

CC-M-641d

September 1, 1964

SUPERSEDING

Int. Fed. Spec. CC-M-00641c (GSA-FSS)

February 7, 1963 and

Fed. Spec. CC-M-641b

May 21, 1957

FEDERAL SPECIFICATION**MOTOR, ALTERNATING CURRENT,
(INTEGRAL HORSEPOWER, 200 HP AND
SMALLER)**

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers integral horsepower, singlephase and polyphase induction motors and polyphase synchronous motors for use on alternating current systems in nontactical equipment.

1.2 Classification.

1.2.1 Types and classes. Motors furnished under this specification shall be of the following types and classes, as specified (see 6.1):

Type I—Single-phase motors.

Class 3—Permanent split capacitor.

Class 4—Two value capacitor.

Class 5—Repulsion.

Class 7—Repulsion induction.

Class 8—Repulsion-start induction.

Class 10—Split phase (capacitor start).

Type II—Polyphase motors.

Class 11—Squirrel-cage induction.

Class 12—Synchronous.

Class 13—Wound-rotor induction.

1.2.2 Enclosures. Motors shall be furnished in the following enclosure styles, as specified (see 6.1):

Style A1—Open.

Style A2—Dripproof.

Style A3—Splashproof.

Style A4—Guarded.

Style A5—Dripproof, fully guarded.

Style B1—Totally-enclosed, non-ventilated.

Style B2—Totally-enclosed, fan-cooled.

Style B3—Waterproof.

Style B4—Explosion-proof.

Style B5—Dust-ignition-proof.

Note 1: Motors with style A enclosures are variations of the open motor. Motors with style B enclosures are variations of the totally-enclosed motor.

Note 2: For definition of the various electrical terms used throughout this specification, reference should be made to A.S.A. C42.10.

**2. APPLICABLE SPECIFICATIONS,
STANDARDS, AND OTHER PUBLICA-
TIONS**

2.1 Specifications and standards. The following specifications and standards, of the issues in effect on date of invitation for bids, form a part of this specification:

Federal Standards:

Fed. Std. No. 102—Preservation, Packaging and Packing Levels.

Fed. Std. No. 123—Marking for Domestic Shipment (Civilian Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index.

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The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

MIL-P-16298—Preservation, Packaging, Packing, and Marking of Electric Machines Having Rotating Parts and Associated Repair Parts.

Military Standards:

MIL-STD-129—Marking for Shipment and Storage.

MIL-STD-130—Identification Marking U.S. Military Property.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following publications form a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

Underwriters' Laboratories, Inc. Standards:

UL-674(a) — Motors and Generators, Electric, for Use in Hazardous Locations, Class II, Groups F and G.

UL-674(b) — Motors and Generators, Electric, for Use in Hazardous Locations, Class I, Groups C and D (Part I—Integral Horsepower).

(Copies may be obtained from Underwriters' Laboratories, Inc., Walt Whitman Road, Melville, N. Y., 11749; 207 E. Ohio Street, Chicago, Illinois, 60611; and 1655 Scott Blvd., Santa Clara, California, 95050.)

American Standards Association, Inc., Standards:

C1—National Electrical Code.

C6.1—Terminal Markings for Electrical Apparatus.

C42.10—Definitions of Electrical Terms: Rotating Machinery.

C50.1—Synchronous Generators, Synchronous Motors, and Synchronous Machines in General.

C50.2 — Alternating-Current Induction Motors, Induction Machines in General, and Universal Motors.

C50.4—Direct-Current Generators, Direct-Current Commutating Machines in General.

C50.8—Dimensions for Motors and Generators.

C50.20 — Polyphase-Induction Motors and Generators, Test Code for.

(Application for copies should be addressed to American Standards Association, Inc., 10 East 40th Street, New York 16, N. Y.).

Institute of Electrical & Electronics Engineers Standards:

No. 502—Single-Phase Induction Motors, Test Procedures for.

No. 503—Synchronous Machines, Test Procedure for.

(Application for copies should be addressed to Institute of Electrical & Electronics Engineers, Box A, Lenox Hill Station, New York, N. Y.)

3. REQUIREMENTS

3.1 Material. All material used in the construction of motors shall be of the quality best suited to the purpose intended. The material used in the construction of any design of motor in all cases shall be consistent

with the strength required for safety and reliability.

3.2 Fire and casualty hazards.

3.2.1 Each contractor shall submit to the contracting agency proof that the motors for hazardous locations he proposes to supply under this specification conform to the requirements of the Underwriters' Laboratories, Inc., Standard UL-674(a) or UL-674(b), as applicable. The label, or listing with reexamination, of the Underwriters' Laboratories, Inc., may be accepted as evidence that the motors conform to this requirement.

3.2.2 In lieu of the label or listing, with reexamination, the contractor may submit independent proof, satisfactory to the contracting agency that the motors for hazardous locations conform to the applicable requirements of the published standards including methods of test of UL-674 (a) or UL-674(b).

3.2.3 Compliance with the above preliminary requirements in regard to fire and casualty hazards does not absolve the contractor from complete compliance with the requirements of this specification in order to secure acceptance of his material.

3.3 Voltage rating.

3.3.1 *Single phase.* Single-phase motors shall be wound for 115 volts or 230 volts, as specified.

3.3.2 *Polyphase.* Motors shall be furnished for 110*, 208-, 220-, 440-, 550-, or 2300** volt operation, as specified.

* Motors rated 15 hp and smaller.

** For motors built in the 444U and larger frames.

3.4 *Frequency rating.* Frequency rating shall be 50-, 60-, or other cycle frequency rating as specified in the invitation for bid.

3.5 Allowable variations in ratings.

3.5.1 *Voltage.* All motors shall operate successfully at rated load and frequency with voltage not more than 10 percent above or below the nameplate rating, but not necessarily in accordance with the performance standard established for operation at normal ratings. Rated exciting current shall be maintained for synchronous motors.

3.5.2 *Frequency.* All motors shall operate successfully at rated load and voltage with frequencies not more than 5 percent above or below the nameplate rating, but not necessarily in accordance with the performance standards established for operation at normal ratings. Rated exciting current shall be maintained for synchronous motors.

3.5.3 *Combined voltage and frequency.* All motors shall operate successfully at rated load with a combined variation in voltage and frequency not more than 10 percent above or below the nameplate rating, provided the limits of variation given in 3.5.1 and 3.5.2, are not exceeded, but not necessarily in accordance with the performance standards established for operation at normal ratings. Rated exciting current shall be maintained for synchronous motors.

3.6 *Duty.* Motors furnished under this specification shall be suitable for continuous duty operation. When short-time intermittent, periodic, or varying duty operation is desired, it shall be so specified in the invitation for bids.

3.7 *Electrical insulation.* The temperature limits on which the rating of electrical machines and apparatus is based, are largely determined by the character of the insulating materials. Insulating materials shall be classed as either class A, B, F, or H.

Class A—Materials or combinations of materials such as cotton, silk, and paper when suitably impregnated or coated or when immersed in a dielectric liquid such as oil. Other materials or combinations of materials may be included in this class if by experience or accept-

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ed tests they can be shown to be capable of operation at 105 degrees C.

Class B—Materials or combinations of materials such as mica, glass, fiber, asbestos, etc., with suitable bonding substances. Other materials or combinations of materials, not necessarily inorganic, may be included in this class if by experience or accepted tests, they can be shown to be capable of operation at 130 degrees C.

Class F—Materials or combinations of materials such as mica, glass, fiber, asbestos, etc., with suitable bonding substances. Other materials or combination of materials, not necessarily inorganic, may be included in this class if by experience or accepted tests they can be shown to be capable of operation at 155 degrees C.

Class H—Materials or combinations of materials such as silicone, elastomer, mica, glass, fiber, asbestos, etc., with suitable bonding substances such as appropriate silicone resins. Other materials or combinations of materials may be included in this class if by experience or accepted tests they can be shown to be capable of operation at 180 degrees C.

Note: An insulation is considered to be "impregnated" when a suitable substance replaces the air between its fibers, even if this substance does not completely fill the spaces between the insulated conductors. The impregnating substances, in order to be considered suitable, must have good insulating properties; must entirely cover the fibers and render them adherent to each other and to the conductor; must not produce interstices within itself as a consequence of evaporation of the solvent or through any other cause; must not flow during the operation of the machine at full working load or at the temperature limit specified; and must not unduly deteriorate under prolonged action of heat.

3.7.1 Utilization. The particular class of insulation to be employed may be specified. If no class of insulation is specified, any one may be used.

3.7.2 Mixed insulation. Unless otherwise specified in the invitation for bids, nothing in the foregoing shall be construed as limiting all the insulation on a given motor to a single class. Class B insulation may, if desired, be used on a motor where class A insulation is specified or approved, and the temperature limits applicable to the particular class of insulation used shall be met in every case. Where a motor is specified as class A insulated, it shall mean that no insulation having a lower temperature limit than class A is utilized; and where class B is specified that no insulation having a lower temperature limit than class B shall be used.

3.8 General construction. Frames shall be accurately manufactured for mounting end shields and arranged to support the stator laminations. End shields shall be mounted by means of accurately manufactured shoulder joints with not less than two machine screws or bolts of suitable size and strength. When so required, the design of these end shields shall provide for, and the accuracy of manufacture shall be such as to permit, the rotation of the end shields through 90° to 180° in either direction, to allow for the mounting of the motor on the ceiling or underside of the apparatus.

3.8.1 Unless otherwise specified, all motor frame sizes to be furnished shall be in accordance with ASA C50.8.

3.9 Enclosing covers. Enclosing covers, where used, shall be attached to the motor frame or end shields in a suitable manner. They shall be readily removable. In the case of waterproof motors the contact surfaces between the enclosing covers and the motor frame shall be free from fins, burrs, or other imperfections detrimental to waterproofness and shall be provided with gaskets suitably secured and treated on the exposed surface to prevent sticking.

3.10 Feet. When motors intended for foot mounting are purchased unattached to any

equipment, the motor frame shall be provided with feet, practically true and drilled or slotted for holding down bolts.

3.11 Drain plug. The frames of all waterproof motors shall be provided with drain plugs or check valves at accessible points and so located that they will drain all pockets in the motor casing.

3.12 Shafts. Unless otherwise specified, a shaft extension with keyway shall be provided for connection to the driven apparatus.

3.13 Lubrication. Pressure lubricating fittings may be used on motor bearings where provision is made for pressure relief. The design of the lubricating system shall assure successful operation. Where sleeve bearings are permitted, oil rings, wool packed bearings or equivalent, or forced lubricated bearings of suitable design shall be furnished.

3.13.1 Oil reservoir. Each oil reservoir shall be liberal in size and provided with an opening at the proper height to prevent overfilling except where wool packed bearings or equivalent are used, and an opening shall be provided for use in filling the bearing with oil. A drain plug (except for wool packed bearings, or equivalent), shall be provided at the lowest point of the oil reservoir.

3.13.2 Oil leakage. Lubricating oil or grease shall be prevented by a suitable method from escaping from motor bearings under operating conditions.

3.14 Bearings.

3.14.1 General. Bearings shall be of the ball, roller, or sleeve type, as specified in the invitation for bids. Any one of the types may be supplied if none is specified.

3.14.2 Sleeve bearings. Ample bearing surface shall be provided and the bearings shall be efficiently lubricated. (See 3.13.)

3.14.3 Vertical motors.

3.14.3.1 The following requirements are based on design of equipment using vertical motors mounted above the driven units.

3.14.3.2 Unless otherwise specified, the thrust bearing of vertical motors shall be a ball, roller, or plate bearing of suitable design to take the thrust and where necessary shall be designed to take thrust in both directions. This bearing may be located in either the upper or lower end shield. If it is intended to take radial load, an additional bearing of the sleeve or ball type may be used. The bearing in the end shield which does not take the thrust may be of either the ball-, roller-, or sleeve-bearing type. Where the motor shaft is solidly coupled to the driven apparatus, the thrust capacity of the thrust bearing shall be sufficient to carry the weight of the rotating element of the motor and, when specified, the weight of the rotating element of the driven auxiliary in addition.

3.14.3.3 For the lubrication of the bearing of vertical motors the requirements of 3.13.1 and 3.13.2 shall apply. The sleeve bearings shall be assured of sufficient lubrication by extension sleeves running in the oil reservoir and circulating the oil by centrifugal force or by other positive lubrication methods. Ball-thrust bearings shall be lubricated by oil or grease at all times. In the case of vertical motors, the requirements of 3.13.2 shall apply with special emphasis when properly lubricated, and the design shall insure that oil or grease from the bearings above the motor cannot spill or run down over the motor windings under operating conditions, including inclined position, where inclined operation is necessary, and the maximum angle is specified.

3.14.3.4 In any case, the design shall incorporate convenient means for removal and replacement of all bearings, including the ball thrust, if supplied, with a minimum disturbance of other parts of the motor.

3.15 Laminated cores. Laminated cores shall be built up of separately punched thin

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laminations of low hysteresis loss, non-aging steel. The laminations shall be processed to insure adequate interlamination resistance. In the assembly of the cores care shall be taken to remove all burrs or projecting laminations in the slot portion of the core which might result in injury to the coils. The laminations shall be clamped together in such manner as to insure that the assembled core is "tight" at the top of the teeth.

3.16 Commutator (where used).

3.16.1 General. Commutators shall be built up of best quality hard-drawn, hard-rolled, or drop-forged copper segments or other suitable metals insulated from each other by mica, pressed mica plate, or other suitable material, and from the shell by mica, pressed mica plate, molded insulation, or other suitable material. They shall be either of the metal V-ring or molded insulation construction. The commutator shall be secured rigidly to the shaft or spider by keying or other suitable methods which will positively insure maintenance of alignment with respect to the rotor core slots.

3.16.2 Commutator segments. The commutator segments shall be securely retained in a manner that will best prevent their relative displacement as a result of centrifugal forces and the stresses imposed by repeated expansion and contraction in service. The segments, when worn to the full extent of the wearing depth specified hereunder, shall be of ample section to operate satisfactorily. The wearing depth, measured on the radius, for commutators up to and including 6-inch diameters shall be not less than 8 percent of the radius and in no case less than 1/8 inch. For commutators more than 6 inches in diameter, the wearing depth, measured on the radius, shall be not less than 5/16 inch.

3.16.3 Connections. The connections to the rotor windings shall be efficiently soldered, and if separate risers are used, they shall be mechanically and electrically connected to the commutator bar in a suitable manner.

3.16.4 Sealing. After the assembly of the commutator, all crevices or joints at each end between the bars and the retaining flanges shall be completely filled up and sealed over with a high-grade, flexible, baking, insulating varnish in a manner that will prevent the entrance of moisture, oil, carbon, or copper dust, or other deleterious substances except at points where the fill would interfere with the function of any short-circuiting device. Likewise, the short creepage paths from the bare copper bars at each end to the bare metal flanges shall be given a heavy durable coating of flexible baked insulating varnish as a protection against short-circuits and grounds at these points.

3.16.5 Undercutting. The insulation between bars shall be undercut. The undercutting shall be accomplished by removing all insulation between bars to form a groove not to exceed 3/64 inch in depth.

3.16.6 Curing. All commutators shall be cured at higher than operation temperatures and shall be of such thoroughly solid construction throughout that they will hold their shape in service and obviate the necessity of frequently dressing the commutators on account of high bars or flat spots.

3.17 Collector (slip) rings (where used).

3.17.1 Material. Collector rings, where used, shall be of copper, brass, bronze, cast iron, or corrosion-resisting steel. The rings shall run true, have smooth polished surfaces and be free from harmful porosity or hard spots.

3.17.2 Construction. The rings, with their insulation, shall be of such thoroughly solid construction throughout as to insure against their becoming loosened or eccentric due to changes in temperature in service. They shall be secured rigidly to the shaft or spider by keying or other suitable method.

3.17.3 Wearing depth. The wearing depth measured on the radius of collector rings, where used, shall be not less than 3 percent

of the radius of the ring for copper, brass, or bronze and 2 percent for corrosion-resisting steel and cast iron, except in no case shall it be less than 1/16 inch.

3.18 Brushes and brush holders (where used).

3.18.1 Brushes shall have sufficient capacity to prevent undue heating when the motor is carrying normal rated load under the most unfavorable service conditions. If the brush slides in the holder, it shall be connected to the brush holder by a flexible copper connector or "pigtail".

3.18.2 The brush holders for reversible motors shall be of a type which will permit satisfactory operation with the motor running in either direction. They shall be protected by the motor end bracket. On 7-1/2-horsepower and larger commutator-type motors, the brush rigging shall be mounted on a rocker ring which shall fit into an accurately machined groove in the motor end bracket or rigidly mounted to the end bracket. Means for shifting the brushes shall be provided.

3.18.3 Brush holders shall be readily accessible for adjustment and renewal of brushes and springs. The springs shall not be depended upon to carry current.

3.18.4 The brush holders and rigging on 7-1/2-horsepower and larger commutator-type motors shall be constructed to permit the proper staggering of the brushes to insure even wear of the commutator.

3.19 Winding connections and terminal leads.

3.19.1 *Winding connections.* All electrical connections may be made by soldering, bolting or other suitable means which will give good electrical contact. Parts shall be so proportioned that no injurious heating will occur under the most unfavorable service conditions. A high temperature tin-lead-silver solder, or spelter solder, or copper welding may be employed in the making of all winding connections in class B, F, or H insulated windings. If desired, a tin-lead

solder may be used where the windings are class A insulated throughout. On motors employing either class A, R, F, or H insulation, the welding together of stator connections by burning off the twisted ends is permissible in lieu of soldered joints.

3.19.2 The electrical connections shall be secured by suitable means to prevent them from becoming loosened by vibration.

3.19.3 *Terminal leads.* All motors shall be provided with suitable and accessible leads for line connection. Leads shall be suitably secured to the winding and shall terminate in a suitable terminal box unless the motor is specified for use on equipment where other construction is suitable. Leads shall be made of flexible, stranded, insulated wire.

3.19.4 *Lead markings.* All line leads or terminal connections shall be permanently marked when, for single-phase motors, more than two leads, and when for polyphase motors, more than three leads are brought out from the motor frame. Terminal markings shall conform to ASA C6.1.

3.20 *Terminal box.* The terminal box shall be so designed that the required size of flexible or rigid conduit can be readily and permanently attached, unless the motor is specified for use on equipment where conduit is not required. Size of conduit shall be determined from ASA C1, in accordance with the size and number of power leads required. Terminal box shall be of ample size to contain all required connections between motor leads and line leads.

3.21 *Nameplates.* All motors shall be provided with a readily visible nameplate containing the information required by ASA C50.1 or C50.2 as applicable.

3.22 *Gear motors.* When so specified, motors shall be equipped with gears of the manufacturer's latest proven design which will drive the power take-off shaft at the specified speed.

3.23 *Painting.* The frames of motors shall be finished to produce a neat and durable surface.

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TABLE I.

Horsepower	60 Cycles				50 Cycles			
	R.p.m.				R.p.m.			
1/2	—	—	—	900	—	—	1000	750
3/4	—	—	1200	900	—	1500	1000	750
1	—	1800	1200	900	3000	1500	1000	750
1-1/2	3600	1800	1200	900	3000	1500	1000	750
2	3600	1800	1200	900	3000	1500	1000	750
3	3600	1800	1200	900	3000	1500	1000	750
5	3600	1800	1200	900	3000	1500	1000	750
7-1/2	3600	1800	1200	900	3000	1500	1000	750
10	3600	1800	1200	900	3000	1500	1000	750
15	3600	1800	1200	900	3000	1500	1000	750
20	3600	1800	1200	900	3000	1500	1000	750
25	3600	1800	1200	900	—	—	—	—

3.24 Detail requirements.**3.24.1 Type I motors.****3.24.1.1 Horsepower and speed ratings.**

Type I motors shall be furnished in the following horsepower and synchronous speed ratings: (See table I.)

3.24.1.2 Design letters. Type I motors shall be furnished in either "L" or "M" designs as defined in ASA C50.2 (see 6.1).

3.24.1.3 Unless otherwise specified, the following requirements shall conform to ASA C50.2 and C50.8 as applicable.

(a) Locked rotor current**(b) Locked rotor torque****(c) Breakdown torque****(d) Temperature rise****(e) Dielectric strength****(f) Tolerance on shaft extension diameter****(g) Tolerance on keyway dimensions****(h) Vibration****3.24.2 Type II motors.****3.24.2.1 Classes 11 and 13 motors.****3.24.2.1.1 Horsepower and speed ratings.**

Classes 11 and 13 motors shall be furnished in the following horsepower and synchronous speed ratings: (See table II.)

TABLE II.

Horsepower	60 Cycles								50 Cycles			
	R.p.m.								R.p.m.			
1/2	—	—	—	900	720	600	514	450	—	—	—	750
3/4	—	—	1200	900	720	600	514	450	—	—	1000	750
1	—	1800	1200	900	720	600	514	450	—	1500	1000	750
1-1/2	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
2	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
3	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
5	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
7-1/2	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
10	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
15	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
20	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
25	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
30	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
40	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
50	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
60	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
75	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
100	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
125	3600*	1800	1200	900	720	600	514	450	3000*	1500	1000	750
150	3600*	1800	1200	900	720	600	514	450	—	1500	1000	750
200	—	1800	1200	900	720	600	514	—	—	1500	1000	750

* Applies to squirrel-cage motors only.

TABLE III.

Horsepower	60 Cycles					50 Cycles				
	Speed, r.p.m.									
20	1800	1200	—	—	—	1500	—	—	—	—
25	1800	1200	—	—	—	1500	1000	—	—	—
30	1800	1200	900	—	—	1500	1000	—	—	—
40	1800	1200	900	720	—	1500	1000	750	—	—
50	1800	1200	900	720	600	1500	1000	750	—	—
60	1800	1200	900	720	600	1500	1000	750	600	—
75	1800	1200	900	720	600	1500	1000	750	600	—
100	1800	1200	900	720	600	1500	1000	750	600	500
125	1800	1200	900	720	600	1500	1000	750	600	500
150	1800	1200	900	720	600	1500	1000	750	600	500
200	1800	1200	900	720	600	1500	1000	750	600	500

3.24.2.1.2 Design letters. Classes 11 and 13 motors shall be furnished in either "A", "B", "C", "D", or "F" designs as defined in ASA C50.2 (see 6.1).

3.24.2.1.3 Unless otherwise specified, the following requirements shall conform to ASA C50.2 and C50.8, as applicable.

- (a) Locked rotor current
- (b) Locked rotor torque
- (c) Pull-up torque
- (d) Breakdown torque
- (e) Temperature rise
- (f) Dielectric strength
- (g) Tolerance on shaft extension diameter
- (h) Tolerance on keyway dimensions
- (i) Vibration

3.24.2.2 Class 12 motors.

3.24.2.2.1 Horsepower and speed ratings. Class 12 motors shall be furnished in the following horsepower and speed ratings: (See table III).

3.24.2.2.2 Excitation. Synchronous motor fields shall be excited from a directly connected direct-current generator conforming to the requirements of ASA C50.4. The exciter shall be overhung on the motor end-shield, unless otherwise required or permitted.

3.24.2.2.3 Unless otherwise specified, the following requirements shall conform to ASA C50.1 and C50.8, as applicable.

- (a) Locked rotor torque
- (b) Pull-in torque
- (c) Pull-out torque
- (d) Temperature rise
- (e) Dielectric strength
- (f) Maximum pulsating armature current
- (g) Tolerance on shaft extension diameter
- (h) Tolerance on keyway dimensions

3.25 Plans with bids.

3.25.1 General. In the case of motors to be purchased solely as motors (not a part of other apparatus), each bidder shall submit with his bid sufficient information in duplicate, to enable the activity concerned to obtain a clear understanding of the apparatus offered before making recommendation of award of contract. This information may be in the form of blueprint plans, photographs, or typewritten or printed descriptive specifications, in such arrangement as the bidder may prefer.

3.25.2 Information required. The information contained in any plans with bids shall clearly show the following:

Outline, over-all and principal dimensions.
Weights.

Complete rating (see 6.1, items b to m inclusive).

In addition, when specifically called for in the invitation for bids, the guaranteed performance including efficiency and power factor at 3/4- and 4/4- rated load, shall be indicated.

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3.26 Workmanship. The motors shall be free from characteristics or defects which affect the appearance, or which might affect the serviceability or render the motors unsuitable or inefficient for the intended purpose.

4. SAMPLING, INSPECTION, AND TEST PROCEDURES

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling. If any department or independent establishment requires laboratory tests in addition to the statements and certified reports referred to in 3.2.2, 3.2.3 and 4.1, one sample of each type and rating of motor purchased shall be supplied to the testing laboratory, as specified in the contract or order.

4.3 Inspection. Each motor shall be subjected to a thorough examination to ascertain that the material, workmanship, and design (type, degree of enclosure, lubrication, etc.) are in accordance with the requirements of this specification.

4.4 Tests. Unless otherwise specified, motors selected in accordance with 4.2 shall be subjected to the tests necessary to determine compliance with the requirements of 3.24.1.3, 3.24.2.1.3, or 3.24.2.2.3. The tests shall be conducted as specified in ASA C50.20, IEEE Test Code No. 502, or No. 503, as applicable.

4.5 Inspection of preparation for delivery requirements. An inspection shall be made

to determine that preservation, packaging, packing, and marking requirements of section 5 of this specification are complied with.

5. PREPARATION FOR DELIVERY

(For civil agency procurement, the definitions and application of levels of packaging and packing shall be in accordance with Fed. Std. No. 102.)

5.1 Preservation and packaging. Preservation and packaging shall be level A, B, or C, as specified (see 6.1).

5.1.1 Levels A or C. The motors shall be preserved and packaged in accordance with MIL-P-16298.

5.1.2 Level B. The motors shall be preserved and packaged in accordance with the level A requirements of MIL-P-16298.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.1).

5.2.1 Levels A, B, or C. The motors shall be packed in accordance with MIL-P-16298.

5.3 Marking. The motors shall be marked in accordance with MIL-P-16298 with the following additional requirement:

Civil agencies. In addition to markings required by the contract or order, the shipping containers shall be marked in accordance with Fed. Std. No. 123.

6. NOTES

6.1 Ordering data. Purchasers should exercise any desired options offered herein and procurement documents should specify the following:

- (a) Title, symbol, and date of this specification.
- (b) Type and class of motor (1.2.1).
- (c) Style of enclosure (1.2.2).
- (d) Voltage rating (3.3).
- (e) Frequency rating (3.4).
- (f) Duty class, if other than continuous (3.6).

- (g) Insulation class required (3.7).
- (h) Mixed insulation (3.7.2).
- (i) Motor frame sizes (3.8.1).
- (j) Shafts (3.12).
- (k) Type of bearings (3.14.1 and 3.14.3.2).
- (l) Horsepower and speed ratings (3.24.1.1, 3.24.2.1.1, and 3.24.2.2.1).
- (m) Motor design letters (3.24.1.2 and 3.24.2.1.2).
- (n) Performance requirement if other than specified (3.24.2.1.3 and 3.24.2.2.3).
- (o) Performance guarantee, if desired.
- (p) Inspection responsibility, if other than specified (4.1).
- (q) Tests, if other than specified (4.4).
- (r) Packaging (5.1).
- (s) Special packing, if required (5.2).
- (t) Special marking, if required (5.3).

6.2 Proper selection of apparatus. Extreme care should be used in the proper selection of apparatus in order that successful operation and good service will result. When in doubt, the exact type of service should be specified. Where the apparatus is subjected to unusual risk, manufacturers should be consulted, especially where the apparatus is used under the following conditions:

- (a) Exposed to chemical fumes.
- (b) Operated in damp places.
- (c) Operated at excess speed.
- (d) Exposed to combustible or explosive dust.
- (e) Exposed to gritty or conducting dust.
- (f) Exposed to lint.
- (g) Exposed to steam.
- (h) Operated in poorly ventilated rooms.
- (i) Operated in pits, or where entirely enclosed in boxes.
- (j) Exposed to inflammable or explosive gases.
- (k) Exposed to temperatures below 10 degrees C.

- (l) Exposed to temperatures above 40 degrees C.
- (m) Exposed to oil vapor.
- (n) Exposed to salt air.
- (o) Exposed to abnormal shock or vibration from external sources.
- (p) Where the departure from rated voltage and/or frequency is excessive.

6.3 When motors rated at voltages other than those specified in 3.3, are required, it is suggested that they be purchased in conformity with all applicable requirements of this specification. In this connection, attention is directed to 3.5.1, and it is suggested that a study of the voltage fluctuations of the line be made. However, it should be noted that motors operated at or near the extreme limits required by 3.5.1, may run "hot" and have very little allowances for any further variation in voltage. The range of the voltage variation of the line should be the determining factor in the voltage rating specified.

6.4 This specification covers only the types, classes, sizes, etc. of the commodity as generally purchased by the Federal Government, and is not intended to include all of the types, etc., which are commercially available. Where a motor is offered competitively where design and operating characteristics conform to the requirements of this specification but exceed those specified in the invitation for bids, the contracting officer, at his option, may accept this motor in lieu of those advertised.

6.5 Transportation description. Transportation descriptions and minimum weights applicable to this commodity are:

Rail:

Motors, electric, not otherwise indexed by name.

Carload minimum weight 30,000 pounds.

CC-M-641d

Motor:

Motors, electric, not otherwise indexed.
Truckload minimum weight 30,000
pounds, subject to Rule 115, Na-
tional Motor Freight Classification.

MILITARY CUSTODIANS:

Army—MO

Navy—YD

Air Force—11

Review Interest:

MO, YD, SH, 11, 79

User Interest:

MU, GL, WP