MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

DEPARTMENT MECHANICAL ENGINEERING

METROLOGY AND MACHINE TOOLS
LAB MANUAL

SUBJECT NAME	**Metrology and Machine Tools Lab**
SUBJECT CODE	**1950379**
COURSE-BRANCH	**B. Tech - Mechanical Engineering**
YEAR-SEMESTER	**III - I**
ACADEMIC YEAR	**2021-2022**
REGULATION	**MLRS-R19**

MARRI LAXAMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT

MISSION AND VISION OF THE INSTITUTE:

Our Vision:

To establish as an ideal academic institutions in the service of the nation the world and the humanity by graduating talented engineers to be ethically strong globally competent by conducting high quality research, developing breakthrough technologies and disseminating and preserving technical knowledge.

Our Mission:

To fulfill the promised vision through the following strategic characteristics and aspirations:

- Contemporary and rigorous educational experiences that develop the engineers and managers;
- An atmosphere that facilitates personal commitment to the educational success of students in an environment that values diversity and community;
- Prudent and accountable resource management;
- Undergraduate programs that integrate global awareness, communication skills and team building across the curriculum;
- Leadership and service to meet society's needs;
- Education and research partnerships with colleges, universities, and industries to graduate education and training that prepares students for interdisciplinary engineering research and advanced problem solving;
- Highly successful alumni who contribute to the profession in the global society.

Vision and Mission statements of the Department of Mechanical Engineering:

Vision Statement:

"The Mechanical Engineering Department strives immense success in the field of education, research and development by nurturing the budding minds of young engineers inventing sets of new designs and new products which may be envisaged as the modalities to bring about a green future for humanity"

Mission Statement:

1. Equipping the students with manifold technical knowledge to make them efficient and independent thinkers and designers in national and international arena.
2. Encouraging students and faculties to be creative and to develop analytical abilities and efficiency in applying theories into practice, to develop and disseminate new knowledge.

3. Pursuing collaborative work in research and development organizations, industrial enterprises, Research and academic institutions of national and international, to introduce new knowledge and methods in engineering teaching and research in order to orient young minds towards industrial development.

PROGRAM EDUCATIONAL OBJECTIVE

PEO 1: Graduates shall have knowledge and skills to succeed as Mechanical engineer's for their career development.

PEO 2: Graduates will explore in research.

PEO 3: Mechanical Graduates shall have the ability to design products with various interdisciplinary skills

PEO 4: Graduates will serve the society with their professional skills

PROGRAM OUTCOMES

- **A.** Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems.
- **B.** Problem Analysis: Identify, formulate, research, review the available literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.
- **C.** Design and development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specific needs with appropriate considerations for public health safety and cultural, societal and environmental considerations.
- **D.** Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
- **E.** Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including predictions and modeling to complex engineering activities with an understanding of the limitations.
- **F.** The Engineer and society: Apply reasoning, informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
- **G.** Environment and sustainability: Understand the impact of the professional engineering solutions in society and environmental context and demonstrate the knowledge of and need for sustainable development.
- **H.** Ethics: Apply ethical principles and commitment to professional ethics, responsibilities and norms of the engineering practice.
- **I.** Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multi disciplinary settings.
- **J.** Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as being able to comprehend, write effective reports, design documentation, make effective presentations, give and receive clear instructions.
- **K.** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **L.** Life – long learning: Recognize the need and have the preparation, ability to engage in independent and life – long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES:

PS01: Students acquire necessary technical skills in mechanical engineering that make them employable graduate.

PSO2: An ability to impart technological inputs towards development of society by becoming an entrepreneur.

COURSE OBJECTIVES:

1. To import practical exposure to the metrology equipment & Machine tools
2. To conduct experiments and understand the working of the same.
3. To learn the measurement of bores by internal micrometers and dial bore indicators.
4. To learn the measurement of the Angle and taper s by Bevel protractor, Sine bars, etc.
5. To learn the Step turning and taper turning and thread cutting Drilling and Tapping on lathe machine
6. To the operations of Shaping and milling

COURSE OUTCOMES:

ME 379.1 Student will be able to use different measuring instruments towards quality.

ME 379.2 Measure the angle and taper using Bevel protractor and Sine bar.

ME 379.3 Measure screw thread parameters.

ME 379.4 Perform step turning, taper turning, thread cutting, drilling, and tapping operations.

ME 379.5 Perform operations on shaper and milling machine.

ME379.6 Perform various operation on slotting, shaper, and planning machines.

INSTRUCTIONS TO THE STUDENTS

1. Every student should obtain a copy of the laboratory manual
2. It is important that all students arrive at each session on time.
3. Dress code: Students must come to the laboratory wearing:
    - Trousers.
    - half-sleeve tops.
    - Leather shoes.
    - Half pants, loosely hanging garments and slippers are not allowed.
4. Students should come with thorough preparation for the experiment to be conducted.
5. Students will not be permitted to attend the laboratory unless they bring the practical record fully completed in all respects pertaining to the experiment conducted in the previous class.
6. Experiment should be started only after the staff-in-charge has checked the experimental setup.
7. All the calculations should be made in the observation book. Specimen calculations for one set of readings have to be shown in the practical record.
8. Wherever graphs are to be drawn, A-4 size graphs only should be used and the same should be firmly attached to the practical record.
9. Practical record and observation should be neatly maintained.
10. They should obtain the signature of the staff-in-charge in the observation book after completing each experiment.
11. Theory regarding each experiment should be written in the practical record before procedure in your own words.

LABORATORY SAFETY PRECAUTIONS

1. Laboratory uniform, shoes & safety glasses are compulsory in the lab.
2. Do not touch anything with which you are not completely familiar. Carelessness may not only break the valuable equipment in the lab but may also cause serious injury to you and others in the lab.
3. Please follow instructions precisely as instructed by your supervisor. Do not start the experiment unless your setup is verified & approved by your supervisor.
4. Do not leave the experiments unattended while in progress.
5. Do not crowd around the equipment's & run inside the laboratory.
6. During experiments material may fail and disperse, please wear safety glasses and maintain a safe distance from the experiment.
7. If any part of the equipment fails while being used, report it immediately to your supervisor. Never try to fix the problem yourself because you could further damage the equipment and harm yourself and others in the lab.
8. Keep the work area clear of all materials except those needed for your work and cleanup after your work.

LIST OF EXPERIMENTS

1. Step turning and taper turning on lathe machine.
2. Thread cutting and knurling on lathe machine.
3. Machining of groves using slotter and shaper machines
4. Machining of holes using Drilling and boring machines.
5. Gear cutting on the milling machine.
6. Grinding of tool angles using Cylindrical/Surface Grinding.
7. Measurement of lengths, heights, diameters by vernier calipers, micrometers.
8. Measurement of bores by internal micrometers and dial bore indicators.
9. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height.
10. Angle and taper measurements by level protractor and sine bars.
11. Thread measurement by 2-wire and 3-wire methods.
12. Surface roughness measurements by Tally Surf.

1. NOMENCLATURE OF SINGLE POINT CUTTING TOOL

1. **Side Cutting Edge Angle:**

The angle between side cutting edge and the side of the tool shank is called side cutting edge angle. It is often referred to as the lead angle.

2. End Cutting Edge Angle:

The angle between the end cutting edge and a line perpendicular to the shank of the tool shank is called end cutting edge angle.

3. Side Relief Angle:

The angle between the portion of the side flank immediately below the side cutting edge and a line perpendicular to the base of the tool.

4. End Relief Angle:

The angle between the end flank and the line perpendicular to the base of the tool is called end relief angle.

5. Back Rake Angle:

The angle between the face of the tool and line perpendicular to the base of the tool measures on perpendicular plane through the side cutting edge. It is the angle which measures the slope of the face of the tool from the nose, towards the rack. If the slope is downward the nose it is negative back rake.

6. Side Rake Angle:

The angle between the face of the tool and a line parallel to the base of the tool measured on plane perpendicular to the base and the side edge. It is the angles that measure the slope of the tool face from the cutting edge, if the slope is towards the cutting edge it is negative side rake angle and if the slope is away from the cutting edge, it is positive side rake angle. If there is no slope the side rake angle is zero.

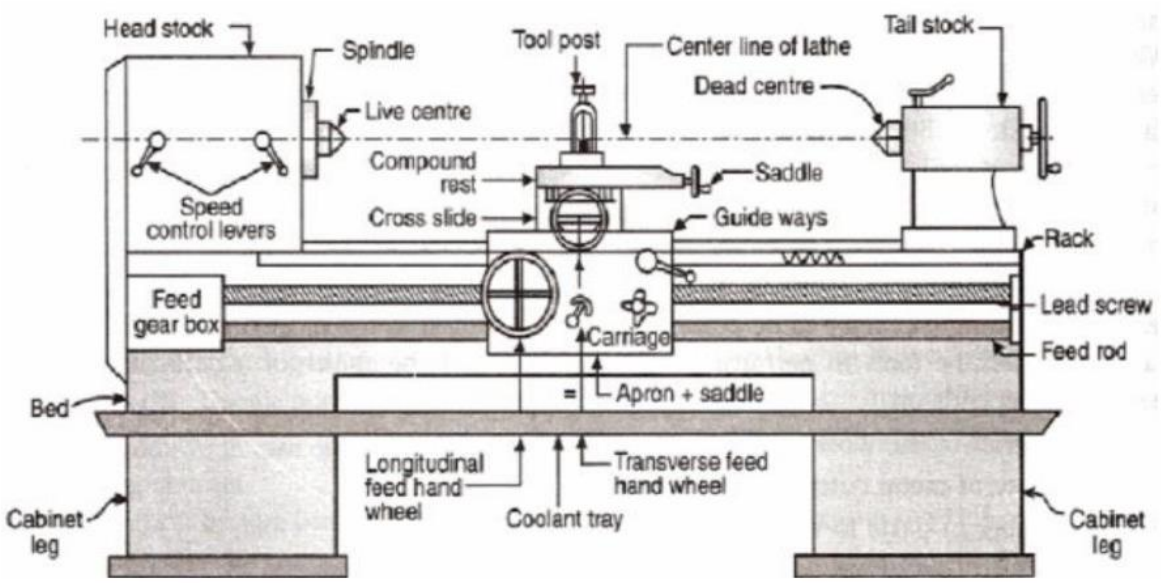
Introduction to General Purpose Machines

INTRODUCTION

Various machining purpose used these all type of mechanical machining machines are Lathe machine, Shaper machine, Slotting machine, Planning machine, Drilling machine, Boring machine, Milling machine, Grinding machine, Lapping machine Honing machine and Broaching machine

These machines are to producing various operations like namely Facing, Chamfering, Step turning, Taper turning, Plain turning, Knurling, Grooving, Thread cutting, Drilling, Tapping, Precision grinding, Cylindrical grinding, Surface grinding, grinding of tool angles etc.,

LATHE MACHINE:



Lathe is the oldest machine tool and is used to remove material from a rotating work-piece on the form of chips with help of a tool traversed along the work-piece and can be fed deep in to the work. The tool material should be harder than the work-piece and the later held securely and rigidly on the machine. A lathe is used mainly to produce cylindrical surfaces and plane surfaces at right angles to the axis of rotation.

Working: - A lathe basically consists of a bed to provide support, headstock, cross slide to traverse the tool. Tool post mounted on the cross slide. The spindle is driven by a motor through a gear box to obtain a range of speeds. The carriage moves over the bed guide ways parallel to the work-piece and the cross slide provides the transverse motion. A feed shaft and led screw are also provided to power the carriage and cutting the threads respectively.

Machining operations: - The most common operations that can be performed on a Lathe machine are: Turning, Facing, Taper turning, Eccentric turning, Boring, Drilling, Reaming, Threading, Knurling etc. In addition to these with the help of special attachments, operations like key-way cutting, Cam and gear cutting, shaping, Milling, Fluting, Grinding can also be performed on this machine.

Components of the Lathe Machine:

Main parts of a lathe machine includes Bed, Head stock, Tail stock, Carriage, Feed mechanism, Screw cutting mechanism etc.

Bed: - The lathe bed forms the base of the machine. Headstock and Tailstock are located at either end of the bed. Carriage and tailstock are free to move / slide on bed where as headstock I fixed rigidly.

Headstock: - The headstock consists of the head stock casting which is located on the ways of the bed at the left side of the operator, the hollow spindle in which the live center I held rigidly by taper and gears and mechanism for obtaining various spindle speeds A head stock may be driven either from a line shaft or from an independent motor . The drive being transmitted to the constant speed main drive pulley.

A separate speed change gear box is placed below the head stock to reduce the speed in order to have different rate of feed for threading and automatic lateral movement of the carriage.

Tailstock: - It I located on the inner guide vanes of right hand end of the lathe bed. It can move freely on the guide ways provided on the lathe bed is used mainly to support the work piece while machining if the free length of the work-piece is large and also to hold some special tools such as drill bit, taper bit boring tool etc.

Carriage: - The carriage of the lathe contains several parts that serve the purpose to support, move and control cutting tool. It consists of the following parts

1). Saddle 2). Cross slide 3). Compound rest 4). Tool post 5). Apron 6). Half-nut mechanism etc.

Saddle is an H shaped casting that fits over the bed and slides along the guide ways. It carries the cross slide and the tool post. Cross slide comprises a casting machined on the underside for attachment to the saddle and carries location on the upper face for the tool post or the compound rest. Cross slide had wheel is graduated on either sides or a separate micrometer dial may be4 fitted on them so that a known amount of feed can be applied.

Compound rest supports the tool post and cutting tool in it in various positions. It may be swiveled on the cross slide to any angle in the horizontal plane, its base being graduated suitably. A compound rest is necessary in turning angles and boring short tapers and in turning angles and forms a forming tool. Tool post is used to hol the variouscutting tools and holders.

Feed Mechanism:- The movement of the tool along the length of the work piece is called as feed. In lathe feed can be obtained by any of these the mechanisms: Gearing at the end of the bed, Feed gear box, Feed rod and lead screw, Apron mechanism

Screw cutting mechanism: - Screw cutting mechanism is mainly obtained by the lead screw to get thread cutting on the work-piece. The pitch of the thread is controlled by the speeds of the headstock spindle and the lead screw.

Specifications of the LATHE

Usually a Lathe is specified by:

1). Distance between the two centers of the lathe,

2). Swinging diameter over the bed,

3). The largest diameter of the work-piece that can be revolved in the chuck without touching the bed,

4). Height of the live and dead centers,

5). Swinging diameter over the carriage This is the largest diameter of the work-piece that can revolve over the lathe saddle and it always less than swinging diameter over the bed,

6). The maximum bar diameter, this is the maximum diameter of the bar stock that will pass through the spindle hole

7). Length of the bed, this indicates the approximate space on the floor by the lathe.

8). The power required by the lathe

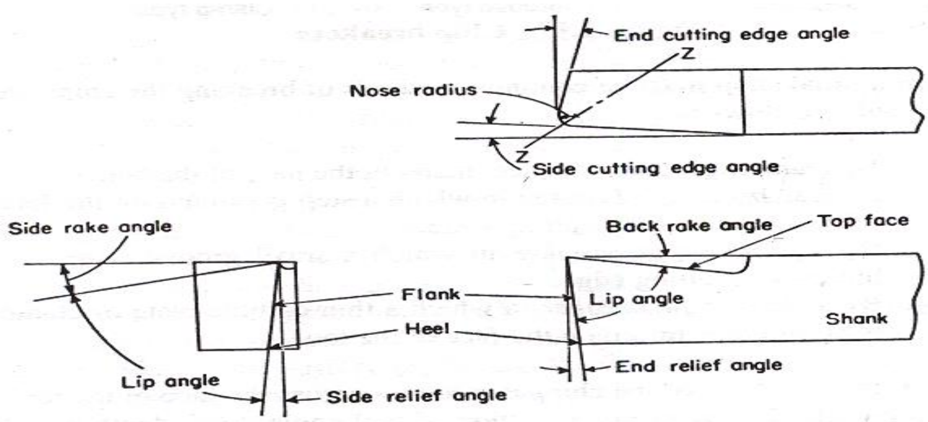


Figure 2.18 Tool nomenclature and tool angles (sec. 3.50 for tool signature)

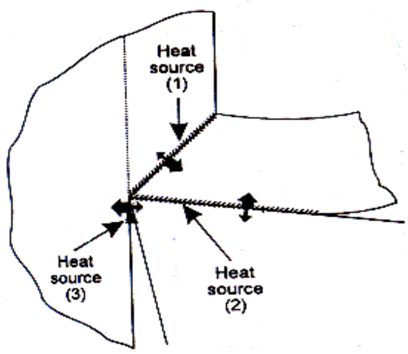


Figure 2.23(a) Source of heat in metal cutting

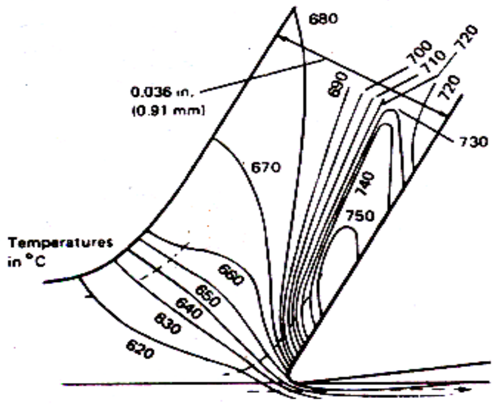


Figure 2.23(b) Temperature distribution in cutting zone

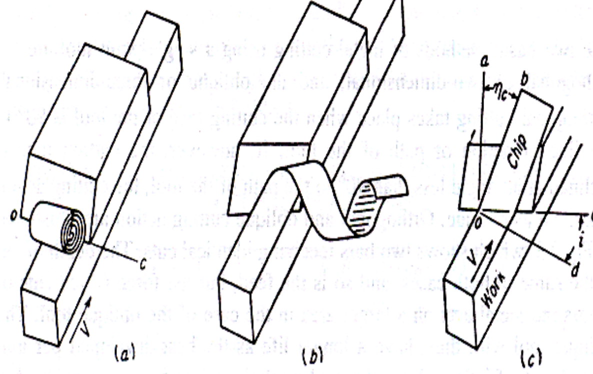


Figure 2.3 Direction of chip flow in orthogonal and oblique cutting

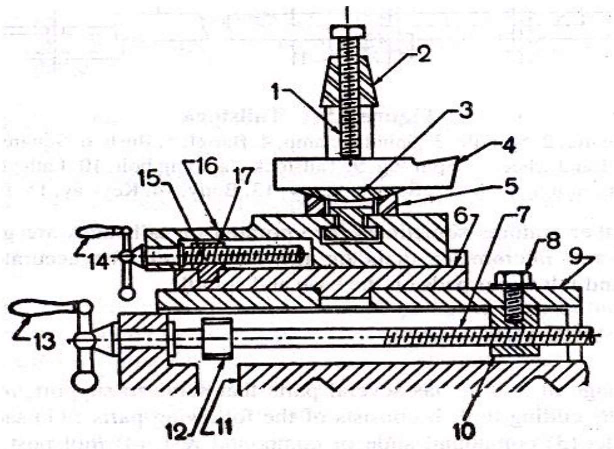


Figure 3.10 Carriage

box.

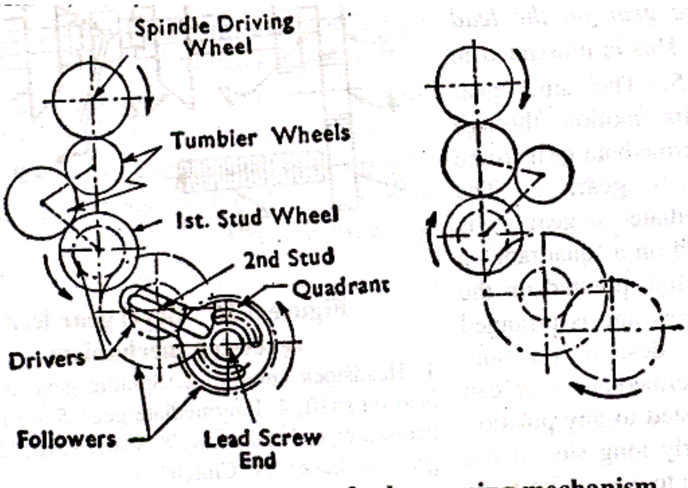


Figure 3.15 Tumbler gear feed reversing mechanism.

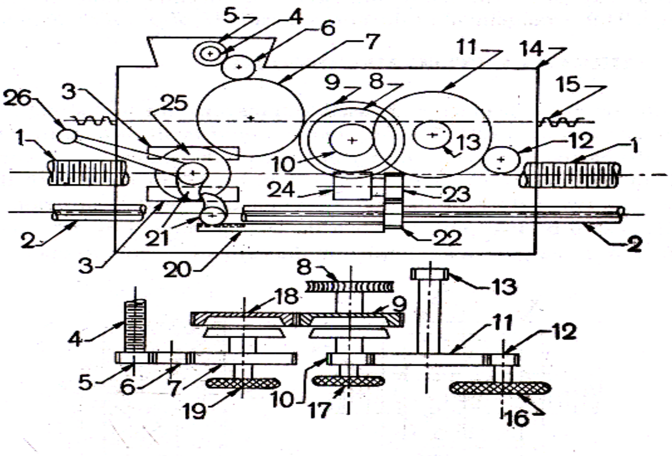


Figure 3.20 Apron mechanism

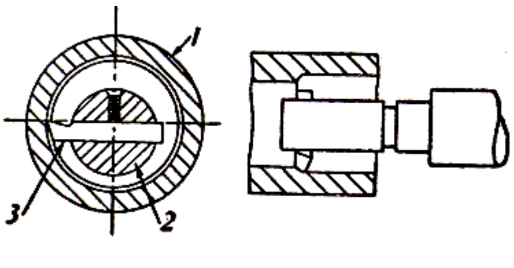


Figure 3.65 Boring operation
1. Work, 2. Boring bar, 3. Boring tool.

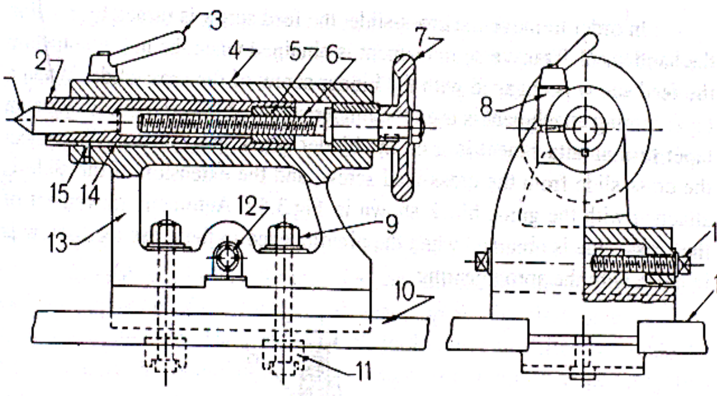


Figure 3.9 Tailstock

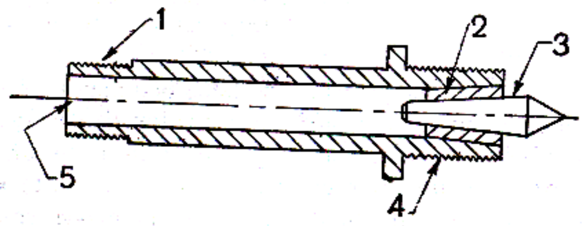


Figure 3.6 Headstock spindle
1. Threaded end, 2. Taper sleeve, 3. Live centre,
4. Threaded nose, 5. Spindle hole.

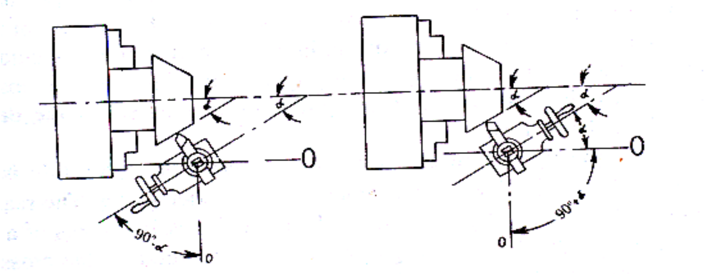


Figure 3.48 Taper turning by swivelling the compound rest.
α. Half angle of taper.

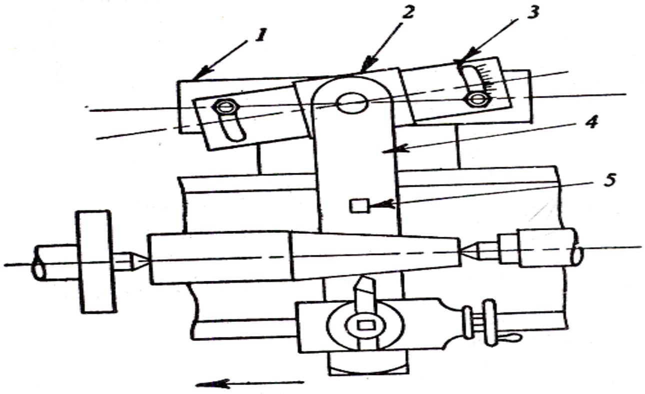


Figure 3.49 Taper turning attachment
... 3. Guide bar, 4. Crossslide, 5. Bin

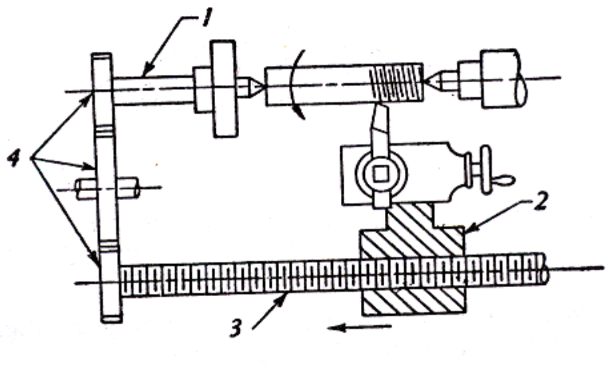


Figure 3.53 Principles of thread cutting

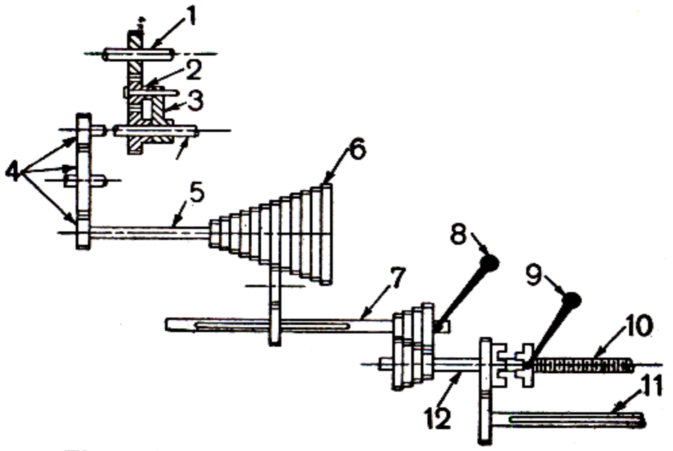
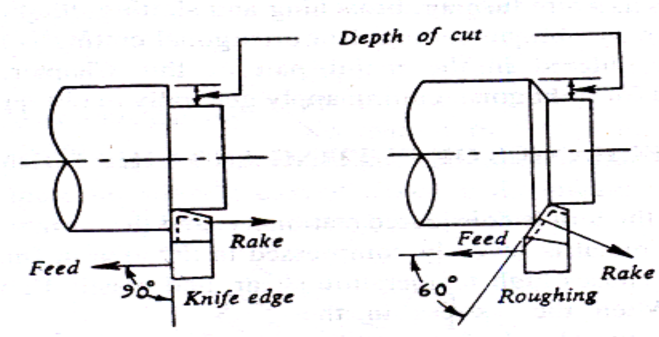


Figure 3.19 Layout diagram of feed drive



Orthogonal and oblique cutting

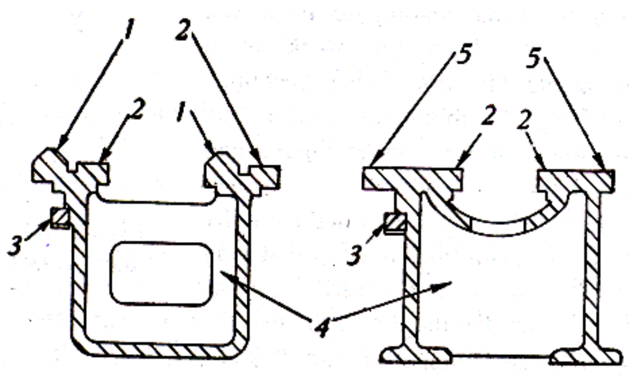
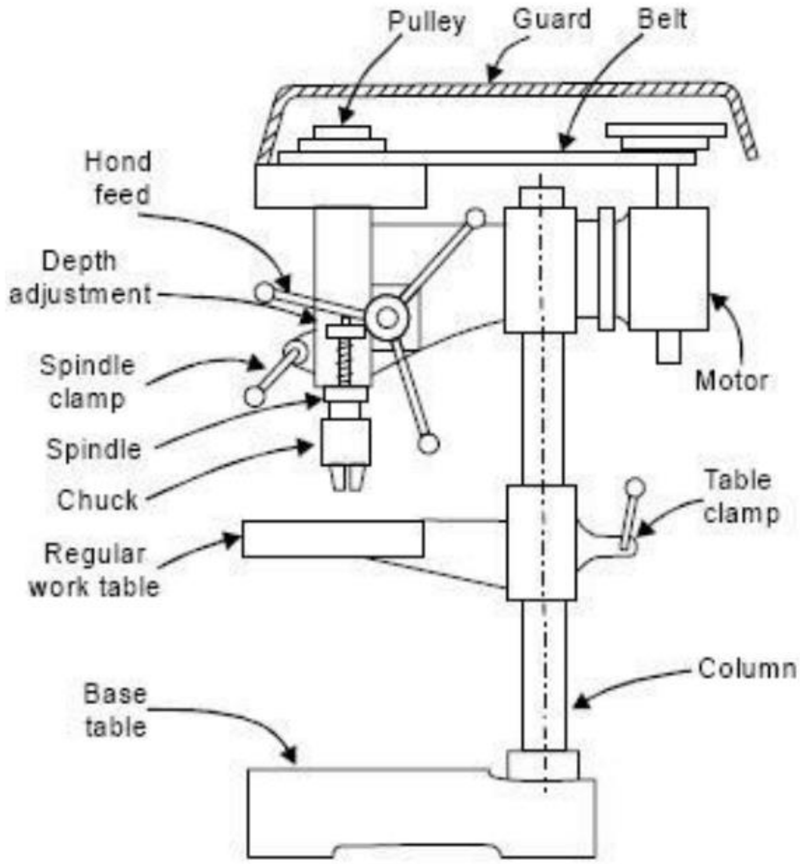


Figure 3.5 Types of lathe bedways

1. Inverted-V bedway, 2. Flat bedways, 3. Rack, 4. Box section, 5. Flat bedways for saddle.

DRILLING MACHINE:



The drilling machine is one of the most important machine tool in the work shop. In drilling machine holes may be drilled quickly and also at low cost. The hole is generated by the rotating edge of a cutting tool known as the drill bit which exerts large force on the work piece clamped on the table.

Working of drilling machine: Drilling I a process of making holes or enlarging a hole in a object for forcing a rotating tool called drill. The same operation can be accomplished in some other machines by holding the drill stationary and rotating the work. The most general example of this case is; drilling hole in lath, in which the drill is held in the tail stock and the work I held and rotated in the chuck.

Boring is the process of enlarging a hole that has already drilled. Principally, it is an operation of turning a hole that ha been drilled previously with a single point tool. To perform this operation on drilling machine a special holder for the boring tool is required.

Operations of drilling machine: Although the drilling machine is mainly meant for drilling operation it can also be used for performing the operations like Reaming, Boring, Counter boring, Counter sinking, Spot facing, Tapping, Trepanning Rivet spinning, polishing etc.

Principal parts of drilling machine:

Base, Column, Radial arm, Drill head, Feed mechanism

Specifications of the drilling machine

1).The size of the portable drilling machine is specified by the maximum diameter of the drill that which can hold.

2). Sensitive and Up right drilling are specified by the diameter of the largest hole that it can be drilled.

3).The radial drilling machine is specified by the length of the arm and column diameter.

4).Multiple spindle drilling machine is specified by the drilling area, the size and the number of holes that the machine can drill.

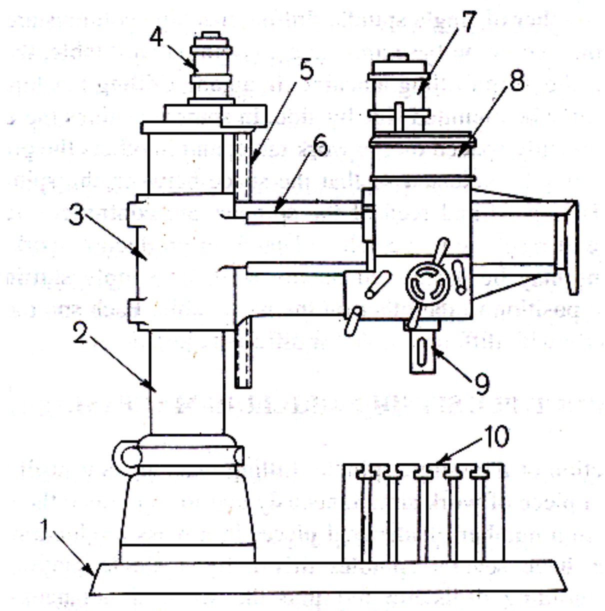


Figure 5.3 Radial drilling machine

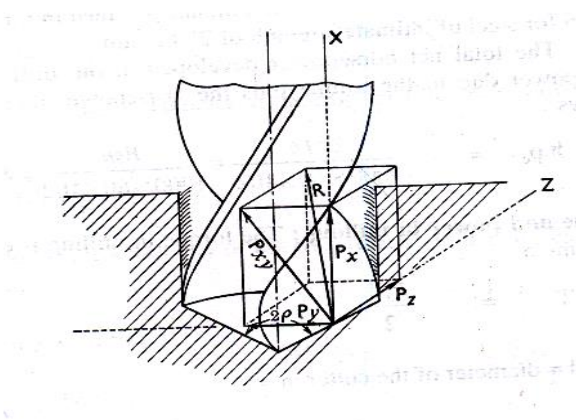


Figure 2.12 Force system in drilling

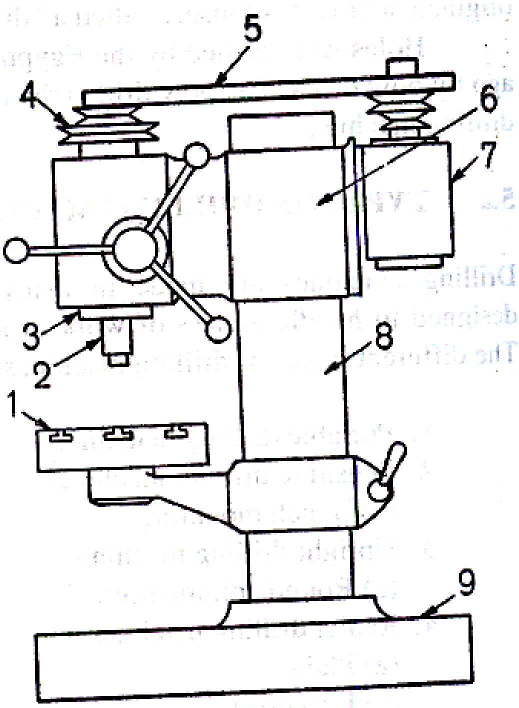


Figure 5.1 Sensitive drilling machine

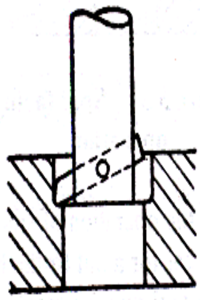


Figure 5.28 Boring operation

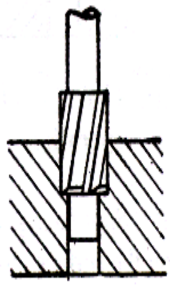


Figure 5.29 Counterboring operation

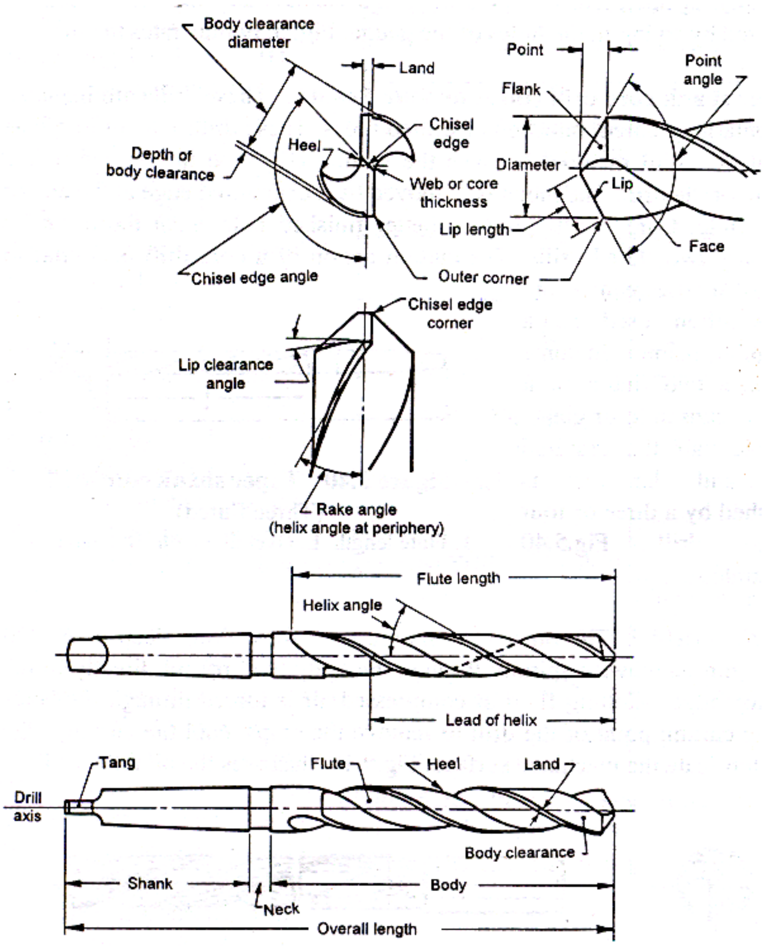


Figure 5.43 Twist drill nomenclature

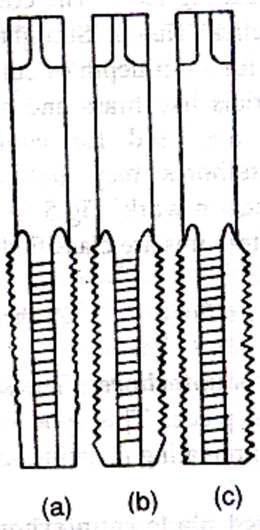
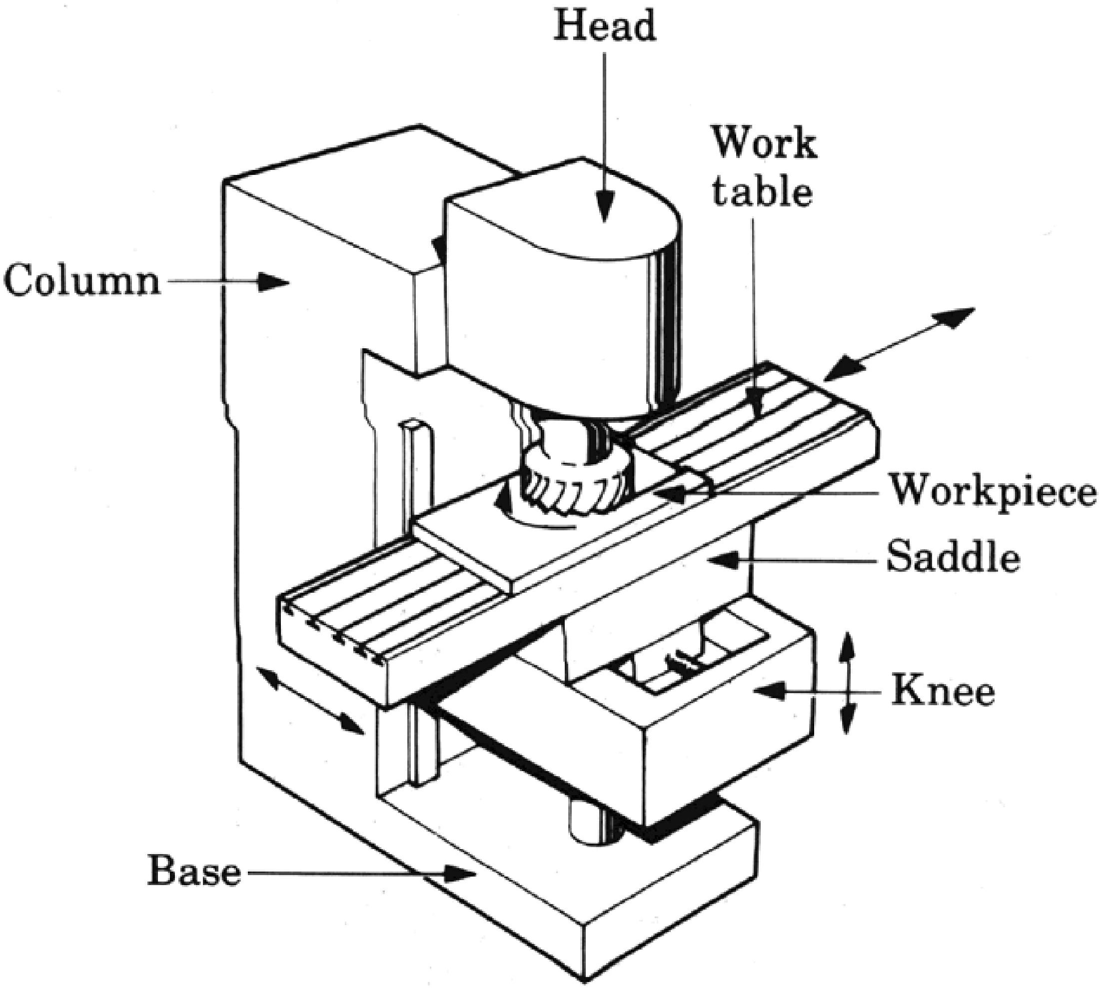


Figure 5.55 Hand taps

(a). Taper tap, (b). Second tap. (c). Bottoming tap

MILLING MACHINE:



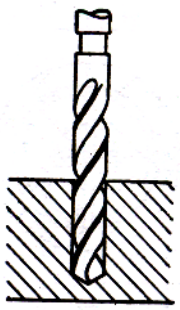


Figure 5.26 Drilling operation

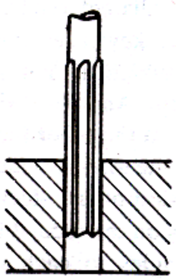


Figure 5.27 Reaming operation

A milling machine finds wide applications in production work. This is superior to other machines as regards accuracy and better surface finish, and is designed for machining a variety of tool room work.

Working of Milling Machine:

A Milling machine is a machine tool that removes metal as the work is fed against a rotating multi point cutter. The cutter rotates at a high speed and because of the multiple cutting edges it removes metal at a very fast rate. The machine can also hold one or more number of cutters at a time.

Operations on Milling Machine:

Plain Milling, Face milling, Side milling, Straddle milling, Angular milling, Gang milling, Form milling, Profile milling, End milling, Saw milling, Milling key ways, grooves and slots, Gear cutting, Helical milling, Cam milling, Thread milling etc.

Principal parts of Milling Machine:

Base: The base is the machine is a grey iron casting accurately machined on its top and bottom surface and serves as a a foundation member for all the other parts which rest upon it. It carries the column at its one end.

Column: The column is the main supporting frame mounted vertically on the base. The column is box shaped heavily ribbed inside and houses all the driving mechanisms for the spindle and the table feed.

Knee: The knee is a rigid grey iron casting that slides up and down on the vertical ways of the column face. The adjustment of height is effected by an elevating screw mounted on the base that also supports the knee The knee houses the feed mechanism of the table and different controls to operate it. The top face of the knee forms a slide way for the saddle to provide cross travel of the table.

Table: The table rests on the ways on the saddle and travels longitudinally. A lead screw under the table engages a nut on the saddle to move the table horizontally by hand or power. In universal machines, the table may also be swiveled horizontally. For this purpose the table is mounted on a circular base, which in it turn is mounted on the saddle.

Overhanging arm: The overhanging arm that is mounted ion the top of the column extends beyond the column face that serves as a bearing support for the other end of the arbor.

Front brace: The front brace is an extra support that is fitted between the knee and the overarm to ensure further rigidity to the arbor and the knee. The front brace is slotted to allow for the adjustment of the height of the knee relative to the over arm.

Spindle: The spindle of the machine is located in the upper part of the column and receives power from the motor through belts, gears, clutches and transmits it to the arbor. The front end of the spindle just projects from the column face and is provided with a tapered hole into which various cutting tools and arbors may be inserted. The accuracy in metal machining by the cutter depends primarily op the accuracy, strength and rigidity of the spindle.

Arbor: The arbor may be considered as an extension of the machine spindle, on which milling cutters are securely mounted and rotated, the arbors are made with taper shanks for proper alignment with the machine spindles having taper holes at their nose. The taper shank of the arbor confirms to the Morse taper or self release taper whose value is 7:24. The arbor may be supported at the farthest end from the overhanging arm or may be of cantilever type which is called stub arbor.

Specifications of the Milling Machine:

The size of the column and knee type milling machine is designated by the dimensions of the working surface of the table and its maximum length of longitudinal, cross and vertical travel of the table.

In addition to above dimensions, number of spindle speed, number of feed, spindle nose taper, Power available, net weight and the floor space required, etc. should also be stated in order to specify the milling machine fully.

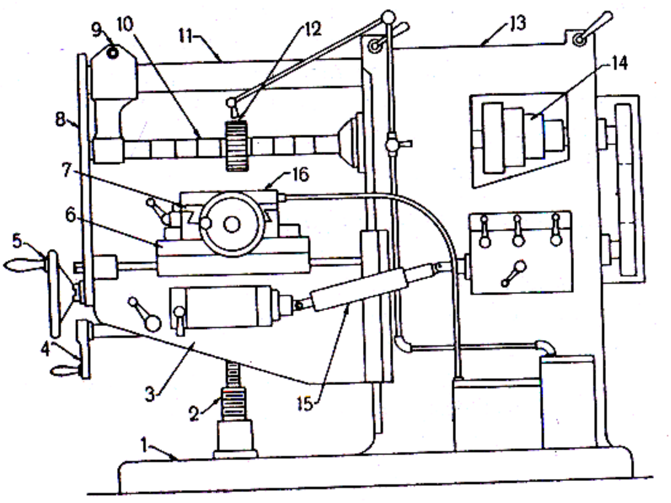


Figure 11.1 **Column and knee type milling machine**

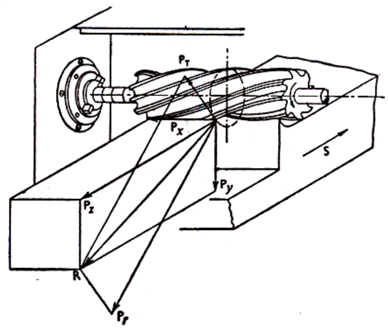


Figure 2.13 **Force system in slab milling**

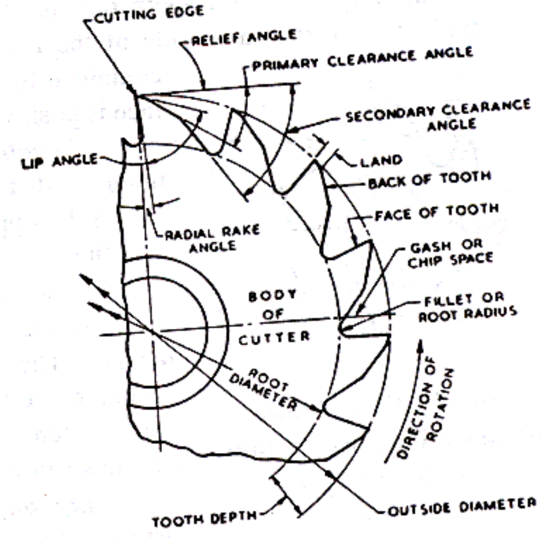
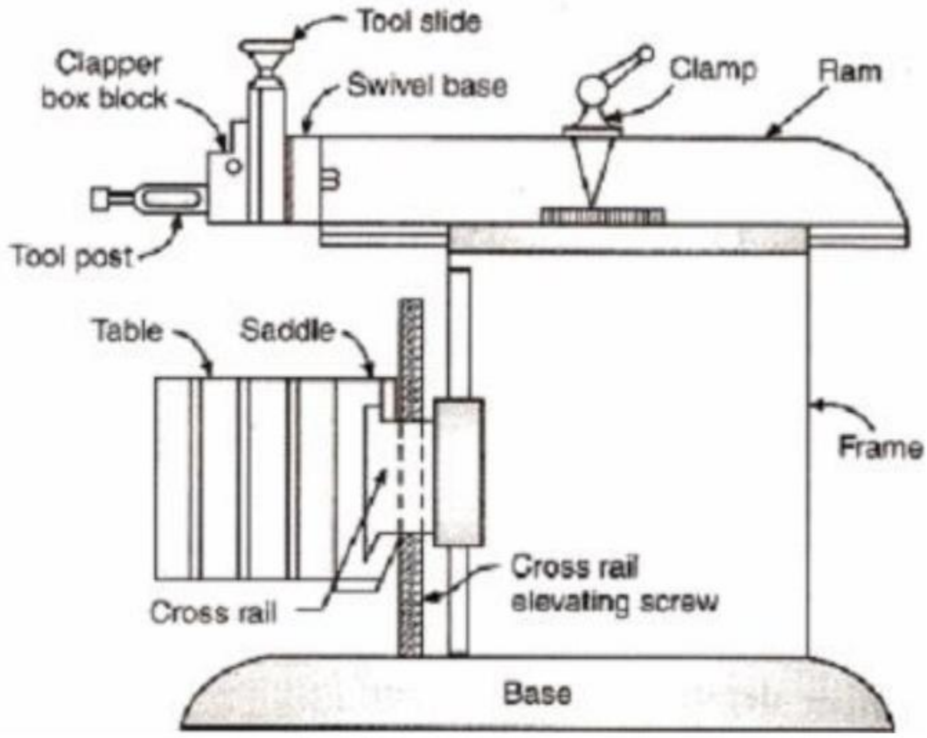


Figure 11.38 Elements of plain milling cutter

SHAPER MACHINE:



SHAPER

The shaper is the reciprocating type of machine tool intended primarily to produce flat surfaces; these surfaces may be horizontal, vertical or inclined

Working of shaper: The shaper makes use of a single point tool that traverse the work and feeds over at the end of each stroke. It is used principally to machine flat or plane surfaces in horizontal, vertical or inclined planes. The cutting tool is mounted on the shaper head to the ram. The ram imparts reciprocating motion to the tool which operates over the shaper table. A big advantage of it is that since the amount of metal at one time is relatively small in area therefore, little pressure is imparted upon the work and the elaborate holding fixtures are not needed. Vertical cuts can be taken by feeding the tool with the shaper head slide. The shaper head can be set at an angle in order to take angular cuts.

Operations of shaper: While producing flat surfaces on the shaper, it is observed that when tool comes into contact with the job, it digs in to the job and therefore the edges are gradually not flat but slightly over curved. Some effect is observed at the end edges also. Due to its limited length of stroke, it is conveniently adopted to the small jobs and best suited for the surfaces composed of straight line elements and for batch production. It can produce all types of surface finishes. The set up time and change over time are less as intricate fixtures and supporting devices are replaced by simple holding gadgets. It is also bets suited for cutting keyways and splines on shafts.

Principal parts of shaper:

Base: The base is the necessary support or bed referred from all machine tools. It is also designated that it can take up the entire load of the machine and forces set by the cutting tool over the work. It is made up of cast iron to resist vibration and take up high compressive load.

Column: It is a box like casting mounted on the bas. It encloses the ram guiding mechanism. Two accurately machine guide ways are provided on the top of the column which the ram reciprocates. The front vertical face of the column has the guide ways for the cross load. The other side of the column contains levers, handles for operating the machine.

Cross rail: It has two parallel guide ways on its top in a vertical plane that is perpendicular to ram axis. The table may be raised or lowered to accommodate different sized jobs by rotating, elevating screw which causes the cross rail to slide up and down on the vertical face of the column.

Rotary table: It is a circular table which is mounted on the top of cross slide. The table may be rotated by rotating a screw, which meshes with the warm gear connected to the under side of the table. The rotation of the table affected either by hand or power. In some machines the table is graduated in degrees. That enables the table to be rotated for indexing in dividing the periphery of a job in equal number of parts. ‘T’ slots are provide on the top face of the table for holding the work by different clamping devices.

Specifications of the SHAPER

1) The size of the shaper is specified by the maximum length of stroke that it can cut. The usual size ranges from 175mm to 900mm.

2) According power feed which ranges from 0.2mm to 5mm per stroke.

3) The power of the motor.

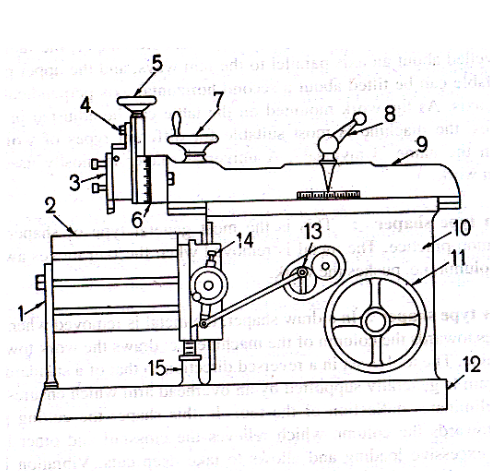


Figure 7.1 Parts of a standard shaper

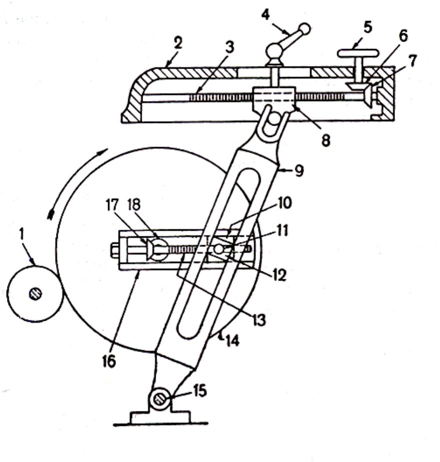
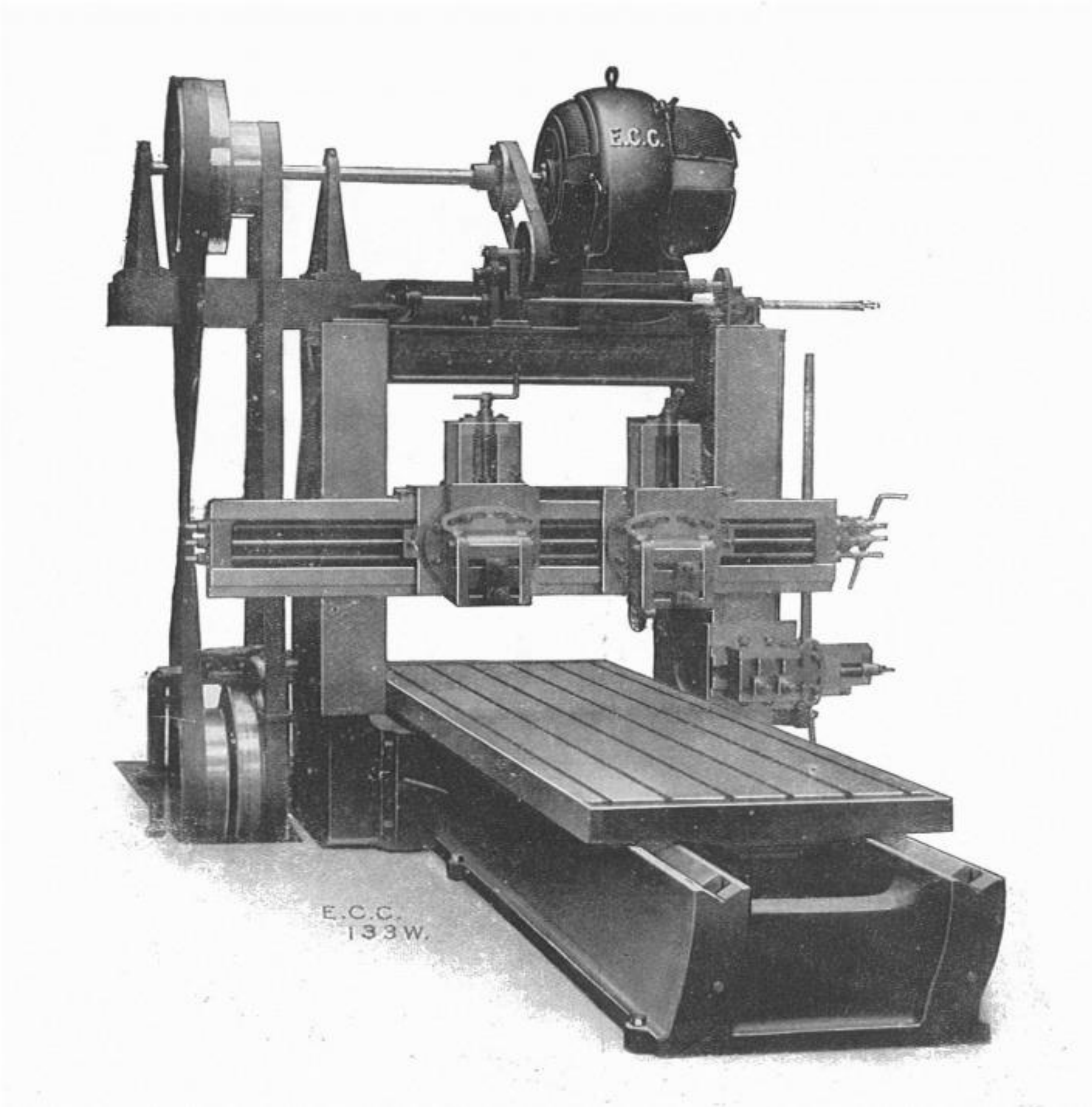


Figure 7.3 Crank and slotted link mechanism

PLANNING MACHINE:



A planer is a type of metalworking machine tool that uses linear relative motion between the work piece and a single-point cutting tool to machine a linear tool path. Its cut is analogous to that of a lathe, except that it is linear instead of helical. (Adding axes of motion can yield helical tool paths; see "Helical planning" below).

A planer is analogous to a shaper, but larger, and with the entire workpiece moving on a table beneath the cutter, instead of the cutter riding a ram that moves above a stationary workpiece. The table is moved back and forth on the bed beneath the cutting head either by mechanical means, such as a rack and pinion drive or a leadscrew, or by a hydraulic cylinder.

SLOTTING MACHINE

The Slotting machine falls under the category of reciprocating type of machine tool similar to a Shaper or a Planer.

Working of Slotter:

It operates almost on the same principle of a Shaper. The major difference between a Slotter and Shaper is that in a Slotter the ram holding the tool reciprocates in a vertical axis, where as in Shaper the ram holding the tool reciprocates in a horizontal direction.

Operations of Slotter:

Machining flat surfaces, cylindrical surfaces, machining irregular surfaces and cam machining, machining slots keyways and grooves etc.

Principal parts of Slotter:

Base: The base is rigidly built to take up all the cutting forces and entire load of the machine. The top of the bed is accurately finished to provide guide ways on which the saddle is mounted.

Column: The column is a vertical member which is cast integral with the base and houses driving mechanism of the ram and feeding mechanism.

Saddle: It is mounted up on the guide ways may be moved toward or away from the column either by power or manual control to supply longitudinal feed to the work.

Cross slide: The cross-slide is mounted upon the guide ways of the saddle and may be moved parallel to the face of the column.

Rotary table: The rotary table is a circular table which is mounted on the top of the cross slide. The table may be rotated by rotating a worm which meshes with a worm gear connected to the underside of the table. The rotary table enables a circular or contoured surface to be generated on the work-piece.

Ram and tool head assembly: The ram is reciprocating member of the machine mounted on the guide ways of the column. It supports the tool at its bottom end on a tool head.

Ram drive mechanism: A slotter removes metal during downward cutting stroke only where as during upward return stroke no metal is removed. To reduce the idle return time, quick return mechanism is incorporated in the machine.

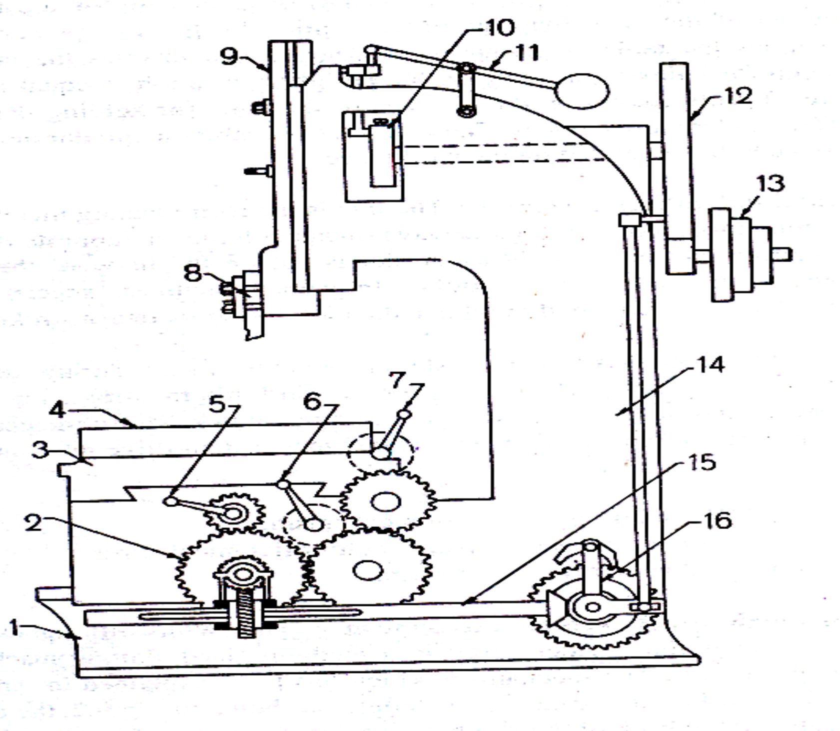
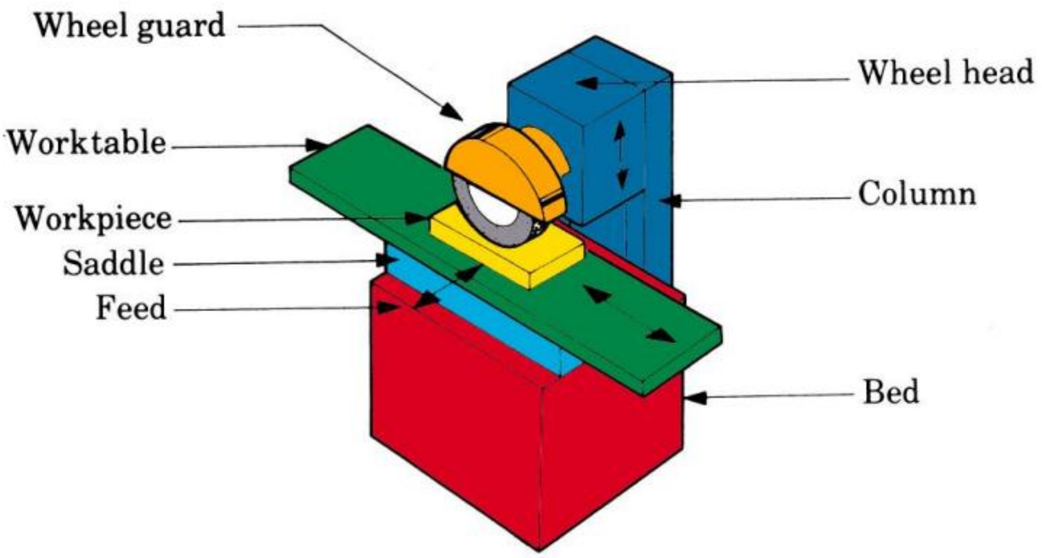


Figure 9.1 **Slotting machine**

Specifications of the Slotter:

The size of the Slotter like that of a shaper is specified by the maximum length of the stroke of the ram, expressed in mm. The size of a general purpose or precision slotter usually ranges from 80 to 900mm. To specify a slotter correctly the diameter of the table in mm, amount of cross and longitudinal travel of the table expressed in mm, number of speeds and feeds available, H.P of the motor, floor space required etc.

GRINDING MACHINE:



Grinding in accordance with the type of surface to be ground, is classified as : a). External cylindrical grinding b). Internal cylindrical grinding c). Surface grinding d). Form grinding..

Grinding machines, according to the quality of the surface finish, may be classified as i). Rough grinders, ii). Precision grinders.

Working of Grinding Machine:

Grinding is the metal cutting operation performed by means of rotating abrasive wheel that acts as a tool. This is used to finish the work pieces which must show a high surface quality, accuracy of shape and dimension

Operations of Grinding Machine:

Grinding of surfaces like, external cylindrical grinding, Internal cylindrical grinding, Surface grinding, Form grinding, rough grinding, Precision grinding, roll grinding, Cam grinding, grinding of cutting tools, sharpening cutters etc.

Principal parts of Grinding Machine:

Base: The base or bed is the main casting that rests on the floor and supports the parts mounted on it. On the top of the base a precision horizontal ways set at right angles for the table to slide on. The base also houses the table-drive mechanism.

Tables: There are two tables, lower table and upper table. The lower table slides on the ways on the bed provides traverse of the work past the grinding wheel. It can be moved by hand or power within the desired limit. The upper table is pivoted at its center is mounted on the top of the sliding table. It can be swiveled and clamped in position to provide adjustment for grinding straight or tapered work as desired. Setting for tapers up to ±10¬¬¬0 can be made in this ways.

Head stock: The head stock supports the work by means of a dead center and drives it by means of a dog, or it may hold and drive the work piece in a chuck.

Tailstock: The tailstock can be adjusted and clamped in various positions to accommodate different lengths of workpieces

Wheel head: The wheel head carries a grinding wheel and its driving motor is mounted on a slide at the top and rare of the base. The wheelhead may be moved perpendicularly to the table ways, by hand or power, to feed the wheel to the work.

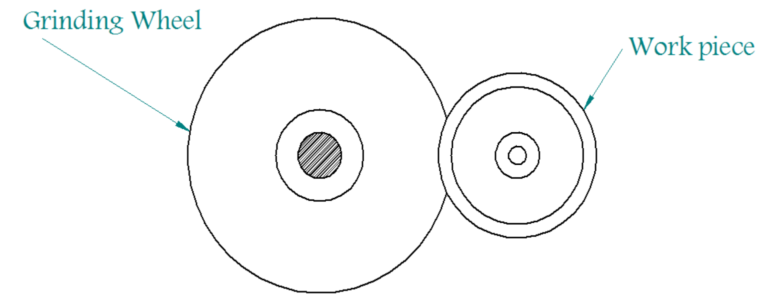
Cross feed: The grinding wheel is fed to the work by hand or power as determined by the engagement of the cross feed control lever.

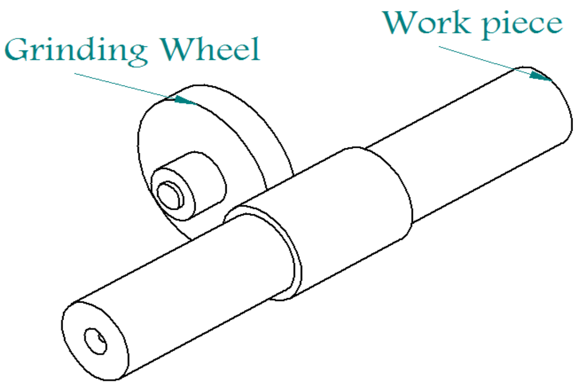
Selection of Grinding Wheels:

There are four constant factors in selection of a grinding wheel. They are, 1). The material to be ground, 2). Amount of stock to be removed, 3). Area of contact, 4). Type of grinding wheel.

Specifications of the Grinding Machine:

Grinding machine size is specified according to the size of the largest work piece that can be mounted on the machine.





Cylindrical grindingCylindrical grinding

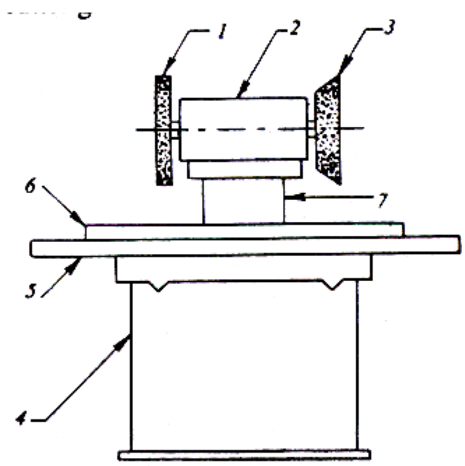


Figure 10.11 Block diagram of a tool and cutter grinder

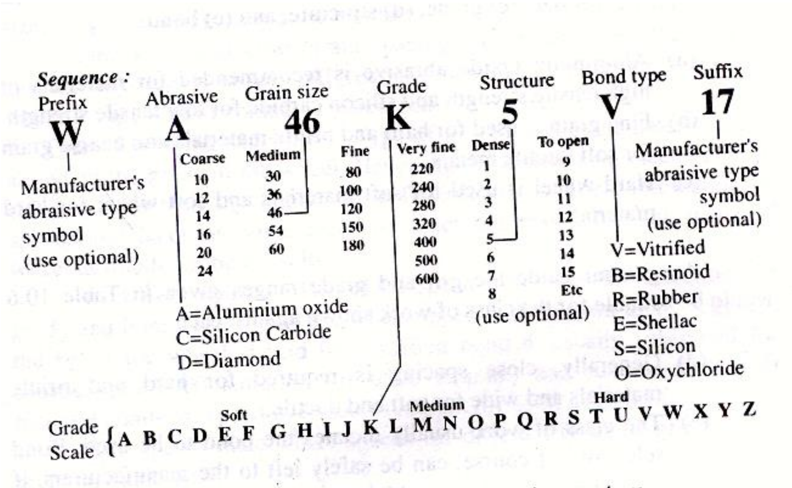


Figure 10.18 Indian standard marking system

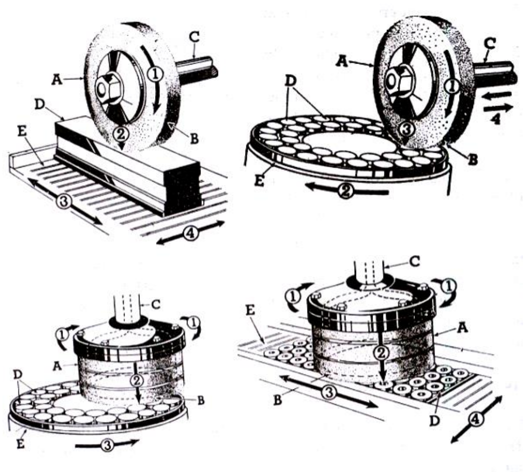
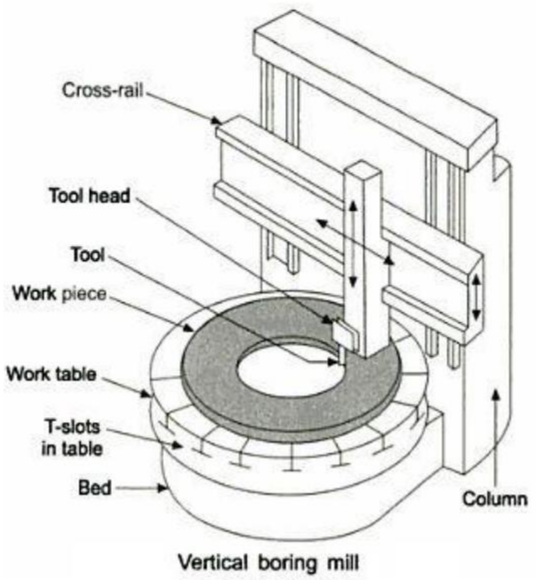


Figure 10.8 Four types of surface grinders
A. Grinding wheel, B. grinding face, C. Wheel spindle,
D. Workpiece, E. Work table.

BORING MACHINE:



In machining, boring is the process of enlarging a hole that has already been drilled (or cast), by means of a single-point cutting tool (or of a boring head containing several such tools), for example as in boring a cannon barrel. Boring is used to achieve greater accuracy of the diameter of a hole, and can be used to cut a tapered hole.

There are various types of boring. The boring bar may be supported on both ends (which only works if the existing hole is a through hole), or it may be supported at one end. Line boring (line boring, line-boring) implies the former. Backboring (back boring, back-boring) is the process of reaching through an existing hole and then boring on the "back" side of the workpiece (relative to the machine headstock).

Experiment No. 1

FACING AND STEP TURNING OPERATION

Aim:

To perform a facing and step turning operation on the given cylindrical work piece.

Apparatus:

1. Lathe with standard accessories.

2. Work piece

Principle:

Turning is a lathe operation in which an external cylindrical surface is produced by generating. The cutting Tool is first adjusted for the desired depth of cut, using the cross slide. Then as the work piece rotates, the cutting tool is advanced relatively slowly I a direction parallel to the rotational axis of the spindle. The motion is known as the feed. These combined motions cause the work piece by adjusting the feed so that the helical path of the tool tip overlaps and generates a cylindrical surface on the work piece. A spindle rpm which gives a desired cutting speed at the circumference of the cylindrical surfaces should be reflected.

This may be calculated using the following formula:

Spindle speed, RPM=$\prod$dN/1000

Feed is measured as advance of the cutting tool per revolution of the work piece.

Tools: Steel rule, outside calipers, tool holder with key, chuck key, HSS cutting Tool bit.

Material: Mild Steel round rod of diameter 20 mm

Procedure for Step Turning:

Initially the given work piece is fitted the chuck using a chuck key. The high speed tool bit is positioned in the tool cutting is kept at an angle to the axis of the given work piece. During this process positioned in the tool holder, the speed of the lathe is high.

After this operation, the diameter of the work piece is to be reduced according to the given dimensions by turning process. While doing the work piece one end of the work piece is reduced to the required diameter and after this, chamfering. Process if performed by burning the tool but at 45O inclination and by bringing the tool in contact with the edge of the job, this process removes all sharp edges of the component.

Procedure for Taper Turning:

The work piece is fixed in the tool post tightly and the center of head stock and tail stock is coincided with the centers of head stock and tail stock. Facing and plain turning operations are performed to get the required diameter on the work piece.

The compound rest is set on the required half taper angle and is locked by the cutting rod is adjusted to a fixed position for the best possible to the open hand wheel and cross feed. Then the carriage is locked and first cut is made at the end of the cut, the tool is again cross fed is given for the next cut. Cuts are repeated piece is then removed from the chuck and dimensions obtained are noted.

Precautions:

1. The chuck key must be removed immediately after the use.
2. The power supply switched off before measuring diameter.
3. Before performing facing they must be in same line.

Result:

The required steps are made on the work piece for the given dimensions.

VERNIER CALIPERS

AIM:

To measure the length and diameter using vernier calipers

APPARATUS:

Linear measurement applies to measure the length, diameter, height and thickness including external and internal measurements. These are designed for linear and end measurement.

CONSTRUCTION:

Vernier consists of 2 scales one fixed and other movable. The fixed scale known as the main scale is calibrated on "L" shaped frame and carriers a fixed jaw. The movable vernier scale slides over the main scale and carriers a measuring tip when the jaws are closed the zero of vernier and main scale coincide. An adjustment is provided to lock the sliding scale.

USE:

These are used for both – internal and external measurement, its generate used for measuring by closing the jaws on work surface and taking readings from main scale is examined to as certain which of its division coincide and added to the main scale reading.

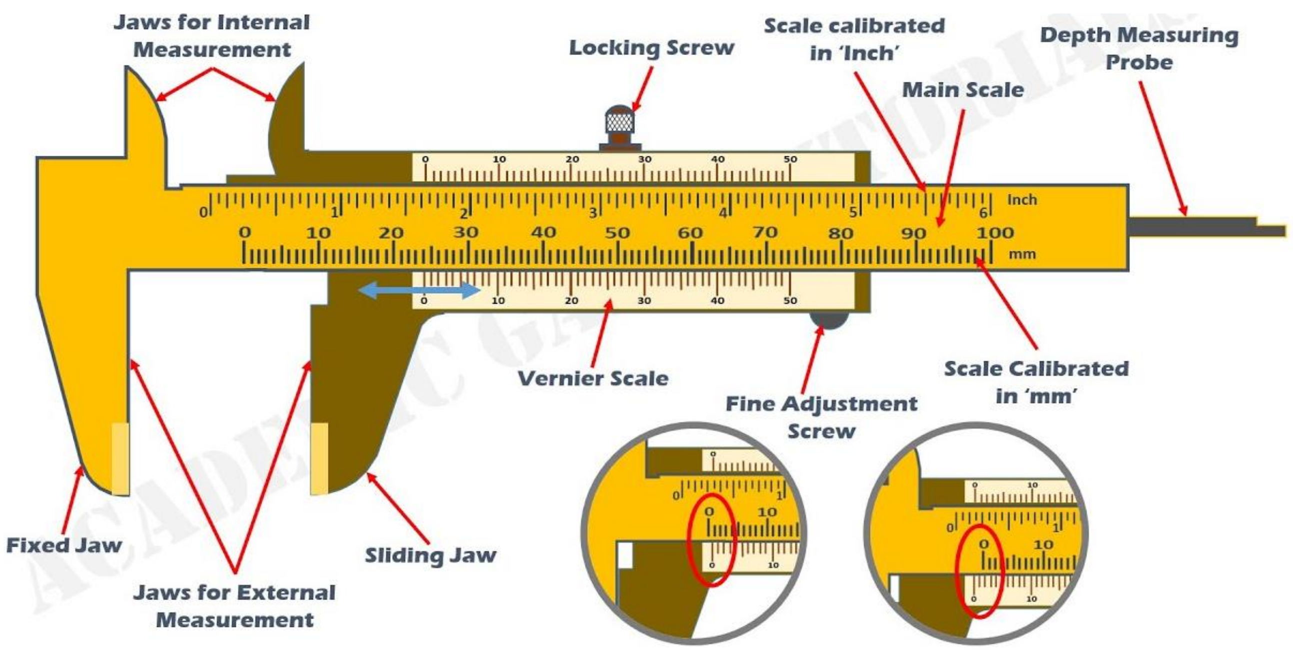
Least count= One division of main scale reading/ No. division on scale .mm

49 MSD=50 VSD

1 MSD=1mm

1 VSD= 49 MSD/50 VSD L.C= 1MSD- 1VSD

= 1- 49/50 =0.02 mm



PRECAUTIONS:

1. Line of measurements and scale must coincide
2. Measurement tips of caliber should parallel to the work place center line
3. Do not apply pressure on place.

Calculations:

Calculate the given Length of the specimen:

S.No	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

S.No	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Calculate the given Depth of the specimen

S.No	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Thickness of the specimen

S.No	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Inside Diameter of the specimen

S.No	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

RESULT:

The experiment is conducted on the vernier calipers for measuring for the physical quantities of the given specimen.

CONCLUSION:

1. Length of the specimen - ----------- mm
2. Diameter of specimen- ----------- mm
3. Inner diameter of the hollow cylinder- ----------- mm
4. Outer diameter of the specimen- - ---------- mm
5. Thickness of the specimen- ----------- mm

Exp-1 (VIVA QUESTIONS)

FACING AND STEP-TURNING OPERATION:

1. What is the material generally used for lathe bed?
2. What are the specifications of lathe machine?
3. What do you mean by centering and facing?
4. What is the purpose of lead screw?
5. What is the purpose of compound rest?
6. What is the purpose of tail stock?
7. What is the purpose of chuck?
8. Name the parts in the carriage of a lathe machine.
9. What is the material used for spindle of head stock?
10. Where is tail stock located in a lathe machine?
11. Why finishing operation is done before step turning?
12. What is meant by facing?
13. What is taper turning?
14. Give the sequence of operations in taper turning process?
15. What do you mean by hard turning? Which types of operations are generally used in this operation?
16. What is tool post?
17. Feed rate is expressed in turning operation.
18. How is feed expressed in turning, shaping, drilling and milling?
19. Difference between facing and turning?
20. What should facing operation be performed?
21. Why will metal get heated after operation?
22. Is coolant important, if yes why?
23. What is the difference between continuous and discontinuous chips?
24. What happens if lubrication is not done properly in lathe?
25. How many types of chucks do you have?
26. What is pitch?

27.What happens to material if facing is not done?

28. Which axis tool moves with respect to work-piece in facing?

29. Which axis tool moves with respect to work-piece in step-turning?

30. Real time applications of facing operation?

31. How do you measure the diameter on any work-piece on lathe?

32. Self-centered chuck is an advantage or disadvantage?

33. Which chuck is known as self-centered chuck and why?

34. Can chips be used again? If yes then how?

35. With what material is tool made of?

36. What happens if tool is made up of ductile material?

37. Is there any angle between tool tip and work-piece in facing?

38. Can we perform groove in lathe?

39. What is brazing?

40. Which type of oil is used in lubrication?

41. Write the difference between single point cutting tool and multipoint cutting tool?

42. What is feed screw?

43. Why are threading present on feed screw?

44. How many tools can a tool post hold?

45. Is there any CNC lathe?

46. What are various operations performed on lathe?

47. What is apron?

48. Why the nose tip should always be sharp?

49. Importance of relief angle in single-point cutting tool?

50. For a smooth surface finish what can be done in facing?

Experiment No. 2

RIGHT HAND SCREW THREAD CUTTING AND KNURLING OPERATION

Aim:

To obtain a Right Hand Screw threaded work piece of given dimensions.

Apparatus:

1. Lathe with standard accessories.
2. Work piece

Material: Mild Steel round rod of diameter 20 mm

Procedure:

The given work piece is fixed tightly in the 3 jaw chuck. Facing and turning operations are done to make the diameter equal to the major diameter of the screw thread. According to the given Pitch, the necessary gearing ratio is calculated. The feed selection lever that unlocks the half-nut lever for use, is set on the carriage apron for cutting metric threads, the included angle of the cutting edge should be ground exactly 60^{O}, the thread cutting tool is fixed in the tool post so that the tip of the tool coincides with the axis of the work piece the lathe spindle speed is reduced by on half, on forth of the speed required for turning by back gear mechanism or quick change levers. The half nut lever engaged at the end of the cut, the spirit nut lever disengages the carriage and the tool is withdrawn to its position sufficient depth is given for each cut using the cross slide the process is repeated till the required dimensions are obtained.

Precautions:

1. For cutting right threads the change gears should be so arranged that the direction of the lead screw is in same direction as that of the rotation of spindle.
2. The work piece should be fixed tight in the jaw.
3. The power supply switched off before measuring diameters.

Result: Right Hand thread with required pitch is produced on the given work piece.

TWO AND THREE WIRE METHOD

Aim:

To measure the screw thread parameters using two wire method by Floating carriage micrometer.

Apparatus:

Micrometer, micrometer stand, a set of two wires, pitch gauge and Screw thread specimen.

Procedure:

- Fix the given screw thread specimen to the arrangement block.
- Measure the pitch of the given thread using pitch gauges and also note down theangle of the thread based on Metric or With Worth.
- Measure the maximum diameter of the screw thread using micrometer.
- Calculate the best wire to be used by using the given equation.
- Consider the available wires and fix the two wires to one end on micrometer Anvil and one wire towards another anvil.
- Measure the distance over the wire properly by using micrometer.
- Calculate the effective diameter of the screw thread.
- Find out the error in effective diameter of the screw thread.

Observations:

Least Count of the Micrometer = ----------mm.

Initial error in the micrometer = ---------- mm.

Pitch of the thread p = -----------mm.

Best size of the wire used d = ------------mm.

Results:

The following parameters are found as follows;

Major Diameter =---------mm

Minor Diameter =---------mm

Effective Diameter = -------mm.

Exp-2 (VIVA QUESTIONS)

1. What are the uses of angle plates?
2. What do you mean by grooving?
3. What is parting tool?
4. What is HSS?
5. What do you mean by form threading screw?
6. How do you measure the speed of lead screw?
7. How do you measure the pitch of lead screw?
8. List out the sequence of operations of knurling operation?
9. What should be the maximum length of cut for mild steel for rough turning?
10. What is the function of lead screw?
11. What is the use of compound rest?
12. Define knurling operation.
13. What is the difference between right hand threading and left hand threading?
14. What are the types of threading?
15. How to measure the pitch of thread?
16. What is the angle of V-thread screw?
17. What is the use of mandrel?
18. What is the function of half-nut mechanism?
19. Which operation on a work-piece will be least spindle speed on lathe?
20. What is the use of study rest?
21. How many types of knurling are there?
22. What is the difference between knurling and threading?
23. State the various parts mounted in carriage.
24. State any two specifications of lathe?
25. What are principle parts of a lathe?
26. What is a semi-automatic lathe?
27. Define the term ‘conicity’.
28. What are the stages of tool layout?

29. What is shaper?
30. What is broaching?
31. Limitations for knurling process?
32. Can knurling be performed by special attachment?
33. Reaming and counter boring can be performed by using special attachment?
34. What is a dead center?
35. What is head stock locking screw?
36. List out different types of lathe.
37. What is tool-tip made of?
38. Which material is used for preparing lathe bed?
39. What is cutting speed?
40. What is a feed?
41. What is grooving?
42. What is boring?
43. What are different types of tool holders on lathe?
44. What is a collet chuck?
45. What is a magnetic chuck?
46. What is meant by a shank?
47. Why should clearance angle be provided for a tool?
48. What do you mean by back rake angle?
49. What is a relief angle?
50. How does tool angle effect chip formation?

Experiment No. 3

UTM TEST SPECIMEN

AIM:

To Prepare U T M test specimen on Lathe Machine with given work piece by the checking the measurements with the help of vernier Calipers.

Equipments:

Engine Lathe.

TOOLS:

Steel rule vernier Calipers, chuck key, and single point cutting tool.

Theory:

Turning: turning is a process of removing excess material from the work piece to produce a cylindrical surface on a lathe machine.

PROCEDURE:

1. Load the given work piece on the lathe machine by using revolving centre.
2. Perform the turning operation
3. Turn the job to diameters and lengths as per the given drawing.
4. Perform the chamfering operation.
5. Perform the tapering operation at the desired position by using form tool

PRECAUTIONS:

1. Chuck key remove from the chuck before starting the machine
2. While taper turning operations do not rotate the cross slide or carriage movement
3. Do not change the gears while machine is running .
4. Use slowest speed while taper turning operation.

Result: The required job is obtained as per the drawing.

VERNIER CALIPERS

AIM:

To measure the length and diameter using vernier calipers

APPARATUS:

Linear measurement applies to measure the length, diameter, height and thickness including external and internal measurements. These are designed for linear and end measurement.

CONSTRUCTION:

Vernier consists of 2 scales one fixed and other movable. The fixed scale known as the main scale is calibrated on "L" shaped frame and carriers a fixed jaw. The movable vernier scale slides over the main scale and carriers a measuring tip when the jaws are closed the zero of vernier and main scale coincide. An adjustment is provided to lock the sliding scale.

USE:

These are used for both – internal and external measurement, its generate used for measuring by closing the jaws on work surface and taking readings from main scale is examined to as certain which of its division coincide and added to the main scale reading.

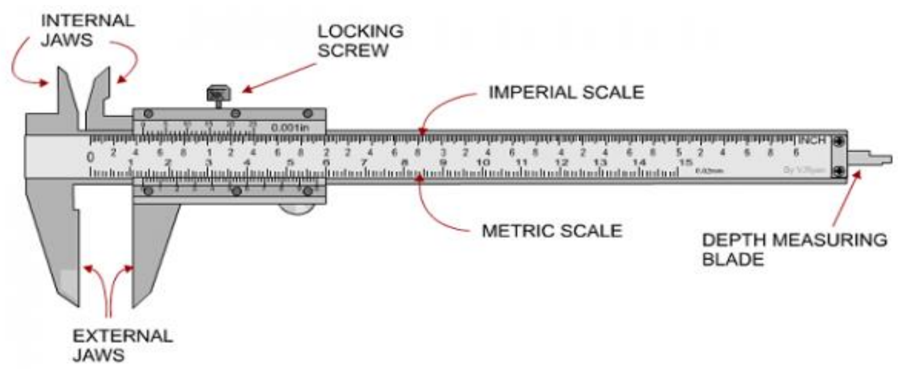
Least count= One division of main scale reading/ No. division on scale .mm

49 MSD=50 VSD

1 MSD=1mm

1 VSD= 49 MSD/50 VSD L.C= 1MSD- 1VSD

= 1- 49/50 =0.02 mm



PRECAUTIONS:

1. Line of measurements and scale must coincide
2. Measurement tips of caliber should parallel to the work place center line
3. Do not apply pressure on place.

Calculations:

Calculate the given Length of the specimen:

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Calculate the given Depth of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Thickness of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Inside Diameter of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

RESULT:

The experiment is conducted on the vernier calipers for measuring for the physical quantities of the given specimen.

CONCLUSION:

1. Length of the specimen - ----------- mm
2. Diameter of specimen- ----------- mm
3. Inner diameter of the hollow cylinder- ----------- mm
4. Outer diameter of the specimen- - ---------- mm
5. Thickness of the specimen- ----------- mm

Exp-3 (VIVA QUESTIONS)

1. What is the material generally used for lathe bed?
2. What are the specifications of lathe?
3. What do you mean by centering and facing?
4. What is the purpose of lead screw?
5. What is the purpose of compound rest?
6. What is the purpose of tail stock?
7. What is the purpose of chuck?
8. Name the parts in the carriage of a lathe machine.
9. What is the material used for spindle of head stock?
10. Where is tail stock located in a lathe machine?
11. What is least count?
12. Why finishing operation is done before step turning?
13. What is meant by facing?
14. What is taper turning?
15. Give the sequence of operations in taper turning process.
16. What do you mean by hard turning? Which type of operations are generally used in this operation?
17. What is a tool post?
18. Feed rate is expressed in turning operation?
19. How is feed expressed in turning, shaping, drilling and milling?
20. Difference between facing and turning?
21. What is boring?
22. What is collet chuck?
23. Why should clearance angle be provided to the tool?
24. What is a relief angle?
25. What is a pitch?
26. Full form of UTM?
27. Which shape the UTM specimen has?

28. Which material is used in making a UTM specimen?
29. M.S. steel is which type of material?
30. Why should we reduce the diameter in UTM specimen?
31. Which tool is used for reducing the diameter?
32. What happens if we don't perform turning operation?
33. Why should we use tapering operation?
34. Why should we always use slowest speed while turning operation?
35. Can we change the gear while the machining is running?
36. What happens if chuck key is not removed before starting the machine?
37. Can we use square specimen on lathe?
38. What is a spindle?
39. How do you measure pitch?
40. What is the least count of vernier caliper?
41. Can we perform operations on a long rod using lathe?
42. Can drilling be performed on lathe?
43. What is compound rest?
44. Why is a saddle used?
45. Why is it important to delete vibrations which occur in lathe?
46. What are the different types of lathe?
47. Can we obtain a smooth finish when we perform on lathe?
48. How many operations can be performed on lathe on the same time?
49. What is difference between chamfering and knurling?
50. Do we perform facing operation in a UTM specimen?

Experiment No. 4

DRILLING AND BORING ON LATHE MACHINE

AIM:

To perform drilling and boring operation on a given M.S plate using Lathe machine.

EQUIPMENT: Lathe machine

TOOLS:

steel rule vernier Calipers, drill bits (6mm,14mm,16mm,Drill chuck, Socket, M16 tap set, tap wrench and screw pitch gauge.

Theory:

Drilling is the operation of producing a cylindrical hole by removing metal by the rotating edge of cutting tool called the drill. The drilling is one of the simplest methods of producing hole .Before drilling the centre of the hole is located on the work piece by drawing two lines at right angles to each other and then a centre punch is used to produce an indentation at the centre. The drill point is pressed at this centre point to produce the required hole so generated by drilling becomes rough and hole is always slightly oversize than the drill used due to the vibration of the spindle and the drill used due to the vibration of the spindle and the drill. A 12mm drill may produce a hole as much as 1.125mm oversize and a 22 mm drill may produce as much as 0.5mm oversize.

Boring is the process of enlarging a hole has already been drilled (for cast) by means of a single –point cutting tool (or of a boring heared containing several such tools), for example as in boring a gun barrel or an engine cylinder . boring is used to acieve greater accuracy of the diameter of a hole , and can be used to cut a tapered hole , boring can be viewed as the internal diameter counter part to turning , which cuts external diameters.

Procedure:

1. Clamp job on the lathe machine.
2. Mark the indentation points at the desired locations as per the given drawing
3. Insert the drill bit in tail stock
4. Rotate the tailstock hand wheel for producing hole in the work piece.
5. Drill the hole of size 6mm by using 6mm drill bit
6. Enlarge the holes gradually by using 9mm, 14mm and 16mm drill bits.

7. Enlarge the hole by using boring tool.

Precautions:

1. Work piece should be clamped firmly
2. Indentation marks for the centre of the hole should be marked correctly before the start of the operation.

Result: Hole with the given diameter is drilled on the given work piece.

BORE GAUGE

AIM:

To determine the bore diameter (int. dice) of the given specimen

APPARATUS:

Bore gauge, Anvils, Washers, Specimens

THEORY:

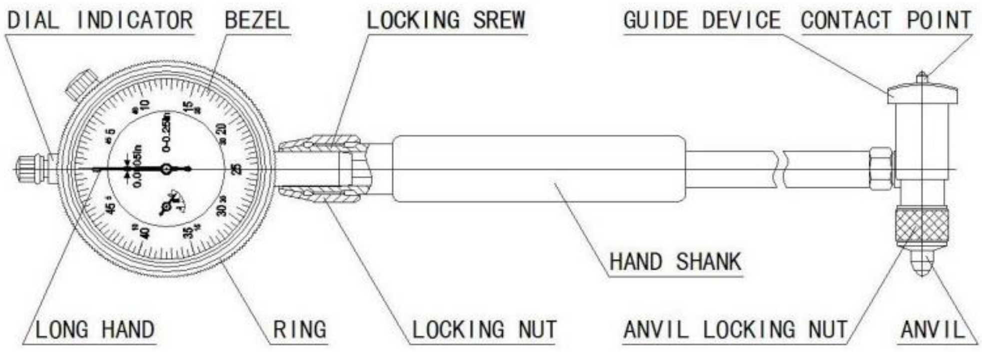
Bore gauge, is generally used to determine the bore diameter of components. Bore gauge consists of following parts.

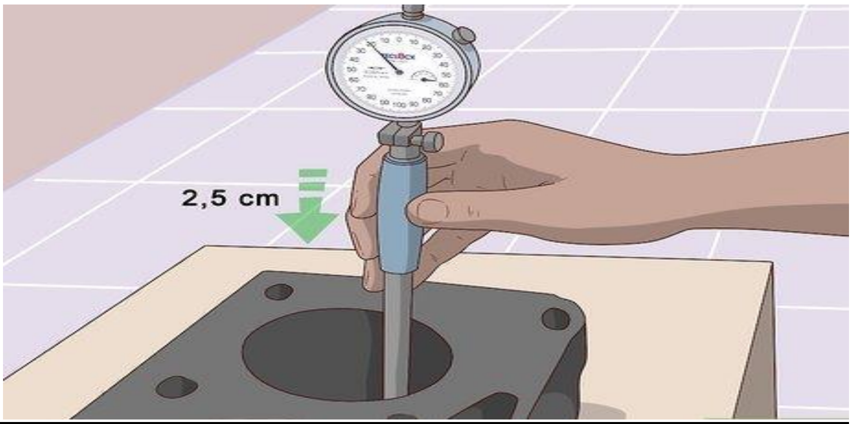
1. Dial gauge
2. Vertical column
3. Arrangement of anvil and washer
4. Movable spindle

Dial indicator:

This is used for measuring and checking linear measurement. These require less skill in their use than other instruments such as micrometer. Gauges etc., when dial indicator is used as essential part in mechanism of any set up for measure purpose. It is referred as dial gauge. This dial gauge consists of graduated circular dial Pointer, Pointer gear train arrangement vessel clamp, revolution counter. It activates a pinion which is attached to the pointer shaft. A gear train is used b/w plunger rack and pinion, to magnify the movement of the plunger to the pointer. A revolution counter is used to count the number of revolutions of the pointer

Least count = 0.01mm





PROCEDURE:

1. Select the suitable anvil and washer to measure the dimension of given specimen.
2. Insert anvil and washer at the bottom of vertical column of bore gauge
3. Subtract the dial indicator value from the sum of anvil and washer value. Which gives the bore diameter of given specimen
4. Repeat same procedure to get the bore diameter at different positions of specimen

SAMPLE CALCULATIONS:

Least count (LC)=0.01mm

Anvil size = 45mm

Washer size = 45mm

Total indicator Reading = 14 X 0.01= 0.145mm

Total Reading=(Anvil size + Washer size)-(Dial indicator for Reading)

= (45+4.5) - (0.145)= 49.355mm

Calculation Total reading:

Bore diameter = (Anvil size + Washer Size)- (Dial indicator Reading).

Calculate the Inner Diameter of the given specimen-1

S.NO	Anvil Size	Washer size	Dial indicator reading	TR= Anvil size+ Washer size – Dial indicator reading (mm)
1				
2				
3				
4				
5				

Inner Diameter of the specimen-2

S.NO	Anvil Size	Washer size	Dial indicator reading	TR= Anvil size+ Washer size – Dial indicator reading (mm)
1				
2				
3				
4				
5				

RESULT:

The experiment has been conducted on bore gauge to determine the bore diameter of given specimen.

CONCLUSION:

The bore diameter of the given specimen is   mm

Exp-4 (VIVA QUESTIONS)

1. Continuous chips will be formed when machining speed is?
2. The part of the twist drill that is held in holding device is called?
3. Counter boring is the operation of?
4. The drill used for drilling deep holes?
5. Can twist drill used for holding?
6. Drill chucks are used for holding?
7. Twist drill generally is made up of?
8. What is the function of drill jig?
9. What is the function of twist drill?
10. What materials are used for drills?
11. How do we ensure proper measure of internal bore?
12. How do we get final diameter?
13. What are the positions of the D.B.I. to be taken?
14. Describe D.B.I.
15. State the different types of drills that are normally used.
16. What are the operations done on a drilling machine?
17. What is boring?
18. An operation performed for enlarging on existing hole up to only a limited length from its one end?
19. What are the tools required to do boring operation?
20. What is reaming?
21. What is drilling?
22. What do you mean by tapering a hob?
23. Which type of specimen is used in drilling?
24. What happens if you don't perform clamp job?
25. List out different types of tool bits.
26. Can a tail stock be rotated?
27. What is tail stock made up of?

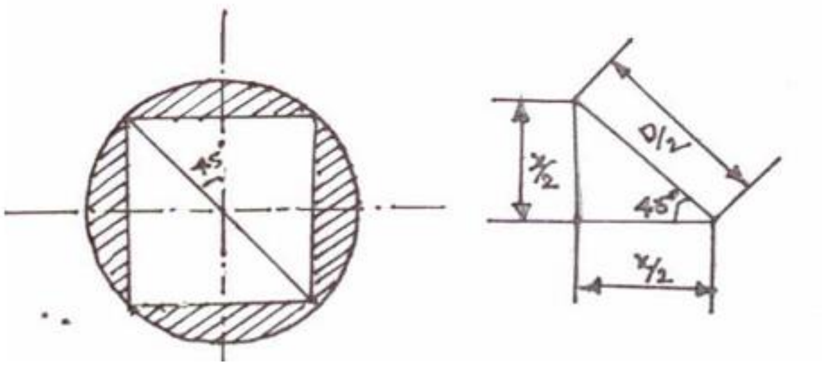
28. Can we produce a square hole using drilling operations?
29. Which type of tool is used in the above operation?
30. Why don't we use multipoint cutting tool in boring?
31. What is the tap wrench for?
32. Screw pitch gauge is used to measure?
33. Can boring and drilling be performed at the same time?
34. How is boring different from drilling?
35. Different materials which are used in making a tool?
36. The least diameter we can make using a drill bit is?
37. The maximum diameter we can make using a drill bit is?
38. Why is it important to clamp?
39. What is a tool post?
40. Tail stock consists of what?
41. We can't perform the boring operation without?
42. Is there any other way to enlarge the hole other than boring?
43. What is a drill chuck?
44. Why is a 3 jaw chuck self-centered?
45. Can a 4 jaw chuck be self centered?
46. How many tools can be kept in a lathe using attachments?
47. Application of boring in real life?
48. Can we produce hole on a tapered surface?
49. Can centering operation be performed on lathe?
50. What is a lead screw?

Experiment No. 5

SHAPING

AIM:

To machine maximum size of square from a given cylinder work piece by using the shaping machine.



Tools: vice, tool, scale etc,

Apparatus:

Shaping tool, lubricating oil, circular shape w/p, punch, hammer, steel rule

CALCULATIONS:

$Cos45^0 = (x/2)/ (d/2)$.

$X/2 = (D/2) \cos45^0$

X = 2* x/2.

Each side to get width X=D-X/2.

SPECIFICATIONS: Capacity:

Length of arm without tool side	=	775 mm
Length of stoke	=	400 mm
Length of working stoke	=	375 mm
Maximum distance from table to arm	=	345 mm
Ram adjustment	=	180 mm

Table:

Table size (l*w*h)	=	325*225*230 mm^3
Working area on the table	=	225*380 mm
Table displacement vertically	=	310 mm
Horizontally	=	455 mm

Tool Head:-

Tool Slide Travel	= 160 mm
Tool Slide Tilting	= 600 - 00 = 600

THEORY:

Shaper in a vertical machine which is primarily intended for producing flat surfaces. This machine involves the use of single point tool head in a properly designed tool box mounted on reciprocating ram. In case of a shaper, the job rigidly held in a vice on the machine table. The tool is held in the tool post mounted on the ram of the machine. This ram reciprocates to and fro and in doing so, makes the tool to cut the machine in forward direction, no material is removed during the return stoke of the ram hence it is termed as a ideal stoke.

SEQUENCE OF OPERATIONS:

1. Marking on the work piece.
2. Hold the work piece.
3. Adjust stroke length.
4. Adjust ram position.
5. Each side D-X/2 metal is removed by step by step.

PROCEDURE:

1. MEASURING AND MARKING: For a given diameter of the circular work piece. Calculate side of a square and locate the centre. Mark the square with the help of punch and hammer by drawing the diagonals.

2. TOOL SETTING: The tool is held in the tool post mounted on the ram of the machine.

3. JOB FIXING: The job is rigidly held in a vice. Now adjust the table so that the highest portion of the circular part should exactly coincide with the tip of the tool.

4. SHAPING: By selecting a suitable depth of cut, start the machine to remove the material. Feed should be given to the table either by hand or by using power. Note down the number of passes required to complete the side of a square.

5. Depth of cut should be increased rapidly during return stroke.

6. After completion of one side rotate the job and repeat the above procedure till completion of a square piece.

PRECAUTIONS:

1. The depth of cut should be given at small rates.
2. Lubrication should be provided for reciprocating and other moving parts.
3. Remove the chips continuously from the work surface or table.
4. It should be seen that always quick return motion is achieved.

RESULT:

The given cylindrical work piece is made into the square piece.

VERNIER HEIGHT GAUGE

AIM:

To measure the height of the given specimen by vernier height gauge

APPARATUS:

It is similar to vernier calipers, but in this graduated is held in a vertical position and it is used in conjunction with a surface plate

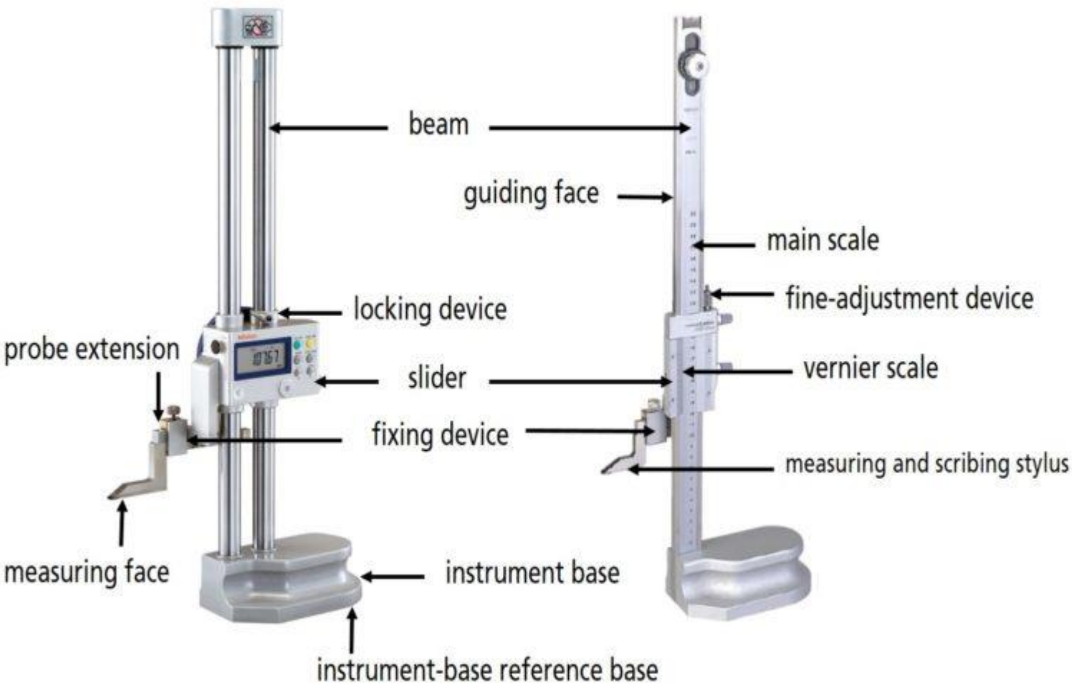
CONSTRUCTION: A vernier height gauge consists of :

1. A finely grouped and lapped base. The base as massive and robust in construction to ensure rigidity and stability.
2. A vertical graduated beam (or) column is supported on a massive base.

3. Attached to the beam is sliding vernier head carrying the vertical scale and a clamping screw.

FEATURES:

1. All the parts are made of good quality steel or stainkless steel
2. The beam should be sufficiently rigid and square wit base.
3. The measuring jaws should have a clear projection from the edge of the beam. At least equal to the projection of the base from the beam
4. The upper and lower gauging surface of the measuring jaws shall be flat and parallel to the base
5. Scruber should also be of the same nominal depth as the measuring jaws so that it may be resolved
6. Projection of the jaws should be at least 25mm



PRECAUTIONS:

1. When not in use .vernier height gauge should be kept in to case
2. It should be tested for the straightness, squareness and parallelism of the working focus of the beam.

Calculate the given Length of the specimen-1

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Calculate the given Height of the specimen-1

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				
5				

RESULT:

The height of given specimen is found using vernier height gauge

CONCLUSION:

The height of the specimen obtained as ------------------ mm

The length of the specimen obtained as ------------------ mm

Exp-5 (VIVA QUESTIONS)

1. What is the difference between shaping, planning and slotting?
2. What are the operations performed by a shaper?
3. What are the principle parts in the shaper?
4. Write the machining time formulae for shaping machine.
5. Write the classification of shaping machine?
6. What are the cutting parameters in shaping machines?
7. What is a saddle?
8. What are the difference between shaper and planer?
9. Write the difference between forming and generating metal surface?
10. What are the cutting parameters in shaping machine?
11. State the major differences between shaping and planing machine.
12. In which conventional machines tool flats surface can be produced?
13. In which machine tools both the cutting motion and the feed motion are imparted to the tool?
14. What is the driving mechanism of shaping machine?
15. Write the types of operations performed on shaping machine.
16. What is the cutting speed of a tool in shaping?
17. Which part of the shaper will give the feed for machining?
18. Which types of components are generally machined on shaping?
19. What is the machining time of shaping?
20. What is the function of clapper box.
21. What is depth of cut?
22. How do you give feed?
23. How many types of shapers are there?
24. What is RAM?
25. Why should depth of cut be increased rapidly during return stroke?
26. What will happen if chips are not removed from the work surface or table?
27. Job fixing is done for which purpose?

28.How many tools can a tool post hold?

29. How can a tool slide be tilted?

30. Why is punch used for?

31. How many types of chips are produced?

32. What is the difference between continuous chips and discontinuous chips?

33. What is the difference between shaping and slotting?

34. What is quick return mechanism?

35. Why goose neck tools are preferred in planers and slotters?

36. Which of the following is used for machining larger jobs?

37. Which operations can be performed in shaper?

38. What do we use for machining smaller jobs?

39. In shaper, the cutting tool is made up of reciprocate across the job.

40. Which stroke is idle stroke in shaper?

41. Can the depth of cut be given by lowering the tool relative to job?

42. Can a RAM be moved up and down?

43. The cross rail is mounted on which part of the body frame?

44. Which movement of arm is called stroke?

45. Shaper can produce contours of?

46. The ram is driven back and forth in its slides by crank slider mechanism.

47. What is a semi-automatic lathe?

48. What is an apron?

49. What are the principles of lathe?

50. What is used for aligning the vice with shaping machine table in position?

Experiment No. 6

PLAIN SURFACE GRINDING

AIM:

To perform a Plain surface grinding operation on the given work piece for the given dimensions.

PRINCIPLE:

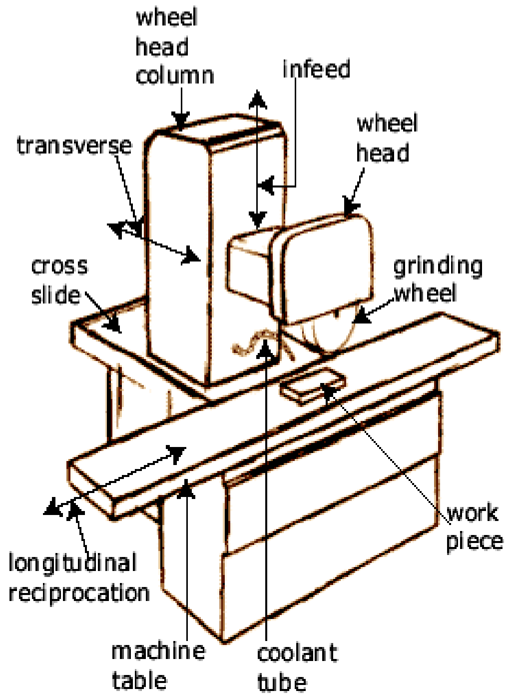
The principle involved in this process is to make flat surface on the given work piece. The cutter is moved perpendicular to the work piece and the grinding is done.

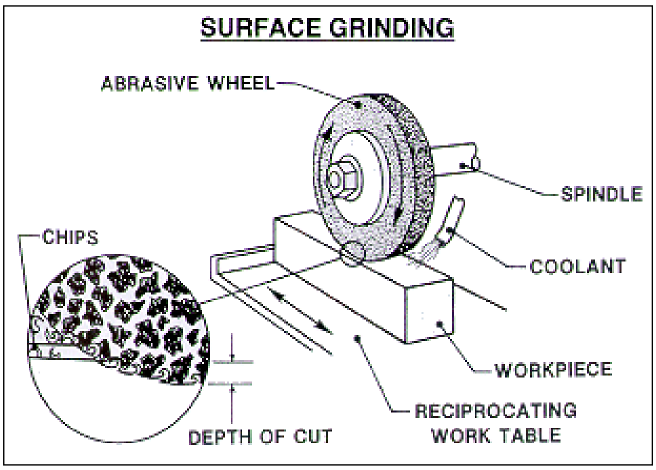
REQUIREMENTS:

1. Grinding Machine

2. Work Piece 100x50x6mmMSPlate

3. GrindingWheel

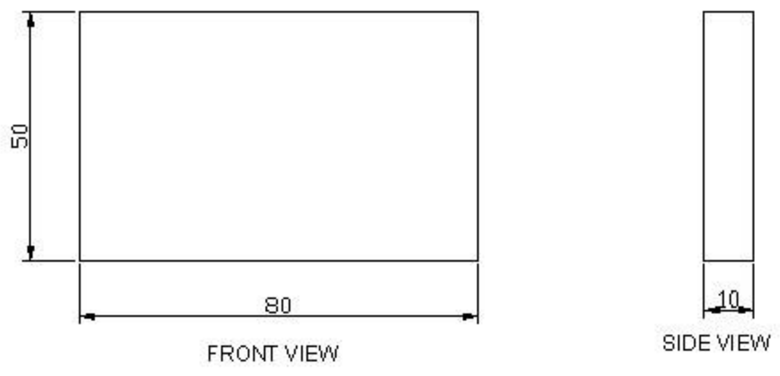




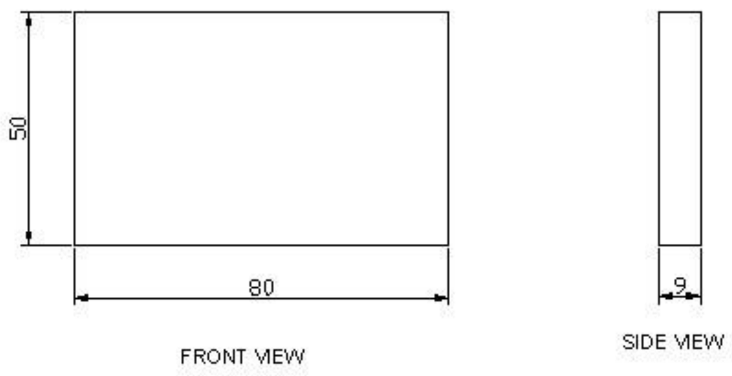
PROCEDURE:

- At first work piece is placed in the magnetic chuck.
- The work piece should be light weight so that it cannot be removed from the magnetic chuck easily.
- Various arrangements regarding the positions of work piece is done.
- Grinding wheel and grinding spindle are kept in position with the work piece.
- Before switching on them to or, necessary steps should take. For proper grinding process wheel speed, work speed transverse speed of the wheel in feed, area of contact is to be noted.
- While running the area of contact is adjusted accordingly to the spindle in order to remove the surface.
- It is done slowly to remove the materials on the both sides. In surface grinding the stock removal rate is given by

BEFORE GRINDING



AFTER GRINDING



Result: Thus the surface grinding is done for the given dimensions.

CYLINDRICAL GRINDING

AIM:

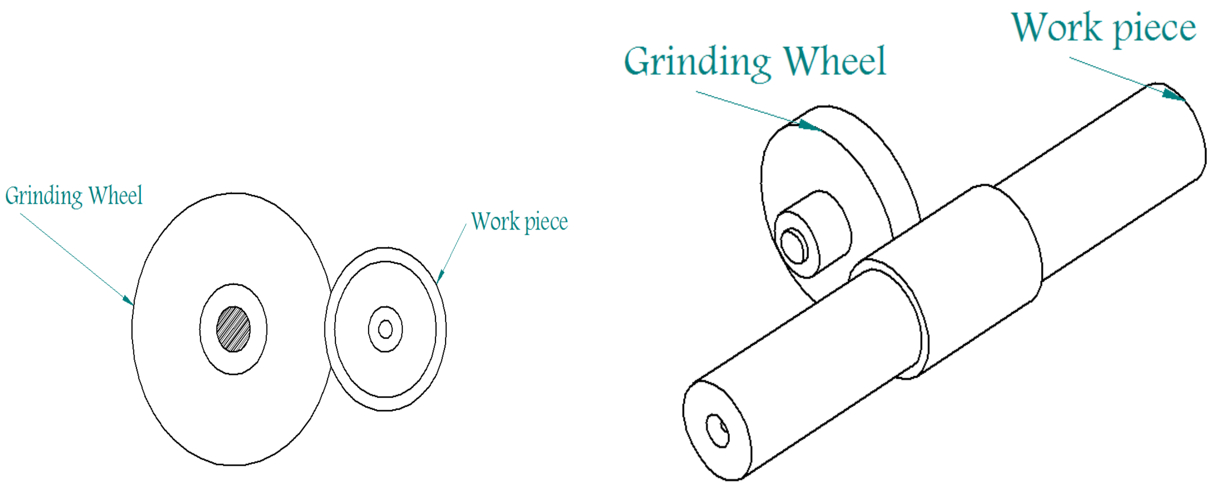
To grind the cylindrical surface of the given materials as per the given dimensions

REQUIREMENTS:

1. Grinding Machine
2. Grinding Wheel
3. Work Piece
4. Steel rule.
5. Outside calipers.
6. Cutting tool.

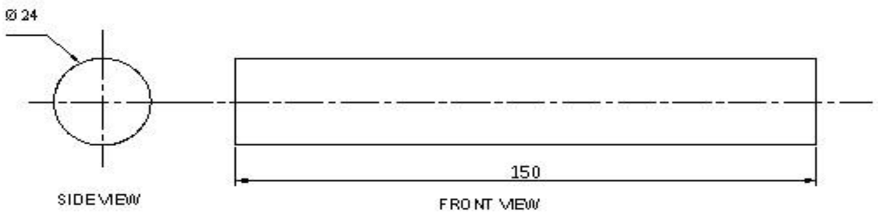
PROCEDURE:

- The given work piece is first fitted in the chuck of the lathe.
- By fitting the tool in tool post the work piece will be reduced to given dimensions.
- First reduce the diameter to 23mm size then reduced the diameter to15mm and 18mm at the middle.
- By facing the work piece to the tool work piece is reduced to70mm.
- After the preliminary lathe operation, the work piece is held in the ends of the cylindrical grinder.
- The grinding wheel is turned on and It is moved towards the work piece such that the surfaces of the cylindrical position are grinded to+-0.2mm



BEFORE GRINDING

AFTERGRINDING



Result: Thus the required dimension of cylindrical surface is obtained.

TALYSURF

Title :

To measure surface roughness of component using surface roughness measuring instrument and compare with standard specimen.

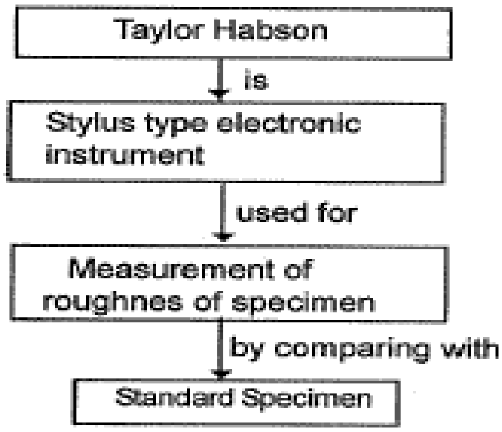
Prior Concepts:

Surface roughness, calculation of Ra, CLA (center line average) and RMS (Root mean square) Value.

New Concepts:

Proposition 1 : Surface roughness measuring instrument.

Taylor Hobson Tallysurf is stylus type electonic instrument used to measure surface roughness of a given sample.



Learning Objectives:

Intellectual Skills:

- To understand the concept of reading Ra value by using Taylor Hobson Talysurf.

Motor Skills:

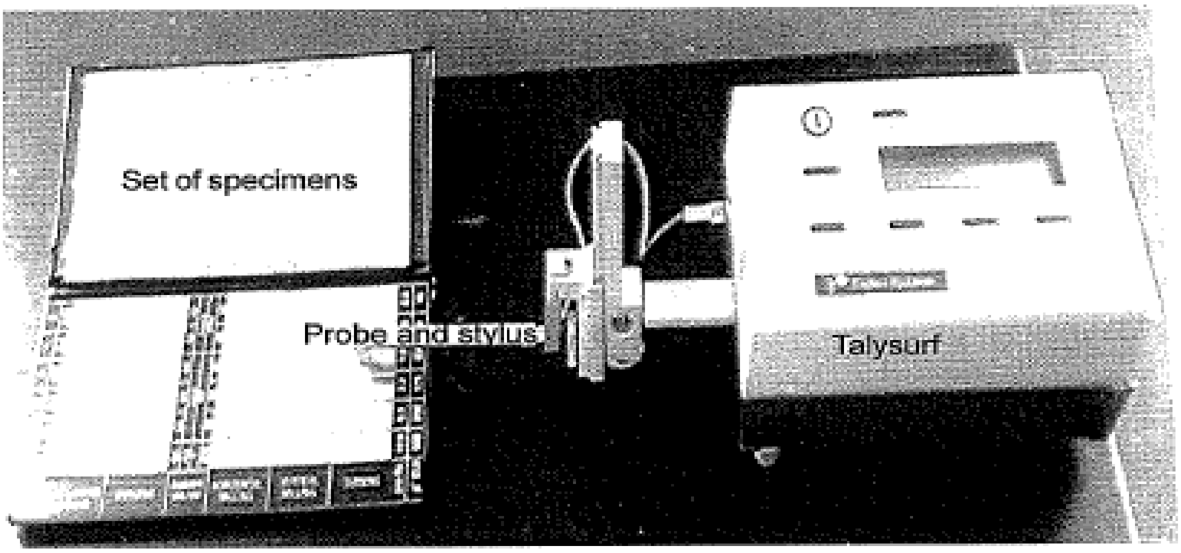
- Ability to set sampling length.
- Ability to handle and set given instrument
- Ability to compare measured Ra value with standard specimen.

Apparatus :

Talylor Hobson Tallysurf is an instrument used to measure surface roughness of work pieces finished by different manufacturing processes, standard set of different finished workpieces with known surface roghness value. It is an electonic stylus probe type instrument working on carrier modulating principle. Measuring head of this instrument consists of a diamond stylus of about 0.002 mm tip radius and skid or screw which is drawn accross the surface by means of a motirised gearbox.

Arm carying the stylus focus an armature which pivots around the centre piece of 'E' shaped stamping. On two legs of E shaped stamping there are two coils carrying an a.c. current. These two coils with the other two resistances form an oscillator. Movement of the stylus causes the air gap to vary and amplitude of the original a.c. current flowing in the coil is modulated. The output i.e. modulation is demodulated so that current flowing is directly proportional to vertical displacement of the stylus.

Diagram :



Experimental Setup

Stepwise procedure :

1. Collect sample work pieces manufactured by different methods.
2. Clean the surface whose roughness value is to be meausred, keep it on the surface plate.
3. Keep the Tallysurf so that its stylus touches the workpiece and adjust proper sampling length.
4. Press the start button of Talysurf.
5. Measure the Ra value of given workpiece.
6. Measure Ra value of different samples.
7. Compare the measured Ra value with the standard value.
8. CLA values of different samples can be measured in a similar manner.

Observations :

S.N	Mfg. process	Indicated Ra value (µm)	Measured Ra value (µm)	Compared with standard specimen (µm)
1	Turning/Milling	0.32 to 25		
2	Drilling	1.6 to 20		
3	Grinding	0.063 to 5		
4	Lapping	0.01 to 0.16		
5				
6				

Exp-6 (VIVA QUESTIONS)

1. How the surface finish of carbide turning tools can be improved by grinding?
2. What are the causes of wheels glazing?
3. What is the difference between lapping & grinding?
4. What is the difference between vitrified & resinoid bonds?
5. What is the difference between wheel dressing & wheel truing?
6. What is the tool nomenclature of grinding wheel?
7. What is the difference between grinding & machining?
8. What is the function of an abrasive wheel?
9. What are the various types of grinding operations?
10. Why is aluminum oxide preferred to silicon carbide in grinding steel?
11. Why is coarse grain and open structured wheel is preferred for stock removal grinding?
12. What is the main short coming of vitrified bond?
13. Dressing is necessary for single layer wheel?
14. State the basic advantage of a creep feed grinder over a conventional surface grinder.
15. State the specific application of a planetary internal grinder.
16. What are the characteristic features of a universal cylindrical grinder?
17. State the disadvantages of centre less cylindrical grinding machine?
18. Transverse feed provided in vertical spindle reciprocating table surface grinder?
19. Why is high velocity desired in grinding?
20. How may the specific grinding energy vary with material removal rate in grinding?
21. How chip accommodation volume is is related to material removal rate?
22. On which factors does the transverse roughness of work piece depend during grinding?
23. Why does single layer grinding wheel show progressive rise of force during grinding of high speed steel?
24. What are the types of abrasive materials?
25. Which type of abrasive is the hardest material?
26. Write types of natural abrasives?
27. Write types of artificial abrasives?

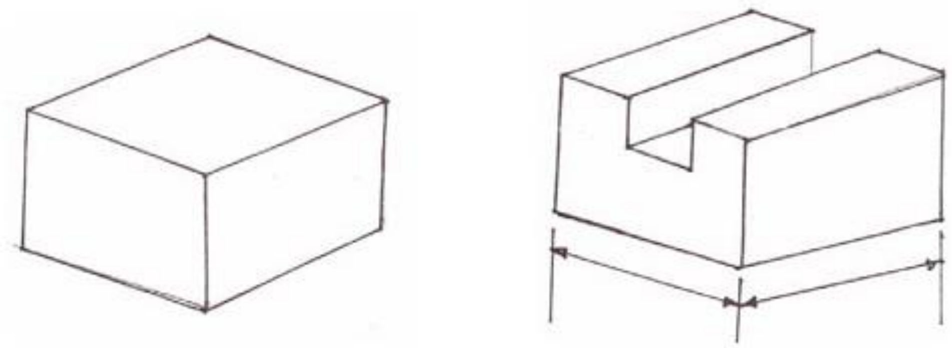
28. Write types of bonds used in manufacturing grinding wheels?
29. Why grinding process is called abrasive machining process?
30. What is the relative motion between tool and work piece in cylindrical grinding machining operation?
31. What are the different between the natural abrasives and artificial abrasives?
32. What are effects on the grain size after grinding?
33. What type of materials requires lubricants during grinding?
34. Define the dressing of the grinding wheel?
35. Which type composition of the grinding wheel requires HSS materials?
36. What is the effect of Velocity on the grinding wheel to the material?
37. Is it necessary to grinding the surface of the material in every manufacturing process?
38. Name the different types of natural abrasives?
39. Name the different types of artificial abrasives?
40. Define the function of abrasive wheel?

Experiment No. 7

MILLING

AIM:

To machine a slot on a given work piece as shown in figure by using milling machine.



TOOLS REQUIRED:

Side & face cutter, standard arbor, spacers vice.

APPARATUS:

Milling Machine, Steel Rule, Punch, Hammer, Number Punch

SELECTION OF RPM:

$$V=\pi DN/1000$$

Where,

- V= cutting speed m/min selected based on work tool combination from data book.
- D = dia of cutter.
- N = rpm of cutter.

$$N= V\times 100/\pi D$$

- Depth of cut = 0.5 to 1mm
- Type of milling = Up milling.
- Feed = given manually.

SPECIFICATIONS:

- Surface of the table = 1050 * 250 mm
- Distance between the t-slots = 62 mm
- Longitudinal travel table = 600 mm
- Gross travel of the table = 230 mm
- Metrical adjustment of table = 450 mm
- Distance b/w center of spindle to Lower surface of the over arm = 115 mm
- Taper in spindle = IS040 STD
- Diameter of Milling Arbor = 254 mm
- Range of spindle speeds. No = 6
- R.P.M =65 To 525

SEQUENCE OF OPERATION:

1. Hold the work piece in vice.
2. Select the cutting speed.
3. Remove the metal by layer & layer, each depth of cut.

PROCEDURE: Milling of an 8×2 groove on the given work piece involves the following steps.

MEASURING AND MARKING: The given work piece is checked for the required dimensions. Filing is done in order to get the flat surface and to obtain the required dimensions of the job. Marking is done on the work piece with the help of punch and hammer.

TOOL SETTING: The required multi point cutting tool is placed in the arbor of a milling machine to perform the operation.

JOB FIXING: The job is fitted in the jaws provided on the table and raises the table so that the work piece is in contact with the cutting tool.

MILLING: Now select a suitable depth of cut in terms of a known value and raise the table based on the graduations provided on the dial.

Start the machine so that the tool rotates in clock wise direction.

The feed is given to the work table in the direction opposite to cutter direction. This milling is termed as up milling.

Increase the depth of cut at successive intervals and repeat the same procedure until we get the required groove on the job. The supply is to be switched off.

PRECAUTIONS:

1. Before starting the process, select the suitable type of milling either up milling or down milling.
2. Depth of cut should be given in small quantities.
3. The fed should be given slowly.

RESULT:

The given slot has been made on the work piece.

GEAR TOOTH MICROMETER

AIM:

To determine the thickness of given gear tooth.

APPARATUS:

Gear tooth micrometer, gear

THEORY:

Gear tooth micrometer is used to measure the thickness of gear tooth at pitch line. It is similar to simple micrometer but gear tooth micrometer having flanks at the end of anvil and spindle. The flank of the micrometer gives the thickness of gear tooth at pitch line.

PRINCIPLE:

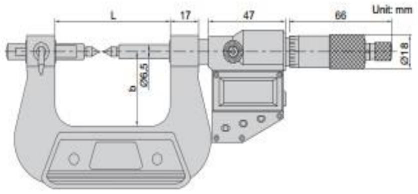
Gear tooth micrometer works on the principle of screw and when screw is turned through nut for one revolution it advances by one pitch distance i.e., one revolution of screw corresponds to a linear moment of a distance equal to the pitch of thread.

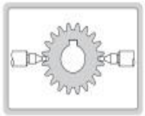
Least Count (LC) = Pitch of the spindle screw/ No of divisions of the spindle (mm)

DIGITAL GEAR TOOTH MICROMETER

DATA OUTPUT | IP54 WATERPROOF

3591-25A





(mm)

Code	Range	Micrometer head accuracy	Ball tips accuracy	L	b
3591-25A	0-25mm/0-1"	±4μm	8μm	67	38
3591-50A	25-50mm/1-2"	±4μm	8μm	92.4	50
3591-75A	50-75mm/2-3"	±5μm	10μm	117.6	62
3591-100A	75-100mm/3-4"	±5μm	10μm	143	70

- Measure over-pin diameter of gears
- Resolution 0.001mm/0.00005"
- IP54 dust/waterproof
- Button function: on/off, set, mm/inch, ABS/INC, data output
- Data output
- SR44 or LR44 battery, automatic power off
- Ratchet stop
- Supplied with setting standards (except 0-25mm/0-1")
- Optional accessary: ball tips (code **7391**, next page), data output system

PROCEDURE:

1. Select the micrometer with a desired range depending upon the thickness of the work piece to be measured.

2. The next is to check it for zero error in case of 0.25mm micrometer, the zero error, is surfaces of anvil and spindle.

3. The barrel has graduations, in interval of 1mm above the subsequent line.

4. For measuring, hold the work piece b/w faces of anvil and spindle and move the spindle by rotating the thimble unit it just touches the work piece.

5. Take the thimble reading which coincides with reference line on the sleeve. Total reading = MSR+ (PSR X LC) mm

SIMPLE CALCULATIONS:

MSR = 3mm

PSR= 6mm

LC = 0.01mm

Error = 27mm

PSR X LC = (6+27) X0.01=0.33mm

TR=MSR+ (PSRXLC) =3+0.33mm

PRECAUTIONS:

1. Clean the micrometer by wiping off dirt
2. Clean the micrometer thoroughly with paper or cloth

Set zero readings on instrument before measuring

Find out Pitch circle diameter of spur gear:

S.NO	MSR(mm)	PSR	PSR X LC	TR= MSR + (PSR X LC) mm
1				
2				
3				
4				
5				

Find out Thickness of spur gear teeth:

S.NO	MSR(mm)	PSR	PSR X LC	TR= MSR + (PSR X LC) mm
1				
2				
3				
4				
5				

RESULT:

The experiment is conducted on gear tooth micrometer and the thickness is diameter

CONCLUSION:

The thickness of the given specimen gear tooth is found to be ---------- mm

Exp-7 (VIVA QUESTIONS)

1. Define Milling

2. Name different types of Knee and Column type milling machines.

3. Name different types of production milling machines.

4. Name some special milling machines.

5. Name principal parts of knee and column type milling machine.

6. What are the limitations of a milling machine?

7. Name two milling methods:

8. Define conventional milling

9. Define Climb milling

10. Define milling cutter.

11. Name the materials used for milling cutters.

12. What is plain milling cutter?

13. What is a side milling cutter?

14. What is the use of metal slitting saw cutter?

15. Define angle milling cutter.

16. Define form milling cutter?

17. What is an end mill cutter?

18. What is the use of T-slot milling cutter?

19. What is the use of wood ruff key slot milling cutter?

20. Define body of milling cutter.

21. Define cutting edge of milling cutter.

22. Define periphery of milling cutter

23. Define face of milling cutter.

24. Define fillet of milling cutter.

25. Define gash of milling cutter.

26. Define land of milling cutter.

27. Define lead of milling cutter.

28. Define outside diameter of milling cutter.

29. Define root of milling cutter.

30. Define plain milling.

31. Define face milling.

32. Define side milling.

33. Define straddle milling.

34. Define angular milling.

35. Define end milling.

36. Define saw milling.

37. What are the specifications of milling machine?.

38. Classify milling machine.

39. List the principle parts of horizontal or plain milling machine.

40. Pocket milling is extensively used in?

Experiment No. 8

DRILLING AND TAPPING ON RADIAL DRILLING MACHINE

Aim:

To perform drilling, reaming and tapping operations on the given M.S Flat workpiece.

Apparatus:

1. Drilling Machine with standard accessories
2. Work piece

Material:

Mild Steel round rod of diameter 20 mm.

Procedure:

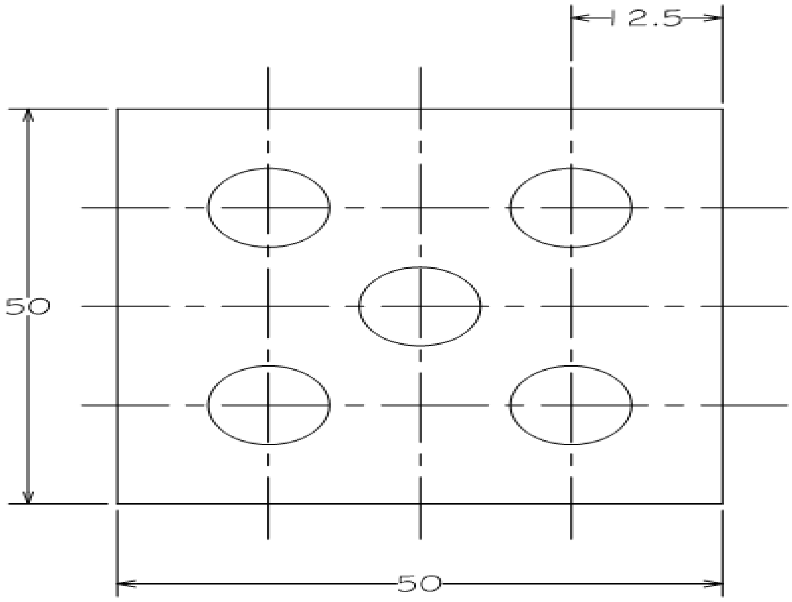
1. The given work piece is first fitted to get required length, breadth and thickness wet chalk is applied on four sides and with the scriber lines are drawn to get center hole at required location.
2. The centers are punched with a Punch and hammer.
3. The work piece is fixed firmly in the vice of the Drilling Machine
4. 3/8" drill bit is fixed firmly in the chuck and drilling is performed giving uniform depths.
5. The drill bit is removed from the drill chuck and is replaced by a reamer.
6. The reaming operation is performed on the hole which has been previously drilled.
7. The work is removed from the vice for performing tapping operation.
8. The job is fixed firmly in a bench vice.
9. Tap is fixed in the tap handle and pressure applied on the taps to obtain internal thread.

Precautions:

While performing reaming and tapping operations lubricant should be used to minimize friction.

Result:

Drilling, Reaming and Tapping operations are performed on the given work piece as per given dimensions.



MICROMETER DEPTH GAUGE

AIM:

It is used for measuring the depth of holes, slots and recessed area.

APPARATUS:

Micrometer, specimen.

THEORY:

It has got one shoulder which act as reference surface and is held firmly and perpendicularly to the center line of the hole. Here also for larger ranges of measurement, extension rod are used. The screw micrometer depth gauge has range of 20mm or 25mm. the length of the micrometer depth gauge varies from 0 to 225mm. the rod is inserted through the top of the micrometer. The rod is marked after every 10mm so that it could be clamped at any position in using this instrument.

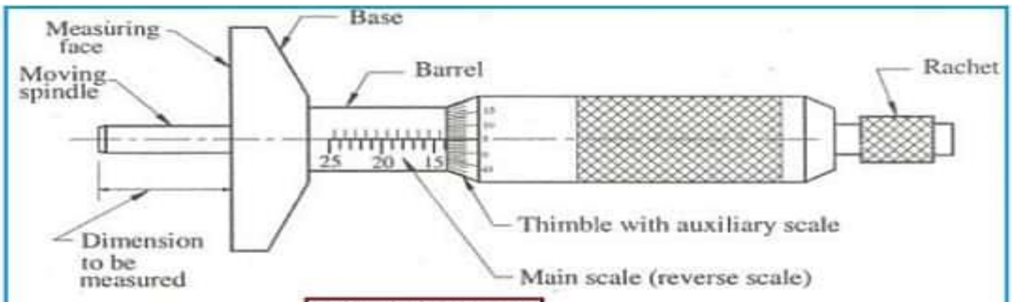
PROCEDURE:

1. To measure the depth of any material, use the micrometer depth gauge.

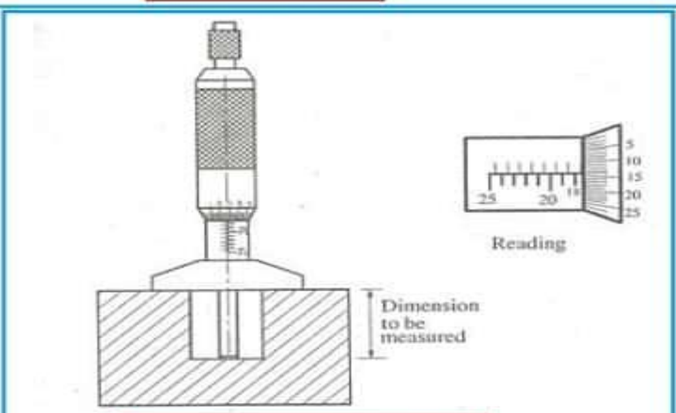
2. Take the sample piece, the length of the rod varies from 0 to 225mm.
3. Various rods are used as per requirement at the certain limit that gauge will move as it is by rotating screw in clock wise direction.
4. Tight the screw and measure the main scale and circular scale also adding the initial value of the rod this gives MSR, VSR, TSR by adding LC.
5. Note down readings by following procedure.

Observation Table: 1. calculate the depth of hole or slot in the given specimen

Sr .No	MSR	VSR	LC	TSR
1				
2				
3				
4				
5				



- Depth micrometer



Reading of Depth micrometer

RESULT:

The depth of the given specimen is found using MICROMETER DEPTH GAUGE.

CONCLUSION:

1. Depth of the hole _______________mm.
2. Depth of the slot _________________mm

Exp-8 (VIVA QUESTIONS)

1. What do you mean by counter sinking?
2. What are the courses for breaking of drill?
3. What is the function of drill jig?
4. What do you mean by tapering a hole?
5. What is the function of a twist drill?
6. What are the materials used for drills?
7. How do we ensure proper measure of internal bore?
8. How do we get final diameter?
9. What are the positions of the D.B.I. to be taken?
10. Describe D.B.I.
11. State the different types of drills.
12. What are the operations done on drilling machine?
13. What is drilling?
14. Specify the precautions to be taken in drilling machines.
15. Define radial drilling machine.
16. What is reaming?
17. What are the tools required to do boring operation?
18. What are the types of drilling machines?
19. What is tapping?
20. Write the type of taps?
21. What if the centers are not punched using a hammer?
22. What is radial drilling?
23. What is the function of drill jug?
24. What are the materials used for drilling?
25. Counter-boring is the operation of?
26. Drill chucks are used for holding?
27. How do we get final diameter?
28. State different types of drillings that are used?

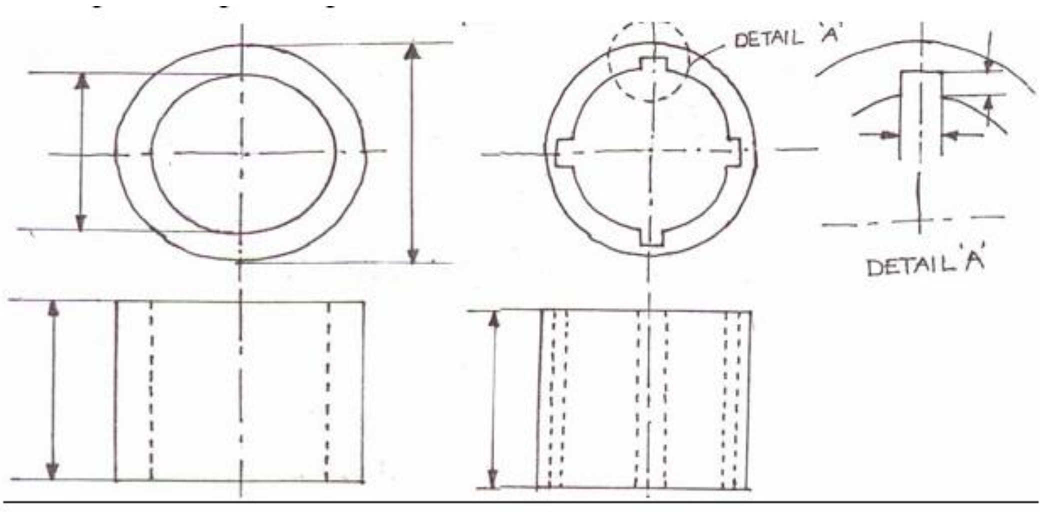
29. Name different type of drill bits.
30. Which material is drill bit made up of?
31. What is the purpose of tail stock?
32. Why is it important to use lubrication?
33. What do you mean by centering and facing?
34. Name the parts of carriage.
35. What are the different operations performed on lathe?
36. Taper turning means?
37. What are the accessories of drilling machine?
38. 3/8” drill bit is fixed why is it?
39. Why is the work piece removed from the vice for tapping operation?
40. What happens if Reaming operation is not performed?
41. Why grooves present on tool bit are of different shapes?
42. Other than lubrication can we reduce friction using any other method?
43. Write the type of taps.
44. Can other operations be performed?
45. What is the function of clapper box?
46. What is cutting speed of a tool in a shaping?
47. Which specimen is used for drilling?
48. What is the difference between taper and turning?
49. What is the difference between reaming and chamfering?
50. What is bench vice?

Experiment No. 9

SLOTTING

AIM:

To machine slots on a given hollow work piece as shown in the figure using slotting machine.



TOOLS:

Slotting tool, steel rule, chuck with dividing head etc,

DIVIDING HEAD DETAILS:

Gear ratio= 36:1

No of slots to be cut=4

1 crank rotation the spindle rotation=1/36×360=10

To turn work piece by 90 the crank should be rotated 9 full rotations

SEQUENCE OF OPERATIONS:

1. Hold the work piece in the chuck.

2. Pick up the tool and align the work piece center.

3. Adjust stroke length.

4. Complete the slotting at present position.

5. Index the job for next position.

6. Complete at all position.

PROCEDURE:

1. The given work piece is placed in the vice by clamping the jaws.

2. The ram is adjusted so that the tool bit is placed inside the work piece hole and just touches the end.

3. Depending on slot size the depth of cut is given by hand wheel.

4. Now rotate the work piece exactly at 90 by using the index plate mechanism .i.e. rotate the index Plate by 9 turns to get the required position.

5. Repeat the above procedure for the required four slots.

PRECAUTIONS:

1. Care should be taken while locating the centre position for the work piece.

2. The position of work piece in the clamp is such that the ram must passes through the entire hole of Work piece.

RESULT:

The given slots have been made on given work piece.

VERNIER CALIPERS

AIM:

To measure the length and diameter using vernier calipers

APPARATUS:

Linear measurement applies to measure the length, diameter, height and thickness including external and internal measurements. These are designed for linear and end measurement.

CONSTRUCTION:

Vernier consists of 2 scales one fixed and other movable. The fixed scale known as the main scale is calibrated on “L” shaped frame and carriers a fixed jaw. The movable vernier scale slides over the main scale and carriers a measuring tip when the jaws are closed the zero of vernier and main scale coincide. An adjustment is provided to lock the sliding scale.

USE:

These are used for both – internal and external measurement, its generate used for measuring by closing the jaws on work surface and taking readings from main scale is examined to as certain which of its division coincide and added to the main scale reading.

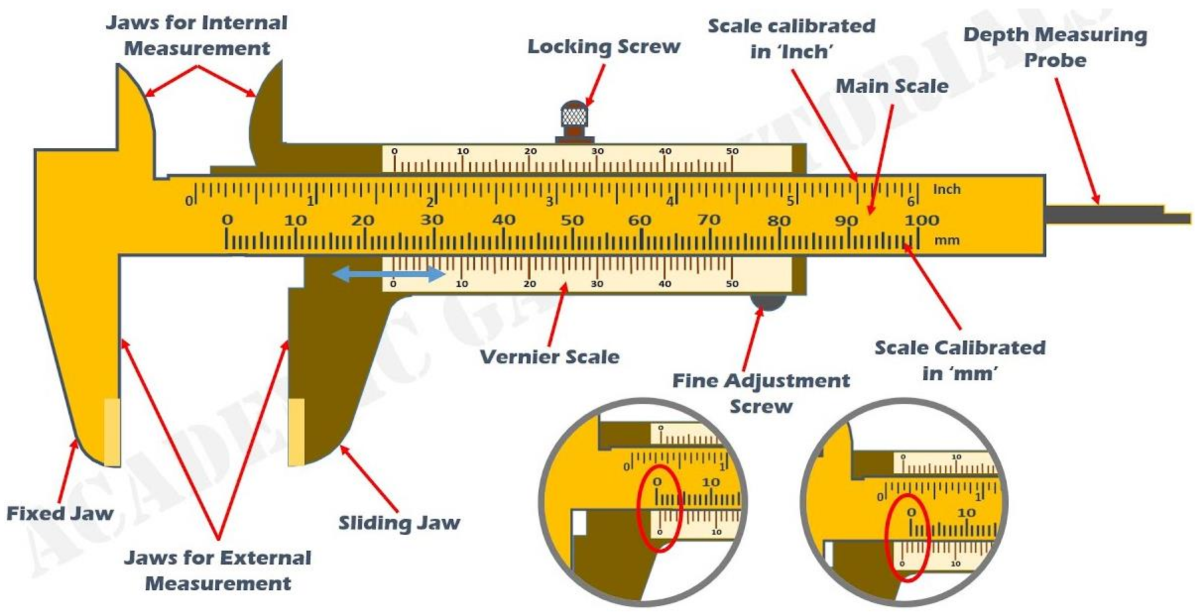
Least count= One division of main scale reading/ No. division on scale .mm

49 MSD=50 VSD

1 MSD=1mm

1 VSD= 49 MSD/50 VSD L.C= 1MSD- 1VSD

= 1- 49/50 =0.02 mm



PRECAUTIONS:

1. Line of measurements and scale must coincide
2. Measurement tips of caliber should parallel to the work place center line
3. Do not apply pressure on place.

Calculations:

Calculate the given Length of the specimen:

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Calculate the given Depth of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Thickness of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Inside Diameter of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

RESULT:

.

The experiment is conducted on the vernier calipers for measuring for the physical quantities of the given specimen.

CONCLUSION:

1. Length of the specimen - ----------- mm
2. Diameter of specimen- ----------- mm
3. Inner diameter of the hollow cylinder- ----------- mm
4. Outer diameter of the specimen- - ---------- mm
5. Thickness of the specimen- ----------- mm

Exp-9 (VIVA QUESTIONS)

1. Which is the reciprocation of the cutting tool in the slotting machines is accomplished?

2. How internal key way in gears can be cut?

3. How the job reciprocates in the slotting machine?

4. Why T –slots in the table of planning machines?

5. Which machine can be produced flat surfaces?

6. In which machine large number of cutting tools can be simultaneously used?

7. In which machine heavy cuts can be given during machining?

8. Why slotting machines are used to cut internal gear ttoth/

9. In which machine the work table can rotate/

10. How length of the stroke can be varied in the slotting machine?

11. What is the cutting stroke in slotter ?

12. Which type of working table is used in slotting?

13. What is the movement of reciprocating tool ?

14. What is the driving mechanism of slotting machine?

15. Write of operations performed on slotter machine?

16. What is the cutting speed of a tool in slotter?

17. Which part o the slotting machine will give the feed for the machining?

18. Which type of components is generally machined on slotter?

19. What is the machining time of the slotter?

20. Write the types of slotting machines?

21. Write the specifications of slotting machines?

22. What is the motion of work piece in slotting machine?

23. What is the motion of tool in slotting?

24. Define machine tool?

25. What is the relative motion between tool and work piece in slotting?

26. What is used to hold the wok piece in slotting machine?

27. What are the sequences of operations performed on slotting?

28. What are the tools required in slotting machine?

29. Define gear ratio?

30. Define stroke length?

31. Define indexing?

32. What are the cutting parameters in slotting machine?

33. Define index plane mechanism?

34. What is the working of slotter?

35. What are principal parts of slotter?

36. Define ram drive mechanism?

37. What are the specifications of the slotter?

38. What is the size of the general purpose slotter?

39. What is the floor space required by slotting machine?

40. What are the parts of slotting machine?

41. Write the classification of slotting machines?

42. Define cutting tool?

43. What is the saddle material made up of?

44. What are the devices used to hold work piece in slotting machine?

45. Write different types of slotting machines?

46. What type of materials can be slotted in slotting machines?

47. What is the use of slotting machine?

48. How does slotting compare in price to other machining operations?

49. What are the operations performed on a slotting machine?

50. What is the principal and working o f the slotting machine?

Experiment No. 10

PLANING

AIM:

To prepare a square block of 22 mm side and 35 mm thick with key way in it from the given work piece by using Planing machine.

MATERIAL REQUIRED:

M.S. Cylindrical rod of 32 mm diameter and 35 mm length.

TOOLS REQUIRED:

Steel rule, dot punch, Ball peen hammer, surface gauge and scriber, Vernier height gauge, V- block, surface plate and H.S.S. Single point cutting tool.

SPECIFICATIONS:

Horizontal distance between two vertical housings:

Vertical distance between table top and the cross rail: 800mm

Maximum length of table travel: 1350mm

Length of bed: 2025mm

Length of table: 1425mm

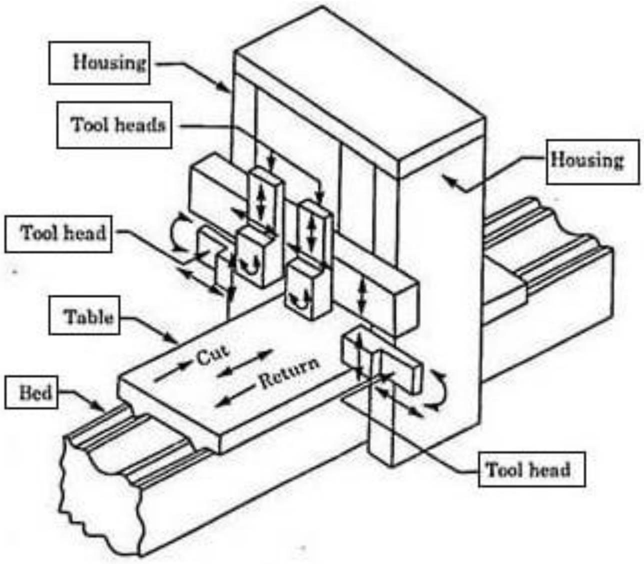
Method of driving – Individual Method driving table – Geared

H.P. of motor: 3 H.P. & 1 H.P.

Planing is one of the basic operations performed in machining work and is primarily intended for machining large flat surfaces. These surfaces may be horizontal, vertical or inclined. In this way, the function of a planning machine is quite similar to that of a shaper except that the former is basically designed to undertake machining of such large and heavy jobs which are almost impractical to be machined on a shaper or milling, etc. It is an established fact that the planning machine proves to be most economical so far as the machining of large flat surfaces is concerned. However, a planing machine differs from a shaper in that for machining, the work, loaded on the table, reciprocates past the stationary tool in a planer, whereas in a shaper the tool reciprocates past the stationary work.

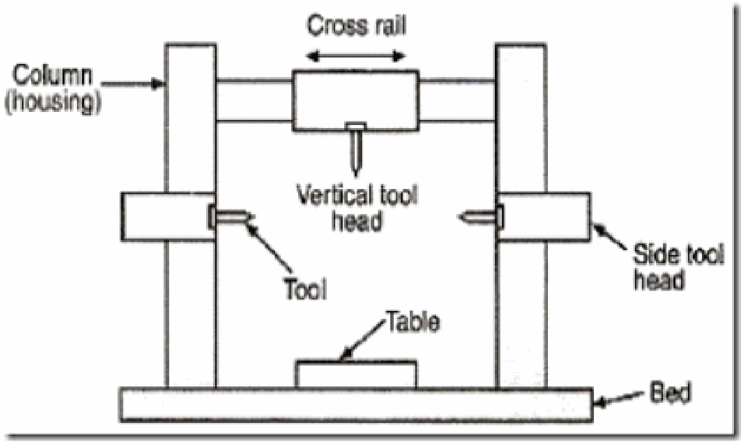
WORKING PRINCIPLE OF A PLANER:

The principle involved in machining a job on a planer is illustrated in fig. Here, it is almost a reverse case to that of a shaper. The work is rigidly held on the work table or a platen of the machine. The tool is held vertically in the tool- head mounted on the cross rail. The work table, together with the job, is made to reciprocate past the vertically held tool. The indexed feed after each cut is given to the tool during the idle stroke of the table.



STANDARD OR DOUBLE HOUSING PLANER:

This is the most commonly used type of planer. It consists of two vertical housings or columns, one on each side of the bed. The housings carry vertical or scraped ways. The cross-rail is fitted between the two housings and carries one or two tool heads. The work table is mounted over the bed. Some planers may fit with side tool heads fitted on the vertical columns.



MAIN PARTS OF A PLANER:

A planer consists of the following main parts as illustrated by means of a block diagram in fig.

- Bed
- Table
- Housings or columns
- Cross – rail
- Tool head
- Controls

Bed: It is a heavy and robust cast iron body which as a support for all the other parts of the machine which are mounted over it.

Column: It is a box type cast-iron body mounted on the base acts as housing for the operating mechanism of the machine and the electrical. It also acts as a support for other parts of the machine such as cross rail and ram etc.

Cross rail: It is a heavy cast iron construction attached to the column at its front on the vertical guide ways. It carries two mechanisms: one for elevating the table and the other for cross traversing of the table.

Table: It is made of cast iron and has a box type construction. It holds and supports the work during the operation and

Slides along the cross rail to provide feed to the work.

Tool head: It is a device in which is held the tool. It can slide up and down can be swung to a desired angle to set the tool at a desired position for the operation.

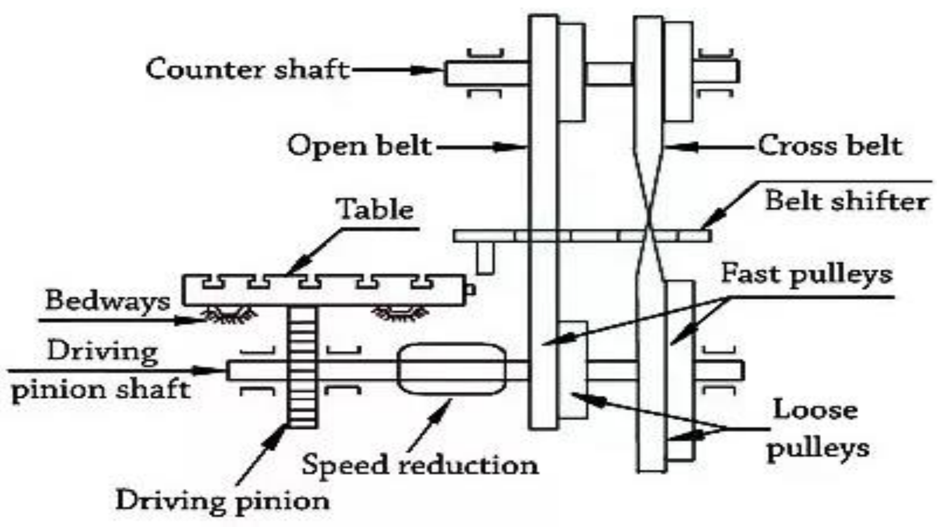
DRIVE MECHANISMS:

Four different methods are employed for driving the table of a planer. They are:

- Crank drive
- Belt drive
- Direct reversible drive
- Hydraulic drive

QUICK RETURN MECHANISM FOR PLANER TABLE:

Belt Drive: Most of the common types of planers carry this system of drive for thequick return of their tables. The main features of this drive are shown in fig.



It consists of the main driving motor situated over the housings. This motor drives the countershaft through an open V- belt. The countershaft, at its extreme carries two driving pulleys; one for open belt and the other for cross belt. The main driving shaft is provided below the bed. One end of it passes through the housing and carries a pinion, which meshes with the rack provided under the table of the machine as shown. The other end of this shaft carries twopairs of pulleys – each pair consisting of a fast pulley and loose pulley. One of these pairs is connected to one of the driving pulleys by means of a open belt and the other to the second driving pulley by means of a cross belt. A speed reduction gear box is mounted on the main driving shaft and the same is incorporated between the pinion and the pairs of driven pulleys. One set of the above pulleys is used for the forward motion of the table and the other set for backward or return motion. the cross belt will be used for forward motion and the open belt for return motion. Note that the driving pulley on the counter shaft for cross belt is smaller than the pair of fast and loose pulleys for the same. Against this the driving pulley on the countershaft for open belt is bigger than the pair of fast and loose pulleys for the same. Consequently therefore for the same speed or number of revolutions of the countershaft the main driving shaft will run faster when connected by open belt than when the cross belt is used. It is obvious therefore that the return stroke will be faster than the forward stroke.

It should also be noted here that the pulleys are so arranged that when the cross belt is on the fast pulley, i.e. in forward stroke the open belt will be on the loose pulley and its reverse will take place during the return stroke. In order that this relative shifting of belt may take place automatically at the end of each stroke, without stopping the machine, a belt shifter and its operating lever are provided on the machine. Trip dogs are mounted one each at both ends, on the table. At the end of each stroke these dogs strike against the operating lever alternately and the belt shifted accordingly. Thus the table movement is reversed automatically.

OPERATION DONE ON A PLANER:

The common operations performed on a planer include the following:

Machining horizontal flat surfaces.

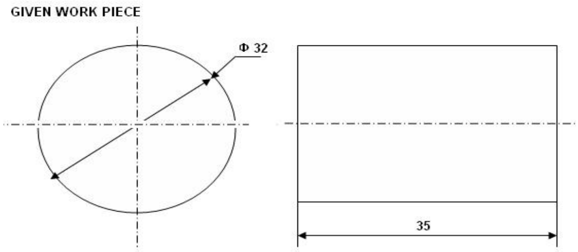
Machining vertical flat surfaces.

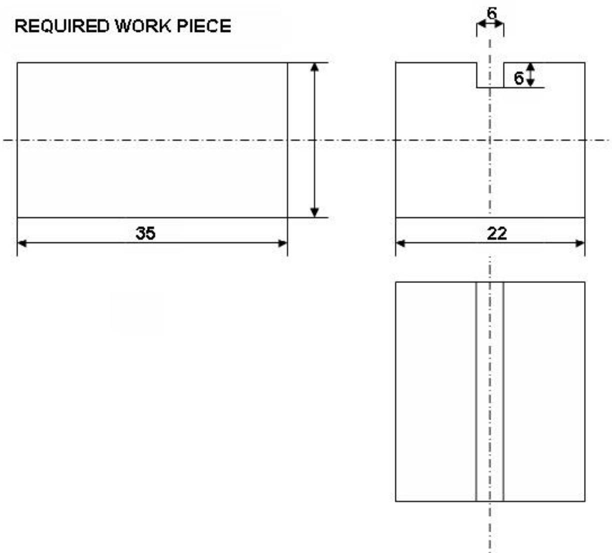
Machining angular surfaces, including dovetails.

Machining different types of slots and grooves.

Machining curved surfaces.

Machining along premarked contours.





PROCEDURE:

1. The two ends of the work piece are first smoothened by filing and apply chalk on its surface.
2. Place the work piece on the V-block and mark centre on the end face using surface gauge, scriber and Vernier height gauge.
3. Mark square on the end face according to the required dimensions.
4. By using dot punch made permanent indentation marks on the work piece.
5. The tool is fixed to the tool post such that the tool movement should be exactly perpendicular to the table.
6. The work piece is then set in the vice such that the tool is just above the work piece.
7. Adjust the length of the stroke.
8. Make sure that line of action of stroke should be parallel to the surface of the work piece.
9. Give depth of cut by moving the tool and feed is given to the work piece during return stroke of the ram.
10. Continue the process, until the required dimensions are to be obtained.
11. Repeat the process for all the four sides.
12. Finally make a key way on one side according to the given dimensions.

PRECAUTIONS:

1. Marking should be done accurately.
2. The work piece should be set securely and rigidly in the vice.

3. Before starting a shaper make sure that the work vise, tool, and ram are securely fastened.
4. Check that the tool and tool holder will clear the work and also the column on the return stroke.
5. Always stand parallel to the cutting stroke and not in front of it.
6. Never attempt to remove chips or reach across the table while the ram is in motion.
7. Never attempt to adjust a machine while it is in rotation.
8. Suitable feeds and depth of cut should be maintained uniformly.
9. Apply cutting fluids to the tool and work piece properly.
10. Always feed will be given to the tool in the backward stroke only.

RESULT:

The given flat work piece is made into the square piece.

VERNIER CALIPERS

AIM:

To measure the length and diameter using vernier calipers

APPARATUS:

Linear measurement applies to measure the length, diameter, height and thickness including external and internal measurements. These are designed for linear and end measurement.

CONSTRUCTION:

Vernier consists of 2 scales one fixed and other movable. The fixed scale known as the main scale is calibrated on “L” shaped frame and carriers a fixed jaw. The movable vernier scale slides over the main scale and carriers a measuring tip when the jaws are closed the zero of vernier and main scale coincide. An adjustment is provided to lock the sliding scale.

USE:

These are used for both – internal and external measurement, its generate used for measuring by closing the jaws on work surface and taking readings from main scale is examined to as certain which of its division coincide and added to the main scale reading.

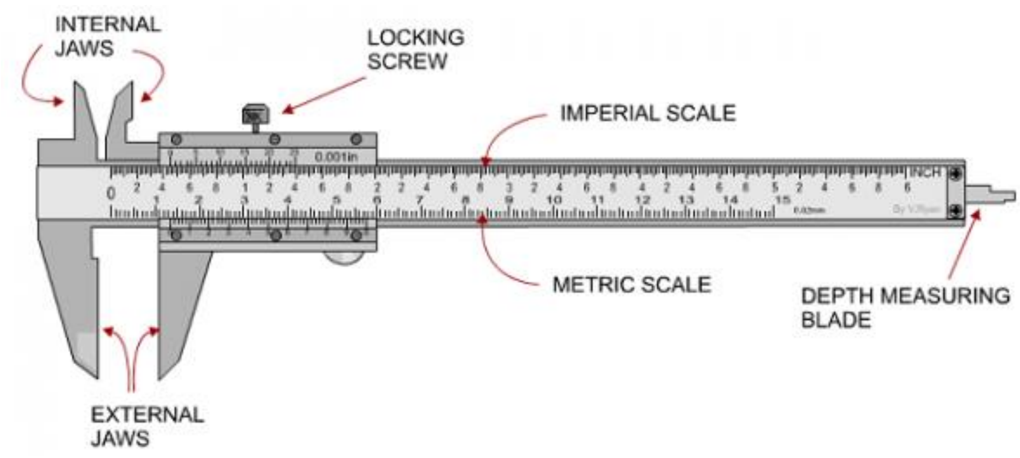
Least count= One division of main scale reading/ No. division on scale .mm

49 MSD=50 VSD

1 MSD=1mm

1 VSD= 49 MSD/50 VSD L.C= 1MSD- 1VSD

= 1- 49/50 =0.02 mm



PRECAUTIONS:

1. Line of measurements and scale must coincide
2. Measurement tips of caliber should parallel to the work place center line
3. Do not apply pressure on place.

Calculations:

Calculate the given Length of the specimen:

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Calculate the given Depth of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Thickness of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

Inside Diameter of the specimen

S.NO	MSR(mm)	VSR	VSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				

RESULT:

The experiment is conducted on the vernier calipers for measuring for the physical quantities of the given specimen.

CONCLUSION:

1. Length of the specimen - ----------- mm
2. Diameter of specimen- ----------- mm
3. Inner diameter of the hollow cylinder- ----------- mm
4. Outer diameter of the specimen- - ---------- mm
5. Thickness of the specimen- ----------- mm

Exp-10 (VIVA QUESTIONS)

1. What is a planer ?
2. Explain the principle parts of planer.
3. Specify the precautions to be taken in planing operation.
4. Can we use shapers and planners for mass production? Justify your answer.
5. How do you specify the size of planning machines?
6. Explain the operations done on drilling machine in detail, with neat sketches.
7. Give the specifications of planer machine tool.
8. What is the material of the planer bed?
9. What are the types of planning machines?
10. What is the difference between planer and shaper?
11. Why Goose neck tools are preferred in planers and slotters?
12. How the cylindrical parts are held in Planer?
13. In modern planer which mechanism is used?
14. In Planer the material is removed in which motion?
15. What is the driving mechanism of planning machine?
16. Write types of operations performed on Planer machine?
17. What is the cutting speed of a tool in a Planer?
18. Which part of the planer will give the feed for machining?
19. Which type of components is generally machined on planer?
20. What is a plane?
21. Explain the principle parts of planes.
22. Specify the precautions to be taken in planning operation.
23. Can we use shaper and planners for mass production? Justify your answer.
24. How do you specify the size of planning machines?
25. Explain the operations due to on drilling machine in detail, with neat sketches.
26. Give the specifications of planer machine tools.
27. What is the material of the planar bed?
28. What are the types of planning machines?

29. What is the difference between planar and shaper?
30. How the cylindrical parts are held in planers?
31. In modern planes which mechanism is used?
32. In planes the material is removed in which motion?
33. What is the driving mechanism of planning machine?
34. Write the types of operations performed on planer machine?
35. What is the cutting speed of a tool in planar?
36. Which part of the planar will give the feed for machining?
37. Which types of components are generally machined on planer?
38. What is the machining time of planer?
39. What is quick worth mechanism?
40. Can a cylindrical work-piece be used in planer machines?
41. Which material is planer bed made up of?
42. Tool heads are used for which purpose?
43. What is feed mechanism?
44. How are grooves provided?
45. What is the machining time of planer?
46. What types of components are generally machined on a planer?
47. Which part of the planer will give the feed for machining?
48. What is the cutting speed of a tool in a planer?
49. What types of operations are performed on planer machine?
50. In planer the material is removed in which motion?

Experiment No. 11

OPTICAL BEVEL PROTRACTOR

AIM:

To determine angle of given specimen

APPARATUS:

Bevel protractor, specimen

THEORY:

It is the simplest for measuring the angle below the two faces of the component

Their consists of protractor which is used to measure the angles

1) Vernier

2) Optical

VERNIER BEVEL PROTRACTOR:

It consists of a base plate to the main body and adjustable blade which is attached to the circular plate. A vernier scale is provided on the main scale the adjustable scale is capable of rotating freely about the center of the main scale and it can be locked at position by lock nut. It is capable of measuring 0 to 360 deg. The main scale on the disc is graduated in degrees of arc. The vernier scale has 12 divisions on each side of centre zero.

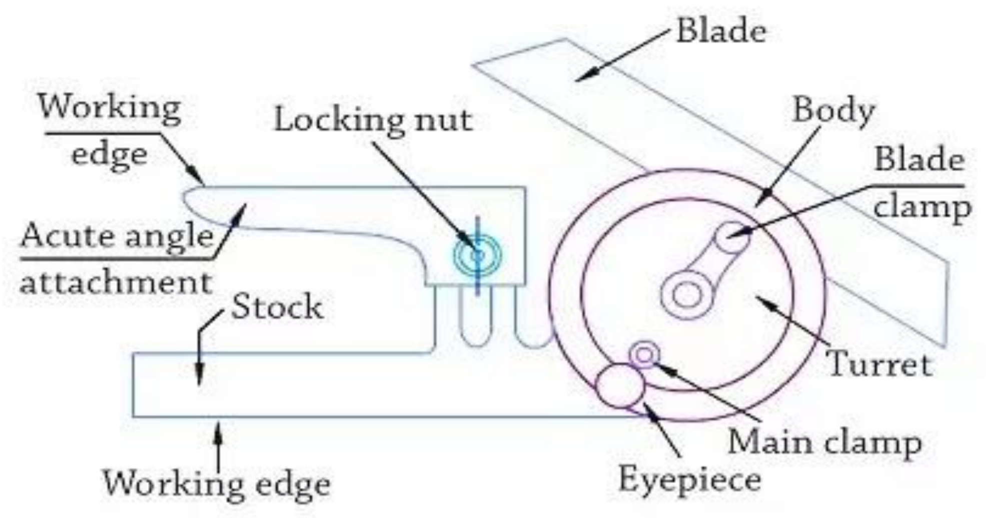
Each division on the vernier scale

= 5pow1 of arc which is the least count of vernier scale

The reading of vernier bevel protractor = MSR+(VSR X LC)mm

OPTICAL BEVEL PROTRACTOR:

A recent development of vernier bevel protractor is optical bevel protractor. In this instrument a glass ole is divided at 10pow1 of arc intervals throughout 360deg and this glass ole is fitted inside the main body. A lens is fitted through which measurements are taken from the glass ole. With the help of the optical bevel protractor it is possible to read 5pow1 of arc 1.e., LC of this instrument is 5pow-1



Optical bevel protractor

PROCEDURE:

1. Place the adjustable blade on the component
2. Tight the blade using lock nut
3. Take the main scale reading
4. Take the vernier scale reading from vernier scale which is fixed on the main scale through lens

Calculate the Angle of the given specimen-1

S.NO	MSR0(mm)	VSR’	VPSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				
5				

Calculate the Angle of the given specimen-2

S.NO	MSR0(mm)	VSR'	VPSR X LC	TR= MSR + (VSR X LC) mm
1				
2				
3				
4				
5				

RESULT:

The experiment is conducted an optical bevel protractor and angle of given specimen is determined

CONCLUSION:

The angle of given specimen is ___________________

SINE BAR

AIM:

To find the angle of inclination of the work surface

APPARTUS:

Sine Bar, Height Gauge, Slip Gauges and Surface Plate.

THEORY:

Measurement of angles using bevel protractor is direct, where as sine bar make direct measurements sine bars frequently used in conjunction with slip gauges for setting of angles and of tapers from a horizontal surface. Preferably a clean surface plate. The accuracy attainable with this instrument is quite high and errors in angular measurement are less than 2 seconds angle up to 45 degrees.

The most common type of sine bar consists of an accurately lapped steel bar which is stepped at the ends, with a roller secured in to each step by a screw which holds it in contact with both faces of the step.

A sine bar is specified by the distance between the centers of two rollers i.e. 100mm or 250mm for accurate measurements, the following points its construction are measured.

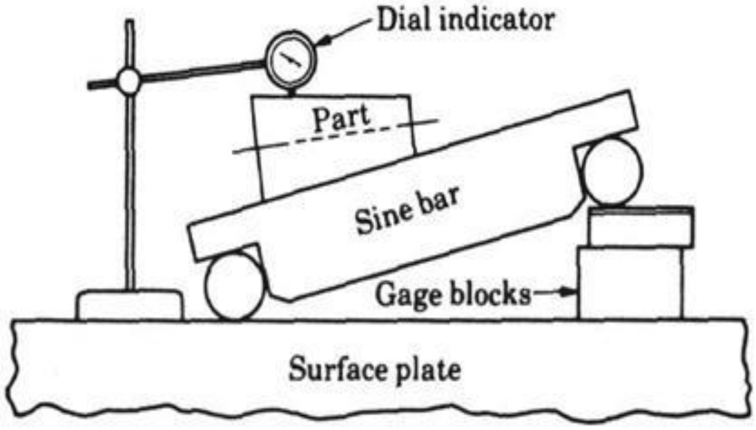
1. First keep the sine bar on the inclined surface
2. Find height of the upper roller by using an height
3. Then and the height of the other bottom roller by using an height gauge let it be (h1)
4. Then find the angle of roller center must be absolutely parallel with bottom

PROCEDURE:

1. First keep the sine bar on the inclined surface
2. Find height of the upper roller by using on height gauge let it be (h_2)
3. Then find the height of the other bottom roller by using a height gauge. Let it be (h_1)
4. Then find the angle of given inclined surface by using a formulae

Sin = h_2- h_1 /L

Where L: distance bah the center of the roller of sine bar



RESULT: Angle of inclination of the given inclined surface.

Exp-11 (VIVA QUESTIONS)

Bevel protractor Post Viva Questions:

1. Which is instrument used to find the effective diameter very accurately

2. Name the instrument used to find the screw thread parameters

3. What is error?

4. Mention the two important requirements of measurements

5. Why we use Sine bars to find angles?

6. What are the sources of errors in sine bars?

7. Write down the applications of bevel protractor

8. What is the major difference between Sine bar, Bevel protractor & Clinometers?

9. Explain the principle of Wheatstone bridge

Sine bar Post viva Questions:

1. What is the major difference between Sine bar, Bevel protractor & Clinometers?

2. Explain the use of Sine Center?

3. Define: i) Major Dia ii) Effective Dia iii) Pitch iv) Angle of Thread.

4. Explain the three uses of sine bars

5. What are the major errors in screw thread?

6. Types of screw thread?

7. What are the types of pitch errors found in screws?

Experiment No. 12

TOOL ANGLE GRINDING WITH TOOL AND CUTTER GRINDER

AIM:

To Study about the angle grinding with tool and cutter grinder on the given work piece for the given dimensions.

INTRODUCTION:

An angle grinder, also known as a side grinder or disc grinder, is a handheld power tool used for cutting, grinding and polishing. Angle grinders can be powered by an electric motor, petrol engine or compressed air. The motor drives a geared head at a right-angle on which is mounted an abrasive disc or a thinner cut-off disc, either of which can be replaced when worn. Angle grinders typically have an adjustable guard and aside-handle for two-handed operation. Certain angle grinders, depending on their speed range, can be used as sanders employing a sanding disc with a backing pad or disc. The backing system is typically made of hard plastic, phenolic resin, or medium-hard rubber depending on the amount of flexibility desired.

REQUIREMENTS:

1. GrindingMachine

2. WorkPiece

3. Grinding Wheel

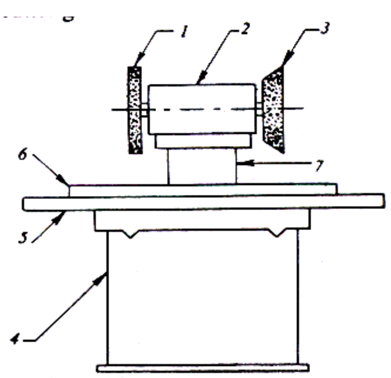
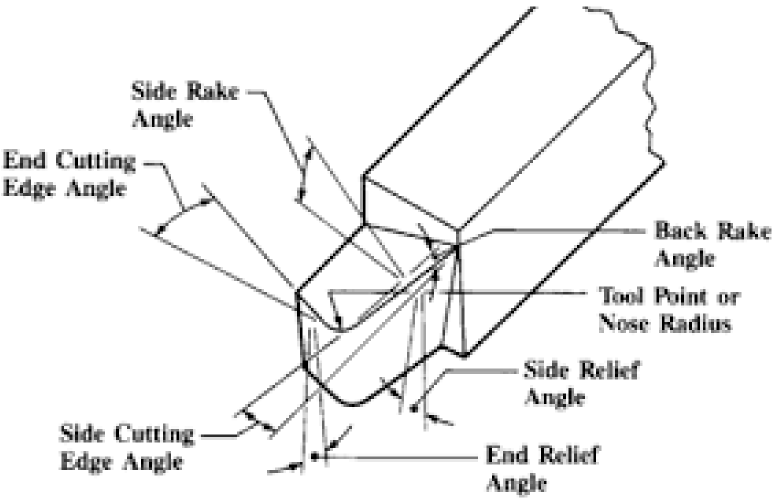


Figure 10.11 Block diagram of a tool and cutter grinder



PROCEDURE:

- At first work piece is placed in the magnetic chuck.
- The work piece should be light weights othatit cannot be removed from the magnetic chuck easily.
- Various arrangements regarding the positions of work piece is done.
- Grinding wheel and grinding spindle are kept in position with the work piece.
- Before switching on them or, necessary steps should taken.
- For proper grinding process wheel speed, work speed, transverse speed of the wheel in feed, area of contact is to be noted.
- While running the area of contact is adjusted accordingly to the spindle in order to remove the surface.
- It is done slowly to remove the material s on all surface of the work piece.

Result:

To Study about the angle grinding with tool and cutter grinder on the given work piece for the given dimensions.

Exp-12 (VIVA QUESTIONS)

1. What is tool signature?
2. What are the causes of wheels glazing?
3. What are the differences between orthogonal cutting & oblique cutting?
4. What are the differences between ASA & ORS system?
5. What are the differences between wheel dressing & wheel truing?
6. What are the tool angles in a single point nomenclature?
7. What is front rake angle?
8. What do you mean by side rake angle?
9. Explain about clearance angle?
10. What do you mean by anti-friction ball bearings?
11. What are the various types of grinding wheels?
12. How back rake of a turning tool is measured ?
13. When normal rake and orthogonal rake of a turning tool will be same .
14. A cutting tool can never have its
15. Orthogonal clearance and side clearance of a turning tool will be same if its perpendicular cutting edge angle is
16. Inclination angle of a turning tool is measured
17. The angle between orthogonal plane and normal plane of a turning tool is
18. The value of side rake of the turning tool of geometry.
19. Shaping grey cast iron block will produce
20. The value of chip reduction coefficient, ζ does not depend upon
21. What are the characteristic features of a universal cylindrical grinder?
22. State the basic advantage of a creep feed grinder over a conventional grinder?
23. Write the properties of tool materials?
24. Write types of tool materials?
25. What is the composition of HSS?
26. Why you’re adding vanadium in HSS?
27. Writes types of tools used in lathe operation?

28. Write the nomenclature of single point cutting tool?
29. When negative rake angle should be given?
30. When zero rake angle is used?
31. Define the rake angle of the tool?
32. Define the standard form of ASA method?
33. Define the standard form of ORS method?
34. Is it necessary make the rake angles in the tool grinding?
35. Define the different types of clearance angles in the tool grinding?
36. Which materials required zero rake angle tools?
37. Which role maintain the chromium in the HSS tool?
38. What is the material composition of carbide tool?
39. Define the nose radius?
40. What is back rake angle?