

General Specification for Consultants, Industrial and Municipal: NEMA Premium™ Efficiency Electric Motors (600 Volts or Less)

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General Specification for Consultants,
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NEMA Premium™
Efficiency Electric Motors
(600 Volts or Less)

Published by:

National Electrical Manufacturers Association
1300 North 17th Street, Suite 1847
Rosslyn, Virginia 22209

www.nema.org

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Foreword

In the preparation of this Publication, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product Subdivision by contacting the following:

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This Publication was developed by the Motors and Generators Section. Section approval of the document does not necessarily imply that all section members voted for its approval or participated in its development. At the time it was approved, the Section was composed of the following members:

A.O. Smith Electrical Products Company—Tipp City, OH
Brook Crompton North America—Toronto, Canada
Cummins, Incorporated—Minneapolis, MN
Emerson Electric Company—St. Louis, MO
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Howell Electric Motors—Plainfield, NJ
Peerless-Winsmith, Incorporated—Warren, OH
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1 GENERAL

The intent of this specification is to outline the minimum requirements for three-phase AC induction motors applied to municipal and industrial applications for operation on voltages 600 volts or less, rated 500HP or less, operating more than 2000 hours per year at >75% of full-load.

2 DESIGN STANDARDS

In addition to this specification, equipment shall comply with the current applicable standards promulgated by the following organizations:

AFBMA	Anti-Friction Bearing Manufacturers Association
ANSI	American National Standards Institute
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
IEEE	Institute of Electrical and Electronics Engineers (Testing)
HI	Hydraulic Institute
NEMA	National Electrical Manufacturers Association (NEMA Standards Publication MG 1)

3 SERVICE CONDITIONS

3.1 Usual Service Conditions

a. Ambient temperature not greater than 40°C and not less than -15°C

b. Voltage variation within +/- 10%

c. Frequency variation within +/- 5%

d. Combination of b) and c) above, not to exceed 10%.

e. Exposure to an altitude that does not exceed 3300 feet (1000 meters).

f. Installation on a rigid mounting surface.

g. Installation in areas or supplementary enclosures, which do not seriously interfere with the ventilation of the motor.

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4 ENCLOSURES

General purpose horizontal motors for indoor operation in a clean environment can be ODP (Open Dripproof).

General purpose horizontal motors for outdoor operation or located in hostile non-hazardous environments shall be "Enclosed" or "Weather Protected."

All motors in hazardous locations shall be approved for the application and meet the Class and Group as required by the area classification.

5 ELECTRICAL DESIGN

Motors shall be rated continuous duty.

Insulation system shall be rated minimum Class B (130°C).

Maximum temperature rise by resistance at rated HP shall not exceed Class B limits (80°C).

For motors rated at 1.15 Service Factor, the maximum temperature rise by resistance shall not exceed Class F limits (115°C).

The speed/torque and speed/current characteristics shall comply with NEMA Design A or B, as specified on the request for quote.

Motors shall be suitable for full voltage starting, unless otherwise specified.

Motors shall meet the requirements of “NEMA PREMIUM™”. (See Annex A.)

Motors applied to variable frequency drives shall adhere to NEMA Standards Publication MG 1, Part 30, *Application Considerations for Constant Speed Motors Used on a Sinusoidal Bus with Harmonic Content and General Purpose Motors Used with Adjustable-Voltage or Adjustable-Frequency Controls or Both,* or Part 31, *Definite-Purpose Inverter-Fed Polyphase Motors*.

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6 MECHANICAL DESIGN

6.1 Bearings

Bearings shall be rated for a minimum of 26,280 hours L-10 life at full-load direct-coupled, except vertical high thrust motors.

Vertical motors shall be capable of withstanding a momentary up-thrust of at least 30% of normal down-thrust.

6.2 Lubrication

Grease lubricated bearings shall be designed for electric motor use. Grease shall be capable of higher temperatures associated with electric motors and shall be compatible with Polyurea-based greases.

Grease fittings, if provided, shall be Alemite™ type (or equivalent).

Oil lubricated bearings, when specified, shall have an externally visible sight glass to view oil level.

Shielded bearings with regreasable provisions are permissible.

6.3 Other

Vibration shall not exceed 0.15 inch per second, unfiltered peak.

Noise level shall meet the requirements of the application.

Motors (180 frame and larger) shall have provisions for lifting eyes or lugs capable of a safety factor of 5.

All external fasteners shall be corrosion-resistant.

6.4 Accessories (When Specified)

Anti-condensation heaters keep motor windings at least 5°C above the ambient temperature.

Winding thermostats shall be normally closed, connected in series.

Grounding provisions shall be in the main terminal box.

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7 SUBMITTAL DATA REQUIRED

Description of product.

Motor nameplate information.

Motor performance data (curves or listed data of torque and current as a function of speed; current, efficiency, power factor, and speed as a function of load).

Motor dimension prints, including coupling of hollow shaft.

Motor parameters required for the determination of the Reed Critical Frequency of vertical hollow shaft motors.

8 TESTS (IN ADDITION TO MANUFACTURERS' STANDARD TESTS)

When specified, provide report of routine tests per NEMA MG 1.

When specified, conduct efficiency test and speed torque test with report. (IEEE 112, Method B)

When specified, conduct noise test with report. (Per NEMA MG 1 Part 9.)

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Annex A

NEMA MG 1-1998 Table 12-12
Full-Load Efficiencies for NEMA Premium™ Efficiency Electric Motors
Rated 600 Volts or Less (Random Wound)

	OPEN MOTORS					
	2 POLE		4 POLE		6 POLE	
HP	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1	77.0	74.0	85.5	82.5	82.5	80.0
1.5	84.0	81.5	86.5	84.0	86.5	81.5
2	85.5	82.5	86.5	84.0	87.5	81.5
3	85.5	82.5	89.5	84.0	88.5	86.5
5	86.5	84.0	89.5	84.0	89.5	87.5
7.5	88.5	86.5	91.0	89.5	90.2	88.5
10	89.5	87.5	91.7	90.2	91.7	90.2
15	90.2	88.5	93.0	91.7	91.7	90.2
20	91.0	89.5	93.0	91.7	92.4	91.0
25	91.7	90.2	93.6	92.4	93.0	91.7
30	91.7	90.2	94.1	93.0	93.6	92.4
40	92.4	91.0	94.1	93.0	94.1	93.0
50	93.0	91.7	94.5	93.6	94.1	93.0
60	93.6	92.4	95.0	94.1	94.5	93.6
75	93.6	92.4	95.0	94.1	94.5	93.6
100	93.6	92.4	95.4	94.5	95.0	94.1
125	94.1	93.0	95.4	94.5	95.0	94.1
150	94.1	93.0	95.8	95.0	95.4	94.5
200	95.0	94.1	95.8	95.0	95.4	94.5
250	95.0	94.1	95.8	95.0	95.4	94.5
300	95.4	94.5	95.8	95.0	95.4	94.5
350	95.4	94.5	95.8	95.0	95.4	94.5
400	95.8	95.0	95.8	95.0	95.8	95.0
450	95.8	95.0	96.2	95.4	96.2	95.4
500	95.8	95.0	96.2	95.4	96.2	95.4

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NEMA MG 1-1998 Table 12-12 (continued)
Full-Load Efficiencies for NEMA Premium™ Efficiency Electric Motors
Rated 600 Volts or Less (Random Wound)

ENCLOSED MOTORS

	2 POLE		4 POLE		6 POLE	
HP	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency	Nominal Efficiency	Minimum Efficiency
1	77.0	74.0	85.5	82.5	82.5	80.0
1.5	84.0	81.5	86.5	84.0	87.5	85.5
2	85.5	82.5	86.5	84.0	88.5	86.5
3	86.5	84.0	89.5	87.5	89.5	87.5
5	88.5	86.5	89.5	87.5	89.5	87.5
7.5	89.5	87.5	91.7	90.2	91.0	89.5
10	90.2	88.5	91.7	90.2	91.0	89.5
15	91.0	89.5	92.4	91.0	91.7	90.2
20	91.0	89.5	93.0	91.7	91.7	90.2
25	91.7	90.2	93.6	92.4	93.0	91.7
30	91.7	90.2	93.6	92.4	93.0	91.7
40	92.4	91.0	94.1	93.0	94.1	93.0
50	93.0	91.7	94.5	93.6	94.1	93.0
60	93.6	92.4	95.0	94.1	94.5	93.6
75	93.6	92.4	95.4	94.5	94.5	93.6
100	94.1	93.0	95.4	94.5	95.0	94.1
125	95.0	94.1	95.4	94.5	95.0	94.1
150	95.0	94.1	95.8	95.0	95.8	95.0
200	95.4	94.5	96.2	95.4	95.8	95.0
250	95.8	95.0	96.2	95.4	95.8	95.0
300	95.8	95.0	96.2	95.4	95.8	95.0
350	95.8	95.0	96.2	95.4	95.8	95.0
400	95.8	95.0	96.2	95.4	95.8	95.0
450	95.8	95.0	96.2	95.4	95.8	95.0
500	95.8	95.0	96.2	95.4	95.8	95.0

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