MACHINE TOOLS & METROLOGY 23MEC356L

SITAMS	MACHINE TOOLS AND METROLOGY LABORATORY	SUBJECT CODE:23MEC356L

INDEX

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1	Step turning and taper turning on given work piece using lathe machine.					
2	Drilling ,Tapping and Surface grinding operation on a given work piece.					
3	Shaping operation on given work piece using Shaping machine.					
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Signature of the faculty in-charge

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CO ATTAINMENT

Experiment Name	Knowledge	Analysis	Design	Complex Analysis & Conclusion	Use ofmodern tools	Communication ability	Ethics	Individual / Team work	Life Long Learning
	CO1	CO2	CO3	CO4	CO5	C06	C07	C08	C09
Step turning and taper turning on given work piece using lathe machine.									
Drilling ,Tapping and Surface grinding operation on a given work piece.									
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Alignment test on Lathe machine									
Alignment test on Drilling machine									
Alignment test on Milling machine									
Average									

Signature of the faculty in-charge

Ex. No: **Ex. Date:**

TAPER TURNING OPERATION BY USING A LATHE

AIM

To machine given work piece by taper turning operation using a lathe machine.

MATERIALS REQUIRED

Mild steel polished round rod of _____mm

TOOLS REQUIRED

1. Lathe machine
2. Steel Rule
3. Cutting tool
4. Vernier Calipers
5. Outside Calipers
6. Spanner

FORMULA

1. The taper angle is calculated using the following formula:

$$\text{Taper angle } (\propto) = \tan^{-1}\left(\frac{D-d}{2l}\right)$$

Where

D = large diameter of taper in mm d = small diameter of taper in mm l = length of tapered part in mm

$\dot{\alpha}$ = angle of taper

2) Time taken for taper turning:

$$T = \frac{\text{Length of the cut}}{\text{[Feed x rpm]}} \times \text{Number of cuts}$$

Where,

Depth of the cut should not exceed 4mm Cutting speed, S = 75 mm/rev Maximum feed, f = 0.05mm/rev

Rpm, N = [1000×S/ π × D]

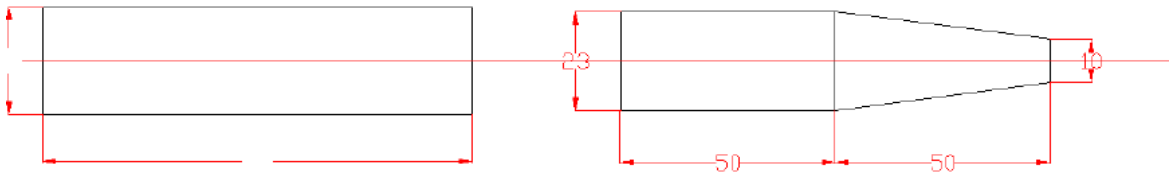
PROCEDURE:

1. The given work piece is held firmly in a lathe chuck.
2. The cutting tool is set in a tool post such that the point of the Cutting tool coincides with the lathe axis.
3. The machine is switched on to revolve the work piece at the selected speed.
4. By giving Cross feed and longitudinal feed to the cutting tool, the facing and turning operations are done respectively.
5. The compound rest is swiveled for the calculated taper angle.
6. By giving angular feed to the cutting tool through the compound slide the taper turning operation is done.
7. The machine is switched off.
8. The work piece is removed from the chuck and all the dimensions are measured and checked.

EX NO: TAPER TURNING

GIVEN JOB

FINISHED JOB



ALL THE DIMENSIONS ARE IN'mm'

CALCULATIONS:

1) Taper angle calculation:

$$\text{Taper angle } (\propto) = \tan^{-1}\left(\frac{D-d}{2l}\right)$$

=

RESULT

MACHINING WITH DRILLING MACHINE

Exp.No: **Date:**

Drilling - Tapping and Reaming

AIM:

To perform drilling, tapping and reaming operations on the given work piece according to the given dimensions.

REQUIRED MATERIAL:

M.S. Flat of 50 x 50x 5 mm^3.

REQUIRED TOOLS:

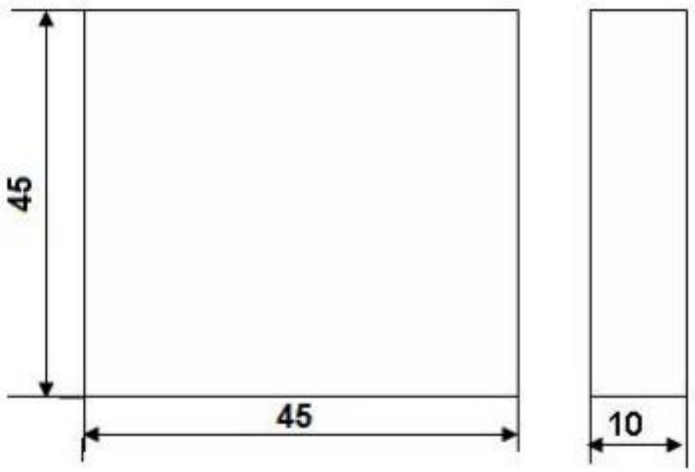
1. Vernier height gauge
2. V-block and Steel rule
3. Dot punch and ball peen hammer
4. Drill bits of diameters 4.5 mm, 8.5 mm & 14 mm
5. Taps of diameter 5mm, 10mm and 16mm.

SEQUENCE OF OPERATIONS:

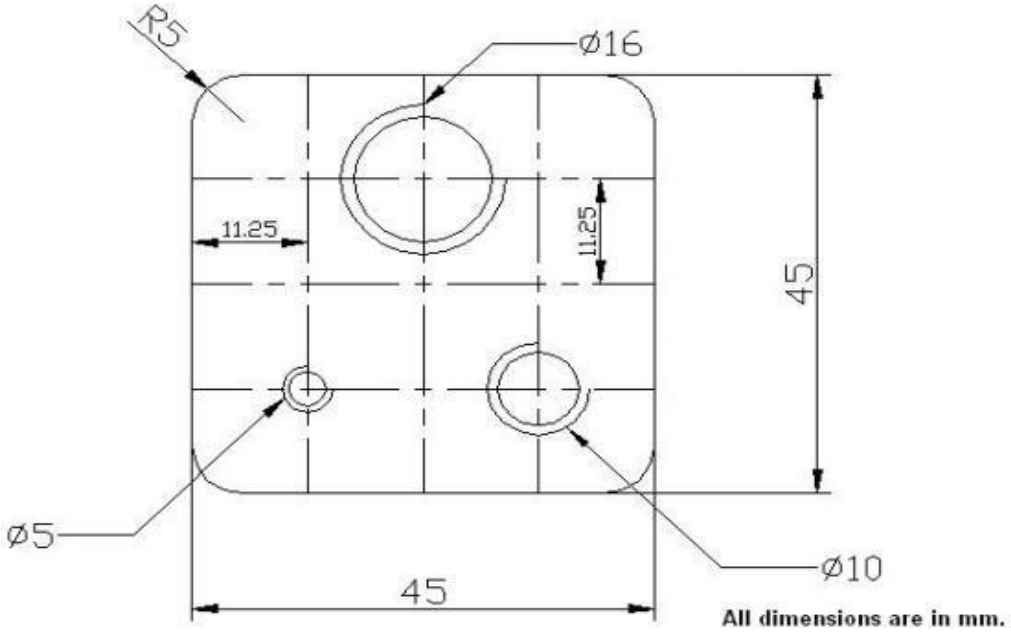
1. Checking the raw material
2. Marking and sawing
3. Marking on the flat
4. Drilling
5. Tapping
6. Grinding the corners
7. Surface grinding

DIAGRAM:

Given Work Piece:



Required Work Piece:



PROCEDURE:

1. The surface of the given work piece is the first smoothened by filing.
2. Then chalk is applied on its surface and marking should be done as per the required dimensions.
3. Cut the four corners of the work piece by using cold chisel.
4. Grind the four corners of the work piece to the required shape by using bench grinder. • Grind the four sides of the work piece.
5. Drilling operation is performed to make different sizes of holes by using drilling machine.

PRECAUTIONS:

1. Ensure cooling of work and blade while sawing the work through the supply of proper cutting fluids.
2. Use properly sharpened drills for drilling to the right specifications.
3. Work piece must be held rigidly on the drilling machine.
4. Axis of spindle, adapter, and tool should be coinciding.
5. The wheel should be correctly mounted in the spindle and enclose by a guard.
6. The wheel speed chosen should be proper.
7. Never grind on the side of a grinding machine.

RESULT:

Exp.No: **Date:**

. Surface Grinding

AIM:

To perform Surface grinding operations on the given work piece according to the given dimensions.

MATERIAL REQUIRED:

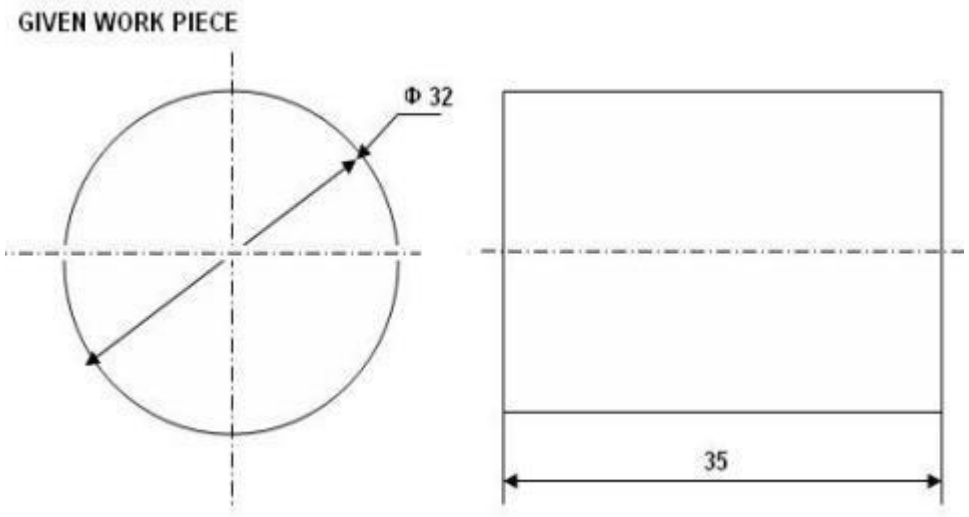
M.S. rod Dia _____mm.

SEQUENCE OF OPERATIONS:

1. Checking the raw material
2. Marking and Cutting
3. Fixing
4. Surface Grinding machine

DIAGRAM:

Surface Grinding Machine:



PROCEDURE:

1. The surface of the given work piece is the first smoothened by filing.
2. Fix the job in the magnetic work holding fixture.
3. Switch on the coolant supply Pump.
4. Switch on the motor to which the grinding wheel is connected.
5. Rotate the feed controls as requirements of the job.
6. Grinding operation is performed in surface grinding Machine.

PRECAUTIONS:

1. Grinding wheel should be rigidly fixed.
2. Work piece must be held rigidly on the Grinding machine.
3. Check the coolant pump and switch it on.
4. The wheel should be correctly mounted in the spindle and enclose by a guard.
5. The wheel speed chosen should be proper.
6. Never grind on the side of a grinding machine.

RESULT:

MACHINING WITH SHAPER MACHINE

MACHINING WITH SHAPER MACHINE

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 Shaping machine.

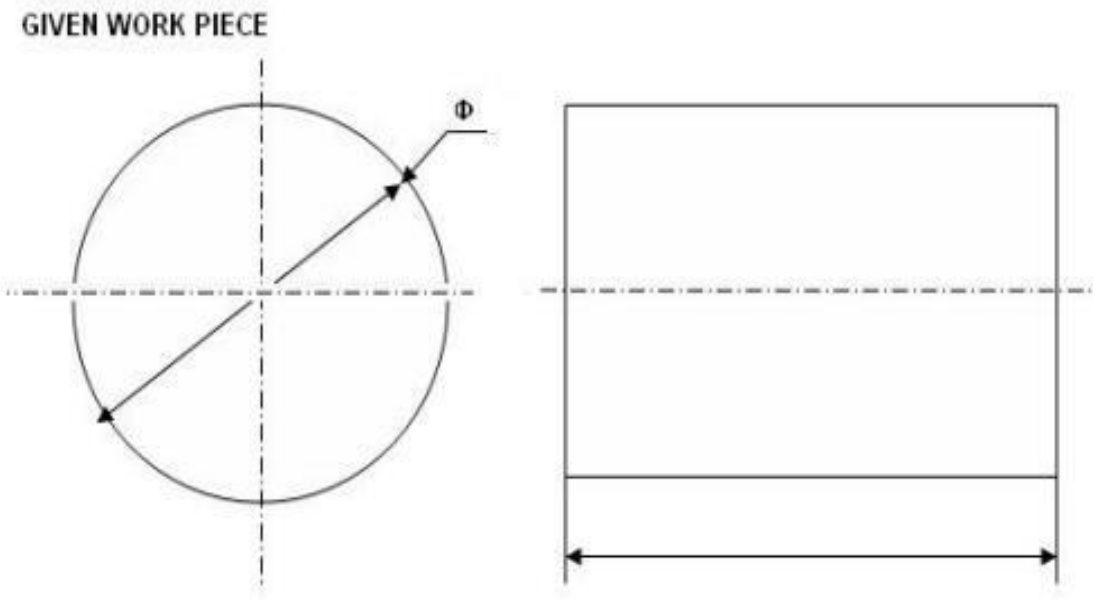
MATERIAL REQUIRED:

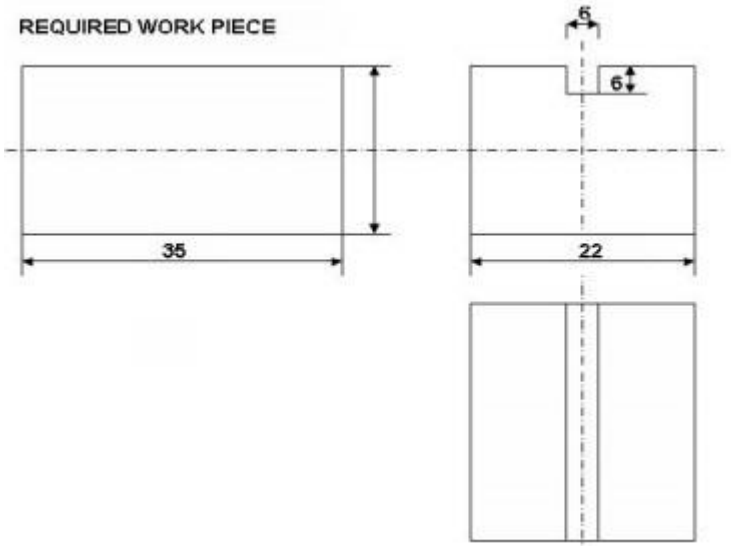
M.S. Cylindrical rod of _____mm diameter and_____mm length.

TOOLS REQUIRED:

1. Steel rule, dot punch
2. Ball peen hammer
3. Surface gauge and scriber
4. Vernier height gauge
5. V-block
6. surface plate
7. H.S.S.Single point cutting tool.

DIAGRAM:





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. • Never attempt to adjust a machine while it is in rotation.

7. Suitable feeds and depth of cut should be maintained uniformly.
8. Apply cutting fluids to the tool and work piece properly.
9. Always feed will be given to the tool in the backward stroke only.

RESULT:

Exp No. **Date:**

. CONTOUR MILLING USING MILLING MACHINE

AIM:

To study the contour milling using vertical milling machine on a work piece

TOOLS REQUIRED:

1. Vernier calipers
2. Contour milling cutter
3. Steel rule, scriber
4. Work holding fixtures: work piece supporting fixtures
5. Miscellaneous tools: Hammer, brush, Allen keys

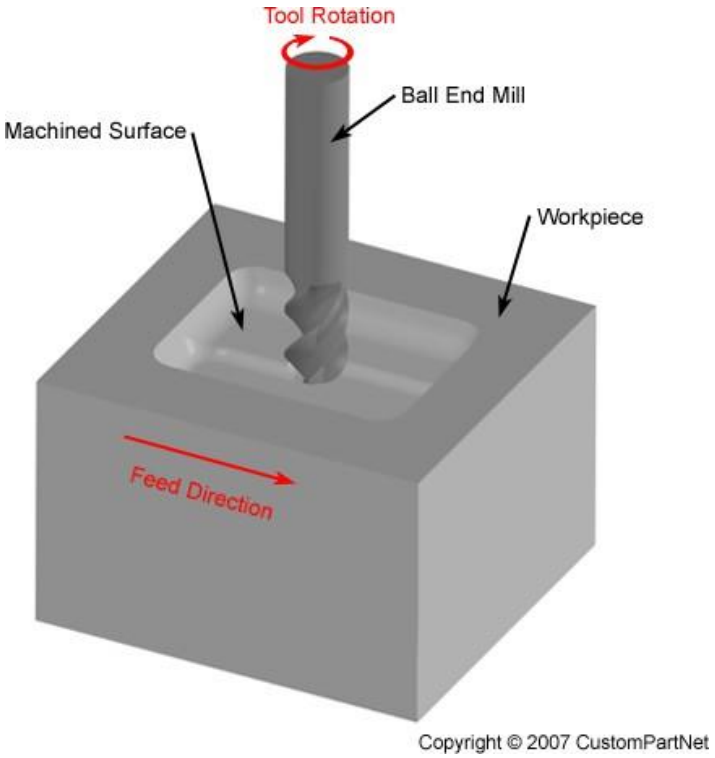
MATERIAL REQUIRED:

Cast Iron

SURFACE CONTOURING

The end mill, which is used in surface contouring has a hemispherical end and is called ball- end mill. The ball-end mill is fed back and forth across the work piece along a curvilinear path at close intervals to produce complex three-dimensional surfaces. Similar to profile milling, surface contouring require relatively simple cutting tool but advanced, usually computer-controlled feed control system.

DIAGRAM:



PROCEDURE

1. Set up the contour milling cutter in the vertical milling machine.
2. Set up workpiece on the work holding fixture.
3. Select a contour milling profile as shown in figure. Start the milling machine spindle and move the table up until the cutter just touches the work piece.
4. Set the micrometer collar on the vertical feed hand wheel to zero, then hand feed the table up toward the cutter slightly less than the whole depth.
5. Perform the milling operation until the required contour milling profile iss obtained.
6. Check the contour profile with a caliper as described previously.
7. The burrs if any along the edges are removed with the help of the flat file.

CALCULATIONS:

PRECAUTIONS

1. The milling machine must be stopped before setting up or removing a work piece, cutter or other accessory
2. Never stop the feeding of job when the cutting operation is going on, otherwise the tool will cut deeper at the point where feed is stopped.
3. All the chips should be removed from the cutter. A wiping cloth should be placed on the cutter to protect the hands. The cutter should be rotated in the clockwise direction only for right handed tools.
4. The work piece and cutter should be kept as cool as possible (i.e. coolant should be used where necessary to minimize heat absorption).
5. The table surface should be protected with a wiping cloth.
6. Tool must be mounted as close to the machine spindle as possible.

Result:

CALIBRATION OF FOLLOWING MEASURING INSTRUMENTS USING SLIP GAUGES
a) VERNIER CALIPER b) MICROMETER

Ex.No. **Date:**

AIM

To calibrate the given Vernier Caliper / Micrometer using Slip Gauge

APPARATUS REQUIRED

1. Surface Plate
2. Vernier Caliper/ Micrometer
3. Slip Gauge set

SPECIFICATION

Vernier caliper	Range:	L. C:
Micrometer	Range:	L. C:

FORMULAE

Vernier Least Count = 1 Main Scale Division – 1 Vernier Scale Division Vernier Scale Reading = Vernier Scale Coincidence X Least Count Total Reading = Main Scale Reading + Vernier Scale Reading

Error = Slip gauge reading - Total reading

Micrometer Least Count = Pitch Scale Division / Number of Threads

Pitch Scale Division = Distance Moved / Number of Rotation Pitch Scale Reading = Pitch Scale Coincidence x Least Count Total Reading = Head Scale Reading + Pitch Scale Reading

Error = Slip gauge reading - Total reading

$$\% \text{ Error} = \frac{\text{Error}}{\text{Actual reading}} \times 100$$

SLIP GAUGES

They are rectangular blocks hardened and carefully stabilized. The surfaces are highly polished to enhance wringing. It is used as a reference standard for transferring the dimensions of unit of length from primary standard. It is generally made up of high carbon, high chromium hardened steel.

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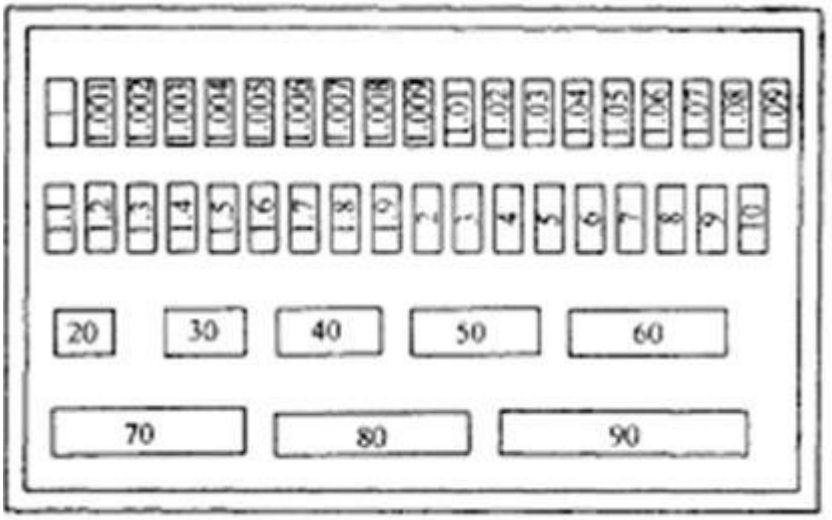
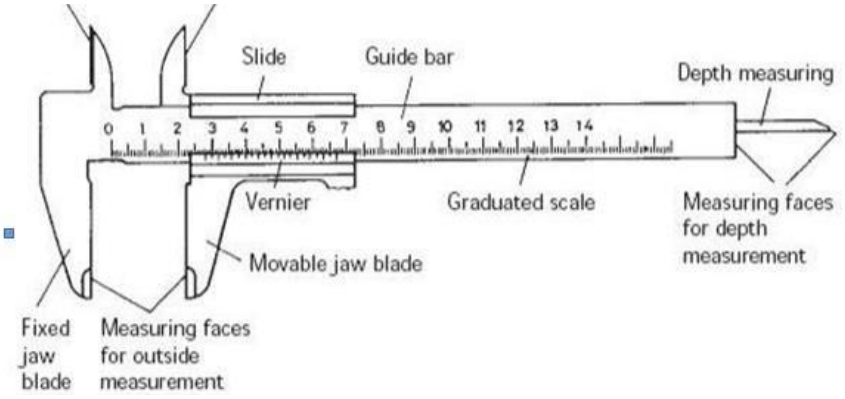


Fig. Set of Slip Gauges

PROCEDURE FOR CALIBRATION

1. The measuring instrument is placed on the surface plate and set for zero
2. Clean the Vernier caliper's fixed and movable jaws and slip gauges to be measured with a fine cotton cloth
3. Vernier is checked for zero error.
4. Slip gauge is clamped between the jaws and the vernier scale is tighten by screws
5. Main scale and vernier scale coincidence are noted for 5 different slip gauges
6. Calculate the error and percentage error
7. Plot the graph between

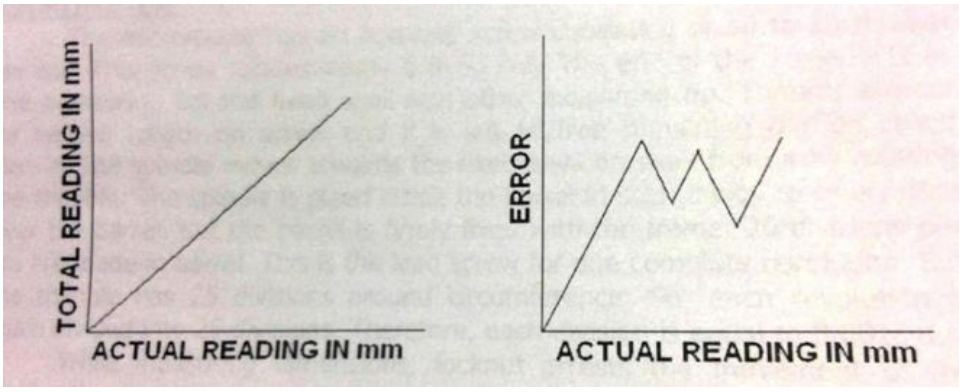


(i) Slip gauge reading vs Total reading (Vernier caliper) (ii) Slip gauge reading vs Error

TABULATION

Least count of Vernier caliper = 0.02 mm							
S. No.	**Slip Gauge Reading**	**Vernier caliper Reading**				**Error**	**% of Error**
		MSR	**VSC**	**VSR=VSCxLC**	**TR =(MSR+VSR)**		
1.							
2.							
3.							
4.							
5.							

MODEL GRAPH



RESULT

Thus the vernier caliper was calibrated using slip gauges

Error range =_____ mm

MICROMETER

The micrometer has an accurate screw having about 10 to 20 threads/cm and revolves in a fixed nut. The end of the screw is one tip and the other is constructed by a stationary anvil.

Uses:

- Outside micrometer is used to measure the diameter o f solid cylinder.
- Inside micrometer is used to measure the internal diameters of hollow cylinders and spheres.

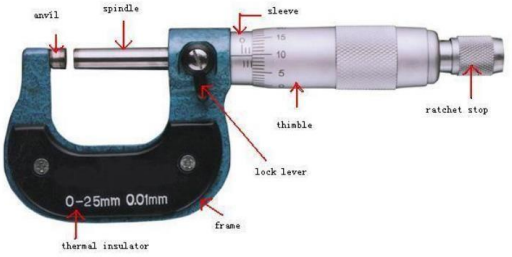


Fig: Micrometer

PROCEDURE FOR CALIBRATION

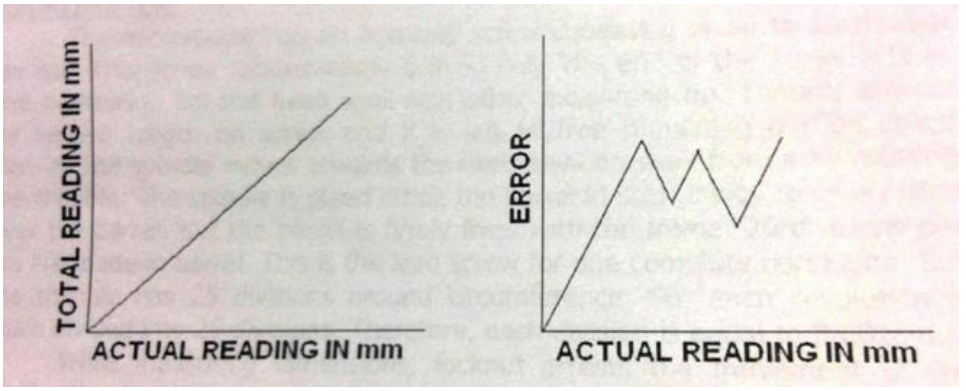
1. The measuring instrument is placed on the surface plate and set for zero
2. Clean the Micrometer‘s anvil, spindle and slip gauges to be measured with a fine cotton cloth
3. Micrometer is checked for zero error
4. Slip gauge is clamped between the anvil and spindle by using friction or ratchet drive
5. Head scale reading and Pitch scale coincidence are noted for 5 different slip gauges
6. Calculate the error and percentage error
7. Plot the graph between

(i) Slip gauge reading vs Total reading (Micrometer) (ii) Slip gauge reading vs Error

TABULATION

Least count of Micrometer = 0.01 mm							
S. No.	**Slip Gauge Reading**	**Micrometer Reading**				**Error**	**% of Error**
		HSR	**PSC**	**PSR=PSCxLC**	**TR =(HSR+PSR)**		
1.							
2.							
3.							
4.							
5.							

MODEL GRAPH



MEASUREMENTS OF INSIDE DIAMETER USING INSIDE MICROMETER

Ex.No. **Date:**

Aim:

To determine inside diameter of a given hollow specimen.

Apparatus Required:

1. Surface Plate,
2. Inside micrometer,
3. Hollow specimen.

SPECIFICATION

Inside Micrometer Range: L. C:

INSIDE MICROMETER

Pitch Scale Reading = Pitch Scale Coincidence x Least Count

Total Reading = Head Scale Reading + Pitch Scale Reading

STUDY SURFACE PLATE

The foundation of all geometric accuracy and indeed of all dimensional measurement in workshop is surface plate. It is a flat smooth surface sometimes with leveling screws at the bottom.

Uses:

- It is used as a base in all measurements.

MICROMETER

It is one of the most common and most popular form of measuring instrument for precious measurement with 0.001mm accuracy are also available.

Uses:

- Inside micrometer is used to measure the internal diameters of hollow cylinders and spheres.

Fig. Inside Micrometer

PRINCIPLE:-

Micrometer works on the principle of screw and nut. When screw is turned through nut one revolutions 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 the thread.

L.C= Pitch of the spindle/ No of divisions on the spindle

PROCEDURE:-

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

2. The next step is to check it for zero error. In case of inside micrometer, the zero error is checked by inserting gauge standard 5mm hole within faces of fixed anvil and the spindle.
3. The barrel has graduation , in travels of 1mm above the reference line.

4. For measuring the dimension, hold work b/w faces of the anvil the spindle by rotating then touches the work piece
5. Take the thimble reading with coincides with the reference line on the sleeve.

Total reading = MSR + (PSR X LC)mm

PRECAUTIONS:-

1. First clean the micrometer by wiping off dirt, fit, dust grit off it.
2. Clean them with a piece of cloth or paper
3. Set zero readings on instrument before measure

TABULATION

Least count of Micrometer = 0.01 mm

S. No.	Micrometer Reading			
	Head Scale Reading(HSR)	**Pitch Scale Coincidence**	**Pitch Scale**	**Total Reading**
1.				
2.				
3.				
4.				
5.				
6.				

RESULT:-

The experiment is used to find the inner diameter of the hollow specimen of given specimen

The inner diameter of the hollow specimen is ---------- mm

TAPER ANGLE MEASUREMENT USING SINE BAR AND SLIP GAUGE

Ex.No. **Date:**

AIM To measure the taper angle of the given specimen using sine bar

APPARATUS REQUIRED

1. Surface plate,
2. Dial gauge with stand,
3. Sine bar,
4. Slip gauge,
5. Specimen.

SPECIFICATION

Sine bar: Range:

FORMULA

$$\sin \theta = h/l$$

Where, θ = Taper angle
h = total height (thickness) of the slip gauges in mm l = standard length of the sine bar in mm = 200mm

STUDY

SURFACE PLATE

The foundation of all geometric accuracy and indeed of all dimensional measurement in workshop is surface plate. It is a flat smooth surface sometimes with leveling screws at the bottom.

Uses:

It is used as a base in all measurements.

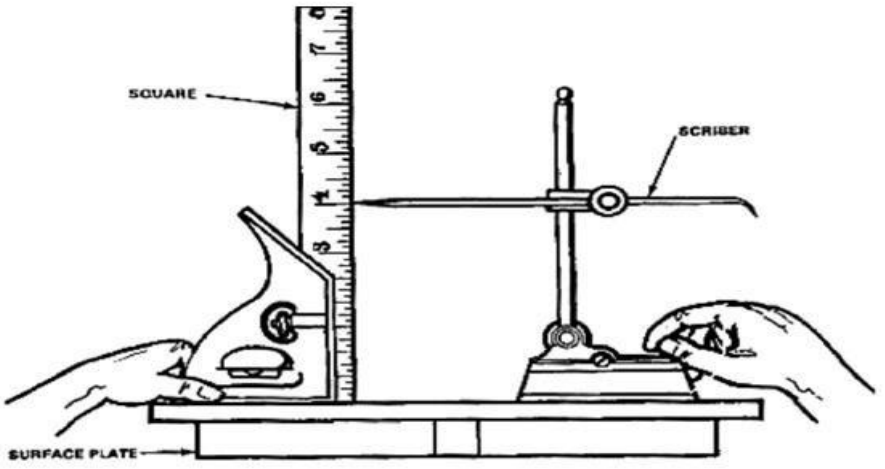


Fig. Surface Plate

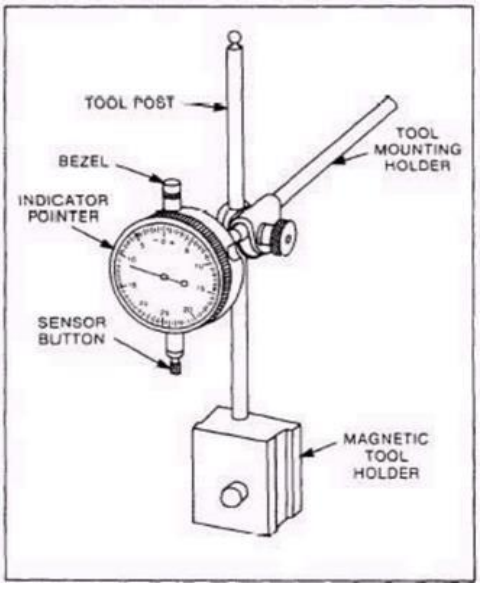
DIAL GAUGE

The dial gauge has got 2 hands. The short hand reads in mm. One complete revolution of long hand reads one mm. The plunger of the dial gauge has to be placed on the surface whose dimension has to be read.

Least Count = One division of the circular scale with long hand.

Uses:

It is used as a mechanical comparator.



SINEBAR

A sine bar consists of a hardened, precision ground body with two precision ground cylinders fixed at the ends. The distance between the centers of the cylinders is precisely controlled, and the top of the bar is parallel to a line through the centers of the two rollers. The dimension between the two rollers is chosen to be a whole number (for ease of later calculations) and forms the hypotenuse of a triangle when in use.

When a sine bar is placed on a level surface the top edge will be parallel to that surface. If one roller is raised by a known distance, usually using gauge blocks, then the top edge of the bar will be tilted by the same amount forming an angle tha t may be calculated by the application of the sine rule.

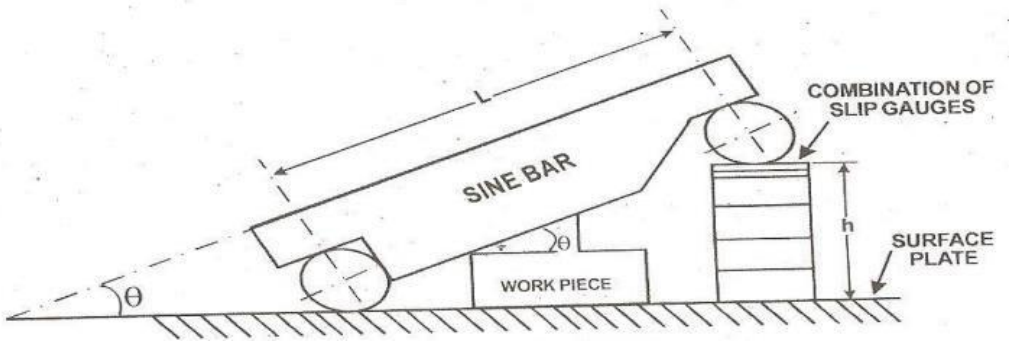


Fig. Sine bar

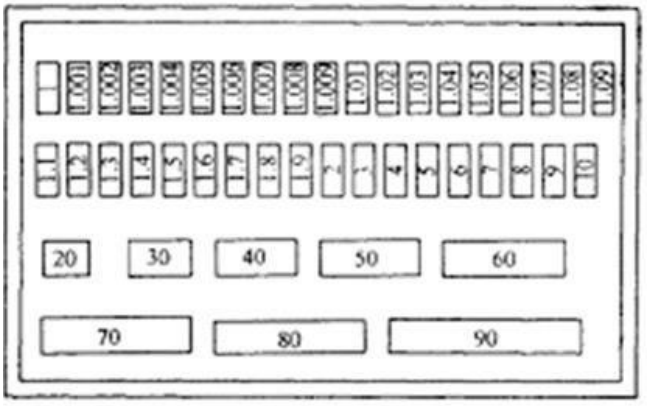


Fig. Set of Slip Gauges

PROCEDURE

1. The taper angle of the specimen is first found out approximately with the help of a bevel protractor.

2. The sine bar is set at this angle on the surface plate with the help of the slip gauges as shown in the figure.

3. The specimen is placed on the sine bar so that its top taper surface is parallel to the surface plate.

4. The parallelism is checked and adjusted by increasing or decreasing the height level of the slip gauges, so that there should be no deflection in the long hand of the digital gauge when the spindle of the dial gauge is moved over the specimen surface.

5. The total height (thickness) of the slip gauges is noted down.

6. Trial readings are taken by placing the specimen at different points of the sine bar surface.

TABULATION

S. No.	Sine bar length in mm	Height in mm	Sin θ	θ
1.				
2.				
3.				
4.				
5.				

Result:

The taper angle of the given specimen is Using sine bar =_____ degrees

---

MEASUREMENT OF DIMENSION OF GIVEN SPECIMEN USING TOOL MAKER'S MICROSCOPE

Ex.No. **Date:**

AIM

To measure the pitch &angle of the screw thread.

APPARATUS REQUIRED

1. Tool makers microscope,
2. Screw thread specimen

SPECIFICATION

Magnification : 30x (standard) Objective : 2x
Eyepiece : w.f.15x with cross rectile Field of view : 8mm. (approx) Working distance : 80mm
Observation tube : monocular inclined at 30 degree
Stand : large and heavy base provide extra overall rigidity to the Instrument Measurement stage : 150x150. size travel up to 50mm in each direction, least count 6 minutes.

STUDY

TOOL-MAKER'S MICROSCOPE

Tool makers microscope is based on the Principle of optics. The microscope consists of a heavy-duty hallow-duty hallow base, which accommodates the illuminating unit underneath, and above this on the top surface of the base, the work table carriage is supported on ball and controlled by micrometer screws. Projecting up from the rear of the base is a column, which carries the microscope unit and various interchangeable eyepieces.

Uses:

The chief applications of the tool room microscope are as follows

1. The determination of relative position of various points on work.
2. Measurement of angle by using a protractor eyepiece.
3. Comparison of thread forms with master profiles engraved in the eyepiece, measurement of pitch and effective diameter.

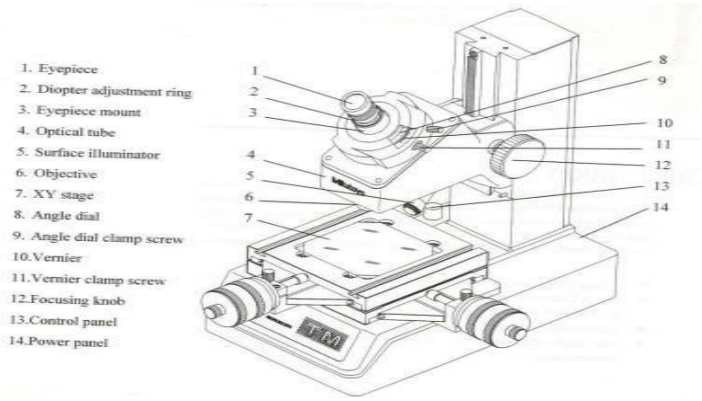


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Fig. Tool makers microscope

Eyepiece Protractor

This unique protractor head graduated 0 to 360 degree with adjustable vernier reading to 6 minutes cross line incorporated in the protractor head rotating in the optical axis of the microscope the cross line graticule is replaceable with many other measuring graticules.

Measuring Stage

The stage plate is of 150 X 150 mm having very smooth and precise movements in both axis with special ball racers arrangements. The travel of the stage is 25mm. in both direction with precise imported micrometer head, least count 0.01 or 0.005mm

Rotary Stage

A rotating stage is fixed in T-slots of square plate having 360 degree graduations on its periphery with vernier reading to6 minute, and lock screw.

PROCEDURE

Measurement of screw thread pitch :

1. The image of the thread profile is set so that some of the profile coincides with the cross hair as seen on the ground- glass screen.

2. The reading on thimble of the longitudinal micrometer screw is noted down.

3. Then the part is traversed by the micrometer screw until a corresponding point on the profile of the next thread coincides with the cross hairs.

4. The reading on thimble is again noted and the difference in two readings gives the actual pitch of the screw.

Tabular Column:

Sl. No	Parameters	Tool Maker Microscope Reading		
		Initial (a)	Final (b)	Total A = a - b
1	Outside dia. (mm)			
2	inside dia. (mm)			
3	Pitch (mm)			
4	Helix angle (Degree)			

Measurement of angle of thread :

1. It is determined by rotating the screen until a line on the screen coincides with one flank of the thread profile
2. The angle of screen rotation is noted and then the screen is further rotated till the same line coincides with the other flank of thread.
3. The difference in two angular readings gives the actual angel of thread on the screw.

PRECAUTIONS

1. The coincidence on the component & cross hairs must be carefully matched.
2. Eyepieces are to be handled carefully.
3. Don‘t expose eyes directly to the light source.

RESULT:

The pitch and flank angle of the given object is measured with toolmakers microscope are tabulated.

ALIGNMENT TEST ON LATHE MACHINE

Ex.No. **Date:**

AIM:-

To perform the alignment test on milling.

APPARATUS:-

Gauge blocks, dial gauge, straight edges, and sprit level

LEVELING OF MACHINE:-

It is essential that a machine tool should be installed truly horizontal and vertical plane and this accuracy must be maintained. The level of machine base in longitudinal and transverse direction is tested by spirit level or precision level. The spirit level is placed at a to measure the level.

TRUE RUNNING OF MAINSPINDLE:-

The true mandrel is placed in the main spindle and test is conducted on the surface of material if dial gauge shows any deviation in the reading then it is said that the main spindle is running in the proper way.

PARALLELISM OF MAIN SPINDLE TO SADDLE MOVEMENT:-

If the axis of the spindle is not parallel to the saddle movement then it is not possible to get req. dimension of work piece while doing the operation on lathe. The spindle is moved and the deviation in the reading of dial gauge are noted.

PARALLELISM OF TAILSTOCK GUIDE WAYS TO SADDLEMOVEMENT:-

To check the parallelism of guide ways with the saddle movement in the both vertical and horizontal directions. The dial indicator is held on the spindle and block is moved simultaneously any deviation in reading of dial gauge is noted if no deviation in the reading then tail stock guide ways is parallel to saddle movement otherwise it is not parallel to saddle movement.

PARALLELISM OFTAILSTOCKGUIDEWAYSTOCARRIAGE MOVEMENT:-

To check the parallelism of guide ways with the carriage in both vertical and horizontal objections. A block is placed on the guide ways of tail stock. The dial indicator is held on the carriage and block is moved simultaneously any deviation in reading of dial gauge is noted

PARALLELISM OF MAIN SPINDLE TO CARRIAGE MOVEMENT:-

To check the parallelism of main spindle to carriage in both vertical and horizontal. The deviation is observed the spindle is not parallel to the carriage.

TRUE RUNNING OF HEADSTOCK CENTER:-

The test mandrel is placed in the head stock and test is conducted on the surface of carriage. The dial gauge shows any deviations in the reading then the head stock is not running in proper.

RESULT

The alignment on lathe machine has been conducted.

Ex.No. **Date:**

ALIGNMENT TEST ON DRILLINGMACHINE

AIM:-

To perform alignment tests on drilling machine

APPARATUS:-

Gauge blocks, dial gauge, straight edges, sprit level

FLATNESS OF CLAMPING SURFACE OF BASE:-

This test is performed by placing a straight edge on same dimension of two gauge blocks on the plate in the various dimensions. The error is noted by inserting the feeler gauge between gauge block and straight edge if clearance is noted than it is said that the base plate is not flat otherwise it is flat.

FLATNESS OF CLAMPING SURFACE OF TABLE:-

This test is performed by placing a straight edge on same dimension of 2 gauge blocks on the table in the various dimensions. The error is noted by inserting the feeler gauge between gauge blocks and straight edge otherwise it is running in proper way

PERPENDICULARITY OF DRILL HEAD GUIDE WITH BASE:-

Perpendicularity (squareness) of drill head guide with the base plate is performed by placing the frame levels on drill head guide and base plate. Th3e error is noted by nothing the difference of two frame levels. If the difference is 0 then it is said that sleeve is parallel to base plate.

TOTAL DEFLECTION:-

For this test in dial indicator is fixed on table and its feeler touches the surface of the spindle. The dynamometer or load is applied to the spindle and spindle is rotated. In this position observe the deviation of dial gauge if any deviation is noted then it is said that the spindle is deflected under load otherwise under load otherwise no deflection of spindle under load.

RESULT

The alignment on drilling machine has been conducted

ALIGNMENTTEST ON MILLING MACHINE

Ex.No. **Date:**

AIM:-

To perform the alignment test on milling.

APPARATUS:-

Gauge blocks, dial gauge, straight edges, and sprit level

TEST FOR LEVELING OF MILLING MACHINE:-

It is essential that a machine tool should be installed truly horizontal and vertical plane and this accuracy must be maintained. If milling base is not installed truly horizontal then bed will undergo a deflection and produce a simple bend.

TRUE RUNNING OF SPINDLE:-

A mandrel placed in the spindle and test is conducted on the surface of mandrel. A dial gauge is fixed on the machine table and feeler of the dial gauge is made to touch the lower surface of it clearance is noted then it is said that the table is not flat otherwise it is flat.

TRUE RUNNING OF SPINDLE:-

For this test the mandrel is p[laced in the spindle and dial indicator is fixed on the table. The feeler of dial gauge is made to touch the surface of mandrel.

PARALLELISM OF SPINDLE AXIS WITH ITS VERTICAL MOMENT:-

For this test the mandrel is placed in the spindle and dial indicator is fixed on the table. The feeler of dial gauge is made to touch the surface of mandrel also moved up and down, the mandrel also moved up and down observe any direction in the reading of dial gauge is noted then that is said that it is not running in proper way mandrel. Axis slip of main spindle is developed due to the error in bearing support for this test feeler of the dial gauge is placed on the face of main spindle and the dial gauge.

PARLLELISM (OR) TABLE SURFACE WITH LONGITUDINAL SURFACE:-

A machine is placed in the spindle and test is conducted on the surface of mandrel. If any degration is noted then it is noted then it is said that spindle is not parallel to the table.

PARALLELISM OF TABLE SURFACE WITH MAIN SPINDLE:-

A mandrel is placed in the spindle and test is conducted on the surface of mandrel. A dial gauge is fixed on the table and feeler is touched to the spindle. If any deviation takes place the spindle is not machined to the table.

PARALLELISM OF TABLE SURFACE WITH ARBOR:-

Arbor is placed in the spindle and test is conducted on the surface of order. If any degrading is noted than it is said if that arbor is not parallel to the table

RESULT

The alignment on milling machine has been conducted.