set X-display to zero (press key DEL)

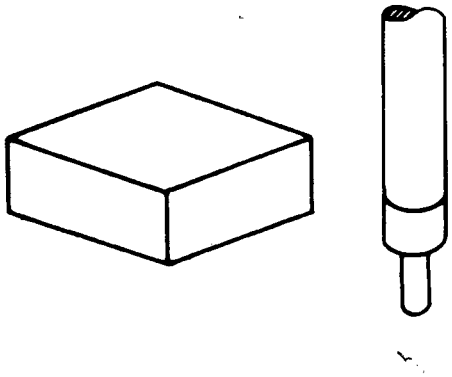



- Scratch front side in Y-direction.
- Set Y-display to zero (press key DEL)

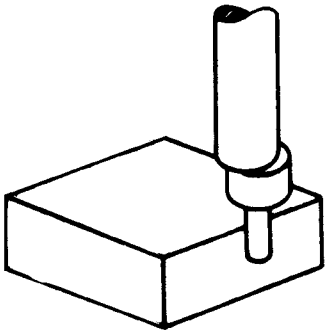


## Positioning spindle using edge finder



The edge finder can be used to position the machine relative to the workpiece edge without actually marking the workpiece.

Mount the edge finder in the spindle with the small .200" diameter downward. Turn main spindle on and adjust speed to 1000 rpm. The end of the finder will center itself.



Now slowly jog the machine to move the edge finder near to the desired edge of the workpiece. When the rotating edge finder contacts the workpiece you will see the tip "jump" off-center about 1/32". At this point the centerline of the spindle is exactly .100" away from the edge of the workpiece.

The edge finder is a precision ground instrument that will accurately read position within .001". Like any other instrument it should be treated with care. Approach the work only in slow jog speed and "step" into the piece slowly, never in rapid traverse.

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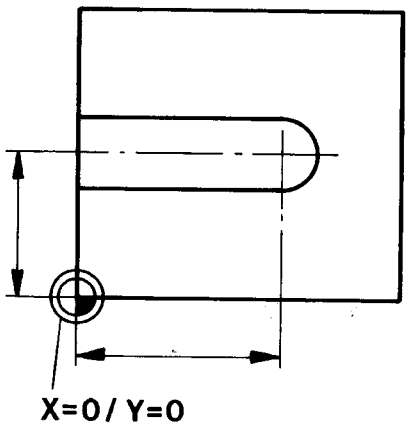
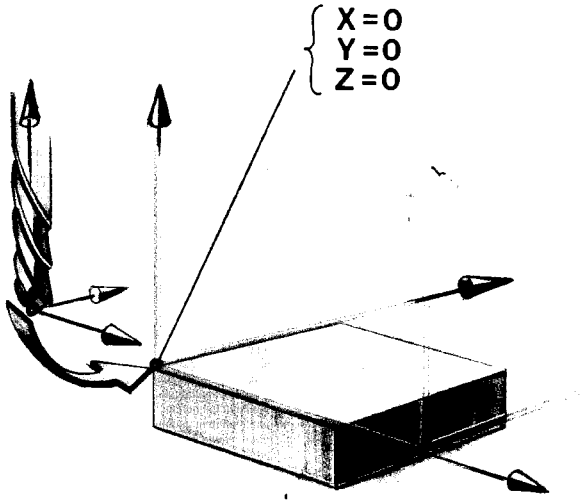
## 2. Zero-setting of Display to Zero Point of Dimensioning (Example: Milling)




Example: Milling of groove

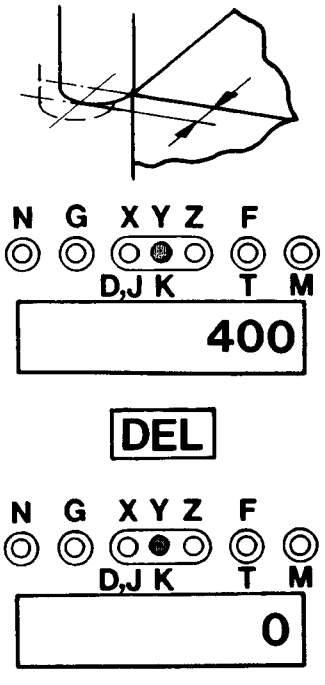
- The groove is milled using a .250" cutter.
- Zero point for the dimensioning is the workpiece edge and surface.
- The measures refer to the center of the milling cutter.




### Consequence

Move axis of milling cutter to edge of workpiece.

a) Scratching of all 3 surfaces and zero-setting of X,Y,Z.




b) Touch milling cutter on left edge to scratch workpiece. Move by value of milling cutter radius (one half the diameter) in the +Y direction. Set Y to "zero" by pressing DEL key.

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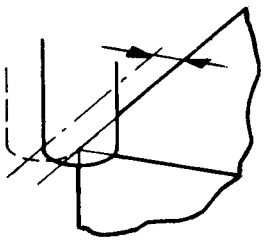
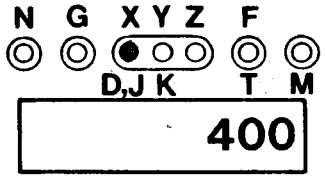
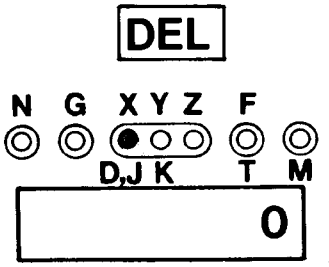




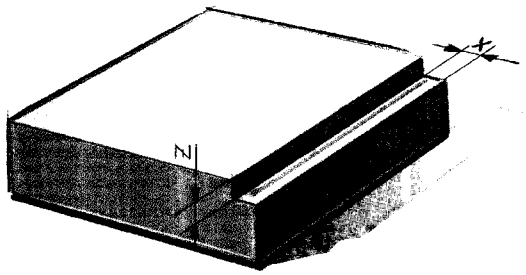

c) Touch milling cutter on front edge to scratch workpiece. Move milling cutter by value of milling cutter radius into X-direction. Set display to "zero".

## Exercise

Move milling cutter such that all display values are at "zero".

## Exercise

Mill a recess as in drawing. Enter the following values:



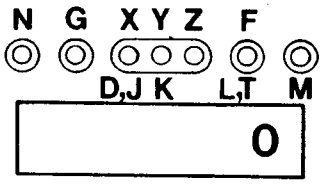
| | |
|---|---|
| Spindle speed S (rpm) | |
| Feed mm/min | |
| Infeed in X (mm) | |
| Infeed in Z (mm) | |

Pay attention to set correct feed.

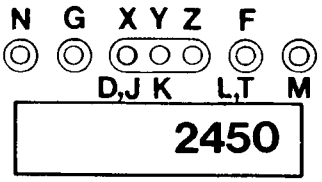
# Traverse — Hand Operation

## Display

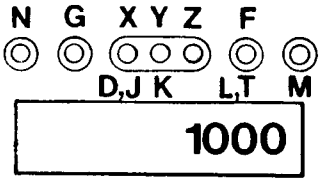
After switching on the machine, the figure 0 appears. Lamps X,Y or Z are on.



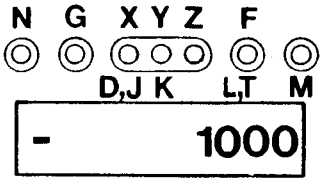

If you traverse in ±X, the X lamp lights up. When you take your finger from the key, the traverse distance is shown in 1/1000" on the display. With a distance of 2.45″ the display indicates 2450.




If you press the Z key, the light jumps to the Z lamp. After you lift your finger from the key, the traverse distance appears (with 1.000" 1000 will appear).

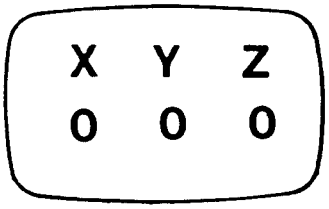



Minus sign on display appears to the left of the numbers.



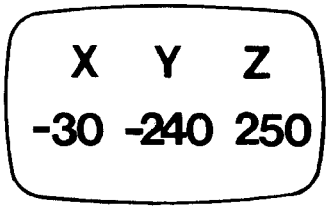

## Monitor

The screen shows zero for X,Y,Z when you switch it on.




If you move in X direction and you take your finger from the key, the traverse distance is shown in 1/1000" or 1/100 mm.

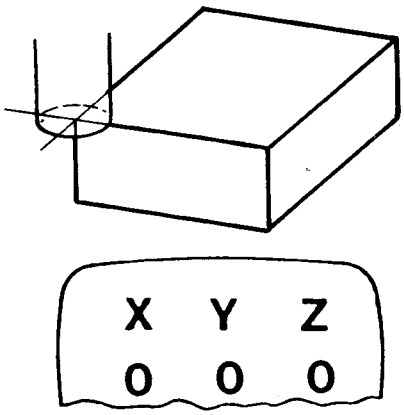
The same happens with Y,Z:
All 3 traverses are shown on the screen.




Minus sign is shown on screen for each axis.

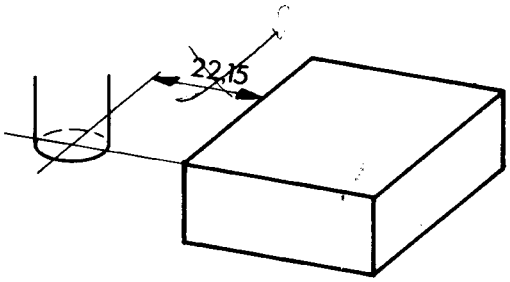
When moving at preset feedrate the display will change every 0.020" or 0.5 mm to update the position shown. In rapid traverse the display will not change until you lift your finger from the key.

# Input of X, Y, Z Zero-Values from any chosen Milling Position



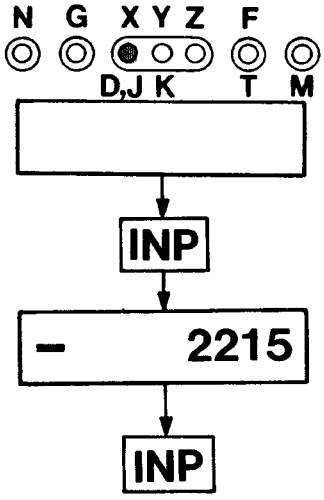

The display should indicate zero, when the milling cutter stands at a given point (X=0, Y=0, Z=0).

You can program the X,Y,Z displays to indicate zero by entering the value of the current position in relation to the desired zero-point.




The center of the milling cutter is at a distance of 2.215" to the workpiece edge in X. The display indicates whatever value.

When the milling cutter traverses in +X direction by 2.215", then the display should indicate the value X=0.

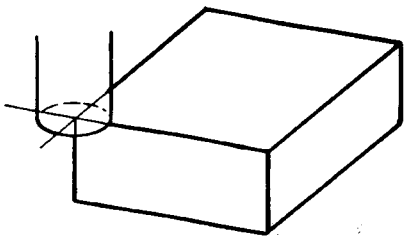



## Procedure:

1. The lamp X on the display lights up
2. Press INP - the lamp X flashes
3. Put in the value 2215 and minus sign, because the milling cutter should indicate with plus "traverse direction 0".
4. Press key INP. The flashing of the X-lamp stops.

You can enter the Y,Z values in the same way.

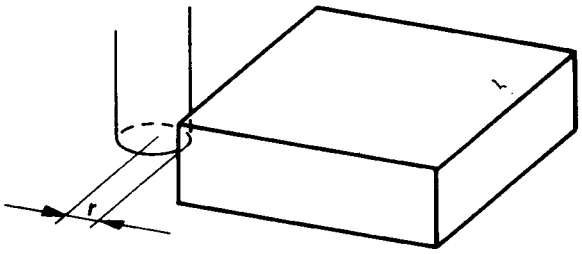
When programming minus-values first put in the figures, then press key minus.



## Application of Path Programming in Hand Operation Mode

Zero point for the dimensioning is the workpiece edge. The milling cutter shall move to this point. The displays shall be set zero.

## Procedure:



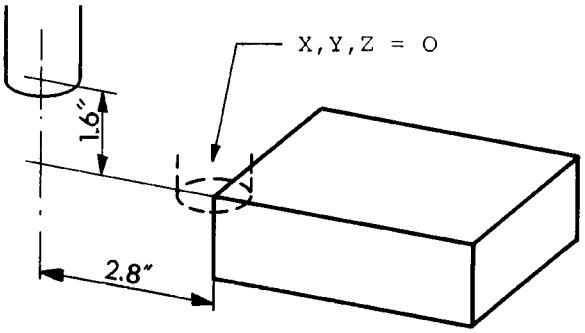

1. Scratch surface, set Z-display zero.

2. Scratch surface in X-direction. Put in value of milling cutter radius r.

3. Scratch surface in Y-direction. Put in value of milling cutter radius r.

## Note:

You can traverse after scratching as you like. If you program the zero-point, you have to add to the X,Y display the radius value and put it in.



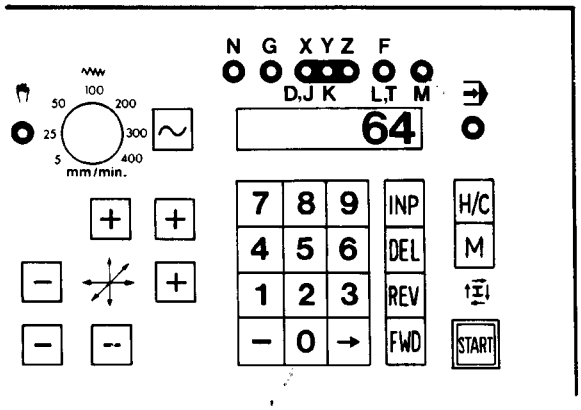

## Exercise:

1. Program the display X,Y,Z=O if the milling cutter is positioned onto the edge.

2. Move the milling cutter to the indicated position.

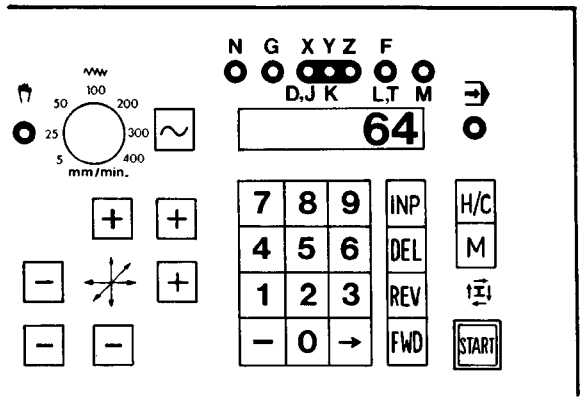
## Switching Feed Motors off

When switching on the machine, the feed motors are not under power.
If you have - in hand or CNC-operation mode - moved the slides, the feed motors stay under power. The video monitor shows a small-[M] symbol in the center of the top line.




Switching power off - with no program being stored

1. Switch to CNC-operation mode: Press H/C key.
2. Press key . The light jumps to G.
3. Key in 6 4. The number appears on the display.
4. Press INP key. Now the feed motors are switched off.
5. The -M symbol disappears from the top line of the video monitor.




Switching power off - with a program being stored

G64 is a pure switching function. It is not stored in memory.

1. Press key so that G light goes on.
2. When a number appears on the display, press DEL.
3. Key in 6 4.
4. Press INP key. Now the feed motors are switched off.
5. The video monitor shows that the previous G-value has been replaced in its proper position and the -M symbol disappears.

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