

For Short Circuit Protection (Magnetic & Setting):

Example for Setting of MCCB for Motor Circuit

- When we select an MCCB for motor application, it is necessary that the instantaneous release setting in the MCCB is set to a value higher than the highest anticipated Motor magnetizing inrush current during switching-on the motor.
- The values for magnetizing inrush current (sub transient current) are higher in case of high efficiency motors as compared to standard efficiency motors.
- By theoretical and empirical means it is established that the maximum ratio between peak and LRC can go up to 2.5 for high efficiency motors.

Motor Starting Current:

- Motor starting current is one of the most important electrical parameter of motor to understand its electrical characteristics.
 - It is important to note the distinction between inrush current and starting current
 - The current drawn by the motor in different phases are.
1. Inrush Current (Sub transient phase)
 2. Starting or Lock Rotor Current (Transient phase)
 3. Steady state operation.

Inrush Current (Sub transient phase)

- During the initial phase of motor starting Current drawn by motor is known as inrush current or peak current.
- Inrush current is the current drawn between switch on and when the magnetic fields are established in the motor this current is due to magnetizing inrush component of the motor starting current.
- **Inrush Current:** It is generally 13 to 17 x FLA for older motors to New Motor.
- **The duration of inrush current:** It is in milliseconds.
- Motor circuits are highly inductive. Motor can be started at any point on voltage wave of the circuit. Depending on the initiation of the circuit i.e. point on the voltage wave.
- The magnitude of the asymmetry is directly related to X/R ratio of the circuit.

Starting Current (Transient phase)

- Motor starting current or Lock Rotor Current is the current drawn while Motor is accelerating to full speed.

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- **Starting Current:** It is depend upon Starting method of Motor
- For DOL Starter : 6 to 8 x FLA
- Star- Delta: 2 to 3 x FLA
- Auto Transformer: 2 to 3 x FLA
- Soft Starter: 3 to 5 x FLA
- VFD: 1.5 x FLA
- The duration of Starting current: Depend upon Load and Application (10 To 40 Sec)

The magnetic settings for Motor should be as follows:

- **Motor Starting Current < Magnetic Setting of MCCB < Short Circuit Current**
- The MCCB should not trip during starting of the motor. Therefore setting should be 1.3 times the starting current. Normally the starting current will be 6 times the full load current of the motor. Therefore it will be 7.8 times the full load current.
- However you have to calculate the short circuit current at the motor terminal. This depends on source fault level at the bus feeding the motor and cable impedance between the MCCB and motor. The setting on the MCCB should be less than the calculated short circuit current.
- **Motor Acceleration Time < Magnetic Time Setting of MCCB**
- Another important consideration is the acceleration time should be less than the time set on the MCCB for the magnetic setting.