

Introduction to CNC Lathe Operations

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Designed as a quick-reference guide for students, apprentices, and anyone new to computer numerical control (CNC) turning.

1. What Is a CNC Lathe?

Feature	Description
Definition	A machine tool that rotates a workpiece about a fixed axis while a cutting tool moves linearly (and sometimes radially) to shape the material.
Key Difference from Manual Lathe	Motions are driven by computer-generated G-code rather than hand wheel or pedal control. • Cylindrical parts (shafts, bushings) • Conical surfaces (tapers)
Typical Applications	• Threaded components • Grooves, shoulders, and face cuts • Small batch or prototype production

2. Main Components of a CNC Lathe

Component	Function
Spindle	Holds and rotates the workpiece; speed is selectable (RPM).
Chuck / Collet / Faceplate	Gripping device for the workpiece.
Tool Turret	Rotating carousel that stores multiple cutting tools; indexed automatically.
Carriage & Cross-Slide	Moves the tool radially (X-axis) and longitudinally (Z-axis).
Tailstock	Supports long workpieces; can hold drills, reamers, or live centers.
Control Panel	Displays the CNC program, status, and allows manual overrides.
Coolant System	Delivers cutting fluid to reduce heat and improve surface finish.
Linear Guides & Ball Screws	Provide precise, repeatable motion on each axis.

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3. CNC Lathe Axis Conventions

Axis	Direction	Typical Use
X	Radial – moves tool toward/away from workpiece centerline.	Cutting diameter, facing, grooving.
Z	Longitudinal – moves tool parallel to spindle axis.	Length cuts, facing, threading.
C	Rotational – rotates the turret (tool change).	Tool indexing.
U / V	Optional secondary linear axes (rare in standard lathes).	Complex 5-axis turning.

Positive X = tool moves outward (increasing diameter).

Positive Z = tool moves toward the operator (increasing length).

4. Basic CNC Lathe Operations

Operation	G?Code (ISO)	Typical Parameters	Result
Facing	G71 (rough) / G70 (finish)	X?stop (diameter), Z?start, Z?stop, depth of cut	Flat face perpendicular to spindle axis.
Turning (diameter reduction)	G71 (rough) / G70 (finish)	X?stop (final diameter), Z?start, Z?stop, depth of cut	Cylindrical shape with reduced diameter.
Grooving	G76 (single?point) / G70 (finish)	X?stop (groove width), Z?start/stop, depth of cut	Narrow slot or keyway.
Drilling	G81 (simple), G83 (peck)	X?position (center), Z?depth, feed rate	Hole drilled along Z?axis.
Thread Cutting	G76 (single?point), G92 (canned)	Pitch, lead, start	