



Baldor Electric Company
Premium Efficiency Motor Specification
Open Drip-Proof Motors 1-500 HP
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Premium Efficiency Motor Specification Open Drip-Proof Motors 1-500 HP

1.0 Purpose

The intent of this specification is to work with Baldor Electric in a partnership environment to supply superior quality motors that consistently perform, with highest efficiency, improved life cycle and lowest maintenance cost. The motors shall be built to provide: (1) safe operation; (2) reliability in general purpose applications; (3) minimum maintenance requirement due to the design and quality of materials and workmanship.

2.0 Scope

This specification covers 3 phase, drip-proof, 1 to 500 HP, at 1200, 1800 and 3600 RPM, 60 Hz, squirrel cage induction motors in integral horsepower NEMA frames 143T through 449T.

3.0 Motor Requirements

3.1 Applicable Codes and Regulations

All motors furnished shall be designed, manufactured, and tested in accordance with the latest applicable standards of NEMA, ANSI, IEEE, and ASTM. As a minimum requirement, all motors shall conform to the latest applicable sections of NEMA Standard No. MG-1. Motors must meet or exceed CEE Premium Efficiency™ full load efficiencies. The Consortium for Energy Efficiency (CEE), a national, non-profit public benefits corporation, promotes the manufacture and purchase of energy-efficient products and services.

3.2 Enclosures

3.2.1 In general, all motors shall be ODP (Open Drip-Proof), NEMA T frame, NEMA F1 assembly for horizontal applications. This specification deals with motors built to comply with the Baldor Super-E™ motor (EM).

3.2.2 Enclosures shall be rolled steel band or cast iron construction depending on horsepower. End brackets shall be die cast aluminum with steel bearing inserts or cast iron construction. Conduit box shall be die cast aluminum or cast iron construction.

- 3.2.3 Shouldered lifting eyebolts or cast provisions within the frame shall be furnished for handling convenience.
- 3.2.4 Motor nameplate shall be mounted on enclosure with stainless steel fastening pins. Nameplate shall have, as a minimum, all information as described in NEMA Standard MG-1-20.60.
- 3.2.5 Motor bearing numbers shall be included on nameplate. Motor connection diagram shall be attached to motor and easily readable.

3.3 Motor Terminal Boxes and Leads

- 3.3.1 Motor terminal boxes shall be sized larger than required by NEC or UL standards, pipe drilled for conduit and shall be attached to the motor frame with cadmium-plated hex head cap screws. Cover shall be installed with cadmium plated hex head cap screws. The conduit box shall come completely assembled to the motor.
- 3.3.2 Motor leads in the conduit box shall be sized in accordance with NEC suggested minimum ampacity values using a minimum of 125°C insulated lead wire. The wiring shall be clearly identified every inch or the lead shall have a metal band in accordance with ANSI C6.1, latest revision. Nameplates shall be supplied stating the above data and permanently attached to the motor.
- 3.3.3 Motors shall be provided with a compression-type grounding lug mounted in the conduit box by drilling and tapping into the motor frame or by a double ended cap screw of silicon bronze.

3.4 Electrical and Mechanical Design Requirements

- 3.4.1 Motors shall be premium efficiency Super-E™ type, NEMA Design B (normal starting torque, full voltage starting), squirrel cage, induction type. Where other designs are required, they will be specified on the Motor Data Sheet.

3.4.2 Per CEE Premium Efficiency™ Criteria, minimum efficiencies for ODP motors shall be equal to or greater than those shown below:

HP	1200 RPM	1800 PM	3600 RPM
1	82.5	85.5	80.0
1.5	86.5	86.5	85.5
2	87.5	86.5	86.5
3	89.5	89.5	86.5
5	89.5	89.5	89.5
7.5	91.7	91.0	89.5
10	91.7	91.7	90.2
15	92.4	93.0	91.0
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	94.1	93.0
40	94.1	94.1	93.6
50	94.1	94.5	93.6
60	95.0	95.0	94.1
75	95.0	95.0	94.5
100	95.0	95.4	94.5
125	95.4	95.4	95.0
150	95.8	95.8	95.4
200	95.4	95.8	95.4

3.4.3 Motors shall be wound for 200, 230, 460, 230/460 or 575-volt, three-phase, 60-hertz, 1.15 service factor. 380 – 415 volt, 50-hertz designs are also available.

3.4.4 Windings shall be copper magnet wire rated at 200° C and moisture resistant. Magnet wire insulation varnish must be of a type designed to resist transient spikes (such as Inverter Spike Resistant™ ISR), high frequencies, and short time rise pulses produced by inverters. Motor insulation system shall comply with NEMA MG1-1998 Part 31.4.4.2.

3.4.5 Insulation shall be a Class F, non-hygroscopic varnish. The maximum permissible temperature for the insulation is not exceeded when the motor operates at service factor load in a 40° C ambient. Magnet wire shall have a service coating equivalent in thickness to a commercial "heavy" coating. The combination of magnet wire and varnish when tested in accordance with IEEE No. 57, latest revision, shall show a thermal rating of not less than 150° C for a duration of 30,000 hours life. Normal temperature rises for 1.0 service factor operation shall not exceed a Class B rise.

- 3.4.6 Windings shall be firmly held in the stator slots to prevent coil shifts. Sharp edges and burs shall be removed from the stator core slots prior to inserting the winding. All coils shall be phase insulated using Nomex paper or equal and laced down such that the windings will not move during repetitive starting. All stator connections will be securely made.
- 3.4.7 The insulation resistance of the sealed stator winding shall be greater than 100 megohms when measured at 25° C with a megohm bridge having 1000-volt direct current.
- 3.4.8 The motor design shall use the best available materials and methods to achieve premium efficiency, power factor and long life operation.
- 3.4.9 Motors shall be designed for operation in either direction of rotation without a physical change in the motor.
- 3.4.10 All motors shall have anti-friction, vacuum-degassed steel ball bearings electric motor quality. On frames 254-up, grease fittings and reliefs are supplied for external lubrication while machine is in operation. These grease fittings and reliefs are plugged.
- 3.4.11 The bearings shall have a rated fatigue life of L-10 (B-10) of 150,000 hours for direct-coupled applications and 50,000 hours for belted applications minimum. Belted rating shall be based on radial loads and pulley sizes called out in NEMA MG1-14.43. The calculation will be determined from the pulley centerline being at the end of the motor shaft.
- 3.4.12 The motor shall have tight mechanical bearing housing fits.
- 3.4.13 Bearing cavities and greasing passages shall be thoroughly cleaned of all debris before lubricating. Motors shall be lubricated at the factory with Exxon Mobil Polyrex™ EM grease or equal. Customer-specified grease may be supplied upon request as noted on the motor data sheet.
- 3.4.14 Motors 200-hp and smaller, unless otherwise noted, shall be furnished with standard NEMA T-frame shaft for V-belt drives even though motors are for direct connected drive duty. In general, motor shall be inter-changeable for horizontal, vertical or belt-driven mounting. For 3600-rpm motors 30 horsepower and up, short shaft (NEMA TS) will be acceptable and is suitable for coupled loads only.

3.4.15 Maximum vibration allowed shall be 0.15 inches per second velocity measured at the bearing housings.

3.4.16 Rotor assemblies shall be die cast aluminum for NEMA frames. Rotors shall be keyed and shrunk or pressed to the shaft. Welding will not be acceptable. Keyed rotors shall be press-fitted on a shoulder the full length of the rotor utilizing the full shaft surface diameter.

3.4.17 Rotor shaft extension run out shall not exceed:

0.002" TIR for shaft diameter 0.1875 - 1.625 inches

0.001" TIR for shaft diameter over 1.625 - 6.500 inches

3.4.18 All shafts shall be precision machined from high-strength carbon steel suitable for belt and pulley drives (except as limited by 3600 RPM motors).

4.0 Testing and Final Inspection

4.1 Electrical Tests

Each motor design shall receive the testing called out for "Polyphase Induction Motors and Generators", IEEE 112, latest edition. The routine tests shall, as a minimum, conform to the NEMA MG-1 tests. In addition to the normal factory tests and those already covered in this specification, the following tests may be performed:

4.1.1 The completed insulation system shall be capable of withstanding continuously a phase-to-ground rms voltage of 1000 volts minimum for a period of 30 minutes minimum.

4.1.2 The winding shall also be capable of passing a 2500-volt AC minimum, phase-to-ground test for one second.

4.1.3 Surge comparison test shall be performed using 3000 volts AC minimum; phase-to-phase comparison waveforms on the test unit shall be supplied.

4.1.4 Full load amperes, watts, power factor and RPM.

4.1.5 Locked rotor current rated voltage.

4.2 Mechanical Inspection

4.2.1 Shaft runout shall be checked after the motor is completely assembled and recorded.

4.2.2 Inches/second velocity vibration data.

5.0 Sliding Base Requirements

5.1 Application

When specified on the Motor Data Sheet, sliding bases of the heavy-duty type shall be furnished for V-belt drives.

5.2 Fabrication

5.2.1 Base construction shall be fabricated from heavy steel to withstand vibration and corrosive atmosphere. Base is to be of single unit construction with a double-supported slide and adjusting bolts.

5.2.2 Base is to have a corrosion resistant finish.

6.0 Vendor Drawings and Data

6.1 Motors

The following information shall be furnished in addition to motor prints and regularly supplied data upon request:

6.1.1 The supplier shall furnish data clearly identifying model and/or catalog numbers.

6.1.2 Motor rated voltage, frequency, full load current, horsepower and rated speed.

6.1.3 Max KVAR allowed for power factor correction.

6.1.4 All options in the motor.

6.1.5 Induction motor time constants.

6.1.6 Outline drawings with all nameplate data clearly identified.

6.1.7 Motor weight.

6.1.8 Bearing size and type data.

- 6.1.9 Guaranteed efficiency and power factor at full load, 75% load, 50% load, 25% load and 0%.
- 6.1.10 Acceleration time with maximum inertia.
- 6.1.11 Internal winding connection of the motor.
- 6.1.12 Speed torque calculations across the line starting from 0 speed to synchronous speed.
- 6.1.13 Motor "A" weighted scale sound power levels, measured in accordance with IEEE "Test Procedure for Airborne Sound Measurements on Rotating Electrical Machinery", Publication No. 85, 1973.
- 6.1.14 The Customer's purchase order number, equipment number, and motor number shall be used to identify all motor drawings and data sheets supplied by the Vendor.
- 6.1.15** Motor installation and maintenance instructions.

6.2 Sliding Bases

When sliding bases are specified on the Motor Data Sheet, complete dimensional drawings shall be provided.

7.0 Shipping

Depending on motor size and weight, motors shall be packed in a secure carton and/or securely fastened to a hardwood skid or pallet for fork truck handling and shall be covered for protection against dirt and moisture during transit and outdoor storage. The motor container shall be clearly identified with permanent ink.

8.0 Limited Warranty

Baldor Electric Company and its employees are proud of our products and are committed to providing our customers and end users with the best designed and manufactured motors, drives and other Baldor products. This Limited Warranty and Service Policy describes Baldor's warranty and warranty procedures.

Comments and Questions: We welcome comments and questions regarding our products. Please contact us at:

Customer Service
Baldor Electric Company
P.O. Box 2400
Fort Smith, Arkansas 72902
Telephone: 501-646-4711
Facsimile: 501-648-5792
Website: www.baldor.com

Scope of Warranty: All Baldor standard motors are warranted against defects in Baldor workmanship and materials.

Warranty Period: Most Baldor motors are warranted for 18 months from the date of shipment to Baldor's customer from Baldor's district warehouse or, if applicable, from Baldor's factory. Baldor Super-E® premium efficient motors are warranted for 36 months. IEEE 841 motors are warranted for 60 months.

Warranty Service Center Locations: Warranty service is available for all Baldor products from Baldor's Customer Service Center in Fort Smith, Arkansas and from Baldor Authorized Service Centers. A list of Baldor's Authorized Service Centers is available in catalog #505 from any Baldor District Office or by contacting us at the above location.

Procedure to Receive Warranty Service: Customers should take or ship prepaid the Baldor product requiring warranty service to a Baldor Authorized Service Center. Please include an explanation of the defect or problem, a description of the way in which the Baldor product is used, and your name, address and telephone number.

Repair by Other than a Baldor-Authorized Service Center: Customers who are unable to take or ship the Baldor product to a Baldor Authorized Service Center, or who desire a repair to be made by other than a Baldor Authorized Service Center, should contact the local Baldor District Office. Baldor must approve a repair by anyone other than a Baldor Authorized Service Center in advance.

Repairs or Replacement Within the Scope of the Warranty: If a Baldor product is defective due to Baldor workmanship or materials and the defect occurs during the warranty period, then Baldor will either repair the product or replace it with a new one, whichever Baldor believes to be appropriate under the circumstances. Baldor is not responsible for removal and shipping of the Baldor product to the service center, the reinstallation of the Baldor product upon its return to the customer, or any incidental or consequential damages resulting from the defect, removal, reinstallation, shipment or otherwise.

Repairs Outside the Scope of the Warranty: Problems with Baldor products can be due to improper maintenance, faulty installation, non-Baldor additions or modifications, or other problems not due to defects in Baldor workmanship or materials. If the Baldor Authorized Service Center determines that the problem with a Baldor product is not due to defects in Baldor workmanship or materials, then the customer will be responsible for the cost of any necessary repairs. Customers not satisfied with a determination that a problem is outside of warranty coverage should contact the Baldor District Office for further consideration.

Intended Use: Baldor products are designed for industrial, commercial and agricultural use rather than household, family or personal use.

Product Specifications: All product specifications, applications and other information provided in Baldor's catalog and publications are subject to correction and change without notice and should be confirmed with the Baldor District Office prior to ordering.

Extended Warranties: Extended warranties are available for certain Baldor products. These warranties are described in Baldor's catalog and other sales literature. Extended warranties are subject to the terms and procedures of this Limited Warranty and Service Policy as modified by the additional terms of the extended warranty.

No Other Warranties and Liability Limitation: This Limited Warranty and Service Policy represents Baldor's sole and exclusive warranty obligation with respect to Baldor products. Baldor's liability to a customer or any other person shall not exceed the Baldor's sales price of the applicable Baldor product. **BALDOR DISCLAIMS ALL OTHER EXPRESS AND IMPLIED WARRANTIES INCLUDING THE IMPLIED WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE AND MERCHANTABILITY.**



AC Induction Motor Data Sheet

District Office: _____ Contact: _____

Req Set: _____ Order No: _____

Customer: _____ Contact: _____

End User: _____ Contact: _____

Industry: _____

Type of equipment: _____

Application: _____

Site Data

Location: City _____ State _____

Elevation less than 3300 ft / 1000 m Other – Specify _____

Ambient temperature Min _____ °C Max _____ °C

Humidity Min _____ % Max _____ %

Motor location Indoor Outdoor Heated Unheated

Roof over motor No roof over motor

Special conditions: _____

Motor Performance Requirements:

HP _____ kW _____

Poles: _____ RPM _____

Speed _____ Fixed speed

Adjustable speed Variable torque Constant torque

Min Speed _____ Max speed _____

Volts _____ 3-phase 60Hz 50Hz

- NEMA Design: Design B Design C Design D
Efficiency level Super-E™ Premium High Efficiency
Rotor design: Standard Fabricated copper bar
Service Factor: 1.0 1.15
Insulation Class: F H
Temperature rise: Class B (80°C) at F.L.
 Class F at F.L.
 Class B (80°C) at F.L.; Class F at S.F.

Torque (Full Load) _____ Torque (Pull-up %Flt) _____
Torque (Breakdown % Flt) _____ Torque (Locked Rotor % Flt) _____

- Enclosure: ODP
 WPI – Weather Proof Type 1
 WP II – Weather Proof Type 2
 Division 2 – Temperature code _____

- Mounting: NEMA IEC
 Horizontal Vertical
 F1 F2 Top Other _____
 C-face D-flange
 P-base - specify flange diameter _____

Shaft: Drive end shaft
 Diameter _____ Length _____ Key _____

 Opposite drive end shaft
 Diameter _____ Length _____ Key _____

Special shaft machining – specify or supply drawing _____

- Material: Standard
 Stainless – type _____

Special Standards:

- NEMA MG1
 UL Approval
 CSA approval
 IEC
 Other _____

Baldor product family: Chemical Process
 Crusher Duty
 Dirty Duty
 Other _____

Bearings Anti-friction: Ball Roller
 Coupled Belted (data sheet attached)

Thrust: **Horizontal:** Towards motor _____ lbs or kg
 Away from motor _____ lbs or kg
Vertical: Down **Continuous** _____ lbs or kg
Maximum _____ lbs or kg
 Up **Continuous** _____ lbs or kg
Maximum _____ lbs or kg

Lubrication: Self lubricated Oil Mist Force lubricated
Special grease or oil _____

Bearing protection: None
 Forsheda® type Both ends
 Inpro/Seal® VBX Both ends
 Contact seal Both ends

Bearing electrical protection: Shaft grounding brush
 Electrically isolated bearings

Bearing temperature monitoring: RTDs - Qty. 6 – 2 per phase
 100 ohm platinum
 10 ohm copper
 120 ohm nickel
 Thermistor - Brand _____

Bearing vibration monitoring: Robertshaw 365 Vibraswitch® Both ends

Vibration level < 0.015 in/sec <0.010 in/sec _____ in/sec
deflection

Sound level Max sound pressure level _____ dBA at _____ ft or _____ m,
NL.

Motor Starting / Drive Full voltage
 Reduced voltage specify _____
 Electronic soft start specify _____
 Loaded Unloaded

Load WK² at Shaft: ≤ NEMA MG1-1998-20.11
 Specify reflected load inertia _____

Number of starts: NEMA MG1-1998 –20.12.1
 Additional _____ Cold _____ Hot

Drive Requirements

- Inverter
- Vector
- Baldor
- Other – brand / model _____
- Feedback: PPR _____ Voltage _____
- Vector – open loop
- Quote Baldor with motor
- Optical Encoder
- Magnetic pulse generator – # of pickups _____
- Specific brand / model _____

Special Options and Accessories

- Winding Temp. Device:
 - Thermostats – normally closed
 - RTDs - Qty. 6 – 2 per phase
 - 100 ohm platinum
 - 10 ohm copper
 - 120 ohm nickel
 - Thermistor - Brand _____
 - Separate conduit box (required for medium voltage)

- Space Heaters:
 - 120 volt
 - 230 volt
 - Separate conduit box
- Special items:
 - Deferred warranty / long term storage provision
 - Export crating

Special Testing

- Routine
 - Unwitnessed
 - Witnessed
- Complete
 - Unwitnessed
 - Witnessed
 - 1. Routine tests above.
 - 2. Measure efficiency at 100%, 75%, 50% and 25% of full load.
 - 3. Measure power factor at 100%, 75%, 50% and 25% of full load.
 - 4. Temperature rise test.
 - 5. Measure locked rotor current.
 - 6. Measure breakdown and starting torques.
- Sound test per IEEE 85
 - Unwitnessed
 - Witnessed
- Speed torque test
 - Unwitnessed
 - Witnessed
 - Provide curves of motor speed-torque and speed-current at specified input voltage and frequency
- Bearing temperature
 - Unwitnessed
 - Witnessed
 - Determines the stabilized bearing temperature at no load. Specify minimum test duration time on order.
- Matched Performance™
 - Unwitnessed
 - Witnessed
 - Baldor Matched Performance™ temperature rise test using Baldor motor control. Operate motor to Class F rise to establish operating envelope for the motor.
- Other _____
 - Unwitnessed
 - Witnessed