Baldor Electric Company
Premium Efficiency Motor Specification
Totally Enclosed Fan Cooled Motor 1 - 250 HP

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BALDOR
MOTORS AND DRIVES

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Totally Enclosed Fan Cooled Motor 1 - 250 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 an application which may be corrosive and wet; (3) minimum maintenance requirement due to the design and quality of materials and workmanship; (4) lowest noise pollution.

2.0 Scope

This specification covers three-phase, TEFC (Totally Enclosed Fan Cooled), 1 to 250 horsepower squirrel-cage induction motors in integral horsepower frames 143T to 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 TEFC, NEMA T frame, NEMA F1 assembly for horizontal applications and designed for the environment where the motor will be used. This specification deals with motors built to comply with the Baldor Super-E™ motors (EM). Where special enclosures or assembly are required, it will be specified on the Motor Data Sheet.

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 Motors shall have drain openings suitably located for the type assembly being provided.

3.2.4 For frames 215 and above, shouldered lifting eyebolts or cast provisions within the frame shall be furnished for handling convenience.

3.2.5 Motor enclosures shall have a bi-directional, spark-proof, abrasion and corrosive resistant fan made of a material that is strong and durable. Fan will be keyed to shaft on frames 254 and above.

3.2.6 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.

3.2.7 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.

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 severe duty 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 TEFC motors shall be equal to or greater than those shown below:

HP	1200 RPM	1800 PM	3600 RPM
1	82.5	85.5	78.5
1.5	87.5	86.5	85.5
2	88.5	86.5	86.5
3	89.5	89.5	88.5
5	89.5	89.5	89.5
7.5	91.7	91.7	91.0
10	91.7	91.7	91.7
15	92.4	92.4	91.7
20	92.4	93.0	92.4
25	93.0	93.6	93.0
30	93.6	93.6	93.0
40	94.1	94.1	93.6
50	94.1	94.5	94.1
60	94.5	95.0	94.1
75	95.0	95.4	94.5
100	95.4	95.4	95.0
125	95.4	95.4	95.4
150	95.8	95.8	95.4
200	95.8	96.2	95.8

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 be 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 rise 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. Grease fittings and reliefs are supplied for external lubrication while machine is in operation. 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. Either the D.E. or O.D.E. bearing must be locked to limit axial shaft movement.

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 Special Application Requirements

4.1 Severe Duty Use

For applications requiring a greater amount of weather protection than a standatrd TEFC motor, Baldor Chemical Processing motors (ECP) may be specified. For a motor built to closer tolerances and with certified test data supplied, Baldor motors built to IEEE Std 841 should be considered. These motors are supplied with Inpro/Seal® VBX bearing isolators on both the output and fan shafts. Motors will be supplied with premium efficiency windings that exceed minimum efficiencies of IEEE 841.

4.2 Hazardous Location Use

Motors with UL and CSA listed enclosures are available for use in hazardous locations. Only the end user or a qualified underwriter is to identify and select the proper class, group, division and temperature code motor to meet the requirements of each installation.

4.3 Adjustable Speed Use

4.3.1 Adjustable speed motors controlled by variable frequency drives in general shall be of a Super-E® design called out in this specification. The manufacturer shall be notified on the

requisition that the motor will be used in conjunction with a variable frequency drive. It shall be the responsibility of the motor manufacturer to ensure that this motor will be capable of operating under the torque requirements and speed range within temperature specifications.

4.3.2 If the duty cycle and speed range requires special design of the motor, it shall be brought to the owner's attention. Baldor Inverter-Duty™ or Vector-Duty™ motors may be quoted as required by the application.

4.3.3 It is recommended that the application be sized using a Matched-Performance™ curve showing the operating range of the particular motor and its matched control.

4.3.4 Any adjustable speed application required for a Division 1 or 2 hazardous location should use an Inverter-Duty™ Explosion Proof motor.

5.0 Testing & Final Inspection

5.1 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:

5.1.1 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.

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

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

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

5.1.5 Locked rotor current at rated voltage.

5.2 Mechanical Inspection

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

5.2.2 Inches/second velocity vibration data.

6.0 Sliding Base Requirements

6.1 Application

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

6.2 Fabrication

6.2.1 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.

6.2.2 Base is to have a corrosion resistant finish.

7.0 Vendor Drawings and Data

7.1 Motors

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

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

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

7.1.3 Max KVAR allowed for power factor correction.

7.1.4 All options in the motor.

7.1.5 Induction motor time constants.

7.1.6 Outline drawings with all nameplate data clearly identified.

7.1.7 Motor weight.

7.1.8 Bearing size and type data.

7.1.9 Guaranteed efficiency and power factor at full load, 75% load, 50% load, 25% load and 0%.

7.1.10 Acceleration time with maximum inertia.

7.1.11 Internal winding connection of the motor.

7.1.12 Speed torque calculations across the line starting from 0 speed to synchronous speed.

7.1.13 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.

7.1.14 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.

7.1.15 Motor installation and maintenance instructions.

7.2 Sliding Bases

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

8.0 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.

9.0 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.

BALDOR
MOTORS AND DRIVES

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: □ TEFC
□ TEBC
□ ODP
□ Explosion Proof - Class _____Group _____ Zone _____
□ 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
□ IEEE 841
□ 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 □ Vector – open loop
□ Baldor □ Quote Baldor with motor
□ Other – brand / model _____

Feedback: PPR _____ Voltage _____
□ 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