

SCOPE

- I 1.1 This practice covers design and testing of low voltage squirrel cage induction motors rated up to and including 200 hp (150 kW). Low voltage motors larger than 200 hp (150kW), motors rated above 660 V and all synchronous motors are covered by [IP 16-9-2](#).
- I 1.2 An asterisk (*) indicates that additional information is required. If a job is contracted, this additional information is furnished in the Job Specification.

SUMMARY OF ADDITIONAL REQUIREMENTS

- I * 2.1 **Table 1** lists the practice and publications which shall be used with this practice as specified by the purchaser.

TABLE 1

PRACTICE	
IP 2-1-1	Plant Noise Design Criteria
STANDARDS	
IEC	
34	Rotating Electrical Machines
72	Dimensions and Output Series for Rotating Electrical Machines
85	Recommendations for the Classification of Materials for the Insulation of Electrical Machinery and Apparatus in Relation to their Thermal Stability in Service

- I ♦ * 2.2 Motors shall be manufactured in accordance with the applicable national and local authority standards and certified as such by approved testing agency recognized in the location where installed. **Table 2** lists standards which shall be used for a-c motors purchased in the USA for use in the USA:

TABLE 2

STANDARDS	
ANSI / ABMA Standards	
9	Load Rating and Fatigue Life for Ball Bearings
11	Load Rating and Fatigue Life for Roller Bearings
IEEE / ANSI Standards	
43	Testing Insulation Resistance of Rotating Machinery
112	Test Procedures for Polyphase Induction Motors and Generators
NEMA Standards	
MG1	Motors and Generators
MG2	Safety Standard for Construction and Guide for Selection, Installation and Use of Electric Motors and Generators

- I * 2.3 **For other conditions of purchase and use** the applicable standards of manufacture and test will be specified by the purchaser.

DOCUMENTATION

- I ♦ * 3.1 **Motor data** specified in [Table 3](#) shall be furnished by purchaser and vendor with all proposals. All the same data shall be furnished with final drawings and data corrected to apply to the actual motor furnished. Guaranteed or published values are acceptable for motors that do not require certified test reports.
- I * 3.2 When specified, **test reports** (5 certified copies) shall be submitted to the purchaser.

GENERAL REQUIREMENTS

- I 4.1 All motors shall be heavy duty, industrial class, continuous duty suitable for installation in a petrochemical process facility at sea coast location.
- I * 4.2 Motor **efficiency** shall be either "high efficiency" per **NEMA MG1** or "standard" per IEC.

IP 16-9-1		Low Voltage A-C Motors Up To 200 HP (150 kW)	
Page 2 of 5			
Rev. 2	June 1999		

(This practice is appropriate for attachment to Inquiry or Purchase Document)

INSULATION, CONDUCTORS AND LEADS

- I * 4.3 Unless otherwise specified, motor **insulation shall be Class F with Class B temperature rise.**

BEARINGS AND LUBRICATION

- R * 4.4 Unless otherwise specified, all motors shall be grease lubricated.
- C ♦ 4.5 **Motors 20 hp (15 kW) and smaller** may have sealed bearings with non-regreasable housings. Use of sealed bearings for motors larger than 20 hp and up to 50 hp shall be referred to the Owner's Engineer for approval.
- M 4.6 **Motors with regreasable bearings** shall:
- Be single shielded, capable of being regreased in service.
 - Be capable of operating for at least 8,000 hours without requiring addition of grease or a complete change of grease.
 - Be equipped with external relief or drain plugs. Alternative arrangements for expelling or collecting used grease may be proposed for Owner's Engineer approval.
 - Have seals provided to prevent loss of lubricant.
- R 4.7 **All bearings** shall be single row Conrad type (no filling slots) with C3 diametrical clearance. Non-metallic (plastic or phenolic) cages are not acceptable.
- R ♦ 4.8 **Anti-friction bearings** shall have an L₁₀ rated life per **ANSI / ABMA Std. 9 and 11** of at least 100,000 hours for all direct connected horizontal motors and at least 17,500 hours for normally loaded belt-connected motors.

LIFTING PROVISIONS

- M 4.9 **All motors weighing more than 100 lb (50 kg)** shall be provided with one or more lifting eyebolts, rings, or lugs capable of supporting the weight of the motor. If lugs are concealed by enclosure, nameplates shall be attached to both sides of the motor warning against improper lifting.

NAMEPLATE

- M 4.10 **Motor data plate material** shall be stainless steel.

TERMINAL BOXES

- S 4.11 **A means of attaching an equipment grounding conductor** shall be provided inside the terminal box.

ENCLOSURE REQUIREMENTS

- R * 5.1 **All motors shall be totally-enclosed fan-cooled**, unless an alternative enclosure is specified.
- R 5.2 **All enclosure parts and terminal boxes** shall be of cast iron.
- S 5.3 **Fan enclosure** shall be guarded type.
- R 5.4 **Fan covers** shall be cast iron, stainless steel or pressed sheet steel.

ADDITIONAL REQUIREMENTS FOR VERTICAL MOTORS

- O 6.1 **Non-reverse ratchet devices** shall be provided on vertical motors to prevent reverse rotation, for the following applications:
- For equipment having drive shafts with screwed joints where reverse rotation of the motor would cause the shaft to unscrew.
 - For deep well pumps, where reverse rotation caused by pump backspin could cause equipment damage from loss of lubrication to water lubricated pump shaft bearings or from overspeed.
 - Non-reverse ratchet devices for explosion proof motors and motors specified for use in Class I Division 2 locations shall be made of non-sparking materials.
- R 6.2 **Drip covers** shall be provided on the **non-drive end** of all vertical motors. Waterproof bearing covers shall be provided to prevent water entering the bearings. Covers shall prevent direct entrance of rain into the motor interior. Covers shall also block entrance of snow and sleet to prevent freeze-up of external fans on non-operating motors.