

Basic Manufacturing Systems

[ME1083]

School Of Mechanical Engineering
KIIT Deemed to be University

Introduction to Turning Section

- **What is Turning?**
- Turning is a form of machining, a material removal process, which is used to create cylindrical parts by cutting away unwanted material.
- It requires a turning machine or Lathe, workpiece, fixture and cutting tool.
- The cutter is typically a single-point cutting tool that is secured in the machine, although some operations make use of multi-point tools
- Turning is used to produce parts that have many features, such as holes, grooves, threads, tapers, various diameter steps, and even contoured surfaces

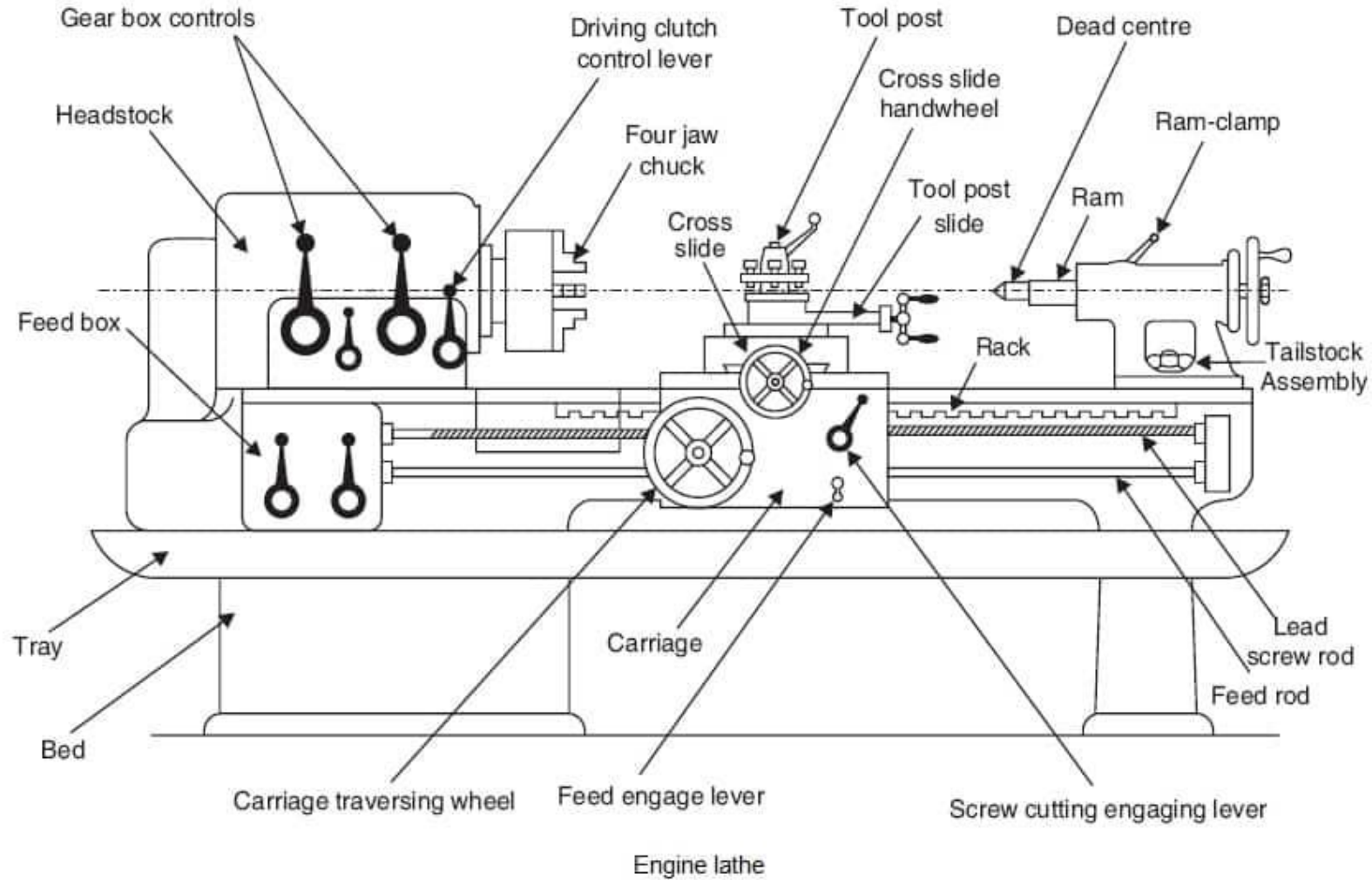
Introduction to Turning Section

- **Lathe machine:** A lathe machine is a machine tool that is used to remove metals from a workpiece to give a desired shape and size
- The Lathe is the most versatile machine tool among all standard of the machine tool.
- The function of Lathe is to *remove the metal in the form of chips* from a piece of work by mounting the same rigidly on a machine spindle and revolving at the required speed
- And the cutting tool is fed against the work either longitudinally or crosswise to make the work to the required shape and size.

Introduction to Turning Section

- A lathe machine consists of several parts like:
 1. Headstock
 2. Bed
 3. Tailstock
 4. Carriage
 5. Saddle
 6. Cross-slide
 7. Compound rest
 8. Toolpost
 9. Apron
 10. Lead Screw
 11. Feed rod
 12. Chuck
 13. Main spindle
 14. Leg

Lathe Machine



Lathe Machine

- **Types of Lathe machine:**
 - Lathe machine has been categorized into the following types:
 - Center or Engine Lathe
 - Speed Lathe
 - Capstan and Turret Lathe
 - Tool Room Lathe
 - Bench Lathe
 - Automatic Lathe
 - Special Purpose and CNC Lathe Machine

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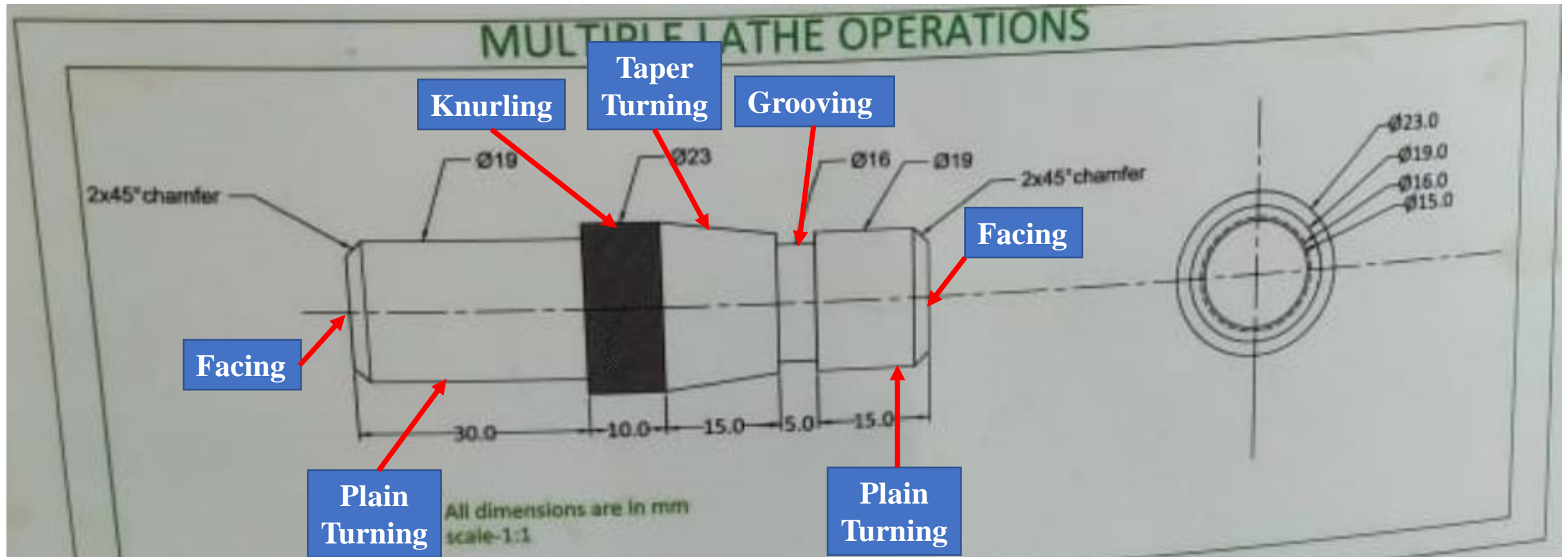
Lathe Machine Specification

- **A Lathe is generally specified by:**
- Swing- the largest work diameter that can be swung for the lathe bed.
- The distance between the headstock and tailstock center.
- Length of the bed in a meter.
- The pitch of the lead screw.
- Horsepower of the machine.
- Speed range and the number of speeds of HS spindle.
- The weight of the machine in a tonne.

Turning Section Experiment

- **Aim of experiment:** To prepare a **Cylindrical job of multiple lathe operations**
- **Raw Material Required:** **MS round bar [Ø25mm x 82mm]**
- **Tools required:** Steel rule, Chuck key, Marking block, tool post key, V-cutting tool, knurling tool, packing, Vernier caliper, grooving tool, brush
- **Operations involved: Six different operations**
 - Facing
 - Plain turning
 - Grooving
 - Taper Turning
 - Knurling
 - Step Turning

Layout of the Job



Procedure

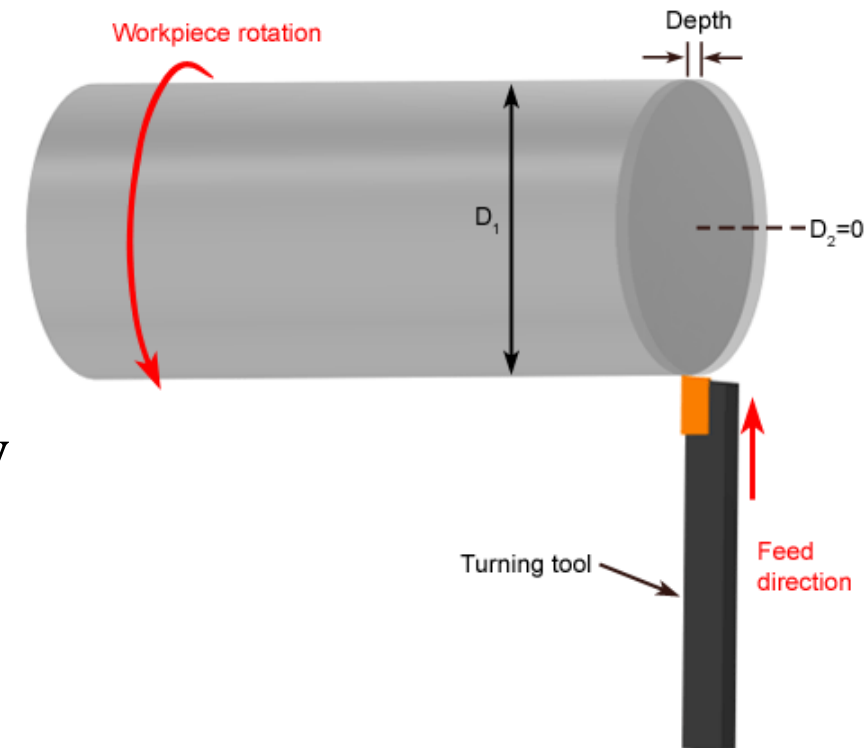
- **Step by step procedure**
 - Fix the cylindrical workpiece in the chuck using chuck key and true it by using marking block
 - Fix the single point cutting tool in the tool post so that its cutting point coincides with the axis of the job
 - Perform facing, plain turning and chamfering operation as per requirement
 - Fix the grooving tool to perform the grooving operation
 - Then, fix the knurling tool to do the knurling operation

Safety Precautions

- Safety precautions to be followed in **Turning** section
 - Always **wear gloves**, to avoid injuries to hand by sharp edges and corners of the cut piece
 - Maintain **proper distance from the machine** to avoid any inadvertent accident
 - **Wear glass** to avoid striking of cutting chips into your eyes
 - Do not wear loose dresses and make sure you are tying your hair tightly

Facing Operation

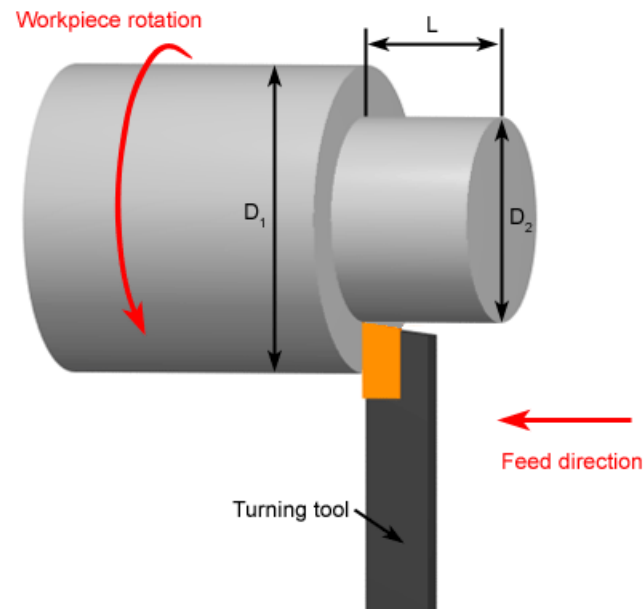
- **Facing operation:** A single-point turning tool moves radially, along the end of the workpiece, removing a thin layer of material to provide a smooth flat surface.
- The depth of the face, typically very small, may be machined in a single pass or may be reached by machining at a smaller axial depth of cut and making multiple passes.
- Tool used is: Single point cutting tool



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Plain Turning Operation

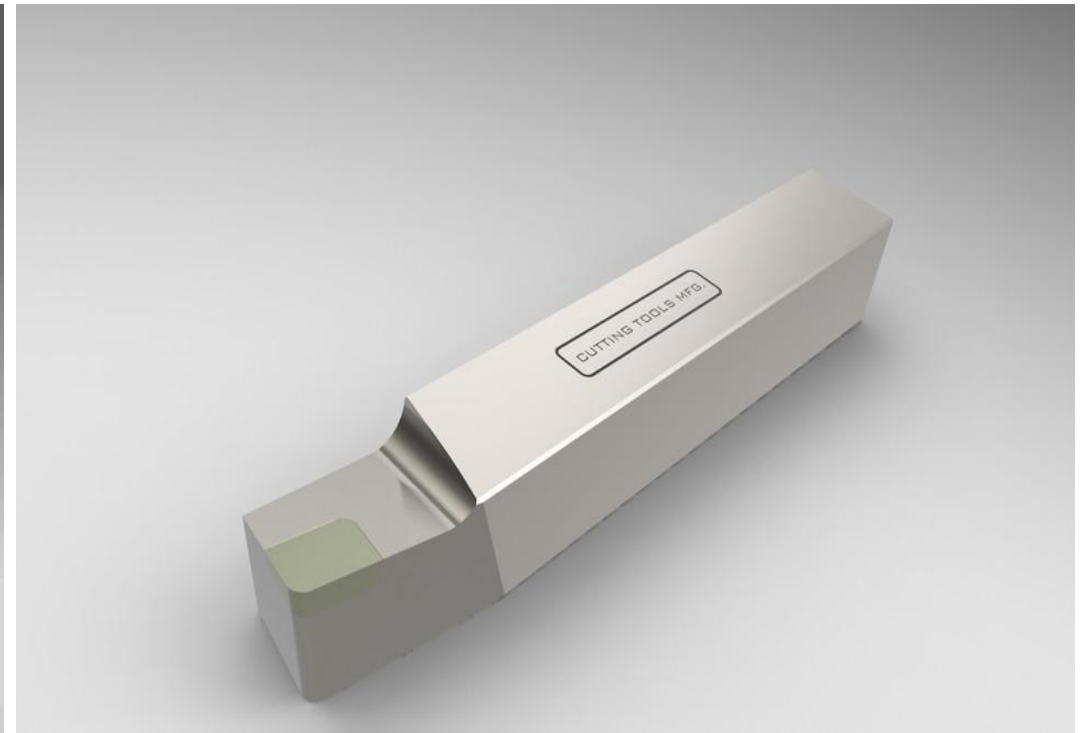
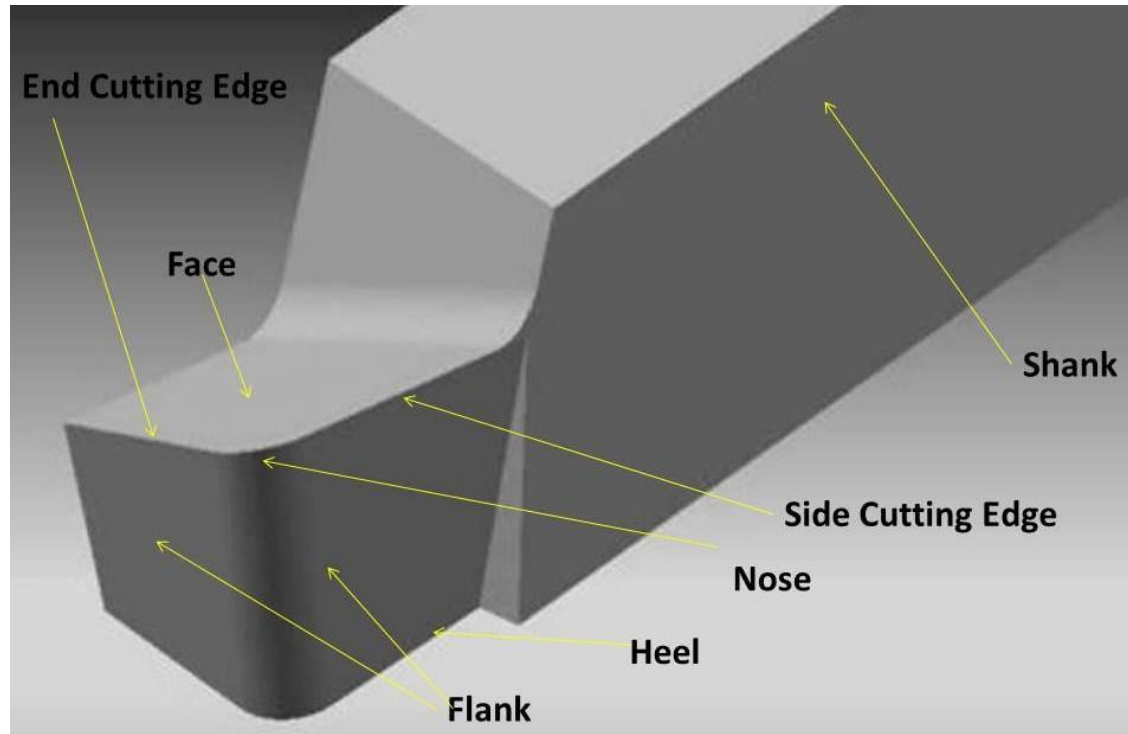
- Plain Turning Operation: A single-point turning tool moves axially, along the side of the workpiece, removing material to form different features, including **steps**, **tapers**, **chamfers**, and **contours**. These features are typically machined at a small radial depth of cut and multiple passes are made until the end diameter is reached.



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Plain Turning - Tool

- Tool used is: Single point cutting tool



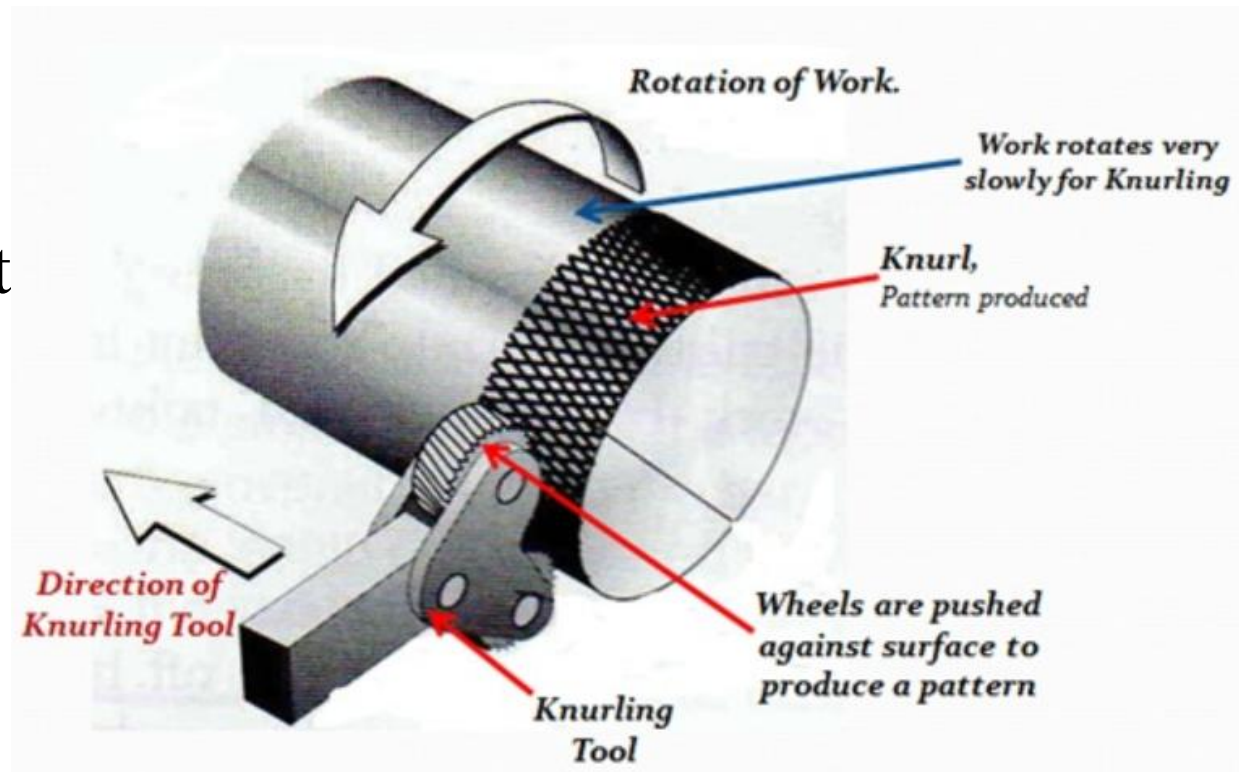
Cutting Parameters

- *Cutting feed*: The distance that the cutting tool or workpiece advances during one revolution of the spindle
- *Cutting speed* - The speed of the workpiece surface relative to the edge of the cutting tool during a cut
- *Feed rate* - The speed of the cutting tool's movement relative to the workpiece as the tool makes a cut
- *Axial depth of cut* - The depth of the tool along the axis of the workpiece as it makes a cut, as in a facing operation
- *Radial depth of cut* - The depth of the tool along the radius of the workpiece as it makes a cut, as in a turning or boring operation

Knurling Operation

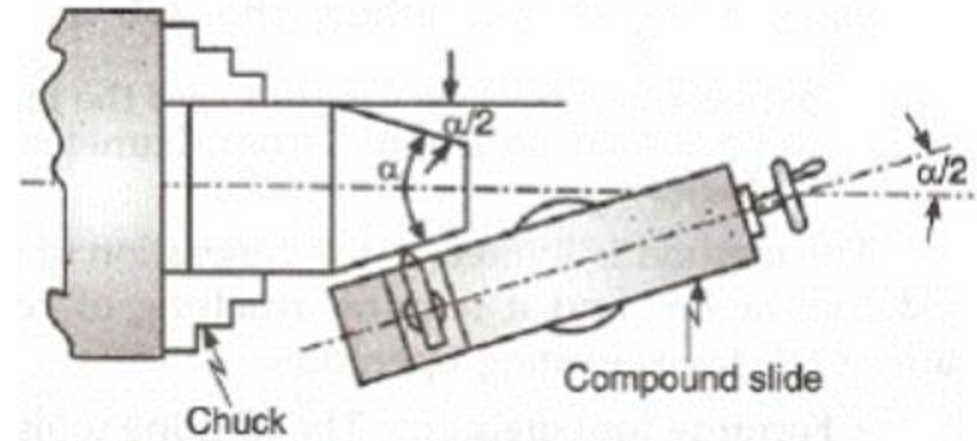
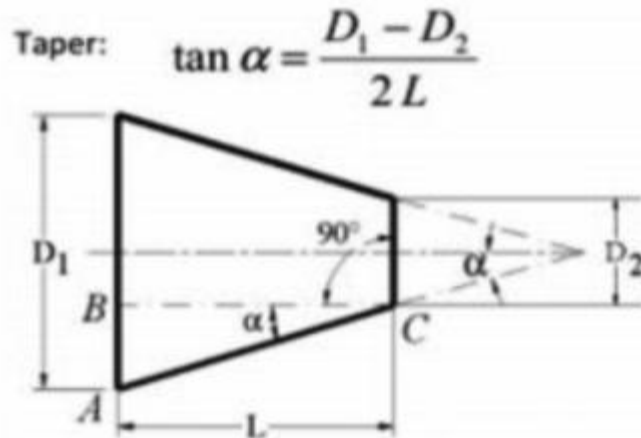
- **Knurling Operation:**

- It is the process of producing a rough surface on the workpiece to provide effective gripping.
- Knurling tool is held rigidly on the tool post and pressed against the rotating job so that leaving the exact facsimile of the tool on the surface of the job.



Taper Turning Operation

- **Taper turning:** A taper is defined as a uniform decrease or increase in the diameter of a workpiece along with its length.
- The operation by which a conical surface of the gradual reduction in diameter from a cylindrical workpiece is produced is called taper turning



Taper Turning Operation

- A tapering form may be done by anyone of the following methods.

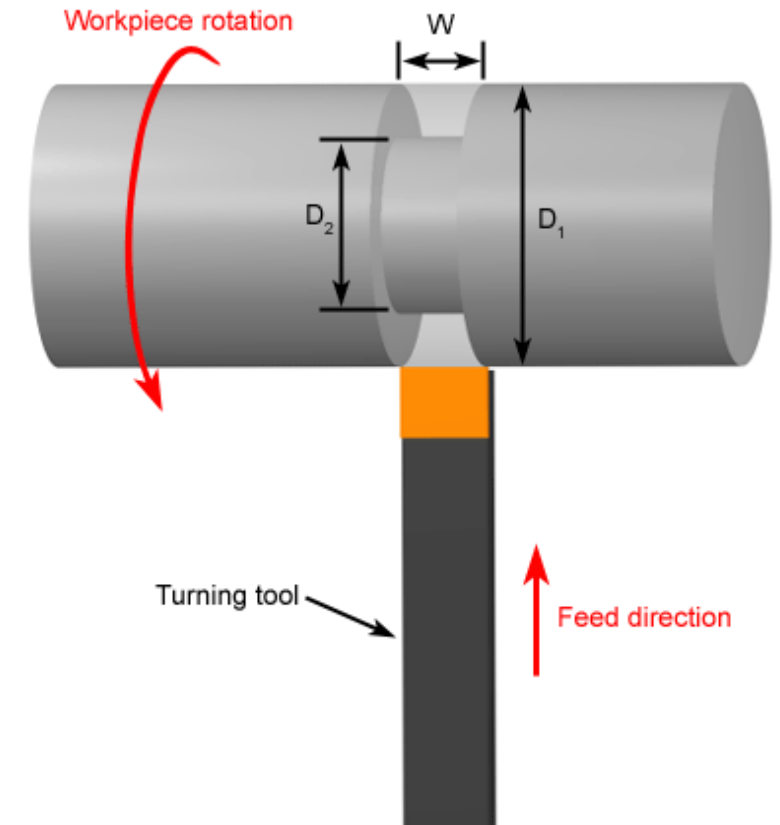
1. Taper turning by form tool
2. **By swiveling the compound rest**
3. Tail-stock set over method
4. By taper turning attachment

By swiveling the compound rest

- Set the compound rest by swiveling it from the centerline of the lathe center through an angle equal to a half taper angle.
- Clamp the carriage in place.
- After adjusting and setting the tool, feed is applied by the compound rest's feed handle to complete the taper.

Grooving Operation

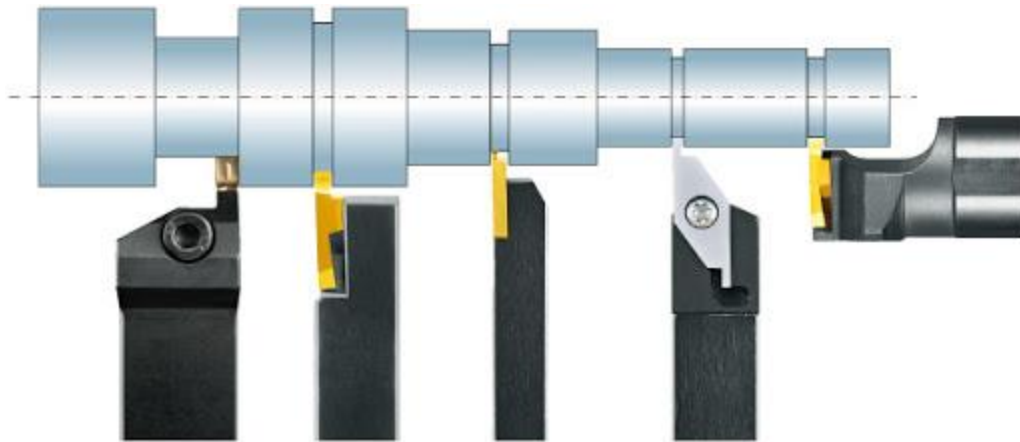
- What is Grooving operation?
- A single-point turning tool moves radially, into the side of the workpiece, cutting a groove equal in width to the cutting tool.
- Multiple cuts can be made to form grooves larger than the tool width and special form tools can be used to create grooves of varying geometries.



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Grooving Operation

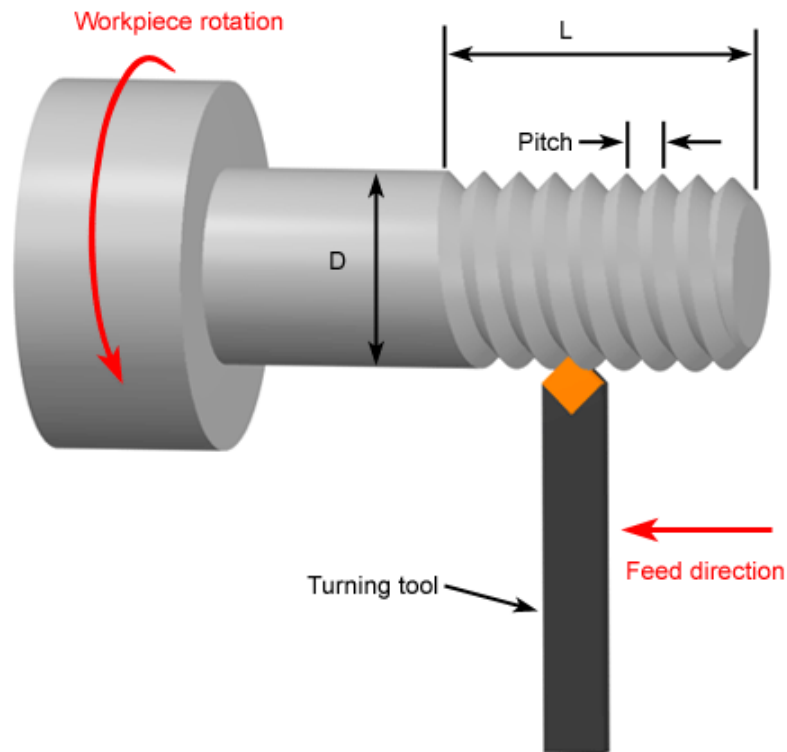
- What are the tools used?
 - Grooving tool - Grooving tool is usually a carbide insert mounted in a special tool holder, like any other tool. Designs of grooving inserts vary, from a single tip, to an insert with multiple tips.



Other Lathe Operations

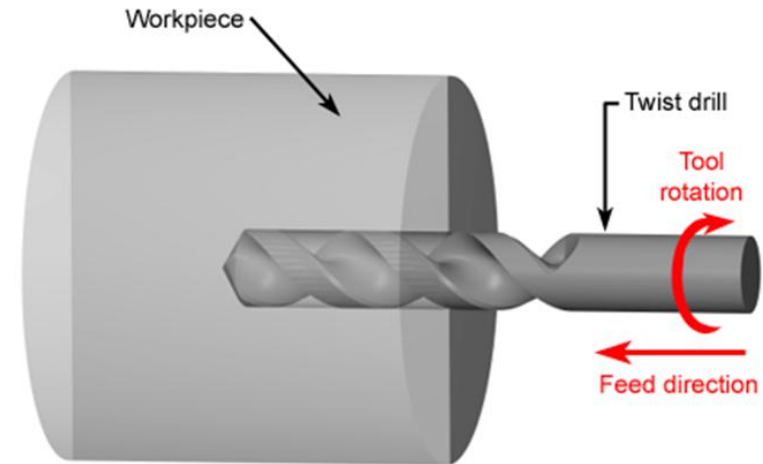
- Other important lathe operations include:

Thread cutting operation



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Drilling Operation

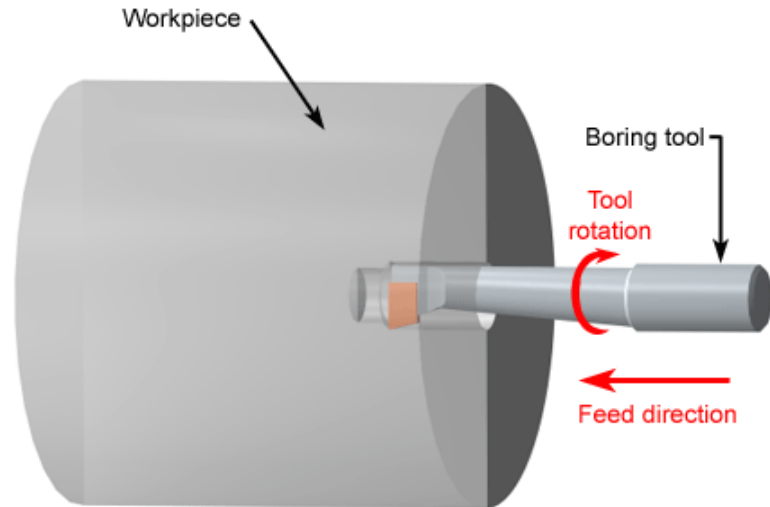


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Other Lathe Operations

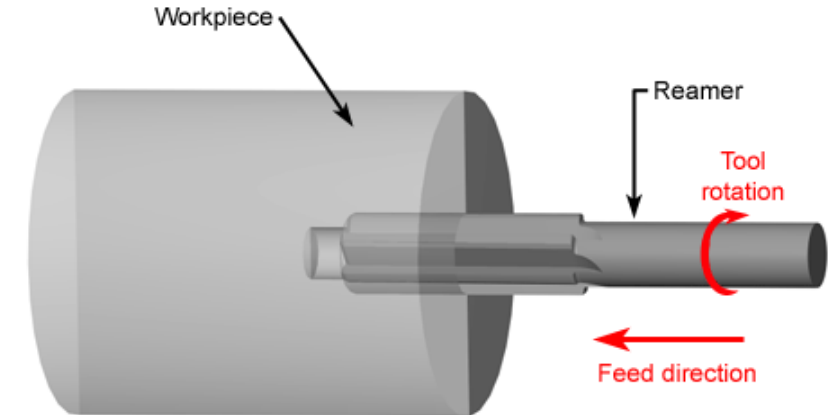
- Other important lathe operations include:

Boring Operation



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Reaming Operation

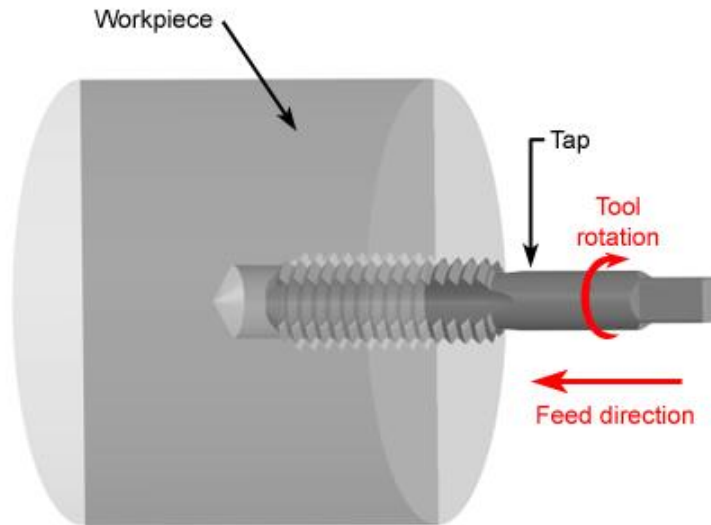


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Other Lathe Operations

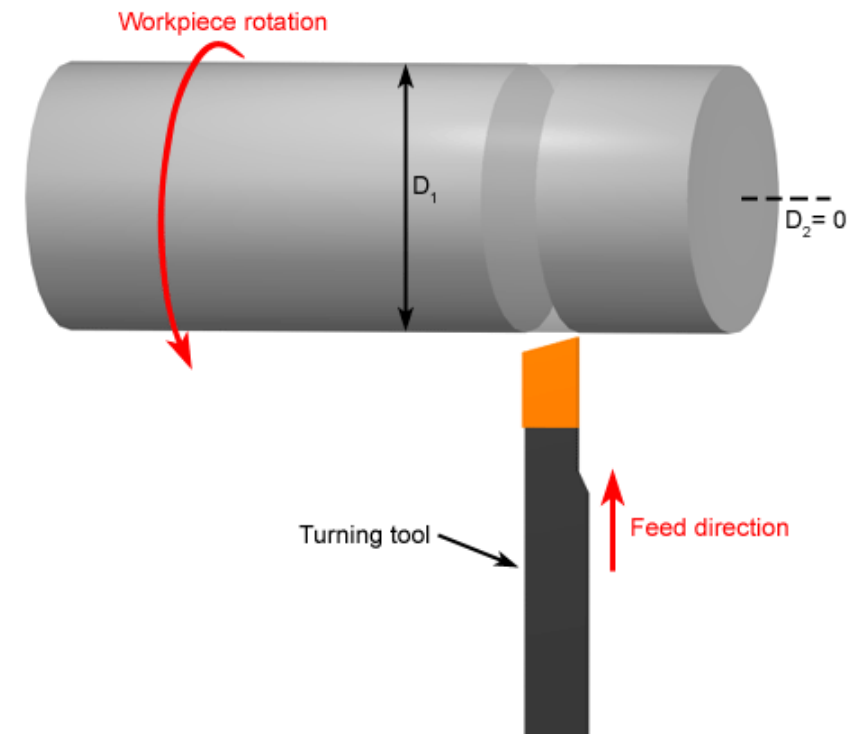
- Other important lathe operations include:

Tapping Operation



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Parting-off operation



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CNC Lathe

- **What is CNC Lathe Machine?**
- CNC stands for Computerized numerically controlled.
- This is widely used as a lathe in the present time because of its fast and accurate working. It is one of the most advanced types.
- It uses computer programs to control the machine tool. Once the program is fed into the computer as per the program it starts operation with very high speed and accuracy.
- Even do preplanned programmed machine is there in which once code is set for the various operations it can starts operation without changing code in the next time.
- These types of lathes are also used for mass production
- The components manufactured by these lathes are very accurate in
- dimensional tolerances.

CNC Lathe

