

Lecture-13

motor and bus zone protection

Topic Covered

- Motor Protection
- Thermal Overload Relays
- Plunger-type Relays
- Induction-type Relays

Motor Protection

- Timed Overload
- Locked Rotor
- Single Phase and Phase Unbalance
- Other

Motor Protection

Timed Overload

Solution:

- Thermal overload relays
- Plunger-type relays
- Induction-type relays

Motor Protection

Timed Overload Protection

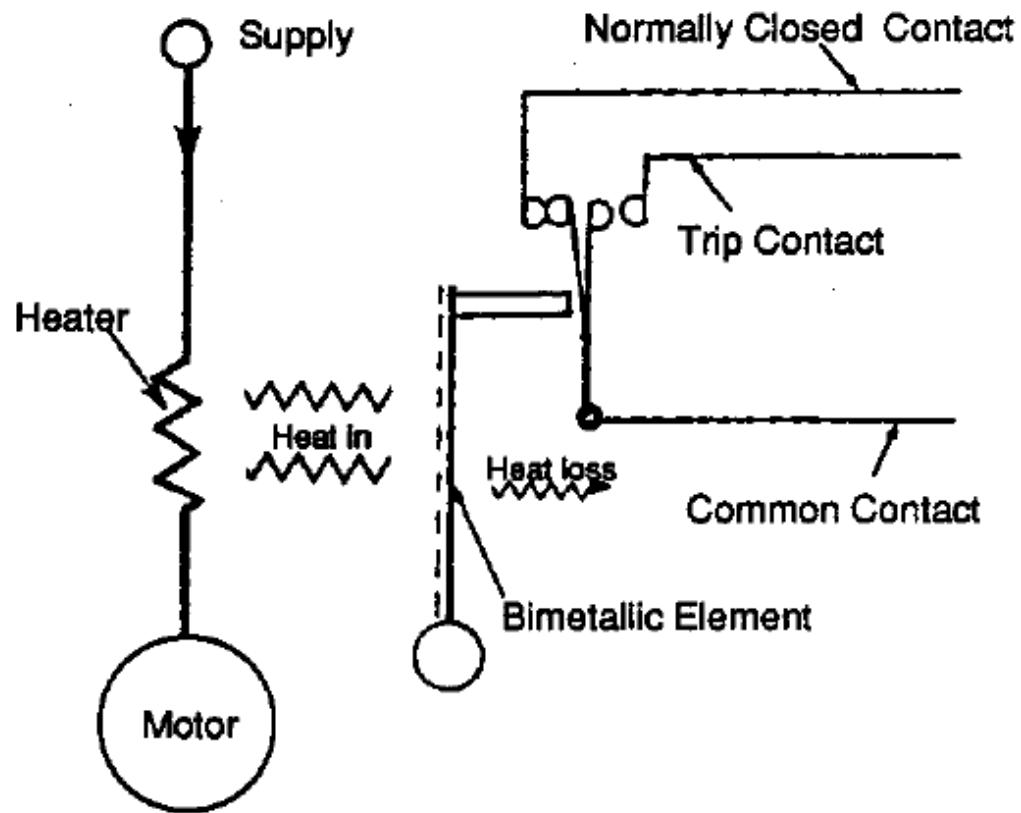
Timed Overload Definition:

Continuously operate motor above its rated value will cause thermal damage to the motor.

Thermal Overload Relays

- Use bimetallic strips to open/close relay contacts when temperature exceeds/drops to certain level.
- Require certain reaction time
- Inverse time/current relationship

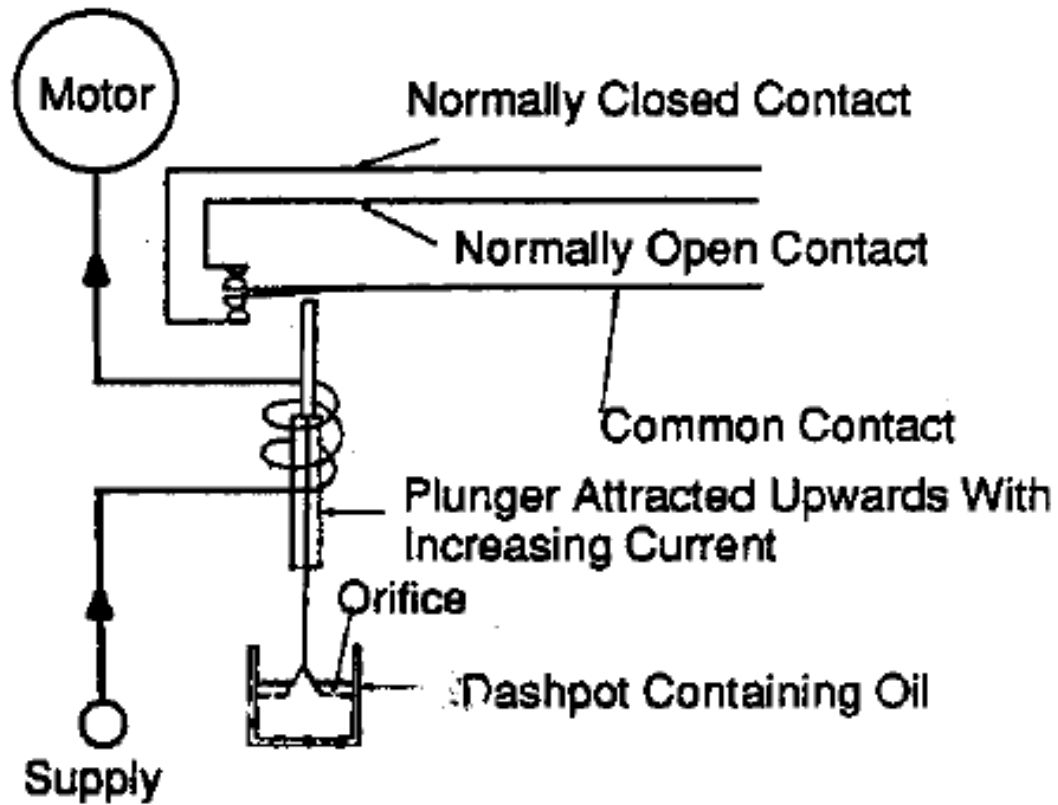
Thermal Overload Relays



Plunger-type Relays

- Fast reaction time
- Use timer for time delay
 - Such as oil dash pot.
- Inverse time/current relationship

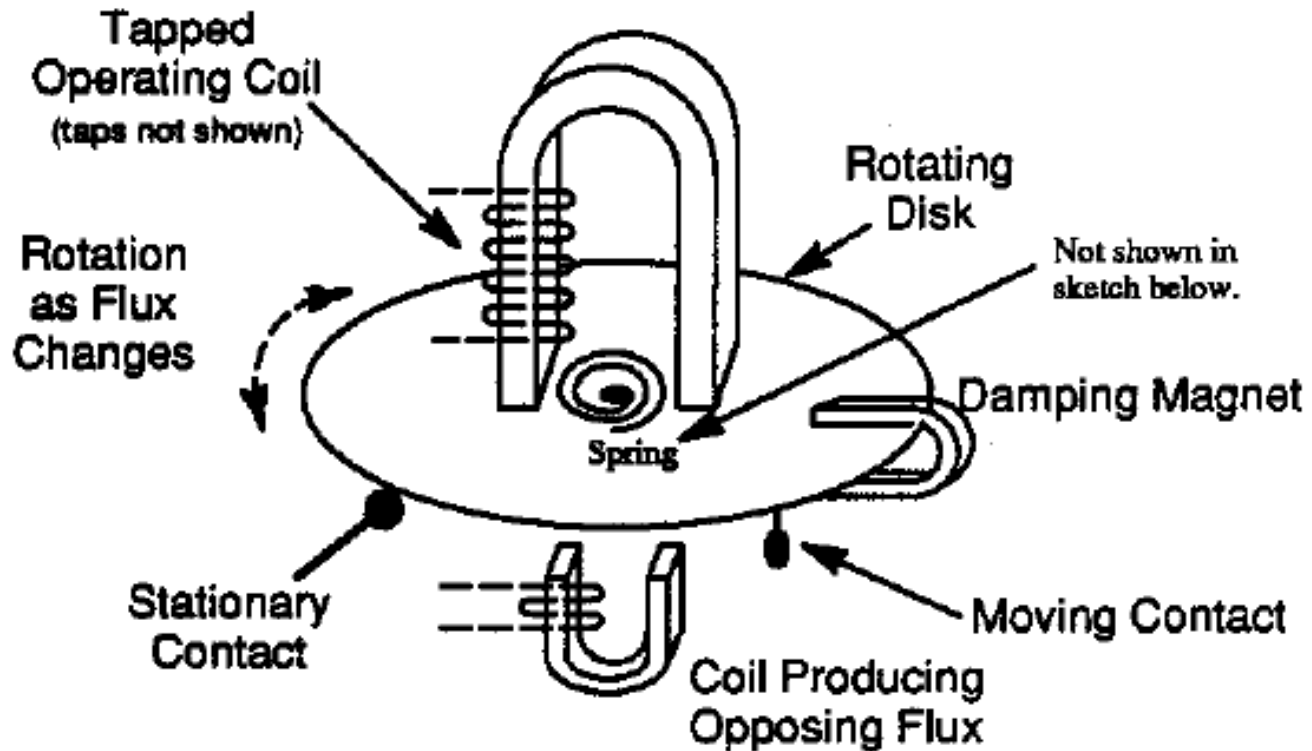
Plunger-Type Relays



Induction-type Relays

- Most frequently used when AC power presents
- Change taps to adjust time delay

Induction-Type Relays



Motor Protection

Stalling

Some Definitions...

- Motor Stalling:
 - It happens when motor circuits are energized, but motor rotor is not rotating. It is also called locked rotor.
 - Effects: this will result in excessive currents flow given the same load. This will cause thermal damage to the motor winding and insulation.

Motor Protection

Stalling

- Similar types of relays that are used for motor timed overload protection could be used for motor stalling protection.

Motor Protection

Single Phase and Phase Unbalance

Some definitions...

- Single Phase:
 - three-phase motors are subject to loss of one of the three phases from the power distribution system.

Motor Protection

Single Phase and Phase Unbalance

Some definitions...

- Phase Unbalance:
 - In a balanced system the three line-neutral voltages are equal in magnitude and are 120 degrees out of phase with each other. Otherwise, the system is unbalanced.

Motor Protection

Single Phase and Phase Unbalance

These conditions will cause

- Motor winding overheating
- Excessive vibrations
- Cause motor insulation/winding/bearing damage

Motor Protection

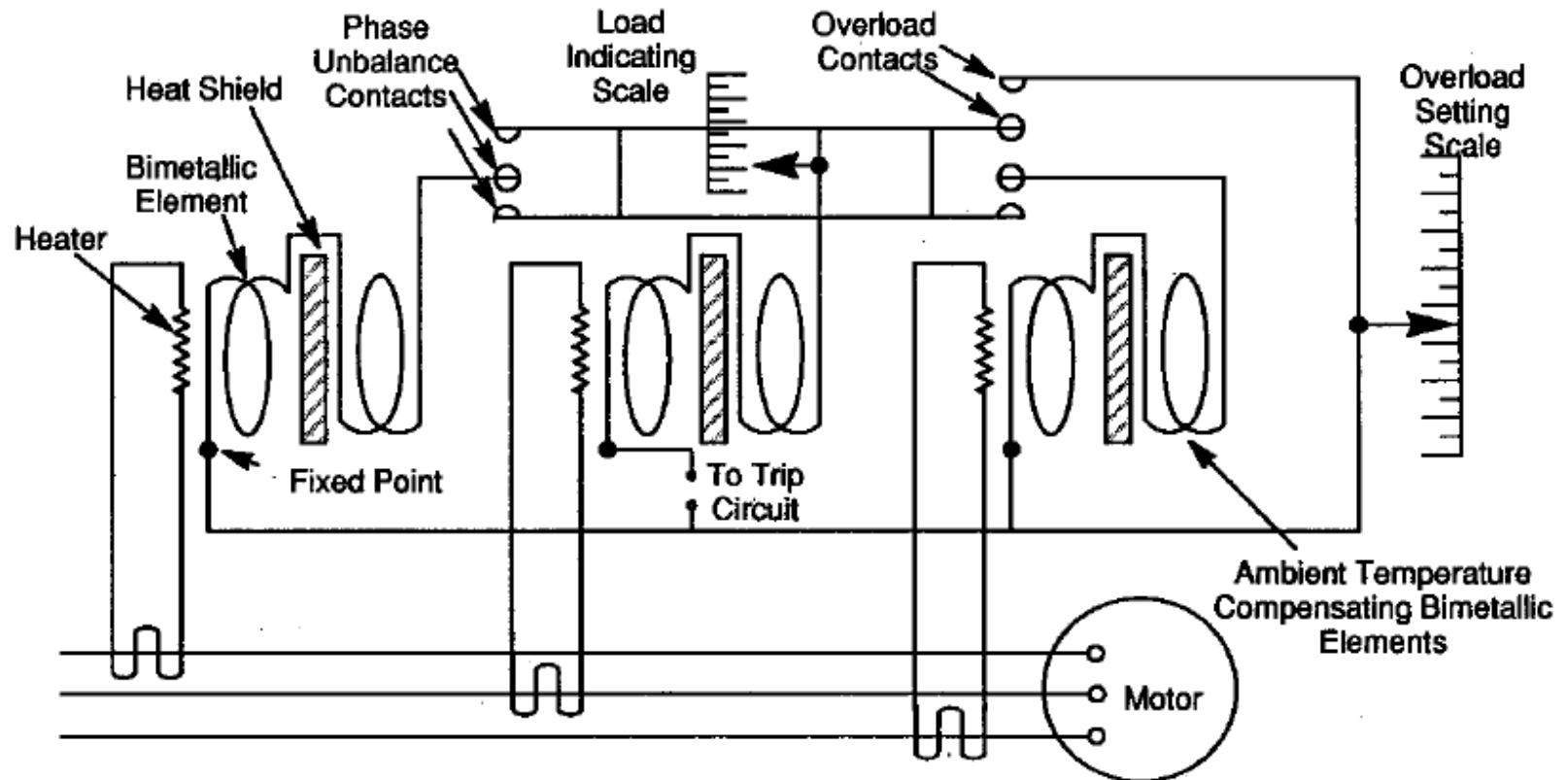
Single Phase and Phase Unbalance

These conditions will cause

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Motor Protection

Single Phase and Phase Unbalance



Motor Protection

Other

- Instantaneous Overcurrent
 - Differential Relays
- Undervoltage
 - Electromagnetic Relays
- Ground Fault
 - Differential Relays