Standards and Methods for Starting Squirrel Cage Induction Motors

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NEMA has adopted standard requirements for the minimum starting capabilities of integral and large squirrel cage induction motors. In general, these standards specify that a motor must be capable of safely accelerating a specified inertia, with a load torque curve that varies by the square of the speed, two times in succession when the motor is initially at ambient temperature and once when the motor is initially at normal operating temperature.

The standard inertia, by horsepower and synchronous speed, are given in NEMA MG1-12.50, MG1-20.42, and MG1-20.43. These sections also restrict the variations from rated voltage and frequency at which the standards are applicable.

NEMA also defines minimum accelerating torques for motors in NEMA MG1-12.37, MG1-12.38, MG1-12.39, and MG1-20.41. These values vary according to the rating of the motor and its design letter.

NEMA does not define the temperature limits that a motor can reach during stall and/or acceleration. These limits are decided by the individual manufacturers and are a function of the materials used in the motor construction and the degree of risk that the manufacturer is willing to stand behind in warranty.

Starting Methods

There are a number of ways of starting squirrel cage induction motors. Each method has its own characteristics and place of correct application. These methods are as follows:

1. Across the line (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/across-the-line)
2. Series resistance reduced voltage (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/series-resistance)
3. Series reactance reduced voltage (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/series-reactance)
4. Solid state reduced voltage (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/solidstate-reducedvoltage)
5. Auto-transformer reduced voltage (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/auto-transformer)
6. Wye/Delta (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/wyestart-deltarun)
7. Part winding (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/part-winding)
8. Double delta (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/double-delta)
9. Capacitor (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/capacitor)
10. Solid state variable frequency (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/solidstate-variablefrequency)
11. Variable speed coupling (https://acim.nidec.com/motors/usmotors/techdocs/profacts/starting-methods/variable-speed-coupling)