MET 237 Computer Numerical Control

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Introduction to CNC [Lathe Machine]

10| Introduction To The CNC Lathe

- **CNC Lathe Axes Of Motion.**

CNC Lathe is a machine designed to remove material from stock that is clamped and rotated.

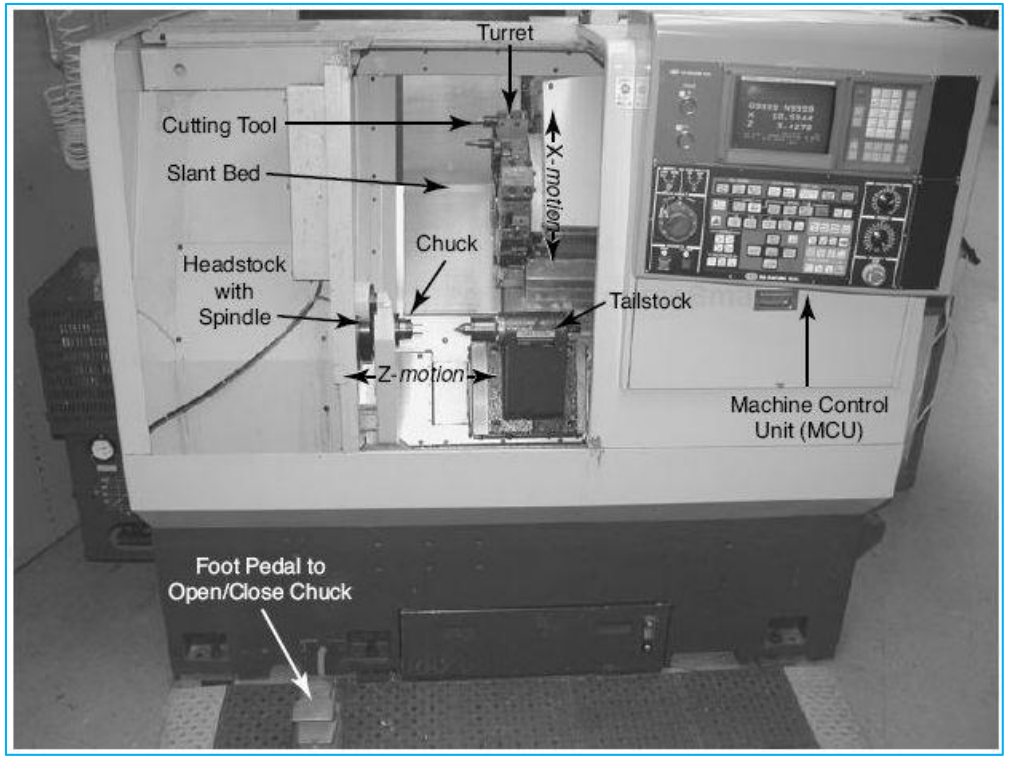

Figure 10 Components of CNC lathe.

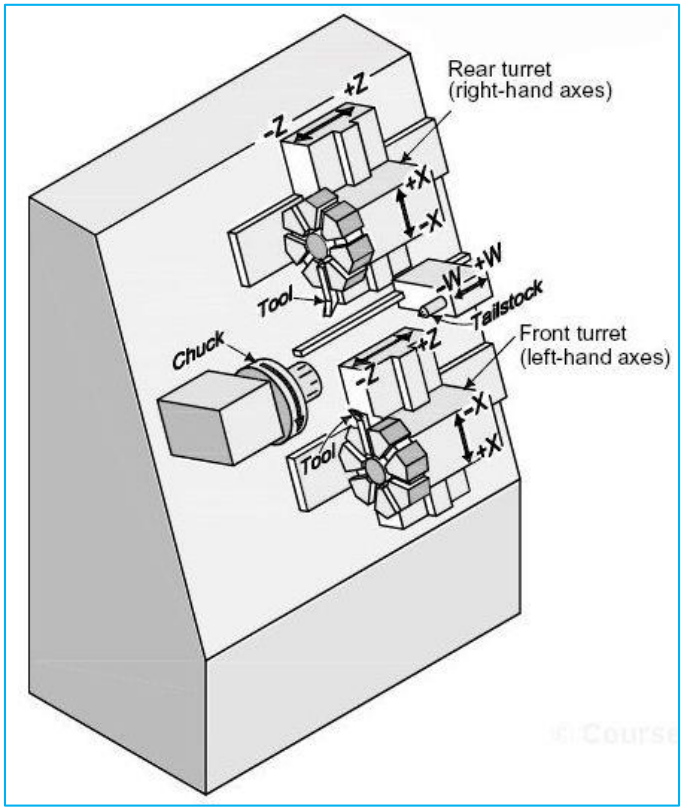

Figure 10-1 Machine axes for CNC lathe.

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- **Location via Cartesian coordinates.**

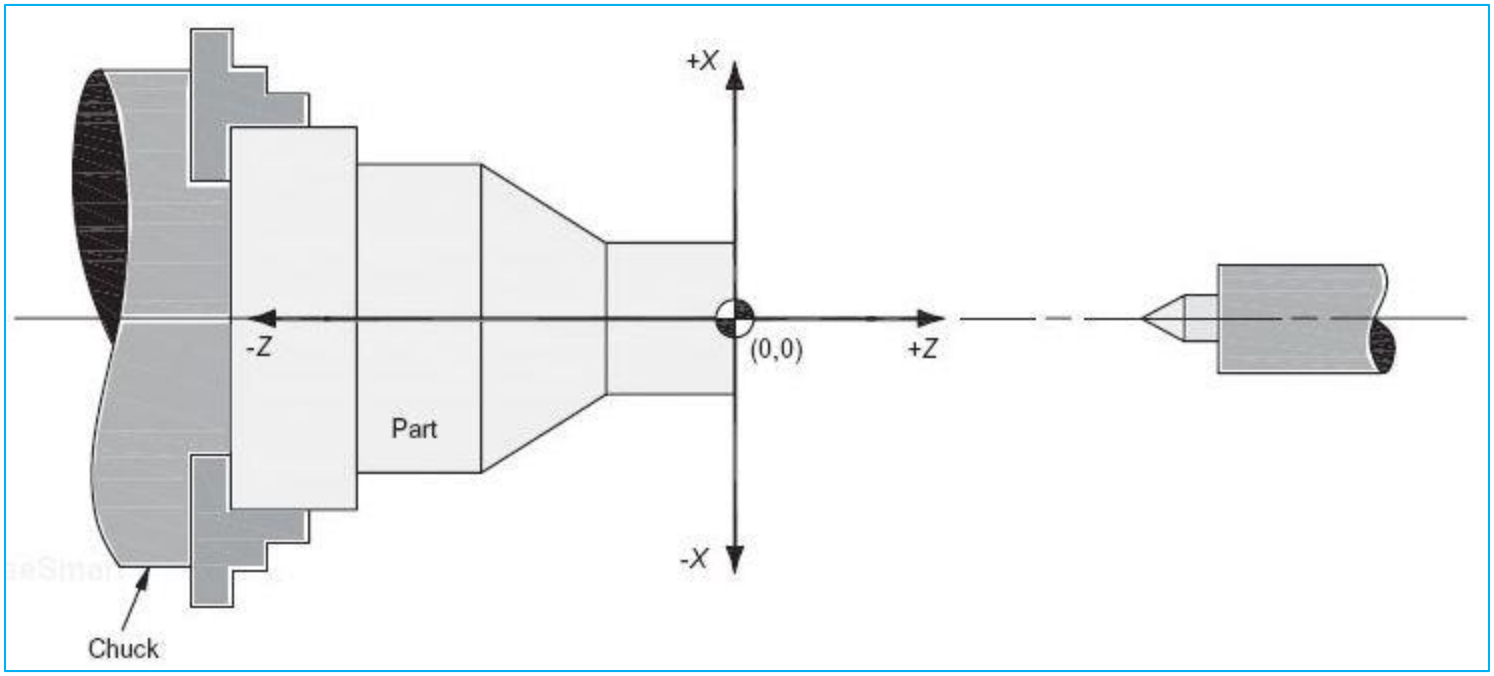

Figure 10-2 The Cartesian coordinates system for rear turret CNC lathes.

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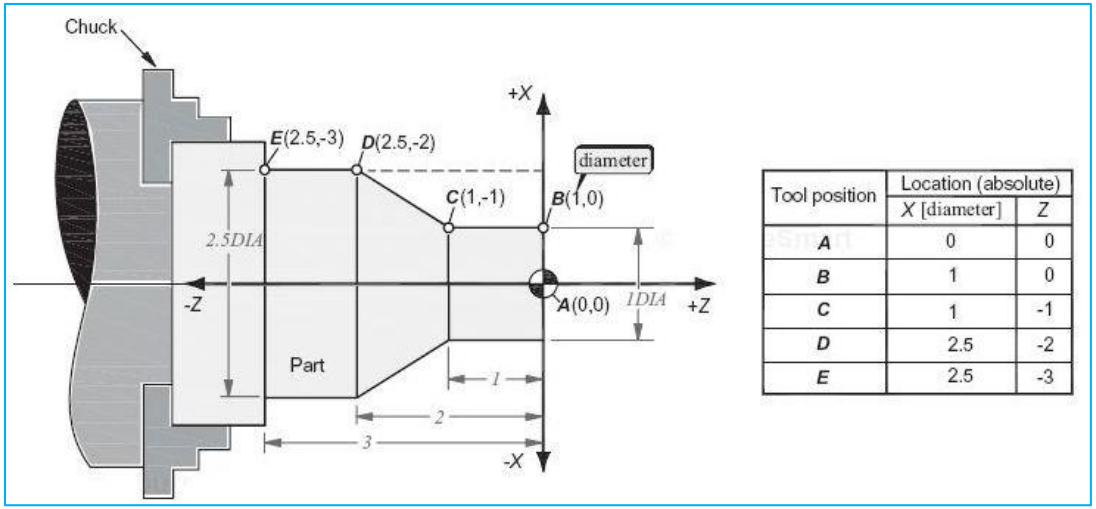
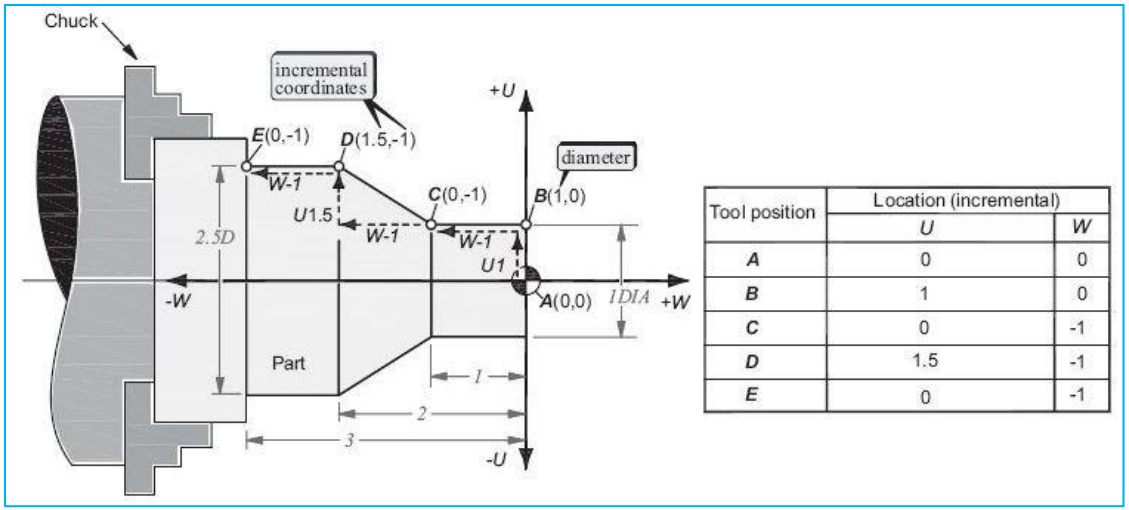
- **Types of tool positioning modes.**



Tool position	Location (absolute)	
	X [diameter]	Z
A	0	0
B	1	0
C	1	-1
D	2.5	-2
E	2.5	-3

Figure 10-3 Programming by diameter (absolute positioning).



Tool position	Location (incremental)	
	U	W
A	0	0
B	1	0
C	0	-1
D	1.5	-1
E	0	-1

Figure 10-4 Programming by diameter (incremental positioning).

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- **Methods of Holding The Part During Machining.**

For simple bar shapes a hydraulic chuck or collet is used to hold the part.

For complex shapes a face plate and fixture is used to hold the part. **Counterweights** must be used to offset the throw when a heavy piece is mounted of center.

The programmer must avoid the holding fixtures when programming tool movement.

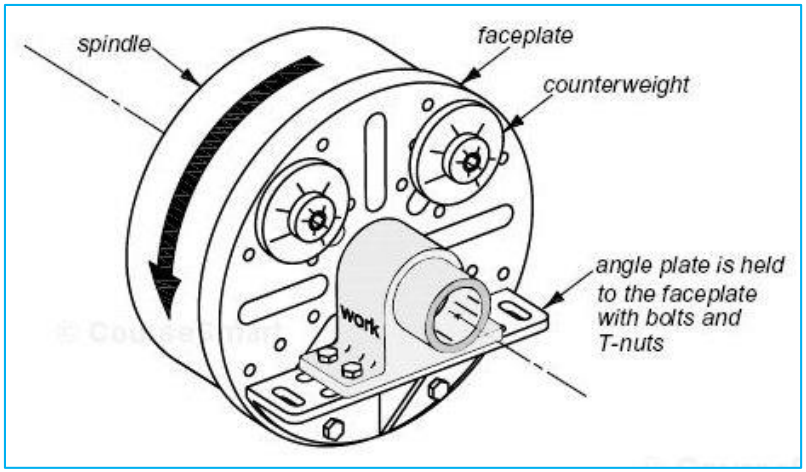

Figure 10-5 Lathe faceplate for irregular shapes

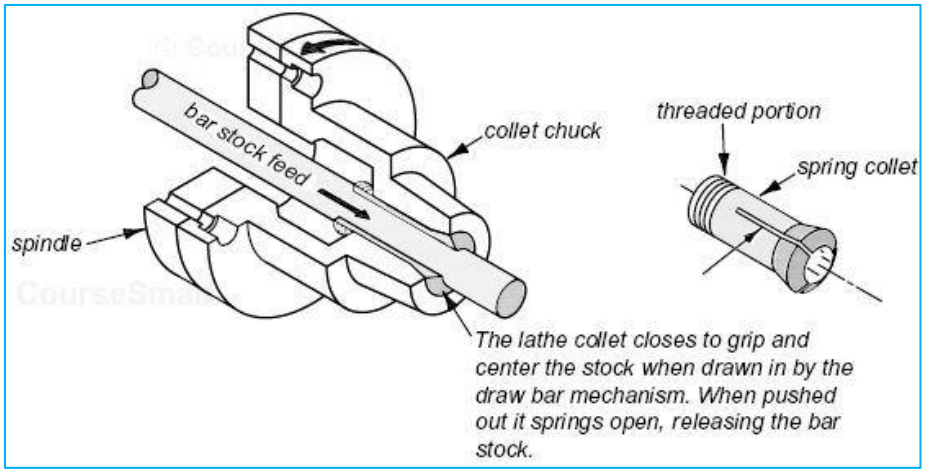

Figure 10-6 Lathe collet chuck for small cross sections

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- **Methods of Holding The Part During Machining.**

A collet chuck is used when high precision and speed are needed for a small cross Section.

Work cross sections normally do not exceed a diameter of **1-in** (25.4mm).

Clloet shapes include round, hexagonal, square, and custom shapes.

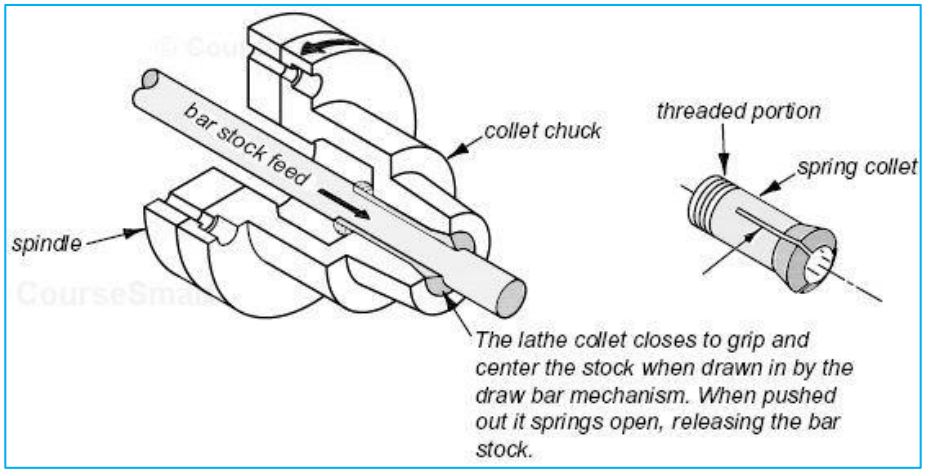

Figure 10-6 Lathe collet chuck for small cross sections

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- **Tool Changing Mechanism.**

Turret holds the cutting tool and replaces an old tool with a new tool (indexes) during tool change.

The Turret moves to a safe tool change location and indexes the old tool out and the new in.

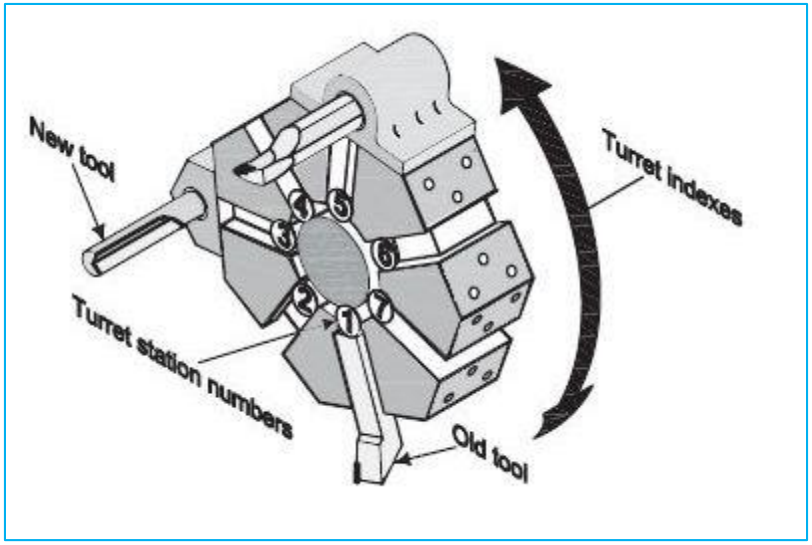


Figure 10-7 Turret motion during a tool change.

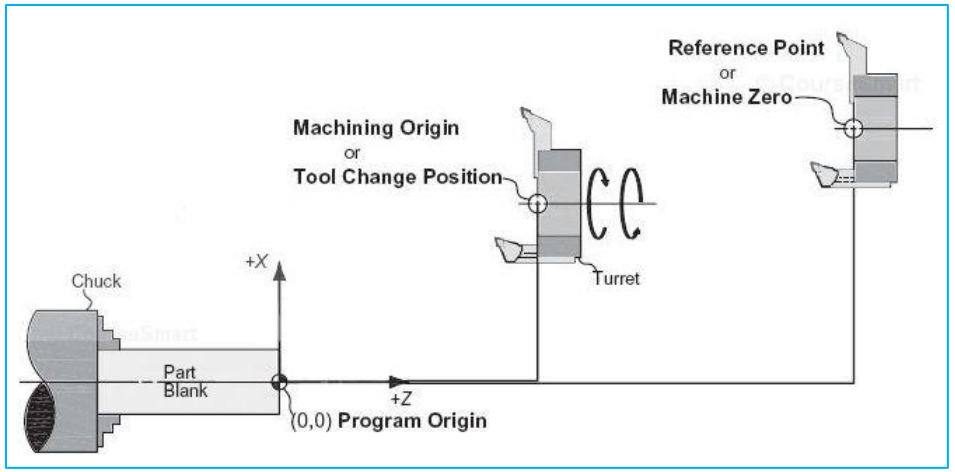


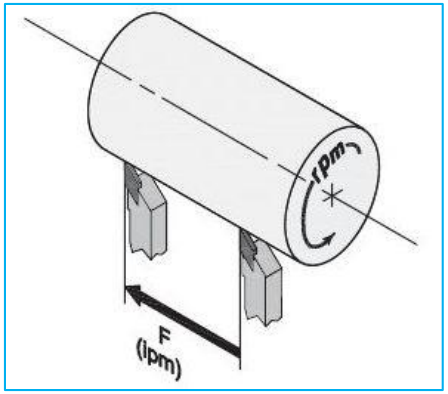
Figure 10-8 Turret motion during a tool change.

10.1| CNC Lathe Programming

- **Feed Rate (F Code).**

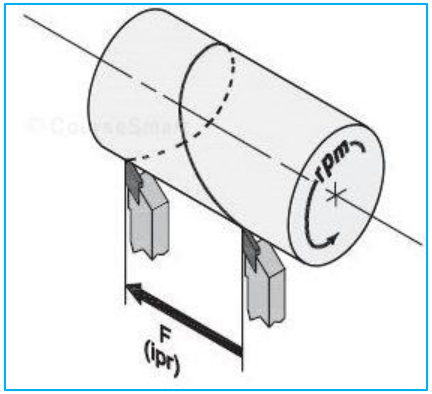
G94

Specifying federate in terms of millimeter per minute ($\frac{mm}{min}$).



G95

Specifying federate in terms of millimeter per revolution ($\frac{mm}{rev}$).



10.1| CNC Lathe Programming

- **Spindle Speed With Constant Surface Speed Control.**

Why do we have to maintain a constant cutting speed ?

- To make the tool operate at optimum performance
- To produce the required surface finish

For outside operations constant cutting speed is maintained by increasing the spindle rpm as the cut diameter decreases.

For inside operations constant cutting speed is maintained by decreasing the spindle rpm as the cut diameter increases.