

## Subject Name & Code:

# MANUFACTURING PROCESSES-BE04000191

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### ASSIGNMENT-3: Drilling Machines (CO-2,3,4)

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**Q1. Explain the alignment test carried out on a drilling machine. Explain what is deep hole drilling.**

#### Alignment Tests for Drilling Machine:

1. **Flatness of Table:** Spirit level or straight edge + feeler gauge. Tolerance: 0.05 mm/300 mm.
2. **Squareness of Spindle Axis to Table:** Dial indicator mounted on spindle, rotated 360° on table. Tolerance: 0.05 mm/300 mm.
3. **True Running of Spindle Taper:** Dial indicator on internal taper. Tolerance: 0.03 mm TIR.
4. **Parallelism of Spindle Axis with Column Guideways:** Dial indicator on mandrel in spindle; traverse along column. Tolerance: 0.05 mm/300 mm.
5. **Perpendicularity of Table to Column:** Dial indicator on table while raising/lowering. Tolerance: 0.05 mm/300 mm.

#### Deep Hole Drilling:

- **Definition:** Drilling holes with depth-to-diameter ratio > 10:1.
  - **Challenges:** Chip evacuation difficulty, coolant access, hole straightness, drill wander.
  - **Methods:**
    - **Gun Drilling:** Single-lip drill with coolant through tool; high pressure coolant flushes chips.
    - **BTA (Boring and Trepanning Association):** Coolant around drill OD; chips exit through drill centre.
    - **Ejector Drilling:** Double tube system; chips evacuated by coolant flow.
  - **Applications:** Gun barrels, crankshaft oil holes, hydraulic cylinders.
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**Q2. Explain the specifications of a radial drilling machine with a neat sketch. Explain the difference between drilling and boring.**

#### Specifications of Radial Drilling Machine:

1. **Drilling Capacity:** Maximum hole diameter in mild steel (e.g., 50 mm).
2. **Radial Arm Length:** Distance from column centre to spindle centre max (e.g., 1500 mm).
3. **Spindle Speeds:** Range of RPM available (e.g., 50-2000 RPM).
4. **Number of Feeds:** Available feed rates (e.g., 4, 9, or 12 feeds).
5. **Spindle Travel:** Maximum vertical movement of spindle (e.g., 250 mm).
6. **Vertical Movement of Arm:** Height adjustment range along column.
7. **Motor Power:** Main drive motor rating (e.g., 3 HP).
8. **Swing:** Twice the arm length (maximum workpiece radius).
9. **Taper in Spindle:** Morse taper size (e.g., MT4).

**Diagram:**

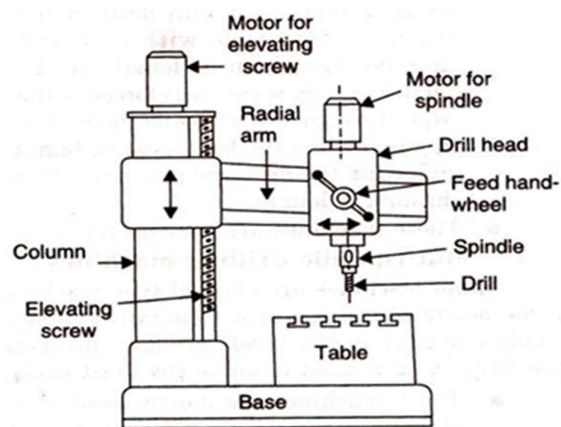


Fig.3.4 Radial Drilling Machine

**Difference Between Drilling and Boring:**

Parameter	Drilling	Boring
Definition	Producing a new hole in solid material	Enlarging and truing an existing hole
Tool Used	Drill (two cutting edges)	Boring bar with single point tool
Accuracy	Moderate (IT10-IT12)	High (IT7-IT9)
Surface Finish	Rough (3.2-12.5 $\mu\text{m Ra}$ )	Better (0.8-3.2 $\mu\text{m Ra}$ )

Parameter	Drilling	Boring
Hole Location	May drift/wander	Accurate location correction
Stock Removal	High rate	Low rate
Application	Initial hole making	Sizing, finishing, correcting alignment

**Q3. Give the differences between gang drilling and multiple drilling machines.**

Parameter	Gang Drilling Machine	Multiple Drilling Machine
Definition	Several <b>independent</b> drill heads mounted on common base/table	Single machine with <b>multiple spindles</b> driven by common power source
Spindle Operation	Each spindle operates <b>independently</b>	All spindles operate <b>simultaneously</b>
Speed/Feed	Different speeds/feeds possible for each head	Same speed/feed for all spindles
Operations	Different operations (drill, ream, tap) on same part	Same operation (multiple holes) at once
Flexibility	More flexible; can process different operations sequentially	Less flexible; designed for specific hole patterns
Production	Medium batch production	High volume mass production
Setup	Each head can be positioned individually	Fixed spindle positions

Parameter	Gang Drilling Machine	Multiple Drilling Machine
Cost	Moderate	Higher
Example Application	Progressive operations: drill, counterbore, tap sequentially	Drilling multiple bolt holes in flange simultaneously

**Q4. List out various operations carried out on drilling machine. Explain any four.**

**Operations on Drilling Machine:**

1. Drilling
2. Reaming
3. Boring
4. Counterboring
5. Countersinking
6. Spot Facing
7. Tapping
8. Trepanning

**Explanation of Four Operations:**

**1. Drilling:**

- Producing a cylindrical hole in solid material using a twist drill.
- Drill has two cutting edges and flutes for chip evacuation.
- Most basic and common operation.

**2. Reaming:**

- Sizing and finishing a previously drilled hole to accurate diameter and good surface finish.
- Reamer has multiple cutting edges along its length.
- Removes small amount of material (0.1-0.5 mm).
- Achieves tolerance IT7-IT8.

**3. Counterboring:**

- Enlarging the entrance of a drilled hole to accommodate bolt heads or washers.
- Produces flat-bottomed recess.

- Uses counterbore tool with pilot to guide on existing hole.

#### 4. Tapping:

- Cutting internal threads in a drilled hole.
- Tap is rotated and fed into hole at correct pitch.
- Can be done by hand or machine (tapping attachment with slip clutch).

#### Q5. Explain twist drill nomenclature with neat sketch.

Diagram:

