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Basics of induction Motors

Name plate details of induction motor Part 3

Insulation Class of Induction Motor

The electrical insulation system for wires used in generators, electric motors, transformers, and other wire-wound electrical components is divided into different classes by temperature and temperature rise. The electrical insulation system is sometimes referred to as insulation class or thermal classification. The different classes are defined by NEMA, Underwriters Laboratories (UL), and IEC standards.

The maximum hot-spot operating temperature is reached by adding the rated ambient temperature of the machine (often 40 °C), a temperature rise, and a 10 °C hot-spot allowance. Electrical machines are usually designed with an average temperature below the rated hot-spot temperature to allow for acceptable life. Insulation does not suddenly fail if the hot-spot temperature is reached, but useful operating life declines rapidly; a rule of thumb is a halving of life for every 10 °C temperature increase.

Older editions of standards listed materials to be used for the various temperature classes. Modern editions of standards are proscriptive, only indicating that the insulation system must provide acceptable life at the specified temperature rise.

Insulation Class	Temperature in °C	Material Used	Relative thermal endurance index (°C)
Y	90	Cotton, silk, or paper	>90 - 105
A	105	Reinforced Class-Y materials with impregnated varnish or insulation oil	>105 - 120
E	120	Reinforced Class-Y materials with impregnated varnish or insulation oil	>120 - 130
B	130	This has a form that inorganic material is hardened with adhesives	>130 - 155
F	155	Made of Class-B materials that are upgraded with adhesives, silicone, and alkyd-resin varnish of higher thermal endurance	>155 - 180
H	180	Inorganic material glued with silicone resin or adhesives of equivalent performance	>180 - 200
N	200	As for Class B, and including Teflon	>200 - 220
R	220	As for IEC class 200	>220 - 250
S	240-250	Polyimide enamel (Pyre-ML) or Polyimide films (Kapton and Alconex GOLD)	>250

International Mounting (IM)

Different types of mountings are standardized throughout the world for international coordination
Horizontal Mountings, Example: IM B _ or IM V_ or IM _ _ _ _

Proper motor installation and mounting position is essential in obtaining top-quality operation, efficient performance, and maximum reliability. Sometimes, however, there is confusion about the many different ways a motor can be installed.

There are two different standards—NEMA and IEC— which you will see when looking at electric motor mounting positions. Although they are generally comparable, there are slight differences between the two.
The standard IEC mounting position places the junction box on the top of the motor, known as the IM B3 mounting position in IEC frame (or F3 in NEMA frames). On the other hand, the NEMA standard mounting position is referred to as F1, with the junction/conduit box located on the left side of the motor facing the output shaft.

The design of most motors is such that they can usually be operated in many mounting positions, unless indicated otherwise. Some mounting positions, however, require additional construction modifications to achieve optimal performance. For example, shaft-up or shaft-down outdoor applications may require drilling of additional drain holes, drip covers and stronger bearings to support heavy loads. Don't just assume you can bolt any motor in any orientation!

Below is a visual reference of typical electric motor mounting positions. Whether you're an installer, engineer, or maintainer, this is a must -have reference.