

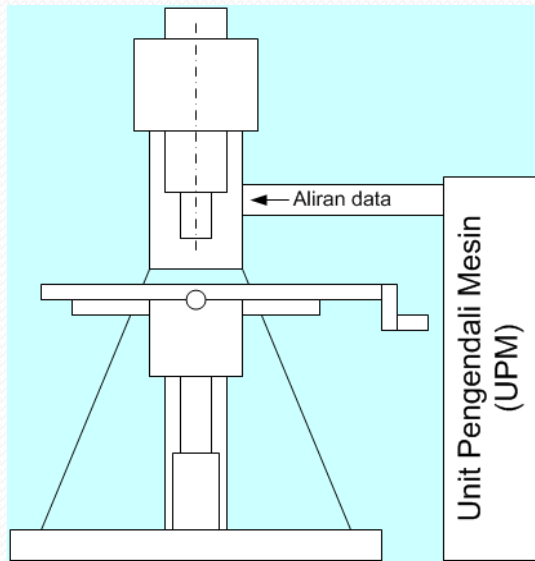
CNC



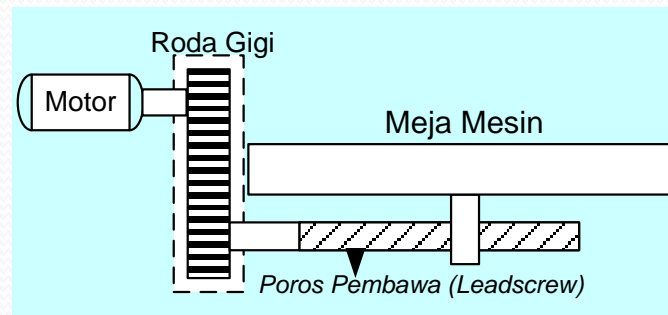
PERKEMBANGAN CNC

- NC (*Numerical Control*) adalah system pengendalian mesin dengan menggunakan angka/numeric.
- CNC (*Computer Numerical Control*) pada prinsipnya sama dengan NC, yaitu sistem pengendalian mesin dengan menggunakan angka/numerik, tetapi memiliki kelebihan dibanding NC. Kelebihan tersebut diantaranya adalah kemampuan dalam menyimpan dan meningkatkan memori pada alat kendali.
- Menurut Pusztai (1983:8) mesin CNC adalah mesin yang terdiri dari *unit input, computing or mathematics unit, memory unit, control unit, and out put unit*.

PENGENDALIAN MESIN NC

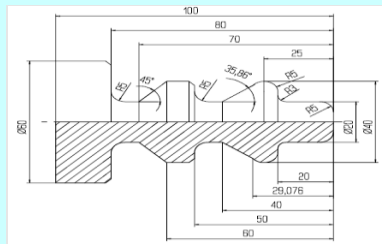


Gambar 1.1 Prinsip Pengoperasian Mesin NC

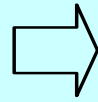


Gambar 1.2 Prinsip pengendalian gerakan sumbu mesin

STRUKTUR PENGOPERASIAN MESIN NC

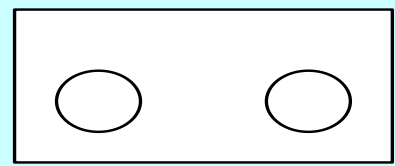
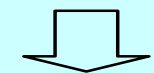


Gambar kerja

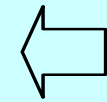


```
G0 X500 Z500 T020202 M3 M42 M63
G96 S200
G50 S3000
G0 X62 Z0
G1 X-1 F0.15 M8
G0 X16 Z2
G86 NLAP1 D6 U0.4 W0.2 F0.3
```

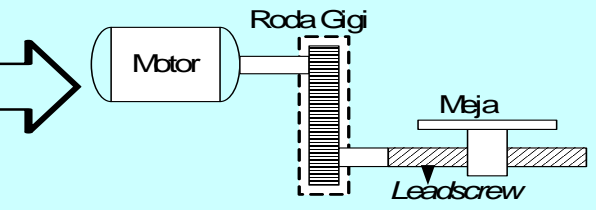
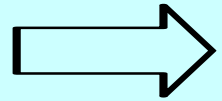
Program



Alat Pembaca Data

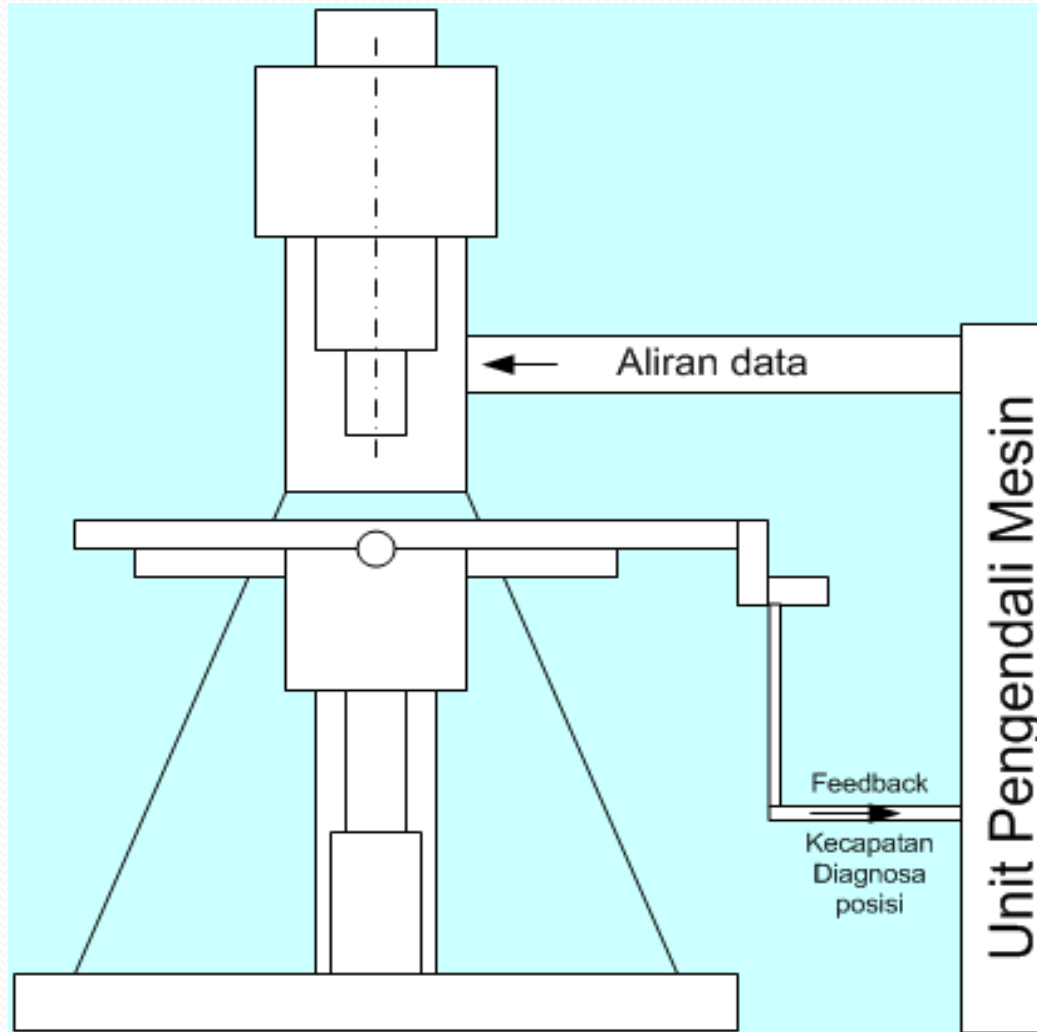


Pengendali

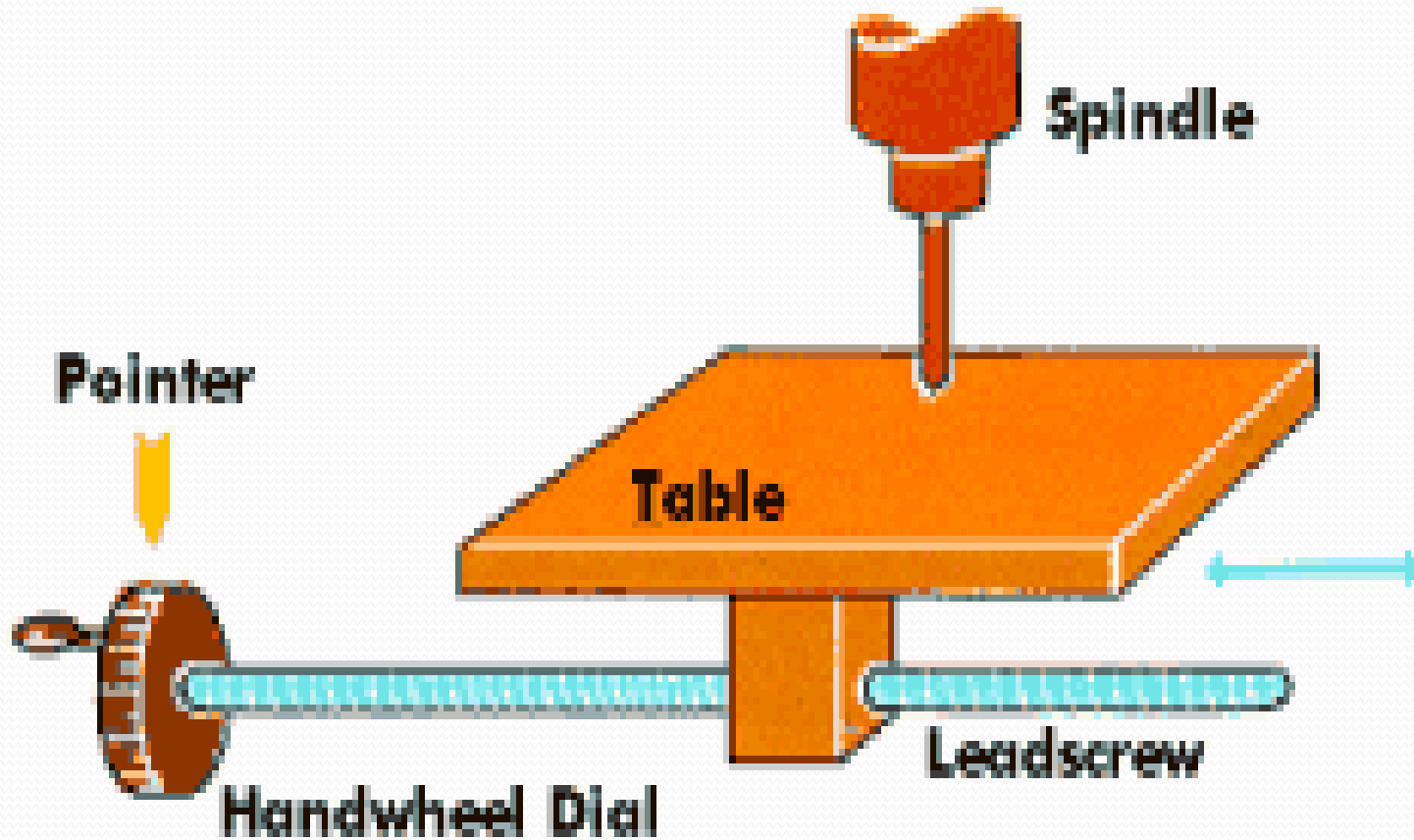


Media penyimpan program (pita berlubang)

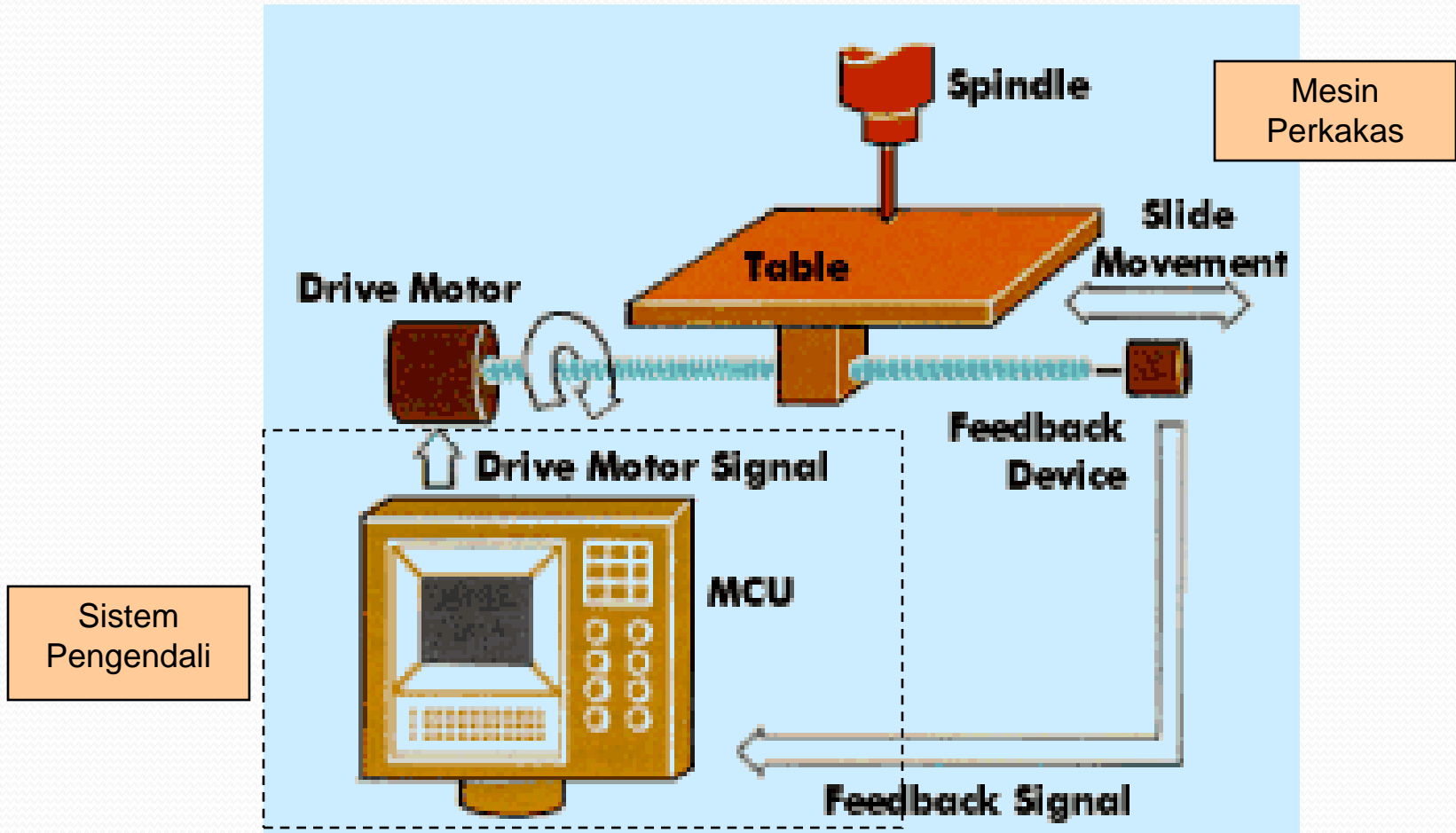
MODEL PENGOPERASIAN MESIN CNC



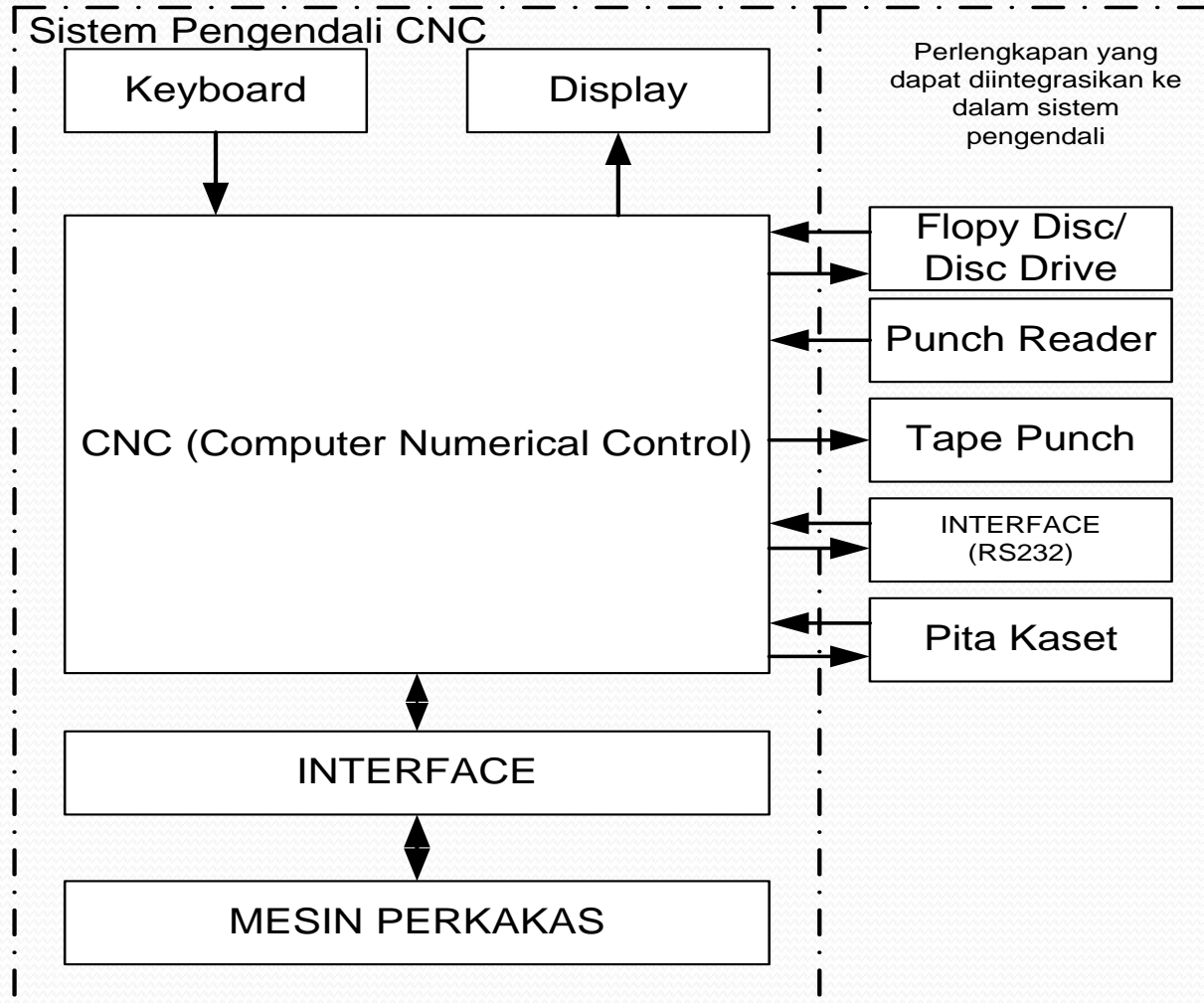
SISTIM PENGENDALIAN MESIN NON NC/CNC



BAGIAN-BAGIAN MESIN CNC



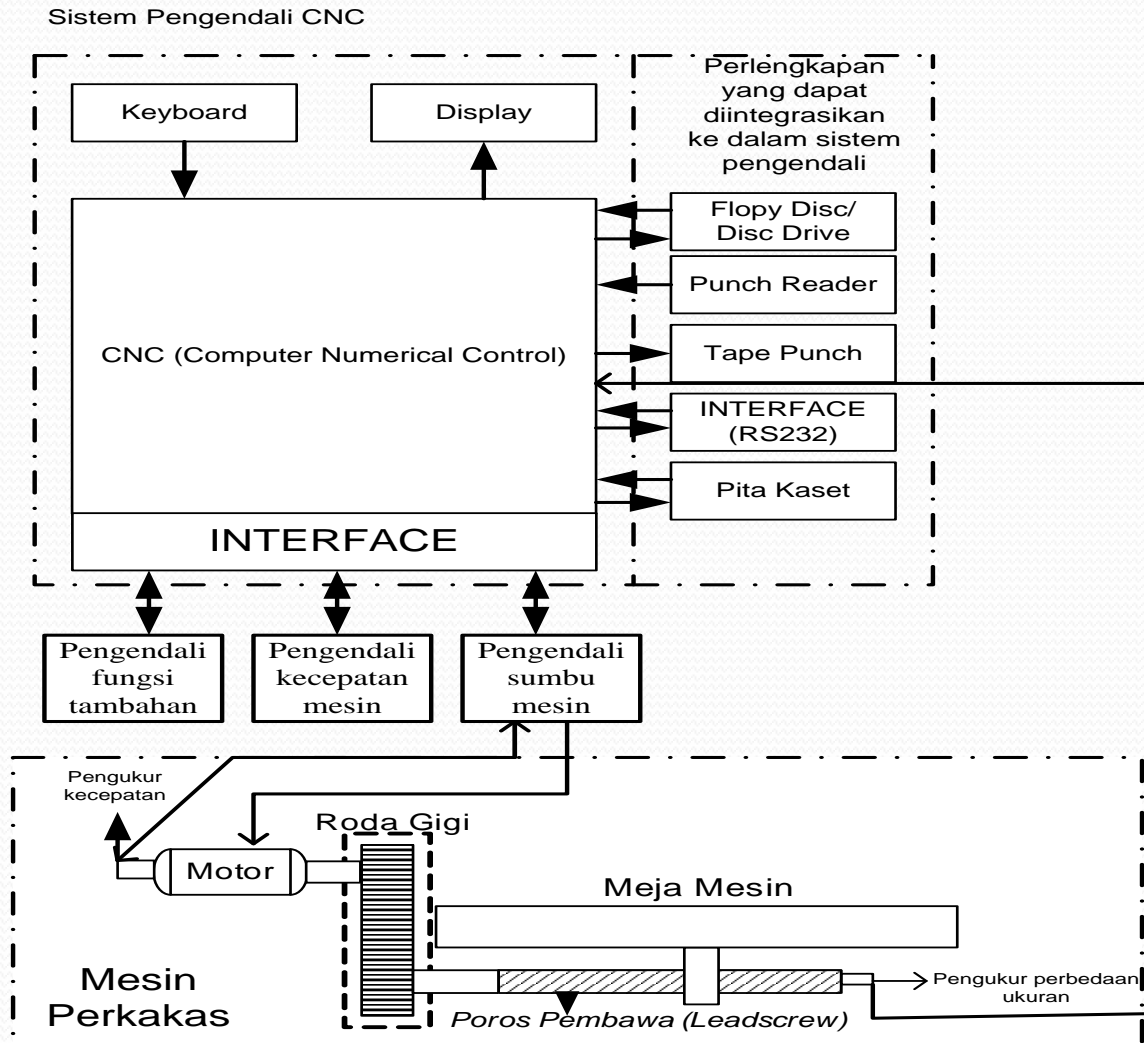
SISTIM PENGENDALI MESIN CNC



MESIN PERKAKAS

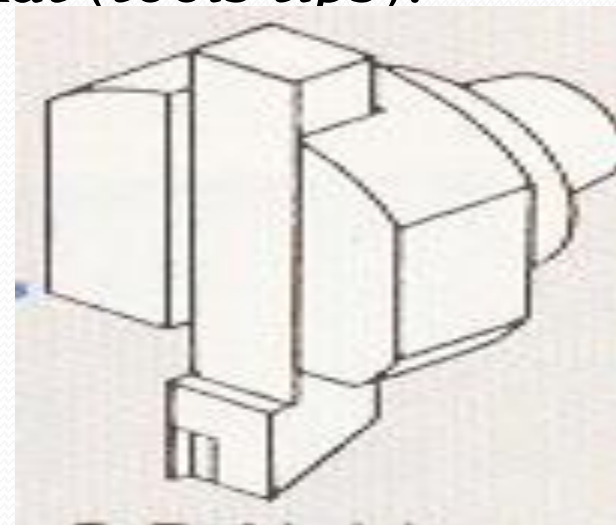
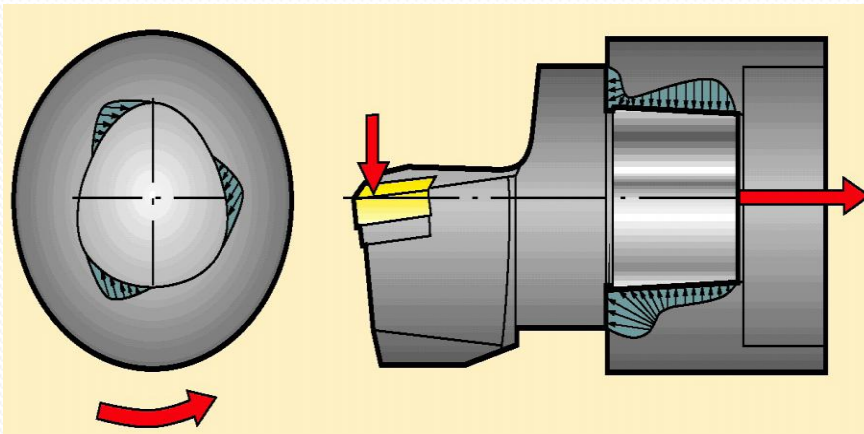
- Struktur mesin,
- Spindel dan sistem pencekam benda kerja,
- Sistem penggerak (Sistem penggerak spindel dan sistem penggerak sumbu),
- Sistem pengukur gerakan/langkah, dan
- sistem pengendalian alat potong.

HUBUNGAN ANTARA BAGIAN PENGENDALI DAN MESIN PERKAKAS PADA MESIN CNC



SISTEM PENGENDALI ALAT POTONG

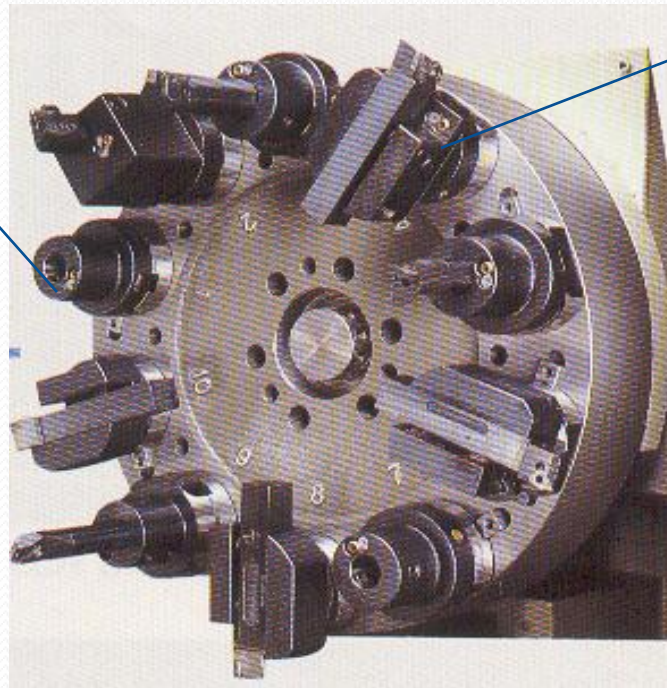
- sebuah pemegang pahat (*tool holder*);
- sebuah tempat pemasangan mata pahat (*tool tip carrier*); dan
- sebuah atau beberapa mata pahat (*tools tips*).



MACAM-MACAM PEMEGANG ALAT POTONG (TOOL HOLDER)

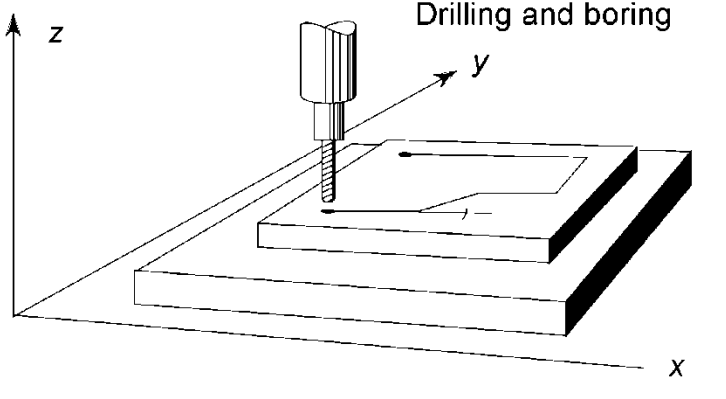
Cylindrical shank,

prismatic.

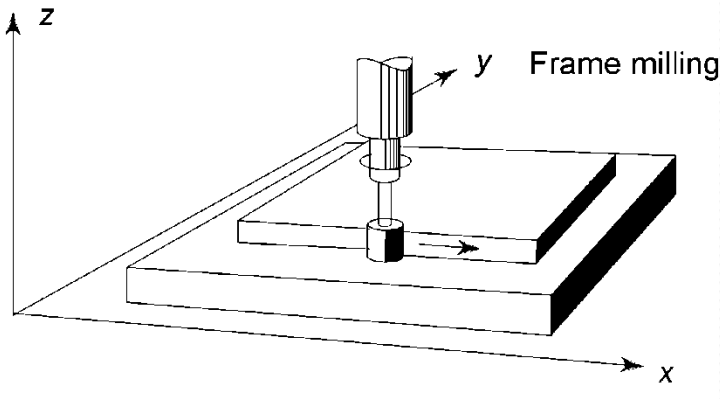


SISTEM PENGENDALIAN PADA MESIN CNC

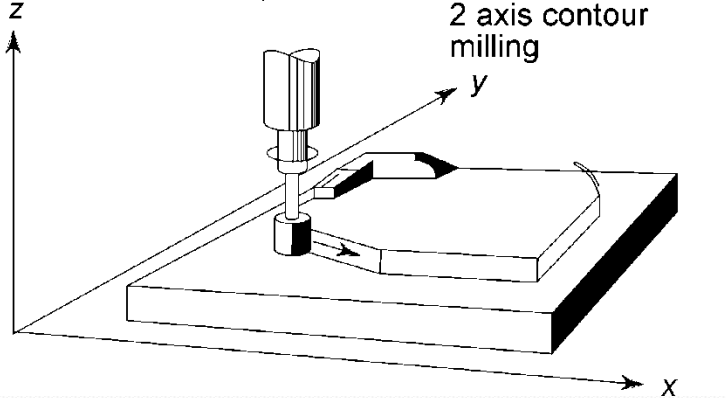
Point-to-point



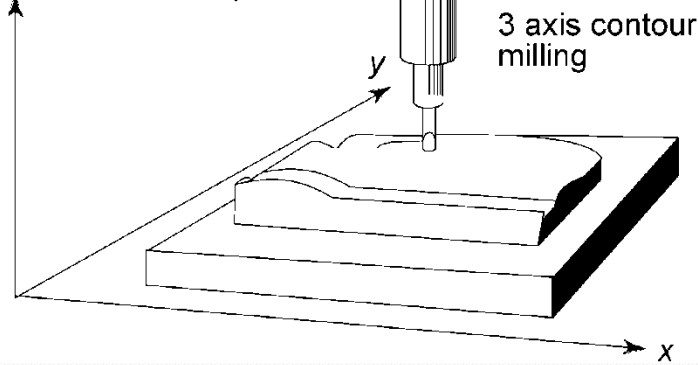
Point-to-point straight line



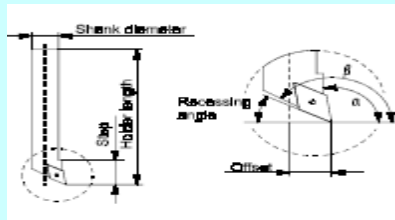
2 axis contouring with switchable plane



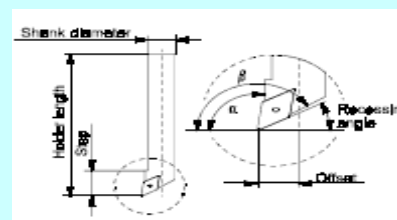
3 axis contouring continuous path



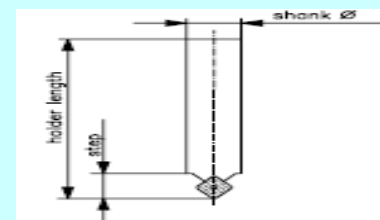
JENIS-JENIS ALAT POTONG



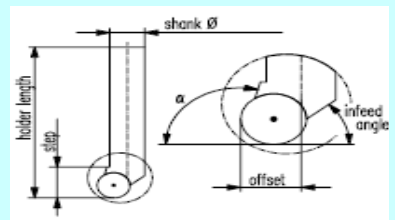
(a)



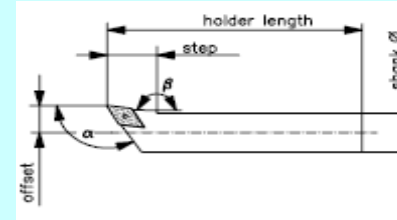
(b)



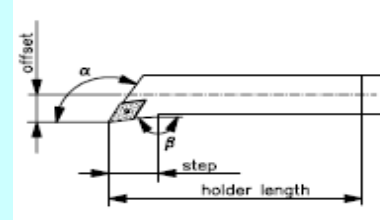
(c)



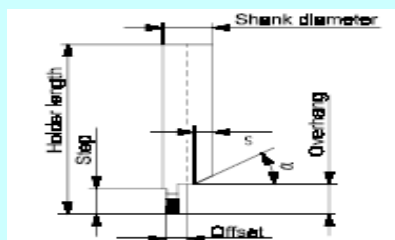
(d)



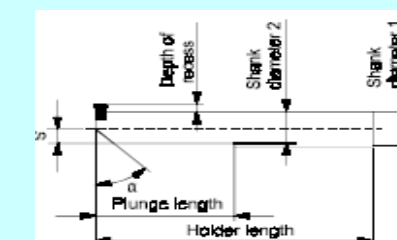
(e)



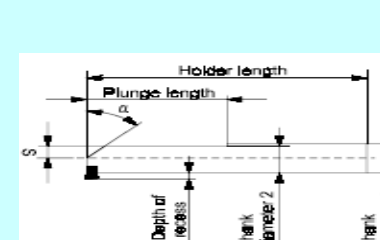
(f)



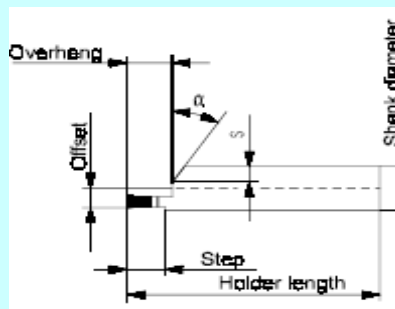
(g)



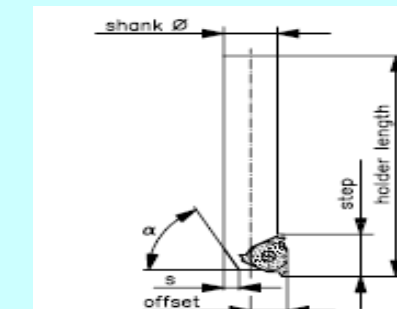
(h)



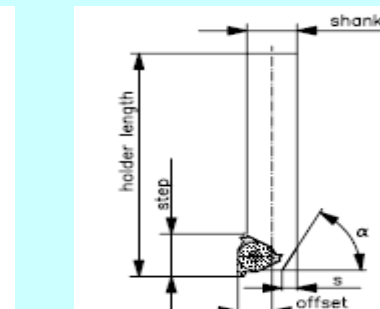
(i)



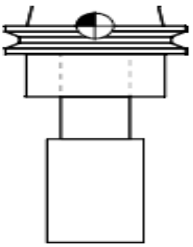
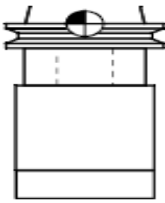
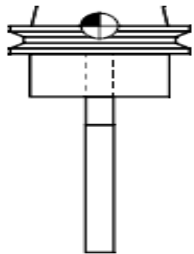
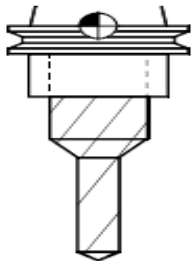
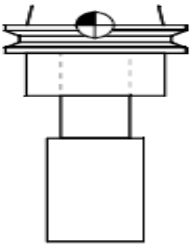
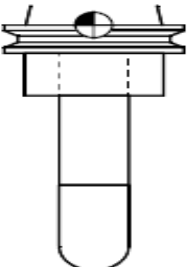
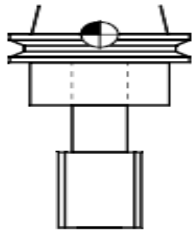
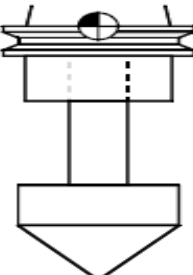
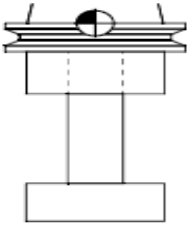
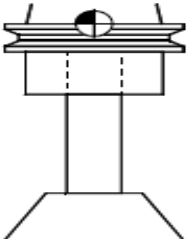
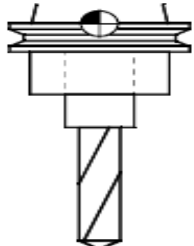
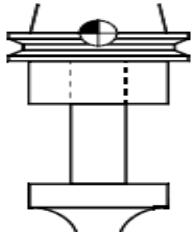
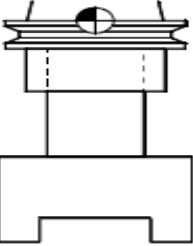
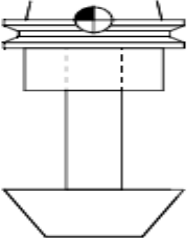
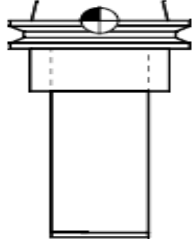
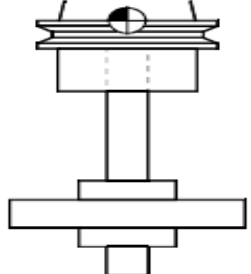
(j)



(k)

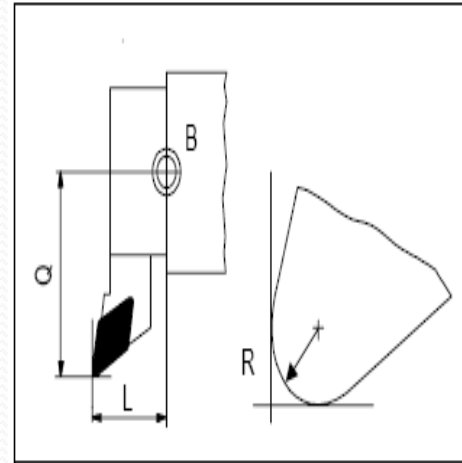


(l)

<p>End mills</p> 	<p>Face milling cutters</p> 	<p>Reamers</p> 	<p>Step drills</p> 
<p>Slot milling tools</p> 	<p>Radius cutters</p> 	<p>Taps</p> 	<p>Core drills</p> 
<p>T-slot cutters</p> 	<p>Corner tool (Type A)</p> 	<p>Drills</p> 	<p>Concave type cutters</p> 
<p>Shell end mills</p> 	<p>Corner tool (Type B)</p> 	<p>Insert tip drills</p> 	<p>Side milling tools</p> 

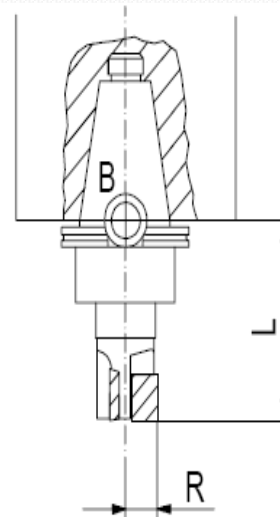
UKURAN ALAT POTONG

- ALAT POTONG BUBUT



- B tool setup point
- L length = distance of the cutting tip to the tool set-in point in Z
- Q overhang = distance of the cutting tip to the tool setup point in X
- R cutting radius

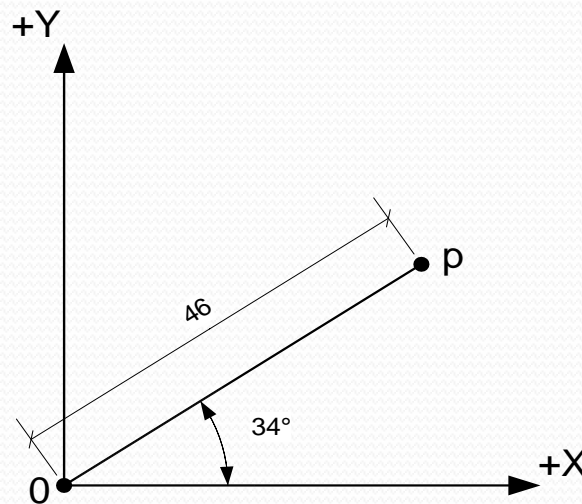
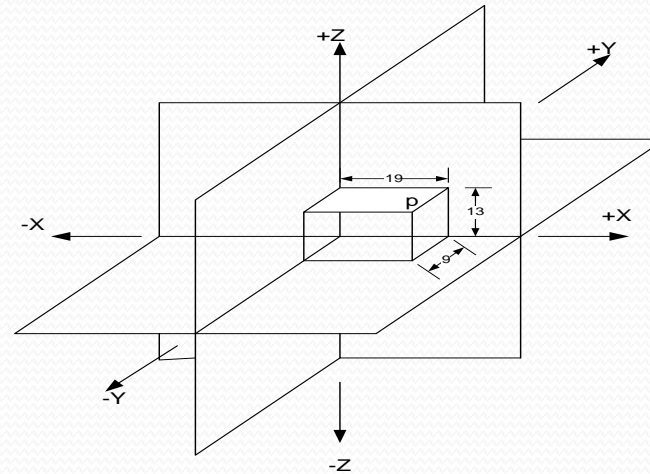
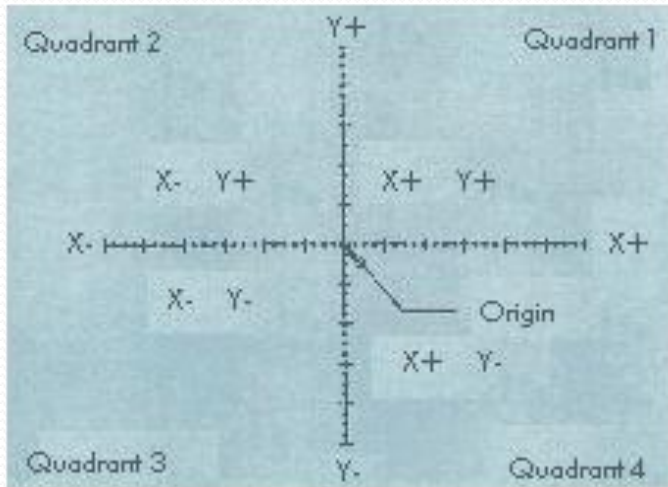
- ALAT POTONG MILLING



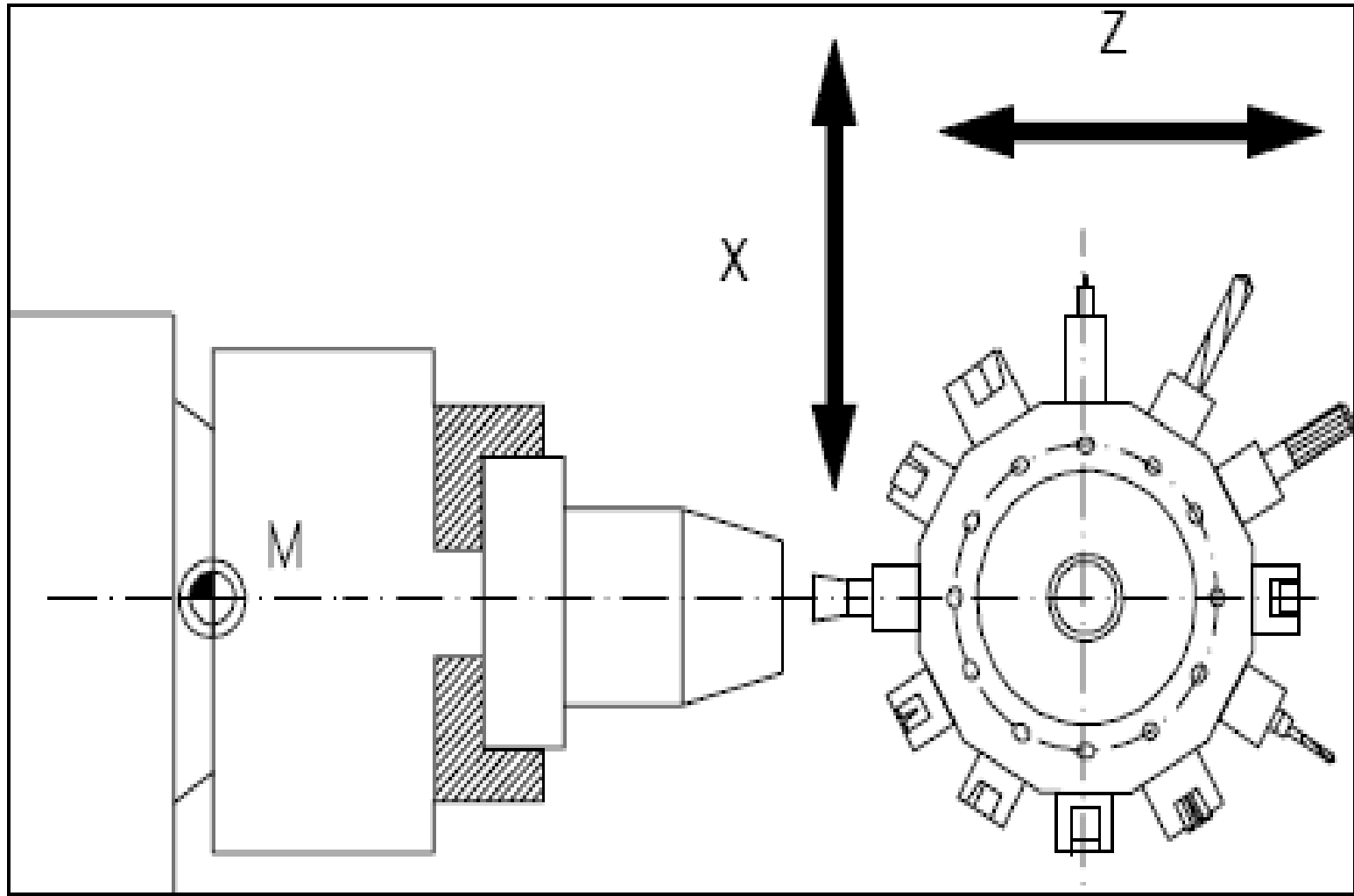
- B tool setup point
- L length = distance of the cutting tip to the tool setup point in Z
- R radius of the milling tool

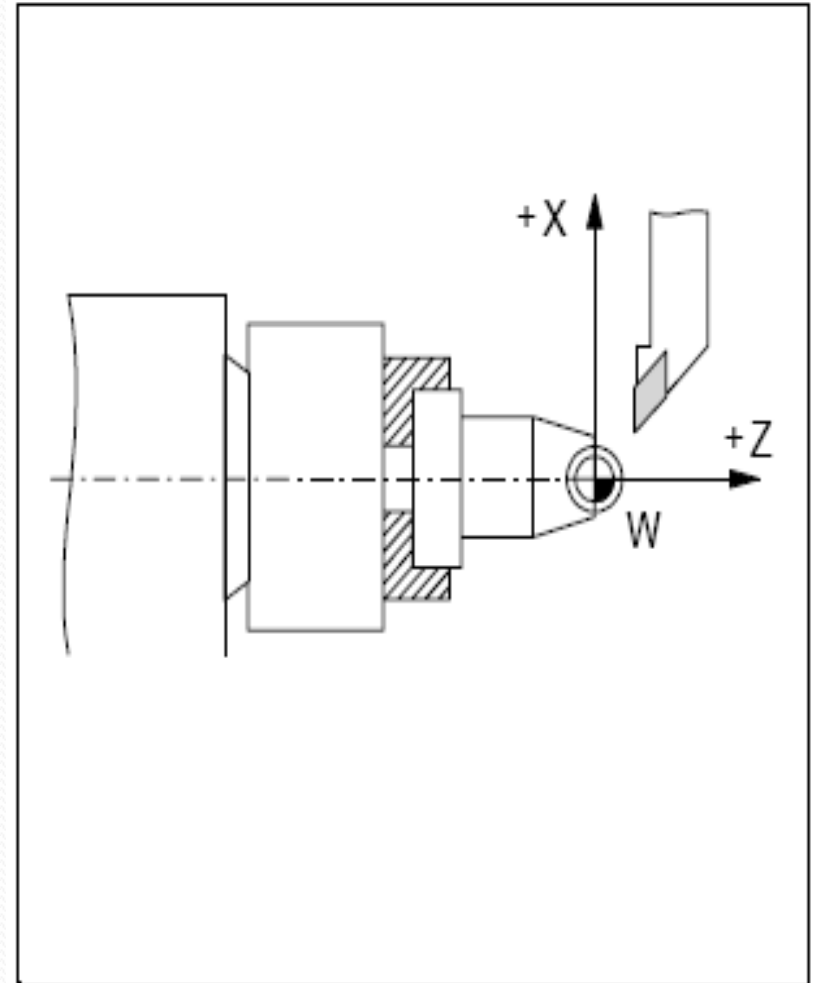
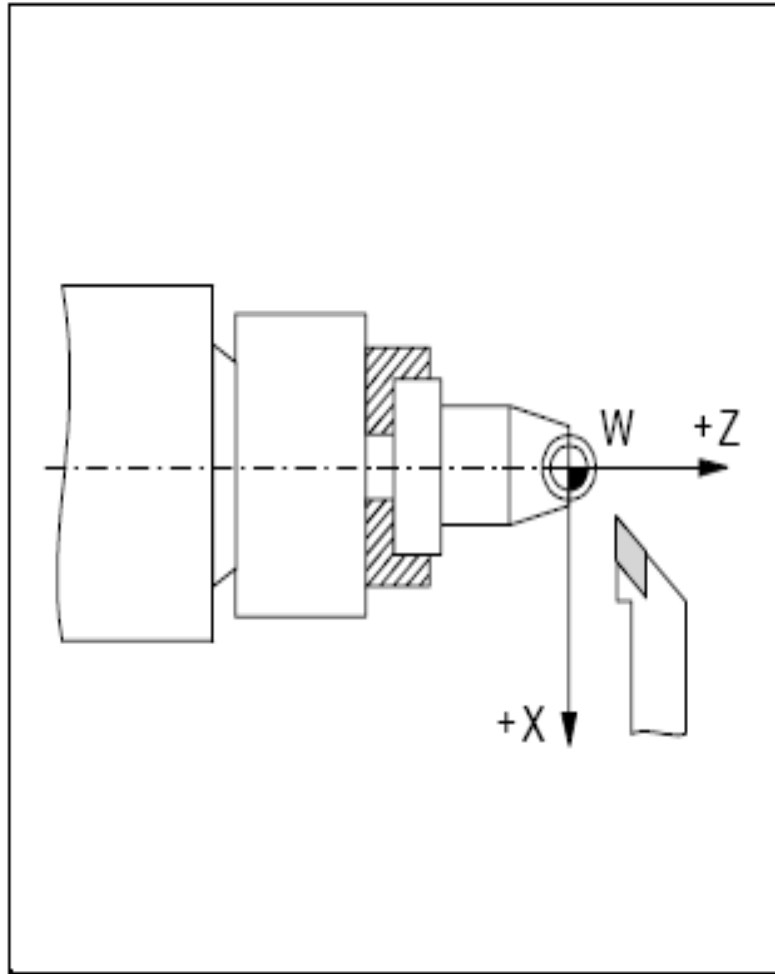
DASAR-DASAR PEMROGRAMAN CNC

- SISTEM KOORDINAT

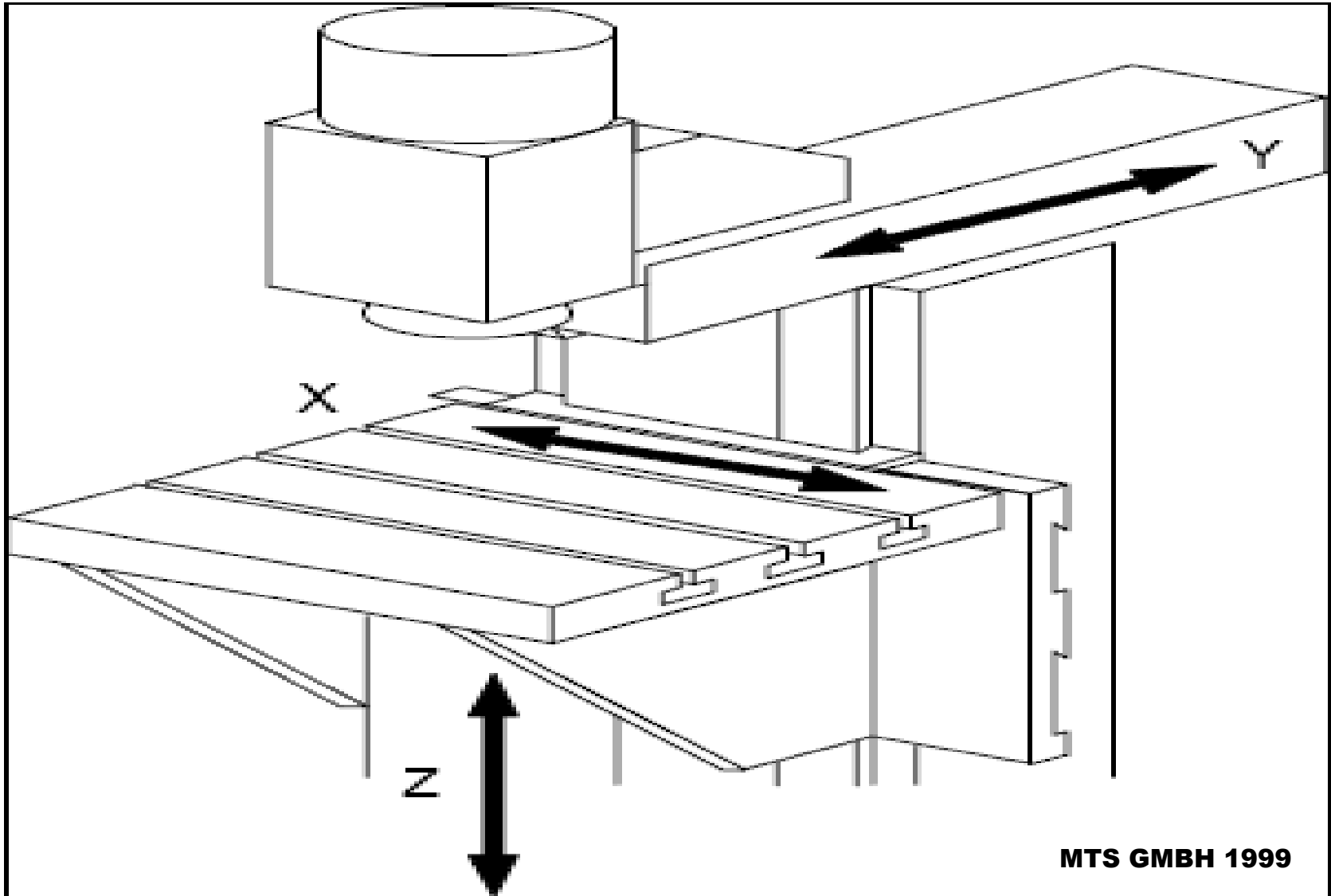


SISTIM SUMBU MESIN BUBUT CNC



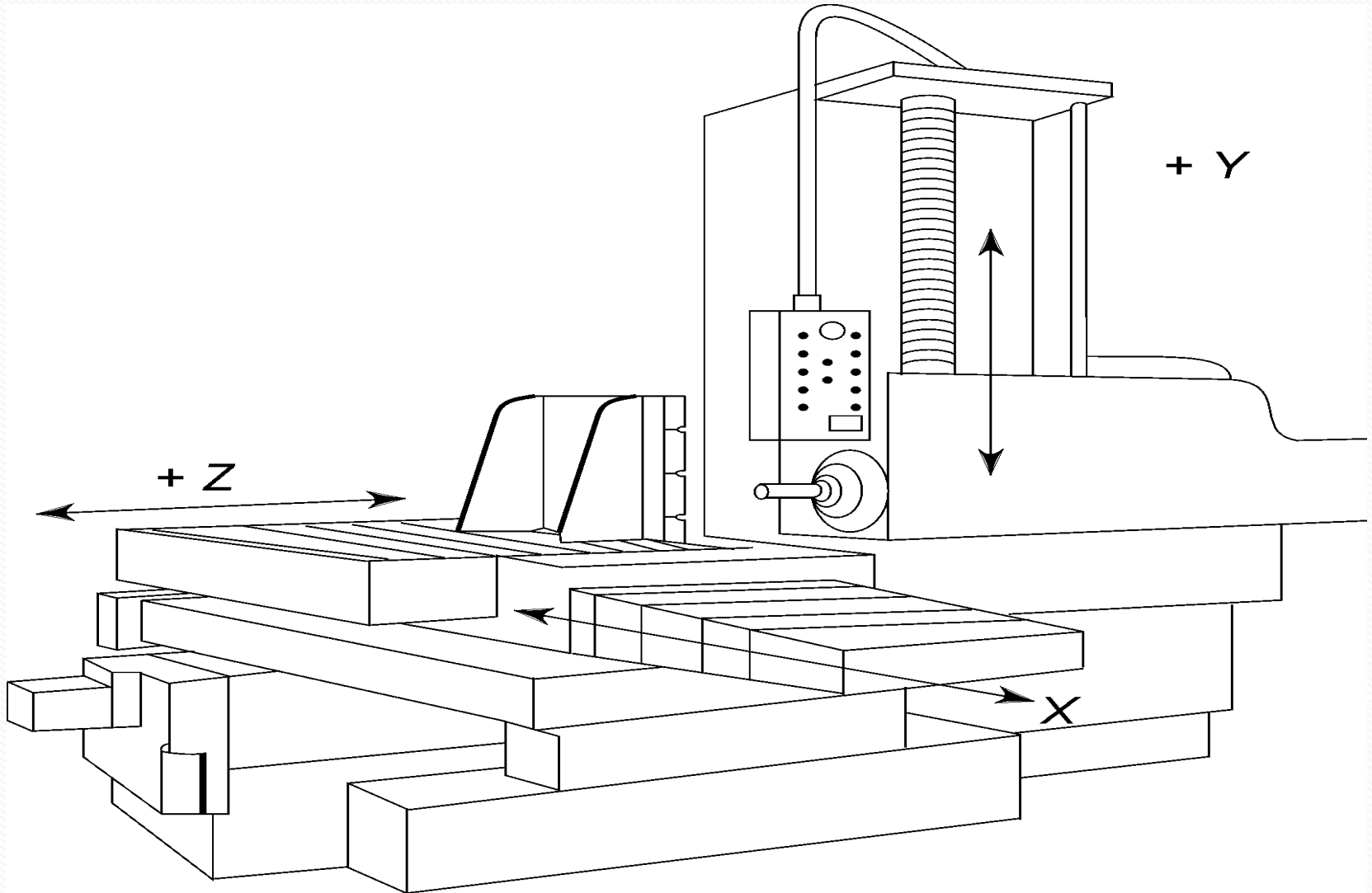


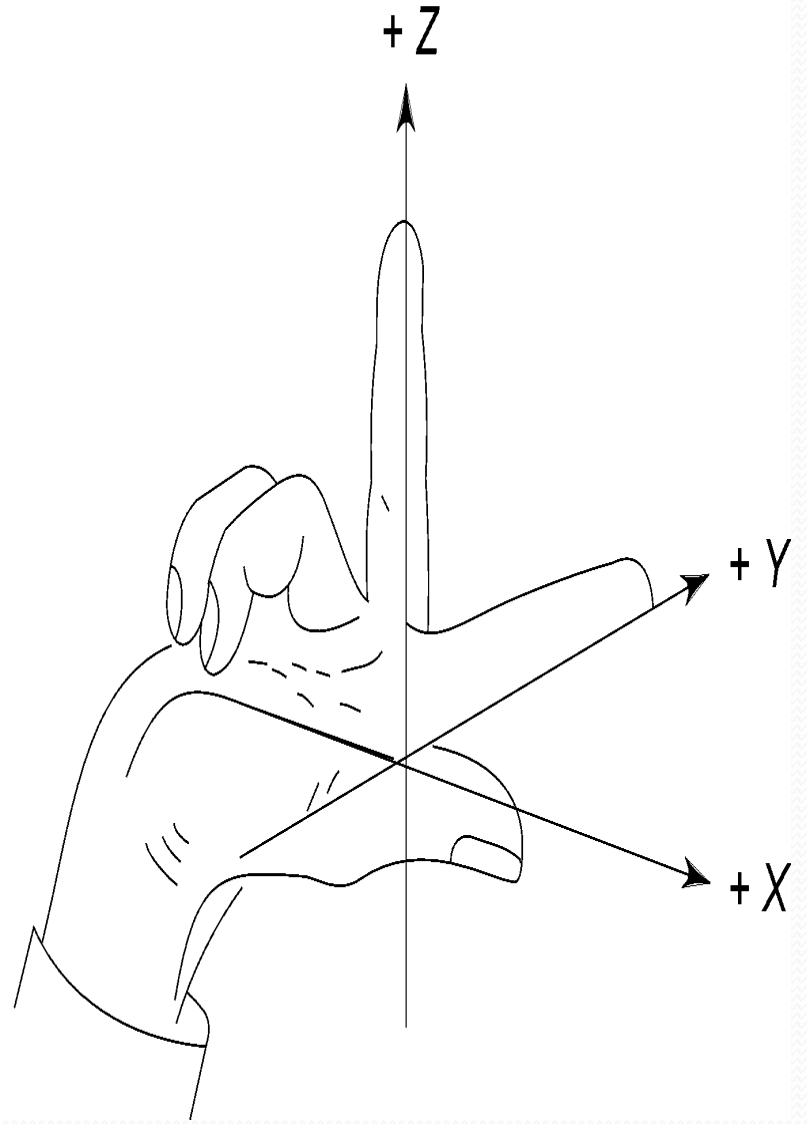
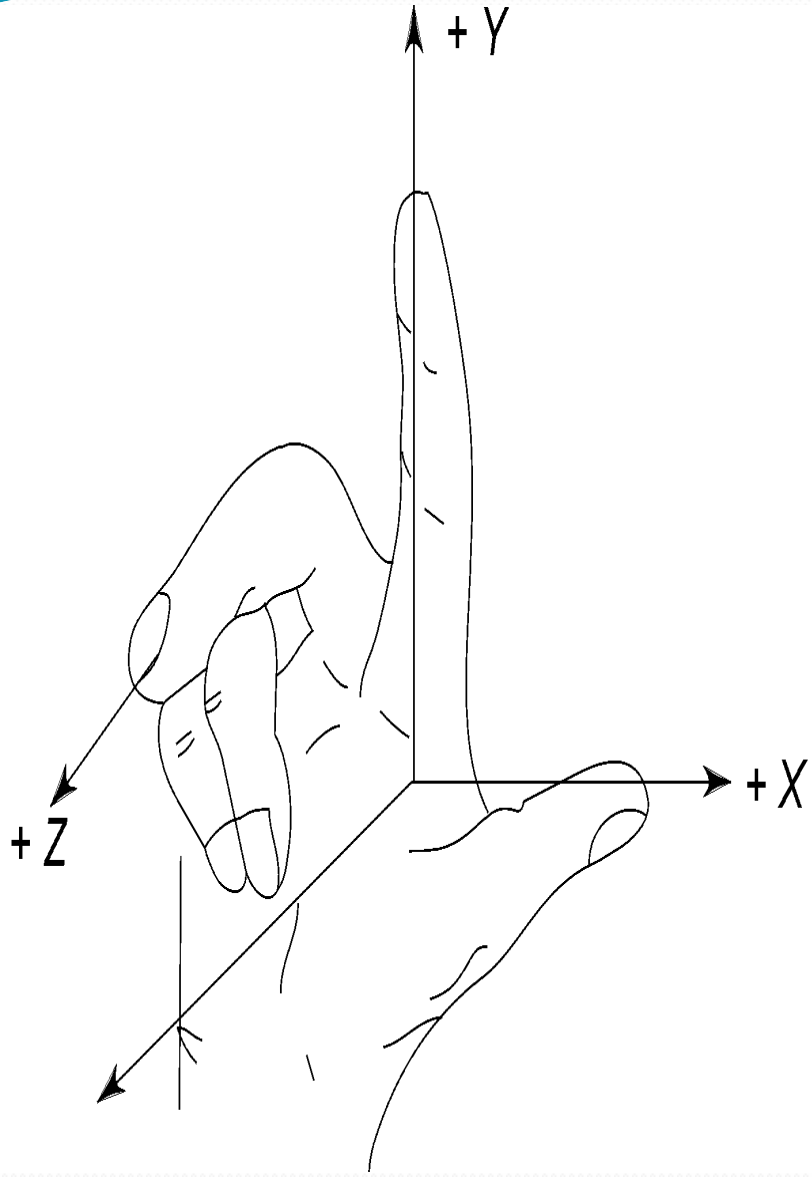
SISTEM SUMBU MESIN MILLING



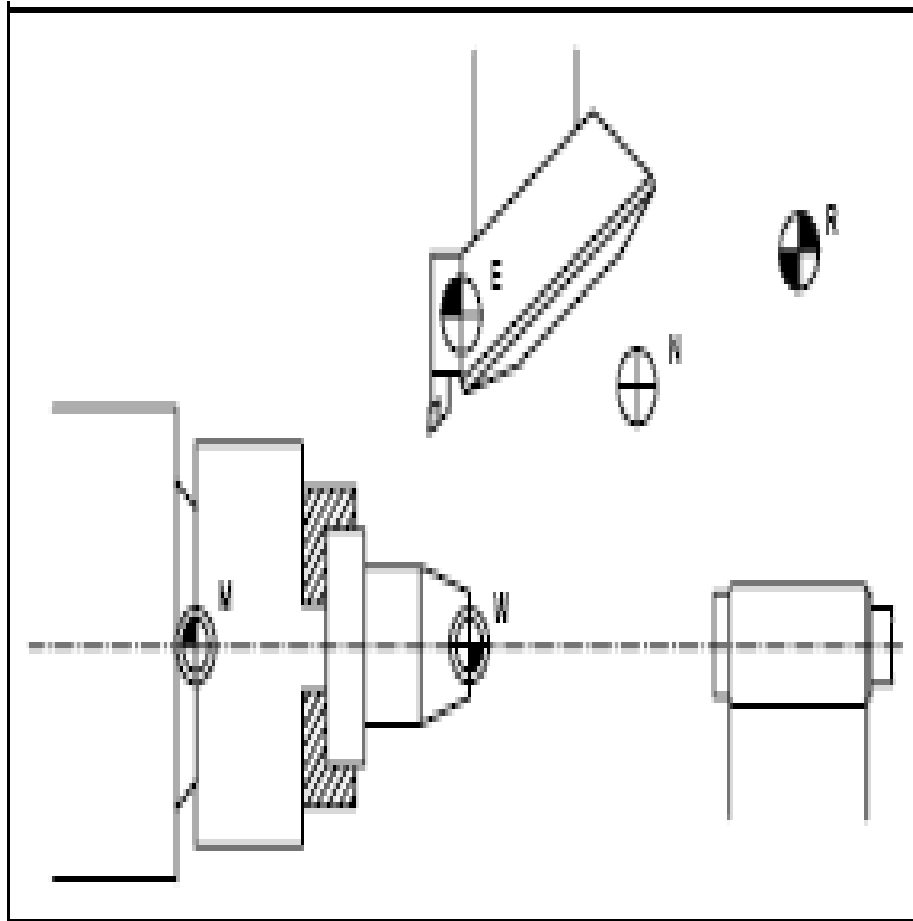
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SISTIM SUMBU MESIN MILLING CNC










JENIS-JENIS TITIK ACUAN PADA MESIN CNC

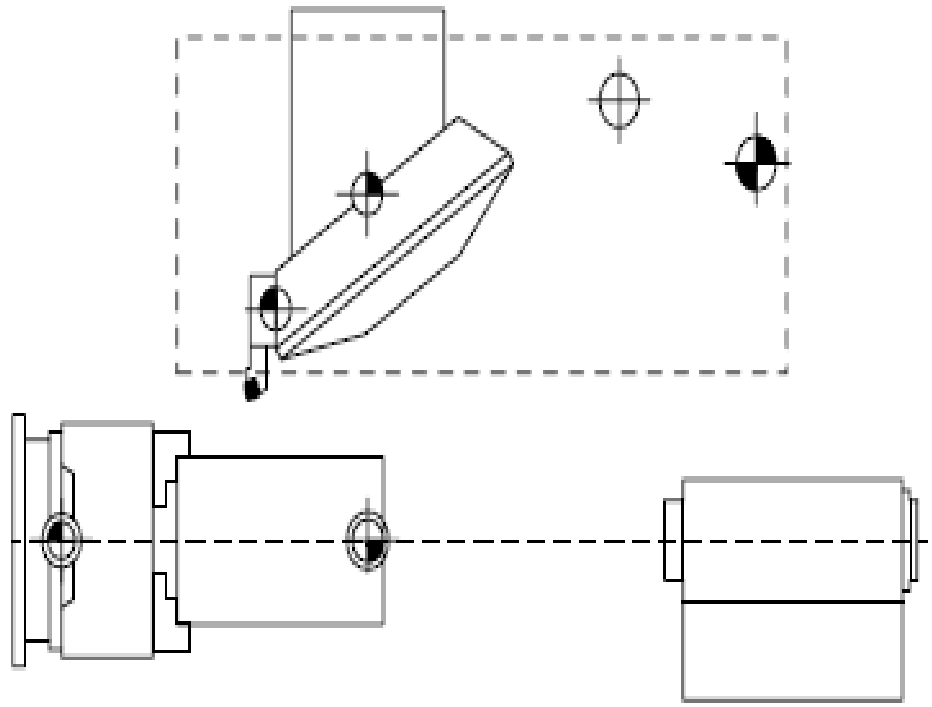


Types of zero and reference points

- | | | |
|--|---|----------------------|
| | M | machine zero point |
| | W | work part zero point |
| | R | reference point |
| | E | tool reference point |
| | B | tool setup point |
| | A | tool shank point |
| | N | tool change point |

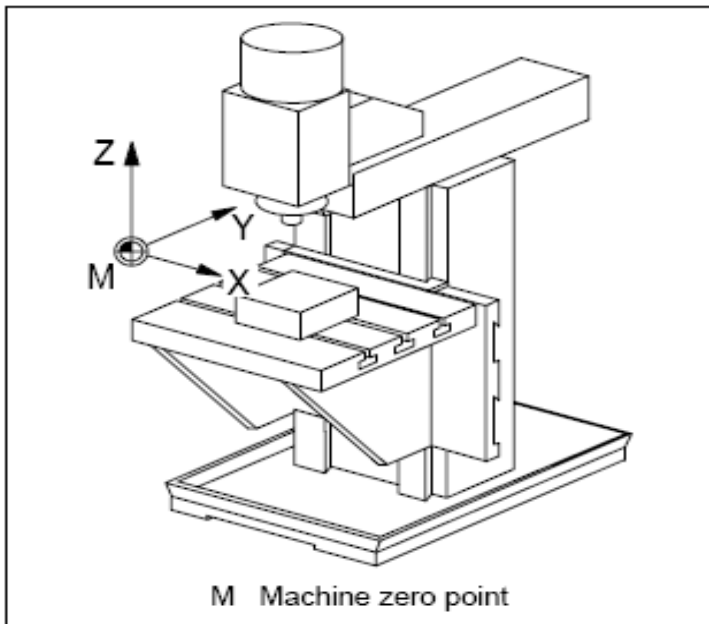
POSISI TITIK ACUAN PADA MESIN CNC

-  Machine zero
-  Reference point
-  Tool reference point
-  Workpart zero
-  Tool changing position



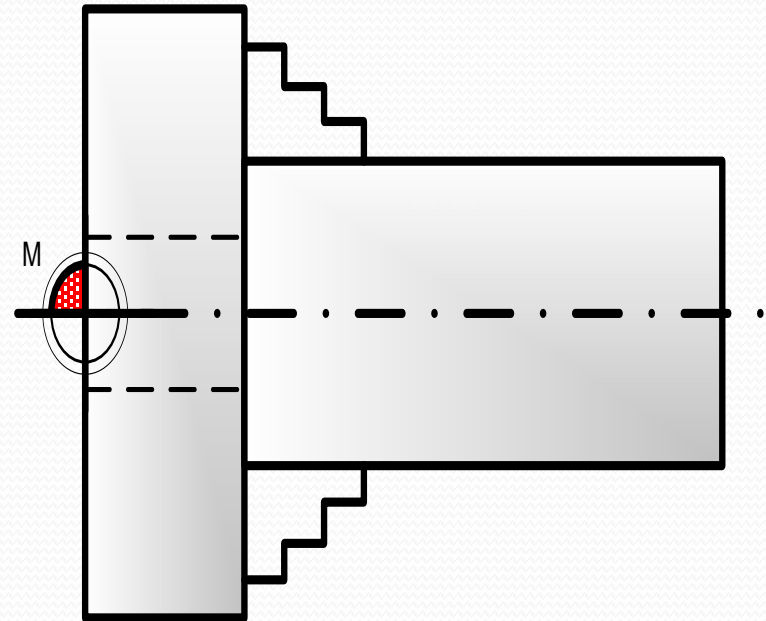
TITIK NOL MESIN

TITIK NOL MESIN FRAIS CNC

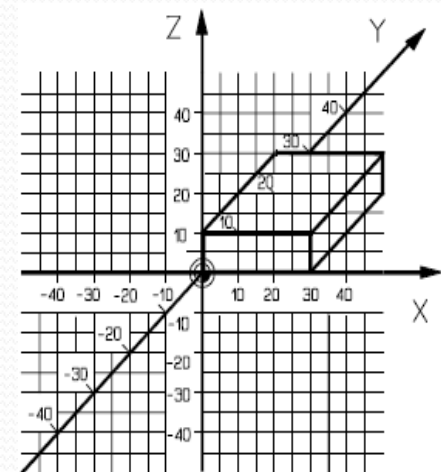
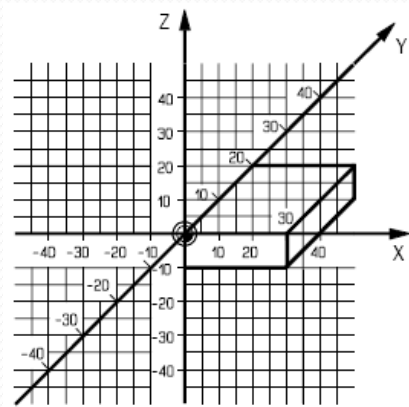
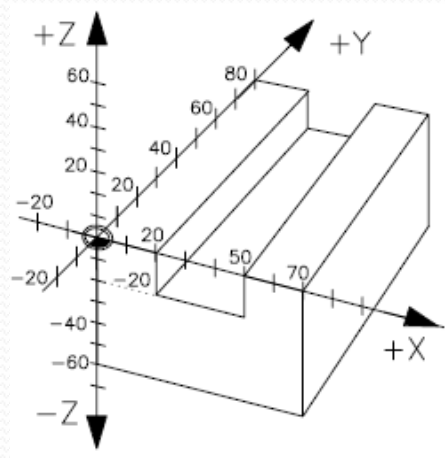
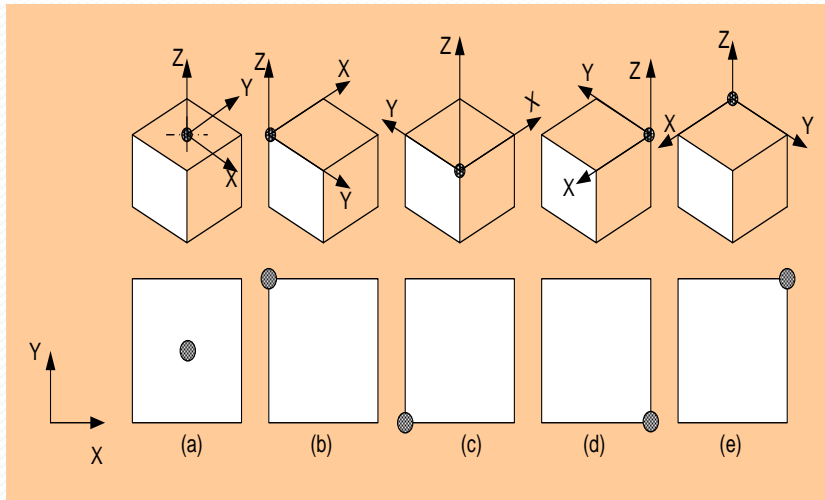


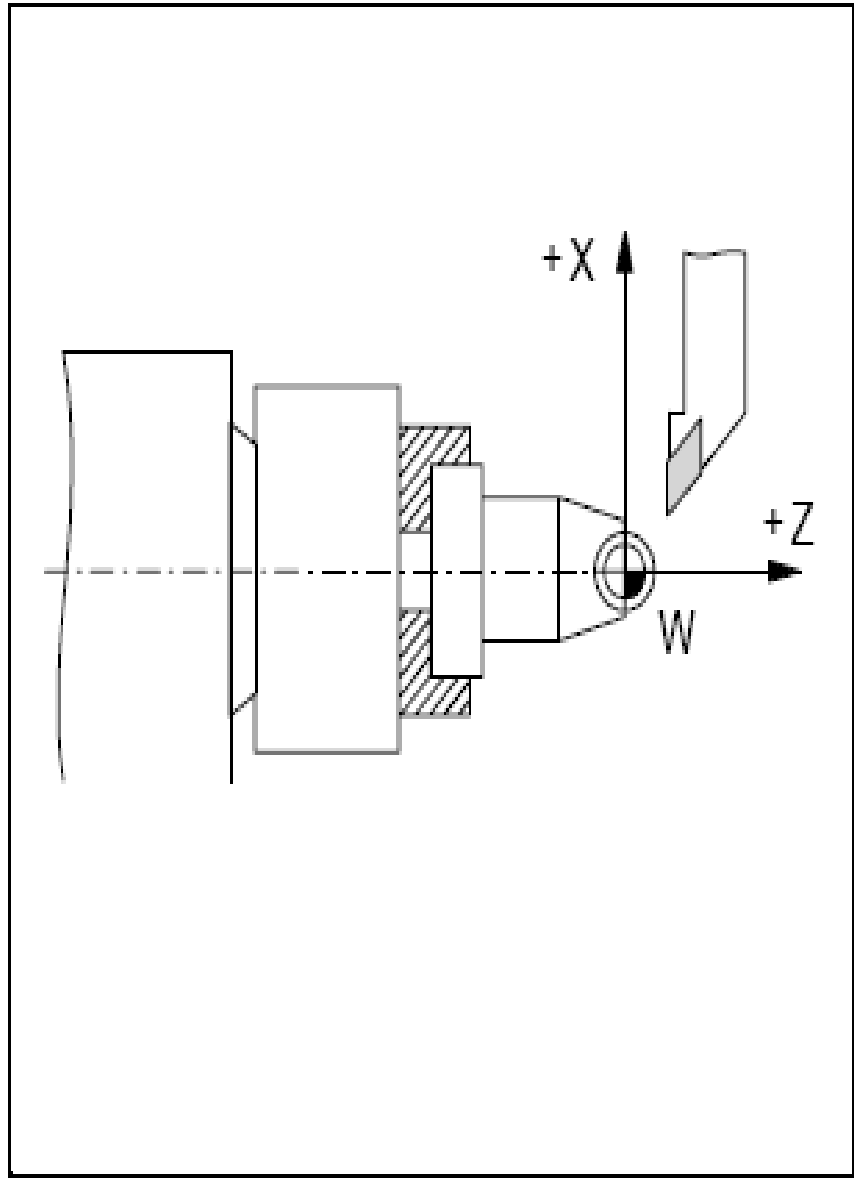
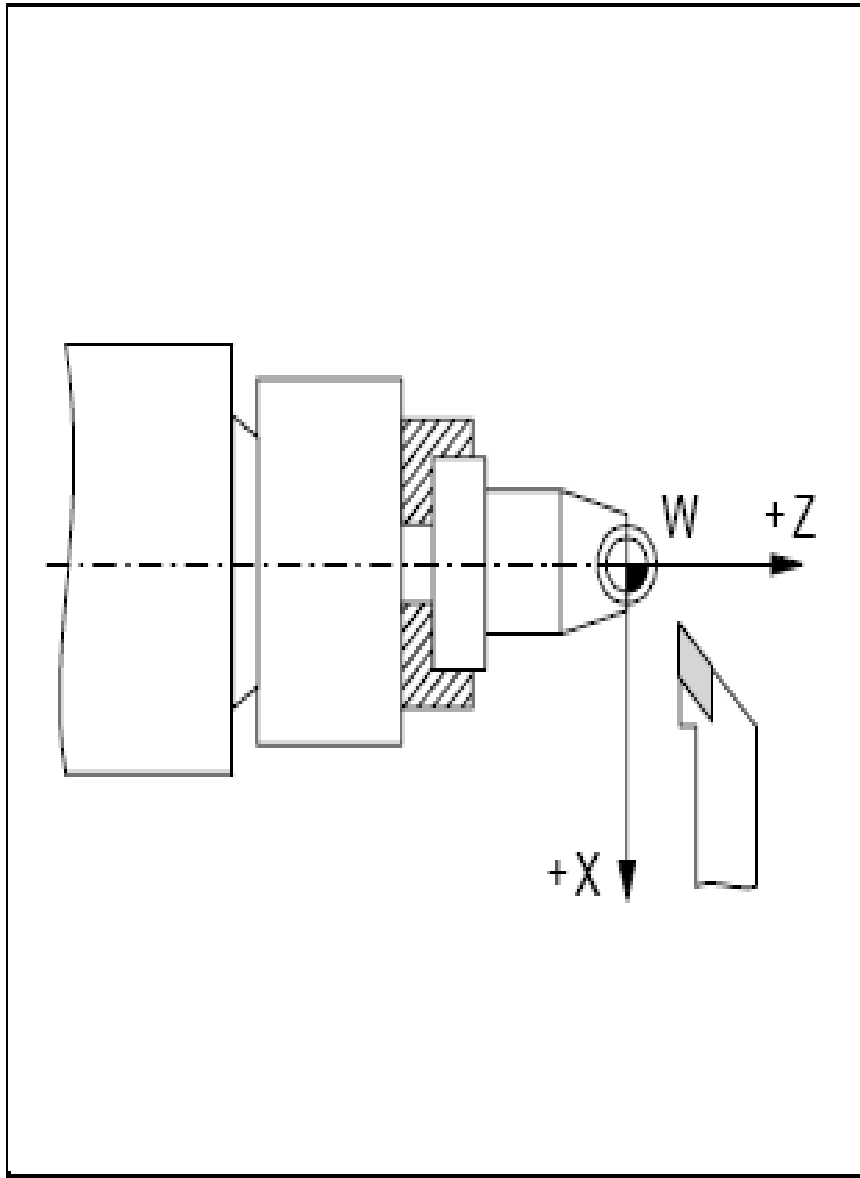
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TITIK NOL MESIN BUBUT CNC



TITIK NOL BENDA KERJA





PERUBAHAN TITIK NOL MESIN KE TITIK NOL BENDA KERJA

