SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EC309 ELECTRICAL MACHINES AND POWER SYSTEMS

II YEAR / 03 SEMESTER MECH & MCT

Unit 3 – INDUCTION MOTORS

Induction Motors Starting Methods

Starter

- ✓By Adjusting voltage during starting , the current drawn by the motor and the torque produced by the motor can be reduced and controlled.

Functions of Starter

- ✓Start and stop the motor
- ✓Limit inrush current when necessary
- ✓Permit automatic control when required
- ✓Protect motor and other connected equipments from over voltage, no voltage, under voltage, single phasing etc

TYPES OF STARTERS

For Squirrel Cage Induction Motor:

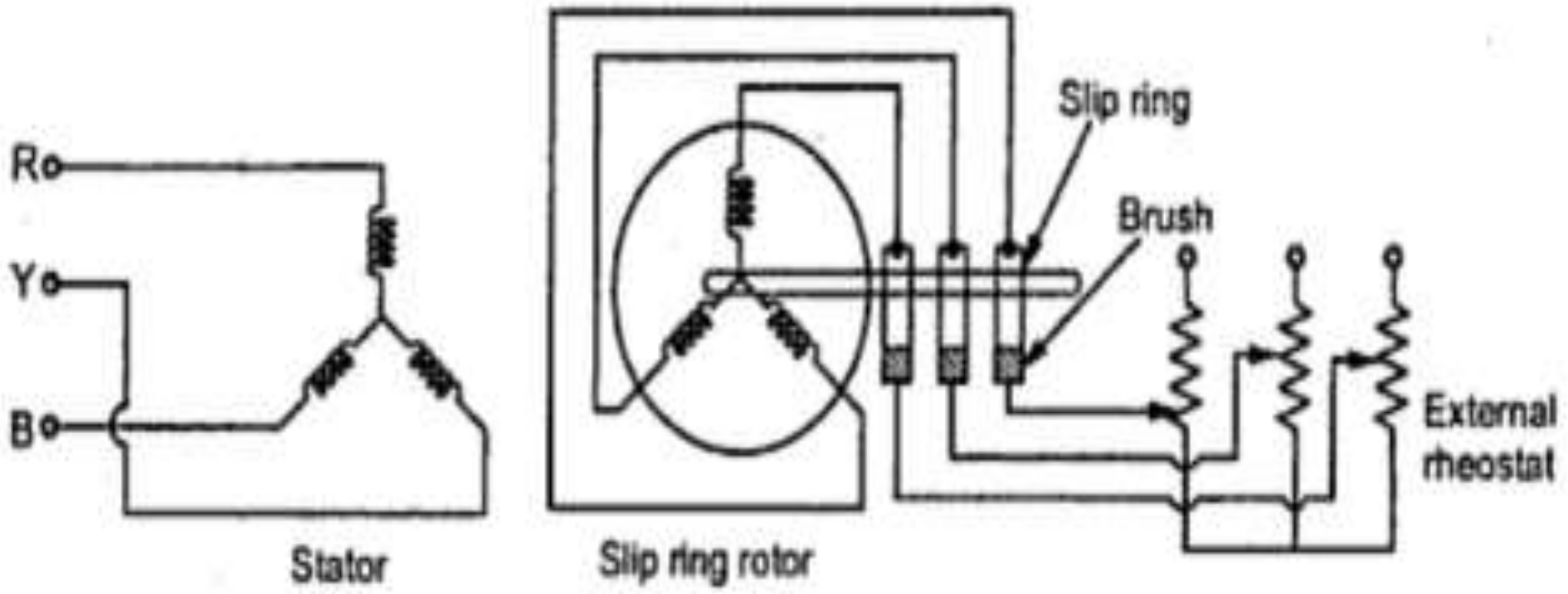
- ✓Primary / Stator Resistance Starter
- ✓DOL (Direct On-Line) Starter
- ✓Auto Transformer Starter
- ✓Star – Delta Starter

For Slip-ring Induction Motor:

- ✓Rotor Resistance Starter

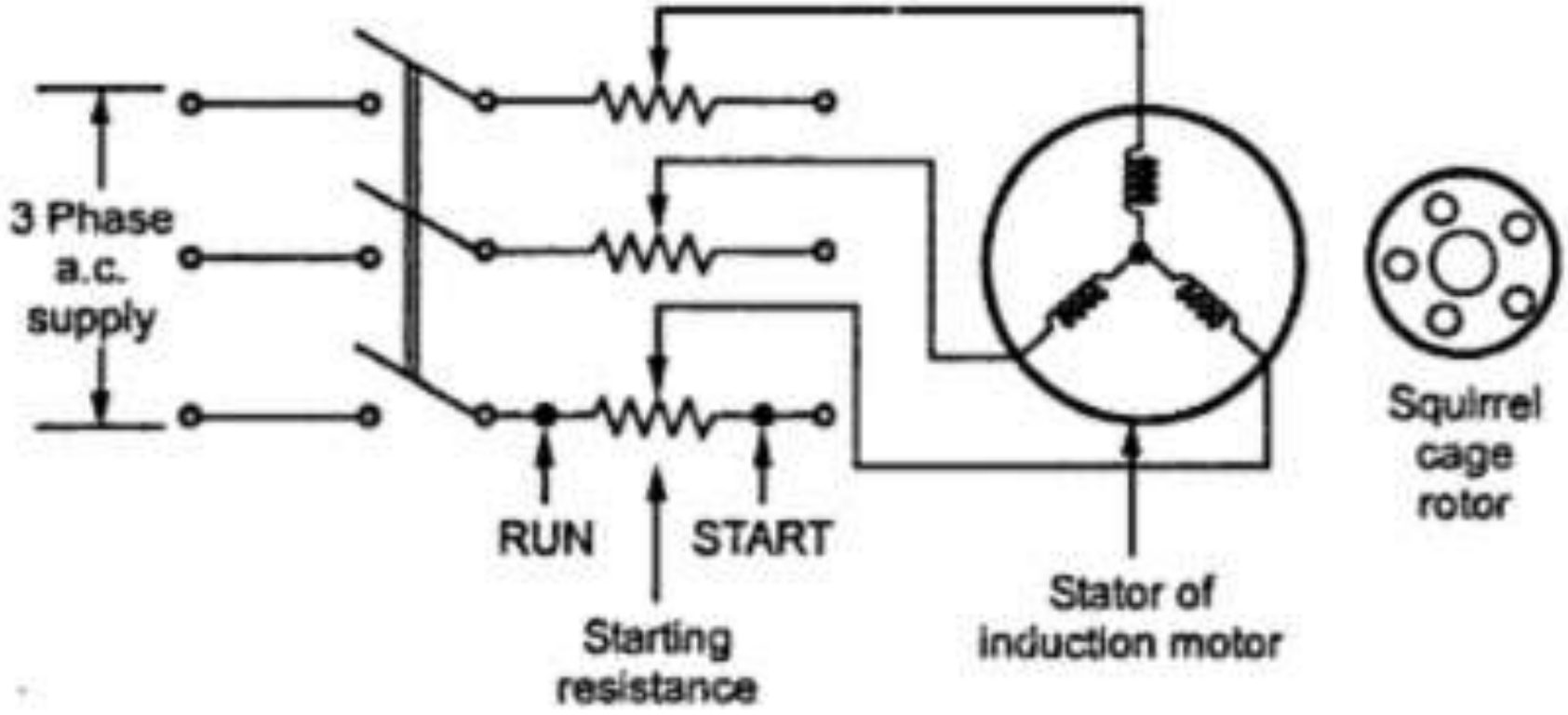
ROTOR RESISTANCE STARTER

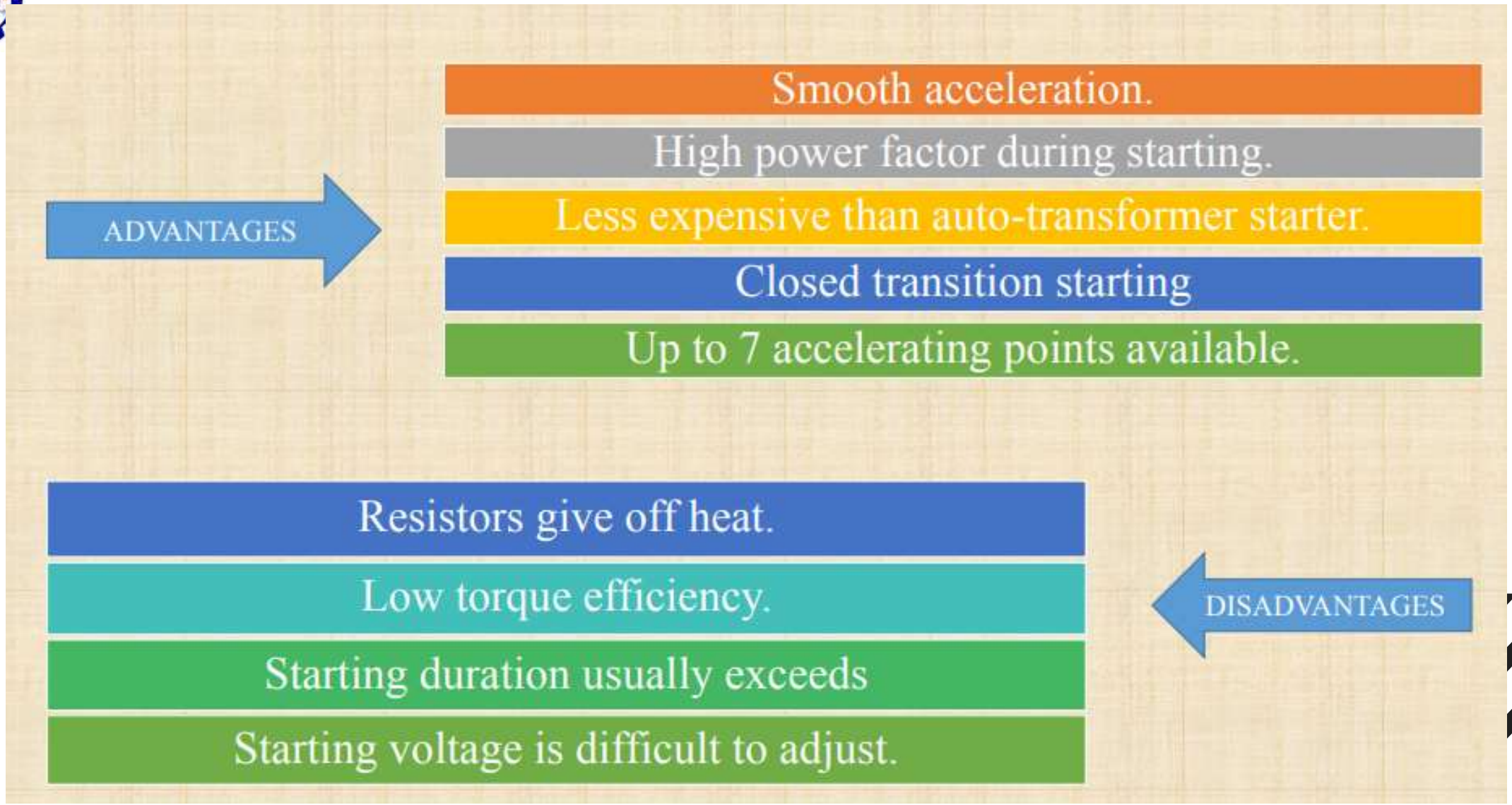
- ✓Motor is started with full line voltage across the stator.
- ✓Variable resistance is inserted in each rotor phase.
- ✓This reduces starting current and increases rotor torque.
- ✓As motor accelerates resistance is cut out in steps and short circuited by slip rings.



STATOR RESISTANCE STARTER

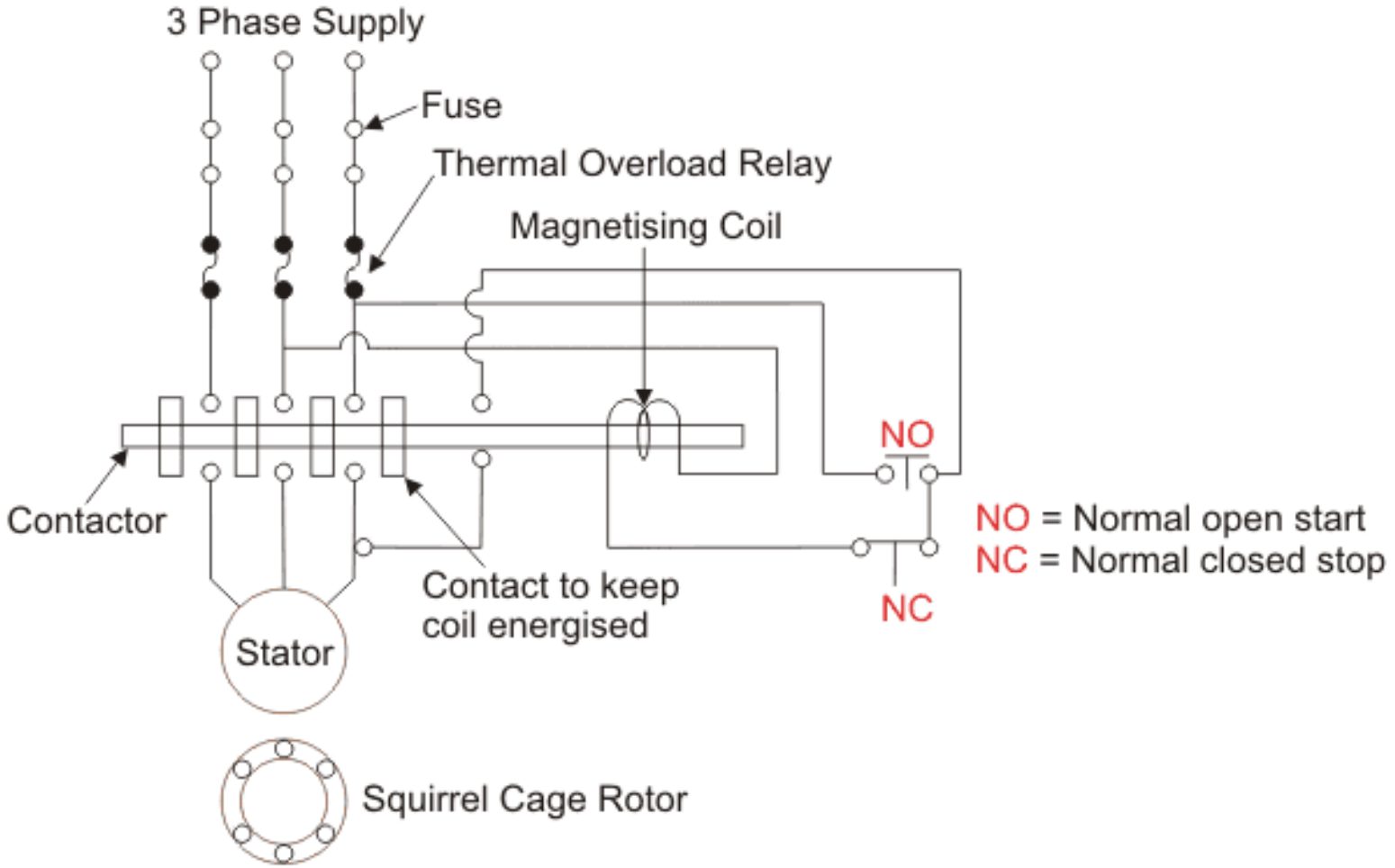
- ✓Resistors or Reactors are connected in series with stator winding.
- ✓Voltage drop in them causes a reduced voltage across the stator.
- ✓As the motor picks up speed, resistors or reactors are cut out in steps and finally short circuited.




ADVANTAGES
Smooth acceleration.
High power factor during starting.
Less expensive than auto-transformer starter.
Closed transition starting
Up to 7 accelerating points available.
DISADVANTAGES
Resistors give off heat.
Low torque efficiency.
Starting duration usually exceeds
Starting voltage is difficult to adjust.

DOL STARTER

- ✓Induction motor is connected directly across its 3-phase supply.
- ✓The DOL starter consists of two switches namely start and stop
- ✓It also has a circuit breaker (or) MCCB, overload relay & contactor for protecting the motor



Advantages

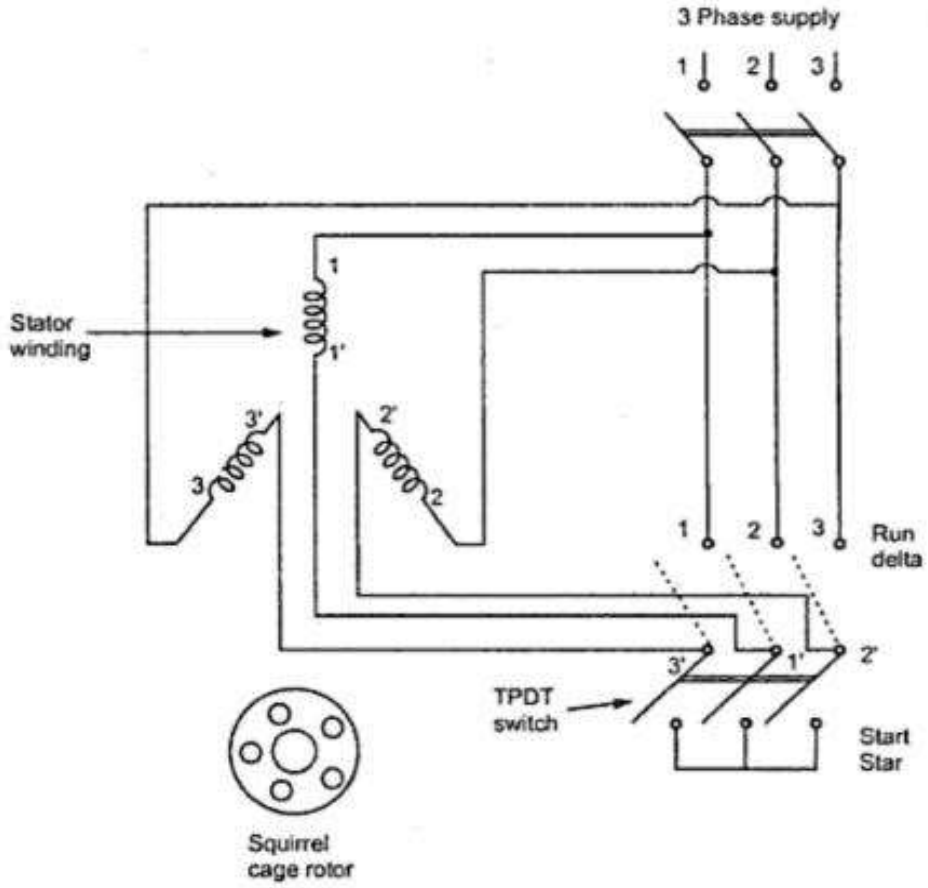
- Inexpensive.
- Gives almost complete starting torque at the beginning.
- Designing, operating and controlling this starter is easy.

Disadvantages

- Starting current is very high.
- This starter causes an important dip in voltage.
- The lifespan of the machine might be reduced.

STAR – DELTA STARTER

- ✓It is based on the fact that in star connection, 57.7% of the total line voltage appears across the coils.
- ✓Stator windings are connected in star at the starting instant.
- ✓After the motor attains required speed, a change over switch connects them in delta.



Advantages:

- Suitable for high inertia loads.
- Simple, cheap, effective and efficient.

Disadvantages:

- limited to applications where high starting torque is not required.
- Not suitable for line voltages exceeding 3000V.

AUTO-TRANSFORMER STARTER

- ✓Reduced voltage is obtained by taking tappings from a three phase autotransformer.
- ✓Transformer oil is mostly used as the arc quenching medium.
- ✓This can be manually or magnetically operated

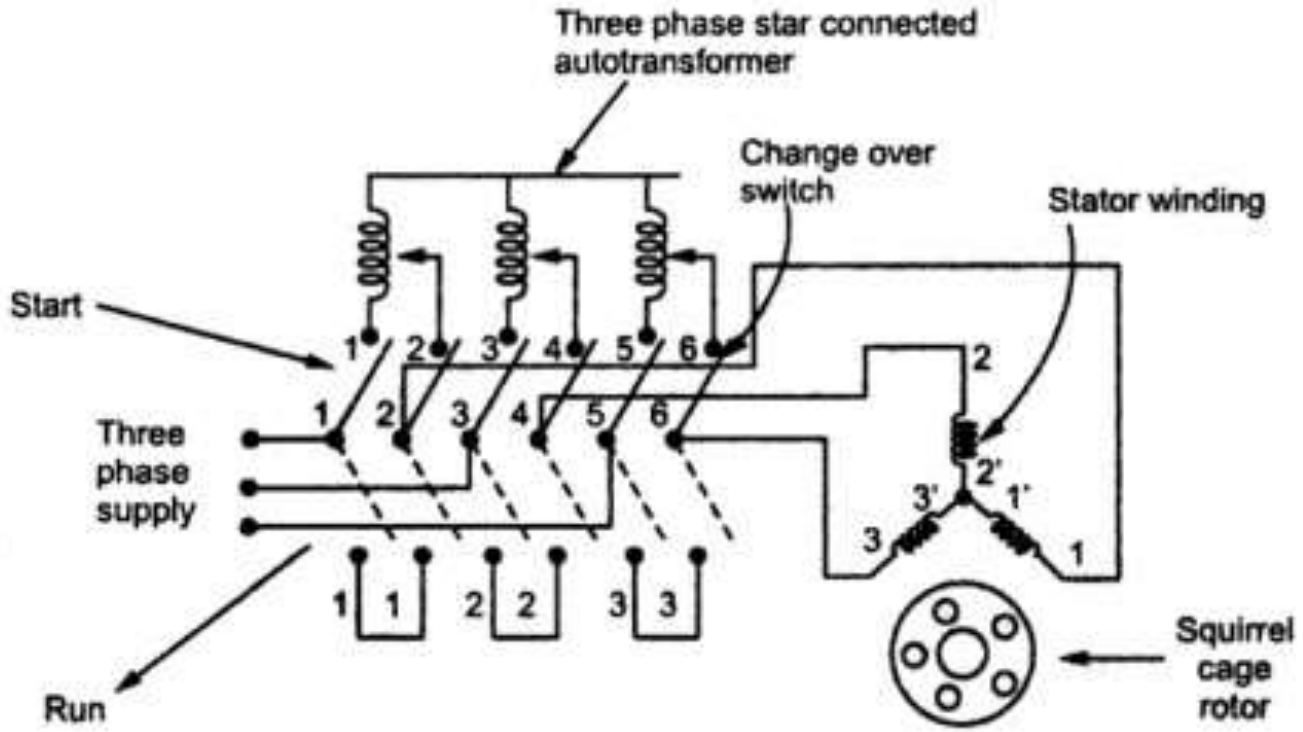


Fig. 7.2 Autotransformer starter

ADVANTAGES

- less voltage is obtained by transformation.
- Higher torque per armature current.
- Starting voltage can be adjusted.
- Suitable for longer starting periods.
- Motor current is larger than supply current.

DISADVANTAGES

- Low power factor
- Higher cost in case of low power output rating motors.