

SAFETY IN WORKSHOP

1. Do not wear necktie, wristwatch, bangles, rings and loose fitting clothing while working in workshop.
2. Wear overcoat or apron.
3. Keep your body and cloths away from moving machine parts.
4. Do not attempt to operate a machine until you have received instruction on its operations.
5. Do not move around. Do not tinker with any machine.
6. Keep your mind on the job be alert, and be ready for any emergency.
7. Be thoroughly familiar with the stop button and any emergency stop buttons provided on the machines.
8. Do not talks to anyone while operating the machine, not allow anyone to come near you or the machine.
9. Stop the machine before making measurements or adjustments.
10. Remove burrs, chips and other unwanted materials as soon as possible. They can cause serious cuts.

MACHINE SHOP

Introduction:

It is associated with performing different operation along with the application of different machines. Such power driven mechanism is called Machine Tool which can cut and shape the metals, with operations namely, Turning, Planning, Milling, Grinding & Drilling etc.

Lathe Machine: It is the earliest machine tool developed by mankind. However today lathe is modified form of ancient version.

Types of Lathe

1. **Bench lathe-** It is very small type of lathe and mounted on bench.
2. **Engine Lathe or Center Lathe-** It is most commonly used. The cutting tool may be fed both in cross and longitudinal directions.
3. **Capstan and Turret Lathe-** They are semi-automatic lathes and widely used in mass production of one item. Replacing the Tail Stock of Center Lathe into a Hexagonal; Turret fed tools in six sequences.
4. **Speed & Production Lathe-** It is simplest. The cutting tool mounted on adjustable slide fed by hand, used in wood working.
5. **Tool Room Lathe-** It is small production modern engine lathe with various spindle speeds and feeds.

Main Parts of center Lathe

1. **Head Stock:** Heavy casted box like structure of Cast Iron mounted on left side. It's spindle hollow cylindrical shaft to hold Chuck. **Chuck** is most important device for holding job piece.
2. **Tail Stock:** It is casted assembly mounted on Right Side of Bed. It is used generally for supporting long Jobs and hold for Drilling Tool.
3. **Carriage:** It control & support the cutting tool motion by:
 - a) **Saddle-Slide:** between Head & Tail Stock & support cross slide.
 - b) **Cross Slide:** It provides cross movement of tool.
 - c) **Compound Rest:** Mounted on cross-slide, can be used to swivel the tool at any angle for taper turning.
 - d) **Tool Post:** Mounted above compound rest. It clamps the cutting tool in desired position.
 - e) **Apron:** It is fastened to saddle and contains the feeding to carriage and cross-slide.
4. **Bed:** The main parts of the lathe, all parts are bolted to the bed. It includes the headstock, tailstock, carriage, cross rails and other parts. It's made Grey Cast Iron. **Half Nut Lever** consist of a lever threaded sleeve in two halves and used for thread making process.
5. **Leg:** Legs are carrying an entire load of a lathe machine tool and transfer to the ground. The legs are firmly secured to the floor by the foundation bolt.

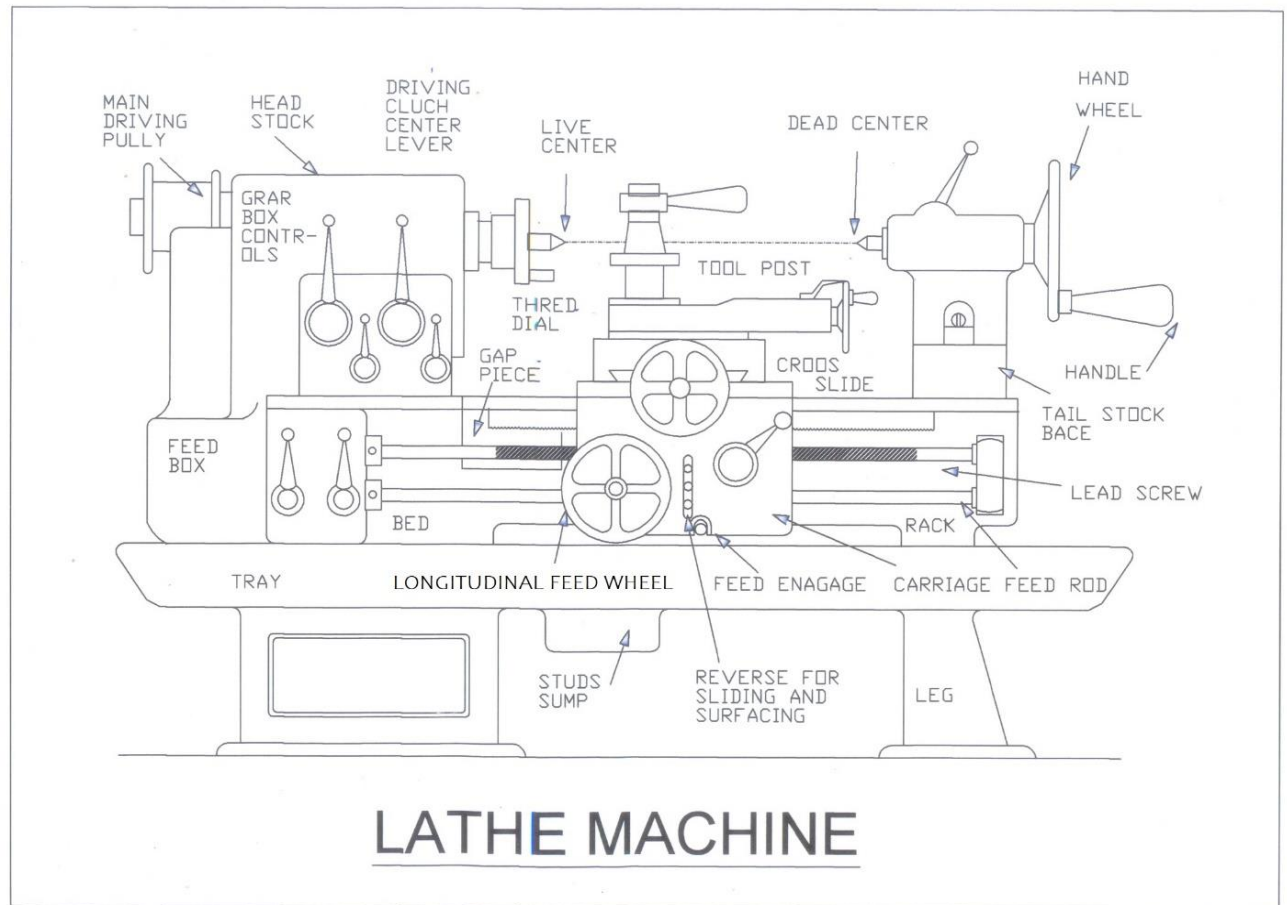


Fig.1: Lathe Machine

Common Lathe Operations

- 1) Centering
- 2) Facing
- 3) Plain Turning
- 4) Step-Turning
- 5) Taper Turning
- 6) Drilling
- 7) Boring
- 8) Reaming
- 9) Threading
- 10) Knurling
- 11) Grooving
- 12) Parting off
- 13) Champhering

Lathe Tools: Tools are alloys of (Fe) as parent metal and W(Tungsteen), Mo, Co, Cr, V and C different percent.

- | | |
|---------------------|-------------------|
| 1) Tungsten Steel | W: Cr: V: C |
| | 18: 4: 1: 0.8 |
| 2) Molybdenum Steel | Mo: W: Cr: V: C |
| | 6: 6: 4: 2: 0.8 |
| 3) Cobalt Steel | Co: W: Cr: V: C |
| | 12: 20: 4: 2: 0.8 |

Atomic Value of Elements:

	Fe	C	V	Cr	Co	Mo	W
Z	26	6	23	24	27	42	74
A	56	12	51	52	59	98	184

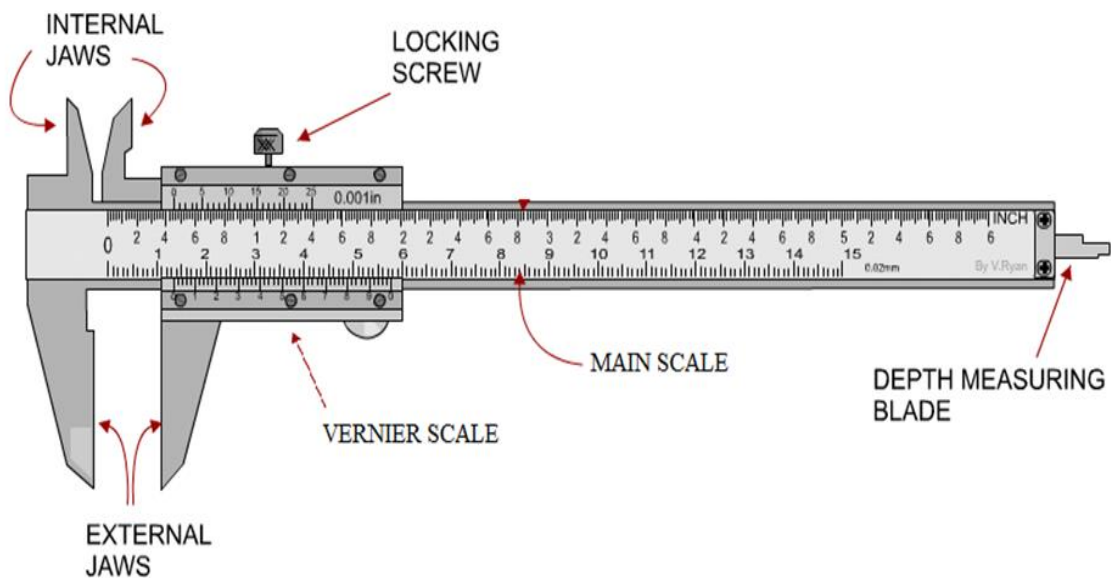


Fig. 2:Vernier calliper

Properties of Metals:

Strength: The strength of a material is its capacity to withstand destruction under the action of external load. The higher the strength of a material the greater load it can withstand.

Elasticity: Elasticity is that property of material by virtue of which deformation caused by applied load disappears when that load is removed.

Ductility: Ductility is that property of material which enables it to draw in to thin wire. Mild steel is a ductile material.

Malleability: This is the property of material which makes it enable to be flattened in to thin sheets without cracking. Aluminum, copper, tin, steel, lead, are the common malleable materials.

Brittleness: The brittleness of a material is the property of breaking without much distortion. There are many materials which break without a notable distortion. Cast iron and glass are the common examples of brittle materials.

Chuck: A chuck is one of the most important devices for holding and rotating a piece of work in a lathe. The chuck is joined at the head stock. Work piece is held rigidly and tightly in the jaws of chuck. The different types of chucks are as follows: -

1. Three jaw chuck or universal or self-centering chuck (Centre Lathe Machine)
2. Four jaw independent chuck (Centre Lathe Machine)
3. Collets chuck (Capstan Lathe Machine)
4. Magnetic chuck (Surface Grinding Machine)
5. Drill chuck (Drilling Machine)

PRACTICAL NO.-1

AIM: To make a work piece using Facing and Plain Turning operation.

OBJECTIVE: To perform Facing and Plain turning operation on Center Lathe Machine.

MATERIAL REQUIRED: Mild steel rod (length-150mm, diameter-45mm).

THEORY: Facing is the operation of machining the ends of work piece to produce a flat surface gauge with the axis. The operation is also applied to reduce the length of work piece or to make the work piece of required length. The operation involves feeding the tool perpendicular to the axis of rotation of the work piece. A proper ground facing tool is mounted in a tool holder in the tool post. The cutting edge should be at the same height as the center of the work piece.

Plain Turning is the process of removing excess material from a work piece to produce a cylindrical shape of desired dimensions by reducing its dia. The cutting tool is mounted in tool holder in the tool post. The feed is given the direction parallel to the axis of rotation of the work piece.

APPARATUS: Side & face tool, V-shape tool, Vernier caliper, surface gauge, tool post key, chuck key.

PROCESSES: Centering, Facing and Plain Turning.

PROCEDURE:

1. Mount the mild steel rod in the three jaw chuck of center lathe machine.
2. Hold the tool in tool post in such a position so that the tip of the tool will coincide with the center of the work piece.
3. Then switch on the power supply of the machine and confirm the rotation of the chuck in the anti-clockwise direction.
4. Apply the feed in the perpendicular direction (cross feed) to the work piece with the help of compound rest wheel for Facing Operation, depth of cut is given by longitudinal feed.
5. Apply the feed in the parallel direction (longitudinal feed) to the work piece with the help of compound rest for Plain Turning Operation, depth of cut is given by cross feed.
6. Repeat this process till the face and dia becomes uniform and smooth.

This process of removing the metal at the cost of reduction in length of work piece is known as Facing operation and removing the metal at the cost of reduction in dia of work piece is known as Plain Turning operation.

RESULT: We performed Facing and Plain Turning operation on center lathe machine.

RESULT ANALYSIS: - Changes in dimensions (length, width, dia, weight etc.).

LEARNING OUTCOMES: - What did you learn in this practical.

APPLICATION: - Where we can apply the knowledge gained in this practical.

SUGGESTIONS: - If you have any suggestion related to this practical ,please advise .

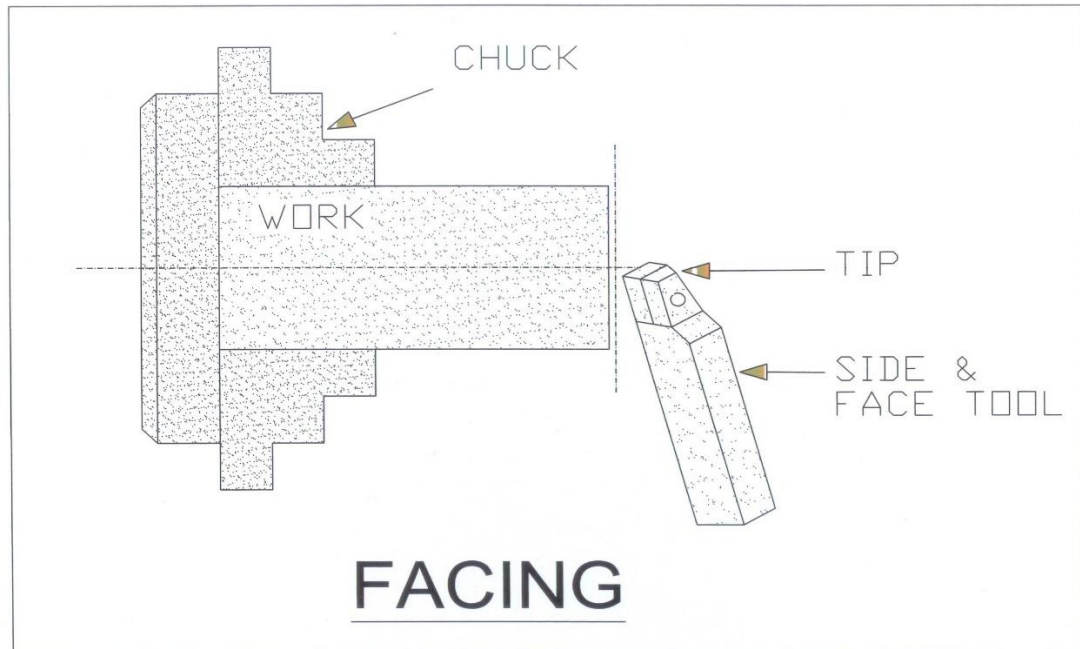


FIG. 3: Facing Operation

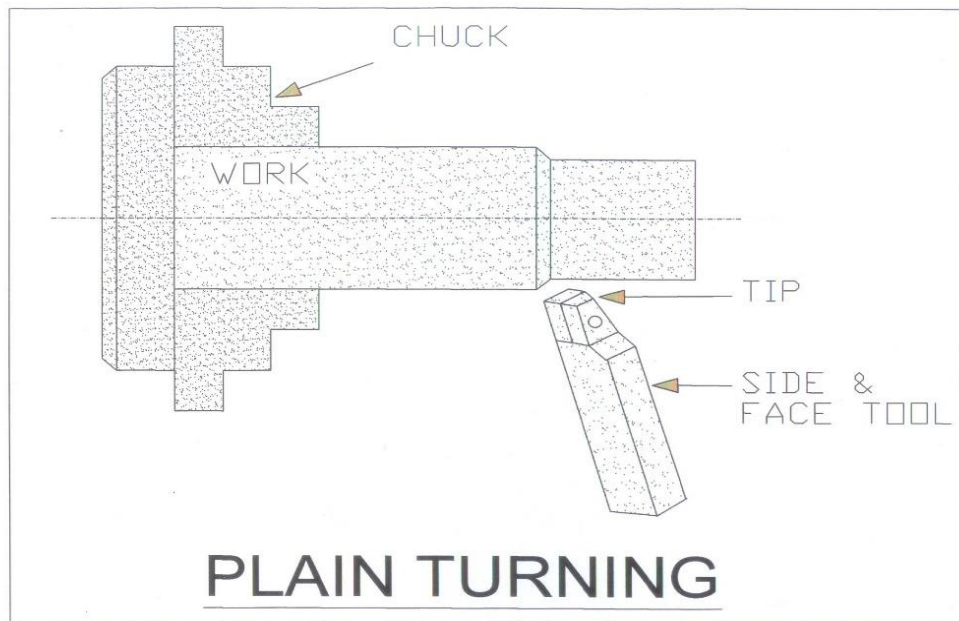


Fig. 4: Plain Turning Operation

PRACTICAL NO. 2

AIM: To make a work piece using Step Turning and Thread making operation.

OBJECTIVE: To perform Step Turning and Thread Cutting(Introduction) Operation on the given work piece on center lathe machine.

MATERIAL REQUIRED: Mild steel rod length-135mm, OD-40mm.

TOOLS REQUIRED: Vernier caliper, steel rule, spanner, chuck key, H.S.S. single point V- shape cutting tool.

THEORY: When a work piece having different diameters for different lengths is called the Step Turning. This process is extension of Plain Turning operation to produce various steps of different diameters. We can say making different diameters for different lengths is also known as Step Turning.

A **thread** is a helical ridge formed on a cylindrical or conical rod. It is cut on a lathe when the tool ground to the shape of thread, is moved longitudinally with the uniform linear motion while the work piece is rotating with uniform speed. By maintaining an appropriate gear ratio between the spindle on which the work piece is mounted, and the lead screw which enables the tool to move longitudinally at the appropriate linear speed, the screw thread of the required pitch can be cut. The pointed tool is employed to cut V-threads.

APPARATUS: Side & face tool, V-shape tool, Vernier caliper, surface gauge, tool post key, chuck key.

PROCESSES INVOLVED: Centering, Facing, Plain turning, Step turning and threading.

PROCEDURE:

1. Mount the mild steel rod in the three jaw chuck of center lathe machine.
2. Hold the tool in tool post in such a position so that the tip of the tool will coincide with the center of the work piece.
3. Then switch on the power supply and confirm that the rotation of the chuck is in the anti-clockwise direction.
4. Apply the feed in the perpendicular direction (cross feed) to the bed with the help of compound feed.
5. Repeat the process till the work piece becomes of different diameters.

PRECAUTIONS: -

1. Before starting the spindle by power lathe spindle should revolve by one revolution by hand to make it sure that no fouling is there.
2. Tool should be properly ground, fixed at correct height and properly secured, and work also be firmly secured.
3. Chips should not be allowed to wind a revolving job and cleared as often as possible.

4. Before operating threading operation, V-tool should be properly ground to the required helix angle.
5. Apply cutting fluids to the tool and work piece property.
6. No attempt should be made to clean the revolving job with cotton waste. On hearing unusual noise, machine should be stopped.

RESULT: We perform Step Turning and Thread making operation on lathe machine.

RESULT ANALYSIS: - Changes in dimensions (length, width, dia, weight etc.).

LEARNING OUTCOMES: - What did you learn in this practical.

APPLICATION: - Where we can apply the knowledge gained in this practical.

SUGGESTIONS: -- If you have any suggestion related to this practical, please advise .

All dimensions are in mm-

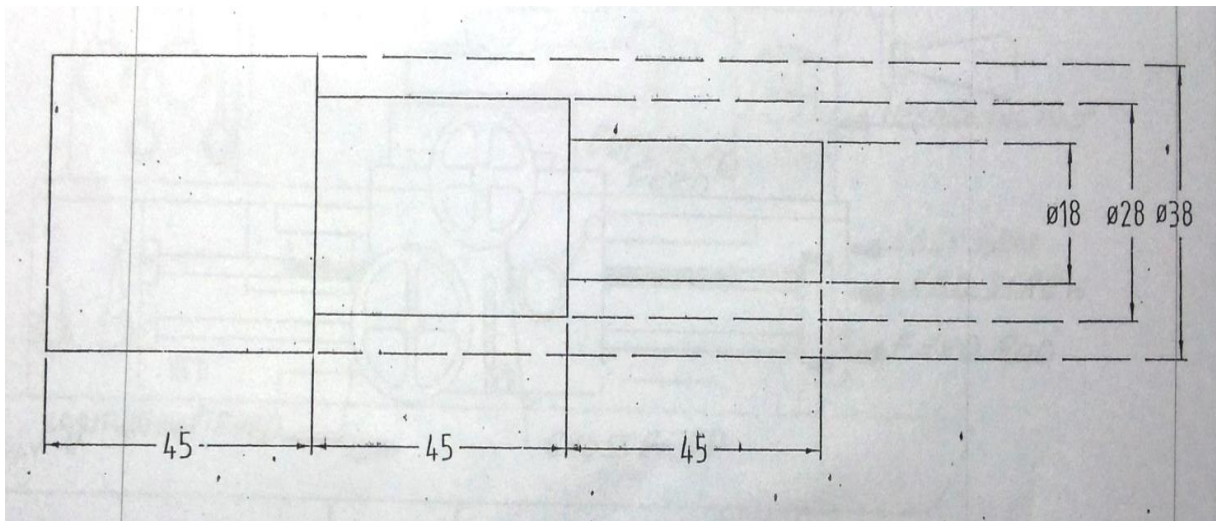


FIG. 5: Step Turning

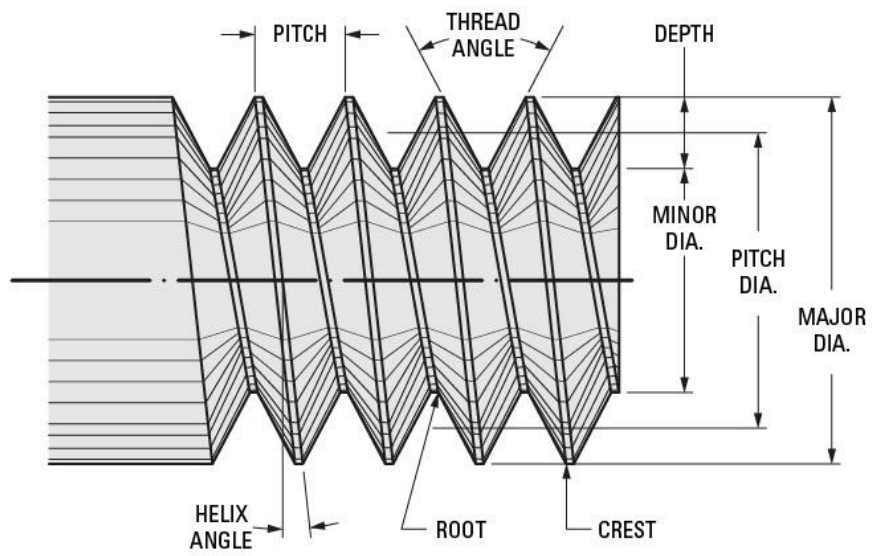


FIG. 6: Screw Thread Terminology