STD.NEMA C12.10-ENGL 1997 ■ 6470247 0514656 927 ■

AMERICAN NATIONAL STANDARD

American National Standard

ANSI C12.10-1997

AMERICAN NATIONAL STANDARD

FOR WATTHOUR METERS

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
1300 NORTH 17TH STREET, SUITE 1847, ROSSLYN, VA 22209
(703) 841-3200 FAX: (703) 841-3300

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

ANSI C12.10-1997

AMERICAN NATIONAL STANDARD

FOR WATTHOUR METERS

Accredited Standard Committee on Electricity Metering, C12

Accredited by

American National Standards Institute

Approved September, 1997

American National Standards Institute, Inc.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

Published by

National Electrical Manufacturers Association
1300 N. 17th Street, Rosslyn, Virginia 22209

© Copyright 1998 by the National Electrical Manufacturers Association. All rights including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention for the Protection of Literary and Artistic Works, and the International and Pan American Copyright Conventions.

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without prior written permission of the publisher.

Printed in the United States of America

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

Table of Contents

Page

Foreword iii

1 Scope 1

2 References 1

3 Standards applicable to watthour meters 1

3.1 Mounting 1
3.2 Voltage and frequency 1
3.3 Current classes and test amperes 1
3.4 Typical form designations 1
3.5 Rotor (electromechanical meters only) 3
3.6 Calibration adjustments (electromechanical meters only) 3
3.7 Meter nameplate 3
3.8 Displays 5
3.9 Requirements for solid-state registers 7

4 Requirements applicable to detachable watthour meters 8

4.1 Dimensions 8
4.2 Hanger 8
4.3 Sealing 8
4.4 Connections 8

5 Requirements applicable to bottom-connected watthour meters 9

5.1 Dimensions 9
5.2 Hanger 9
5.3 Sealing 9
5.4 Connections 9
5.5 Terminal blocks 9
5.6 Terminals 9

6 Performance requirements for solid-state registers for electromechanical meters 10

6.1 Initial conditions – accuracy tests 10
6.2 Effect of voltage variation 10
6.3 Effect of variation of temperature 10

7 Procedure for assigning form designations 11

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

Foreword (This foreword is not part of ANSI C12.10-1997.)

This standard was developed by the Accredited Standards Committee on Electricity Metering, C12, for full consensus approval as an American National Standard and provides recommended minimum requirements for both detachable and bottom-connected watthour meters. This revised edition supersedes ANSI C12.10-1987.

Suggestions for improvement to this standard are welcome. They should be sent to:

National Electrical Manufacturers Association
Vice President of Engineering
1300 North 17th Street
Suite 1847
Rosslyn, VA 22209

The technical contents of this standard were brought up-to-date, all definitions in section two were moved to ANSI C12.1-1995, all specifications in ANSI C12.13, C12.15, and C12.16 were included in this edition, and all sections were modified and updated.

Dimensions and other relevant specifications given in this standard have been coordinated with the American National Standard Requirements for Watthour Meters Sockets, ANSI C12.7-1993. At the time the committee approved this standard, the C12 Committee had the following members:

Tom Drew, *Chairman*
Christopher Merther, *Secretary*

Organization Represented	*Name of Representative*
ABB Power T&D Company	Drew, T.
APTECH, Inc.	Beverly, W.
Arizona Public Service	Cook, B.
Arizona Public Service	Ensor, G.
AVO International	Williams, D.
Consumers Power	Blackmer, J.
Edison Electric Institute	Miller, G.
Florida Power & Light	McEvoy, J.
Florida Power & Light	Malemezian, E.
General Electric	Germer, W.
Georgia Power Company	McDonald, K.
Itron	Buckley, B.
Mississippi Power	Buckner, E.
NIST	Oldham, N.
Pacific Gas & Electric	Nguyen, D.Y.
Pacific Gas & Electric	Vahlstrom, T.
Pacificorp	Pananen, L.
Pacificorp	Smith, C.
Public Service Electric & Gas	Powers, G.
Siemens	Voisine, J.
Siemens PT&D	Jannelli, R.
Scientific Columbus	Martin, J.
Schlumberger	Purc, M.
Schlumberger	Stevens, R.
Tampa Electric	Malich, S.
TU Electric	Johnson, B.
TU Electric	Mining, J.
Watthour Electric Institute	Weimer, C.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

AMERICAN NATIONAL STANDARD

for Watthour Meters

1 Scope

This standard covers the physical aspects of both detachable and bottom-connected watthour meters and associated registers. These include ratings, internal wiring arrangements, pertinent dimensions, markings, and other general specifications. Refer to ANSI C12.1-1995 for performance requirements.

2 References

The following publications shall be used in conjunction with this standard:

1. ANSI C12.1-1995, *American National Standard for Electric Meters*
2. ANSI MH10.8M-1993, *American National Standard Specifications for Bar Code Symbols on Unit Loads and Transport Packages*
3. *The Handbook for Electricity Metering,* 9th edition, Pub #06-92-01, The Edison Electric Institute, 1992

3 Standards applicable to watthour meters

3.1 Mounting

Mounting arrangements shall be either detachable (socket or type "S") or bottom-connected (type "A").

3.2 Voltage and frequency

The typical voltage and frequency ratings are 120, 240, 277, or 480 V and 60 Hz.

3.3 Current classes and test amperes (TA)

The normal current classes and test amperes shall be as listed in Table 1:

Table 1 – Current classes and test amperes

Current Class	Test Amperes
10	2.5 A
20	2.5 A
100	15 A
200	30 A
320	50 A

NOTE—Current classes 200 and 320 in "S" type only.

Other values of test amperes may be used.

3.4 Typical form designations

The form designations for watthour meters are listed in Table 2.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS Not for Resale

Table 2 – Typical form designations

Form Designation	Elements	Current Circuits	External Circuit Wires	See Figure
1S	One	One	Two	10
2S	One	Two	Three	10
3S	One	One	Two	10
4S	One	Two	Three	10
5S	Two	Two	Three	11
6S	Two	Three	Four Wye	11
7S	Two	Three	Four Wye	11
8S	Two	Three	Four Delta	11
9S	Three	Three	Four	11
10S	Three	Three	Four	11
11S	Three	Three	Four Delta	11
12S	Two	Two	Three	12
13S	Two	Two	Three	12
14S	Two	Three	Four Wye	12
15S	Two	Three	Four Delta	12
16S	Three	Three	Four	12
17S	Three	Three	Four Delta	12
24S	Two	Three	Four Delta	11
25S	Two	Two	Three	12
26S	Two	Two	Three	11
28S	Two	Four	Four	12A
29S	Two	Three	Four Wye	11
35S	Two	Two	Three	11
36S	Two	Three	Four Wye	11
45S	Two	Two	Three	11
46S	Two	Three	Four Wye	11
56S	Two	Two	Three	11
66S	Two	Two	Three	11
1A	One	One	Two	16
2A	One	Two	Three	16
3A	One	One	Two	16
4A	One	Two	Three	16
5A	Two	Two	Three	17
6A	Two	Three	Four Wye	17
8A	Two	Three	Four Delta	17
9A	Three	Three	Four	17
10A	Three	Three	Four	17
11A	Three	Three	Four Delta	17
13A	Two	Two	Three	18
14A	Two	Three	Four Wye	18
15A	Two	Three	Four Delta	18
16A	Three	Three	Four	18
17A	Three	Three	Four Delta	18
18A	Two	Four	Five	18
29A	Two	Three	Four Wye	17
35A	Two	Two	Three	17

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

Not for Resale

Table 2 – Typical form designations (continued)

Form Designation	Elements	Current Circuits	External Circuit Wires	See Figure
36A	Two	Three	Four Wye	17
45A	Two	Two	Three	17
46A	Two	Three	Four Wye	17
48A	Three	Three	Four	17

3.5 Rotor (electromechanical meters only) (see Figure 2)

3.5.1 Direction of rotation

Viewed from the top, the direction of the rotor's rotation shall be counter clockwise.

3.5.2 Provisions for testing

Meters shall provide the following means for testing:

3.5.2.1 Radial markings

Two rings of radial markings shall be placed on the top outer surface of the rotor disk. The outer ring shall have 100 equally spaced marks, and the inner ring shall have 180 equally spaced marks.

3.5.2.2 Index markings

Index markings shall be provided on the rotor disk.

3.5.2.3 Holes

1. For single-stator watthour meters, two holes 180º apart and equidistant from the center of the rotor disk shall be provided.

2. For multi-stator meters, one or two holes shall be provided. When two holes are used, they shall be as described in subclause 3.5.2.3(1).

3.6 Calibration adjustments (electromechanical meters only)

3.6.1 Means required for making calibration adjustments shall be readily accessible.

3.6.2 The direction of control of light load and full load adjustments shall be marked with "F" for fast and "S" for slow.

3.6.3 All calibration adjustments shall be loaded to prevent change in meter adjustment during normal handling or vibration.

3.7 Meter nameplate

The nameplate shall contain the following information:

1. Form designation(s) or circuit description
2. Watthour meter or other description
3. Manufacturer's name or trademark

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

4. Manufacturer's serial number
5. Manufacturer's type
6. Current class
7. Rated voltage
8. Number of wires
9. Frequency
10. Test amperes
11. Watthour meter constant
12. Watthour meter test constant (where applicable)

Transformer rated meters shall contain space for the following additional information:

13. Primary watthour meter constant
14. Current transformer ratio (e.g., 200:5)
15. Voltage transformer ratio (e.g., 20:1)

3.7.1 Permissible abbreviations

FM	=	Form designation(s)
CL	=	Current class
V	=	Rated voltage
W	=	Wires
Hz	=	Hertz
TA	=	Test amperes
Kh	=	Watthour meter constant
PKh	=	Primary watthour meter constant
CTR	=	Current transformer ratio
VTR	=	Voltage transformer ratio
Kt	=	Watthour meter test constant

3.7.2 Marking

1. Items 6 through 8 in subclause 3.7 should preferably be placed in a row, in the order listed. Such row may run from left to right at the top of the nameplate or from top to bottom at the left side of the nameplate. On self contained meter nameplates, the figures in these items shall be at least 0.100 inch high.

2. On the nameplates for transformer rated meters, the space allowed for marking of primary ratings shall be adequate for numerals of at least 0.125 inch high and shall be a sufficient width for the highest current and voltage ratings in normal use.

3. The manufacturer's serial number shall be bold faced and shall be at least 0.187 inches high.

3.7.3 Location of nameplate

The nameplate shall be readily readable from the front of the meter.

3.7.4 Material

Nameplates shall be made of durable material that will remain legible when exposed to sunlight.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

3.7.5 Space for utility data or company (utility) number

3.7.5.1 Space for company number

Slots for holding a 2.50-2.75 inches long and a 0.500 inch wide company number badge may be provided. This same space can be used for utility data specified in subclause 3.7.5.2.

3.7.5.2 Space for utility data

A space on the nameplate shall be provided for bar coded information as specified below. Specifications for bar coding are provided in ANSI MH10.8M-1993 (2).

3.7.5.3 Bar coding specifications

3.7.5.3.1 The bar code shall be Bar Code 39 using the 43 character ASCII set, printed 9.4 characters per inch.

3.7.5.3.2 There shall be three lines in the bar code in the following order:

1. Line 1 (top line): free text, specified in the buyer's purchase order (e.g., utility name)
2. Line 2 (middle line): Bar Code 39
3. Line 3 (bottom line) : bar code interpretation line

3.7.5.3.3 The height dimensions of the three lines should be as follows:

1. Line 1: 0.090 to 0.140 inch
2. Line 2: 0.187 to 0.250 inch
3. Line 3: 0.070 to 0.100 inch

The minimum spacing between lines should be 0.020 inch. The sum of the three line heights, plus the spaces between the text, should not exceed 0.600 inch.

3.7.5.3.4 There shall be 19 characters composed of 17 characters and two start/stop asterisks, plus a quiet zone (0.200 inch minimum) at the beginning and at the end of the characters.

3.7.5.3.5 The format of the characters shall be as follows:

@ 1 2 3	@ 4 5 6 7 8 9 10 11 12	@ 13 14 15 16 17 @
user specified	@ serial number @ (manufacturer serial @ number or utility @ number)	@ user @ specified @ @

Positions 1-3 are user specified, positions 4-12 are for manufacturer serial number or utility meter number, and positions 13-17 are user specified.

3.8 Displays

All displays on the meter that are essential for billing purposes shall be readable from the front of the meter.

A register constant, when required, shall be preceded by "multiply by" or "mult by." This wording may be contained on a removable plate that shall provide a minimum space of 0.5 x 0.185 inch for insertion of a multiplier.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

3.8.1 Pointer type register

3.8.1.1 A pointer type register shall divide each dial into ten equal parts, the division marks being numbered from zero to nine, starting at the top. The gearing between the dial pointers shall be such that the relative movements of adjacent dial pointers are in opposite directions and in a 10:1 ratio.

3.8.1.2 The fastest moving dial pointer shall turn clockwise and shall be to the right when viewed from the front.

3.8.1.3 The finish of the register dial face shall be non-gloss white, aluminum, or the equivalent.

3.8.1.4 The dial circle printing, etching, or equivalent, and the dial pointers shall be black.

3.8.1.5 The dial centers shall lie on a horizontal straight line or on the arc of a circle whose chord is a horizontal straight line.

3.8.1.6 The minimum diameter of the dial circle shall be 0.5 inch for four and five dial registers.

3.8.1.7 The register ratio shall be clearly marked in numbers no less than 0.125 inches high and shall be visible from the front of the meter without removing the cover.

3.8.1.8 The word kilowatthours, or the abbreviation kWh or KWHR, shall appear immediately above or below the dial circles on the front of the register.

3.8.1.9 Registers for current class 10 and current class 20 meters shall be provided with four or five dials. Registers may be of such ratio that the required register constant will be equal to the ratio of the current transformers, or to the product of the ratios of the current and voltage transformers, to which the meter is connected.

3.8.2 Drum type cyclometer register

3.8.2.1 Cyclometer registers shall be provided with four or five indicating drums.

3.8.2.2 Each drum shall be divided into 10 parts with divisions of zero through nine. The gearing between indicating drums shall produce relative motion between adjacent indicating drums of 10 to 1.

3.8.2.3 The fastest moving indicating drum shall be to the right.

3.8.2.4 The indicating drums shall feature high contrast numerals, such as white-on-black. The centers of the numerals, as presented for reading, shall be on a horizontal line. The minimum height of a numeral on the indicating drums shall be 0.200 inch.

3.8.2.5 The finish of the register dial plate shall be non-gloss white, aluminum, or equivalent non-reflecting surface.

3.8.2.6 The register ratio shall be clearly marked in numbers no less than 0.125 inch high and shall be visible from the front.

3.8.2.7 The word kilowatthours, or the abbreviation kWh or KWHR, shall appear immediately above or below the indicating wheel numerals.

3.8.2.8 The registers shall be direct reading or of a ratio corresponding to the product of direct reading and the transformer ratios employed.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

3.8.3 Solid state type

3.8.3.1 Size of digits

The digits for visual reading of measured quantities shall be no less than 0.195 inch high.

3.8.3.2 Number of digits

A minimum of five digits shall be provided to display the measured quantities. The decimal point in the displayed demand quantities shall be programmable for up to three decimal places.

3.8.3.3 Code indication

If a digital display is used to display several different quantities, a code shall be used to identify each quantity displayed. Annunciators with appropriate legends shall serve as an acceptable "code." The code characters shall be in addition to the number of display digits in subclause 3.8.3.2.

3.8.3.4 Display time of measured quantities

Display time of measured quantities may be programmable.

3.8.3.5 Display modes

Registers should have three display modes: normal, alternate, and test.

3.8.3.6 Indicator for time of use period

Time of use registers should have a means to indicate either the active time of use period or the active quantity being measured.

3.9 Requirements for solid-state registers

3.9.1 Switch points

The starting and ending switch points of a time of use period shall be capable of being set to within 60 minutes of each other.

3.9.2 Demand interval (non-thermal)

Typical demand intervals are 5, 15, 30, or 60 minutes.

3.9.3 Power outage

Program and data shall be maintained during a power outage.

3.9.3.1 Power outage carryover (when applicable)

Registers shall maintain time during a power outage for a minimum of 24 hours, over a temperature range of –30°C to +70°C, and shall return to normal operating mode when power is restored.

3.9.4 Optical communication interface

The dimensions for the optical communication interface probe or coupler, exclusive of remote reading devices, shall be Type 2 (see Figure 1).

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

3.9.5 Security

Security shall be provided to prevent unauthorized access to programmable registers.

3.9.6 Register nameplate information

The register nameplates shall contain the following information:

1. Manufacturer
2. Serial number
3. Type or style number designation
4. Space for insertion of utility information

NOTE—Where the register is included as an integral part or parts of a meter assembly and is not wholly detachable, the information in subclause 3.9.6 shall be included on the meter nameplate.

3.9.7 Auxiliary switching outputs

Auxiliary switching outputs, when provided, may include the following functions:

1. Customer alerts
2. Load control
3. Pulse initiator
4. End of demand interval indicator
5. Demand threshold alert

4 Requirements applicable to detachable watthour meters

4.1 Dimensions

Dimensions to assure mounting and connecting interchangeability are shown in Figures 3 through 9. For metric conversions, multiply inches by 25.4 to obtain millimeters and round off to the nearest 0.02 millimeter.

4.2 Hanger

A hanging device shall be provided on the back of the base.

4.3 Sealing

Meters shall be provided with facilities for sealing the cover to the base, the demand reset lever, and the battery access port. The hole in a meter base for the T-seal shall not exceed 0.131 inch in diameter or the rectangular equivalent.

4.4 Connections

4.4.1 The internal connections shall be as indicated in Figures 10, 11, 12, and 12A.

For external connections, refer to reference [3], *Handbook for Electricity Metering* (the socket jaw position identification is shown in Figure 13).

4.4.2 When pulse initiator contact terminals are provided, they shall be located and may be identified as shown in Figures 11 and 12A. K and Z shall be used for two-wire contacts; K (common), Y, and Z shall be used for three-wire contacts.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

5 Requirements applicable to bottom-connected meters

5.1 Dimensions

Dimensions to assure mounting and connecting interchangeability are shown in Figures 14 and 15.

5.2 Hanger

A hanging device shall be provided on the back of the base.

5.3 Sealing

5.3.1 Meters shall be provided with facilities for sealing as shown in Figures 14 and 15.

5.3.2 The meter cover shall be provided with separate sealing facilities to seal the cover to the base, the demand reset lever, and battery access port (when applicable).

5.3.3 The terminal cover seal shall seal both the terminal cover and the meter cover.

5.4 Connections

5.4.1 The terminal arrangement and internal connections shall be as indicated in Figures 16 through 18. For external connections, refer to reference [3], *The Handbook for Electricity Metering.*

5.4.2 When pulse initiator contact terminals are provided, they shall be located and may be identified as shown in Figures 17 and 18. K and Z shall be used for two-wire contacts; K (common), Y, and Z shall be used for three-wire contacts.

5.5 Terminal blocks

Terminal blocks shall be of arc-resistant material.

5.6 Terminals

5.6.1 Current terminals

The current terminals shall accommodate the following wire sizes:

1. Self-contained meters: from 14 to 2 AWG, inclusive
2. Transformer-rated meters: from 14 to 4 AWG, inclusive

5.6.2 Voltage terminals

1. The voltage terminals of single-element meters shall accommodate wire sizes from 14 to 10 AWG, inclusive.
2. The voltage terminals of multi-element meters shall accommodate wire sizes from 14 to 6 AWG, inclusive.

5.6.2.1 Grounding terminal

Grounding the exposed metal base of the meter shall be possible by one of the following methods:

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

1. A #10-32 tapped hole shall be provided on the front, lower right corner of the base (see Figure 15 for the location). A #10-32 binding head machine screw (washerhead) shall be provided in the tapped hole.

2. As an option, an untapped 3/16 inch hole entering the base from the right side and intersecting with the tapped hole may be provided.

6 Performance requirements for solid-state registers for electromechanical meters

6.1 Initial conditions – accuracy tests

A solid-state register can be tested for accuracy of the register and its input pulse initiator, using electromechanical watthour meter disk revolutions as the input source for tests 6.2 and 6.3. For testing the accuracy of the solid-state register only, an auxiliary input pulse source may be used, bypassing the input pulse initiator. A minimum count of 1000 for the measured quantity is required to establish the test accuracy. The tests in 6.2 and 6.3 must recognize the ambiguity of ±1 least significant digit. These tests shall be made with the solid-state register and meter combination energized with rated voltage and rated frequency, at an ambient temperature of 23°C ±5°C unless otherwise specified.

6.2 Effect of voltage variation

The accuracy of the measured quantities shall not differ from the input source by an amount exceeding that specified in Table 3.

6.3 Effect of variation of temperature

The test shall be made at rated voltage and rated frequency. The register, while energized, shall be exposed to each specific test temperature for at least two hours prior to the test. The accuracy of the measured quantities shall not differ from the input source by an amount exceeding that specified in Table 4.

Table 3 – Effect of variation of voltage on solid-state registers

Conditions	Percent of Rated Voltage	Permissible Deviation from the Input Source Measured Quantity
1	100	Reference
2	90	±0.1%
3	110	±0.1%

Table 4 – Effect of variation of temperature on solid-state registers

Conditions	Air Surrounding Register	Permissible Deviation from the Input Source Measured Quantity
1	+23°C ±5°C	Reference
2	-30°C ±5°C	±0.1%
3	+70°C ±5°C	±0.1%

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

7 Procedure for assigning form designations

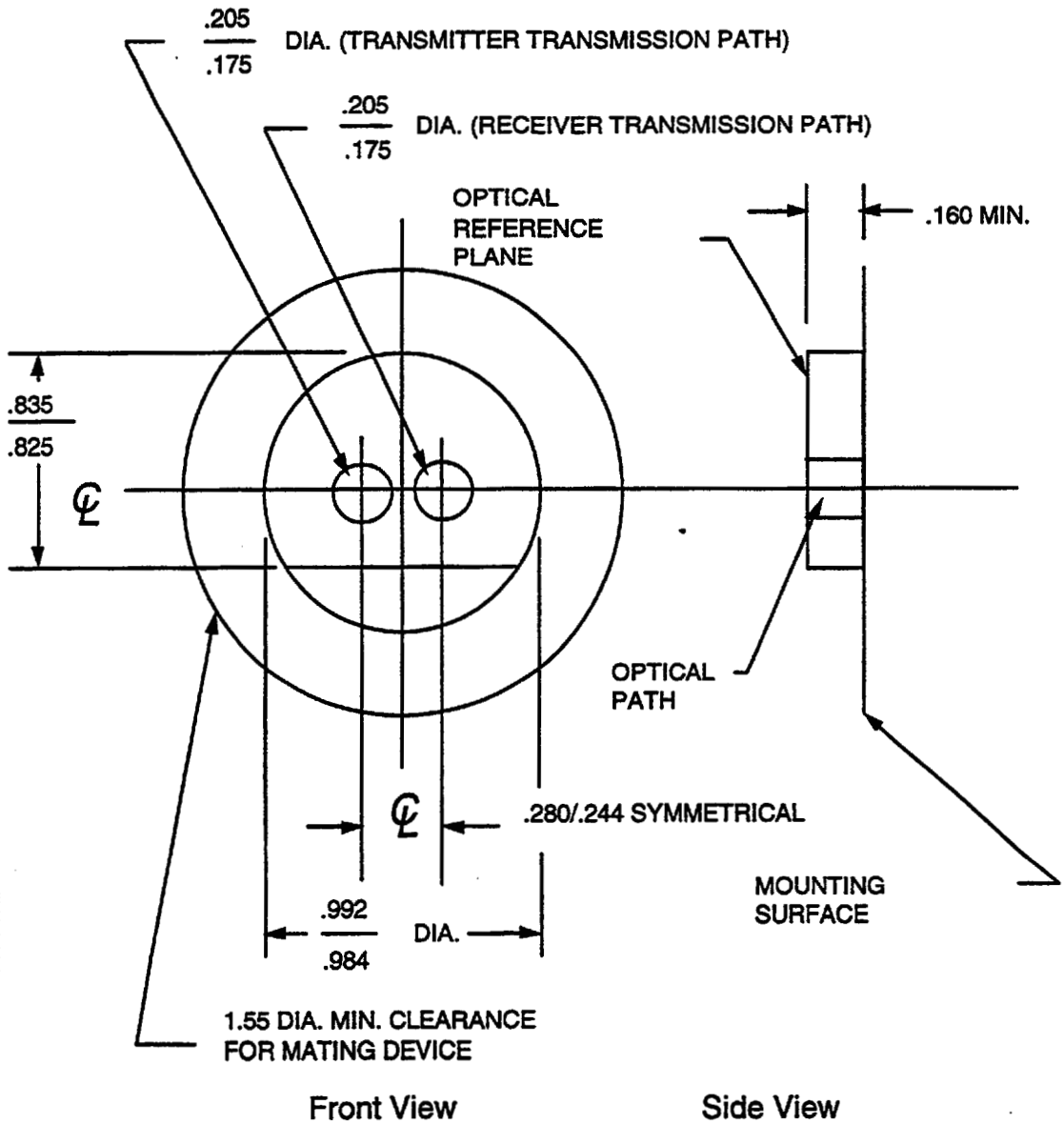
The form designation system denotes the circuit arrangement to which the meter is applicable, with due consideration given to the variations in terminal arrangement and wiring. The purpose is to provide a system of meter nomenclature that will assist in the selection and installation of equivalent meters, independent of the make of the meter and of successive types of the same manufacturer.

Each form designation corresponds to an internal connection diagram in this publication and in reference [3], and is recorded at the National Electrical Manufacturers Association (NEMA). The suffix "A" or "S" in the form designation refers to bottom-connected or detachable meters, respectively.

Though the form designation relates to the wiring and terminal arrangement, it does not change with current or voltage ratings, the number of voltage disconnects used, or the addition of auxiliaries—such as demand indicators, detents, voltage indicators, pulse sending devices—and the like.

When a new variety of meter should be assigned a new form designation, a request for the assignment designation is filed with the Secretary of the Technical Committee of the NEMA Electricity Equipment Section, NEMA Headquarters, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209. The Secretary of the NEMA Technical Committee shall assign the form designation, and advise the Accredited Standards Committee, C12. Upon counsel of this committee, the assigned new designation shall be considered approved.

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



NOTE: All dimensions are in inches.

Figure 1 – External view of ANSI type 2 optical port

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

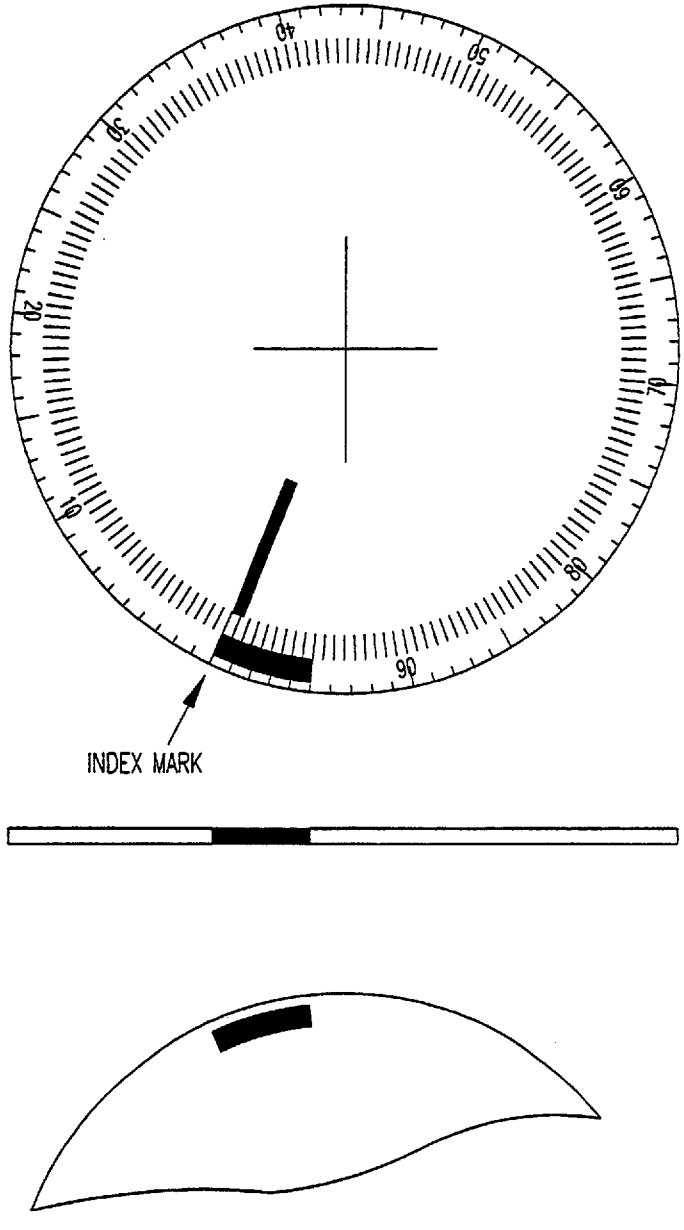
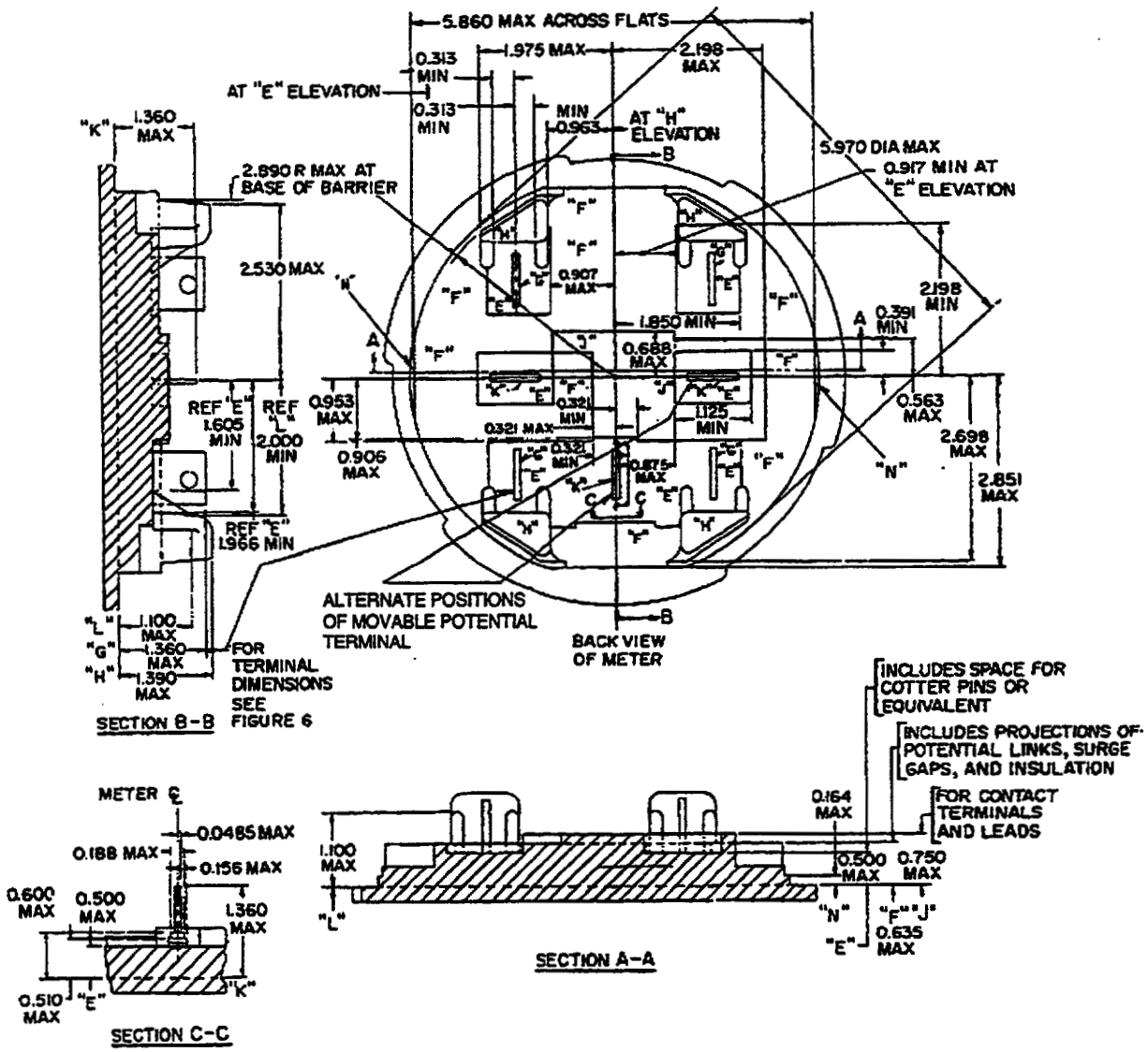


Figure 2 – Markings for watthour meter rotors

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS

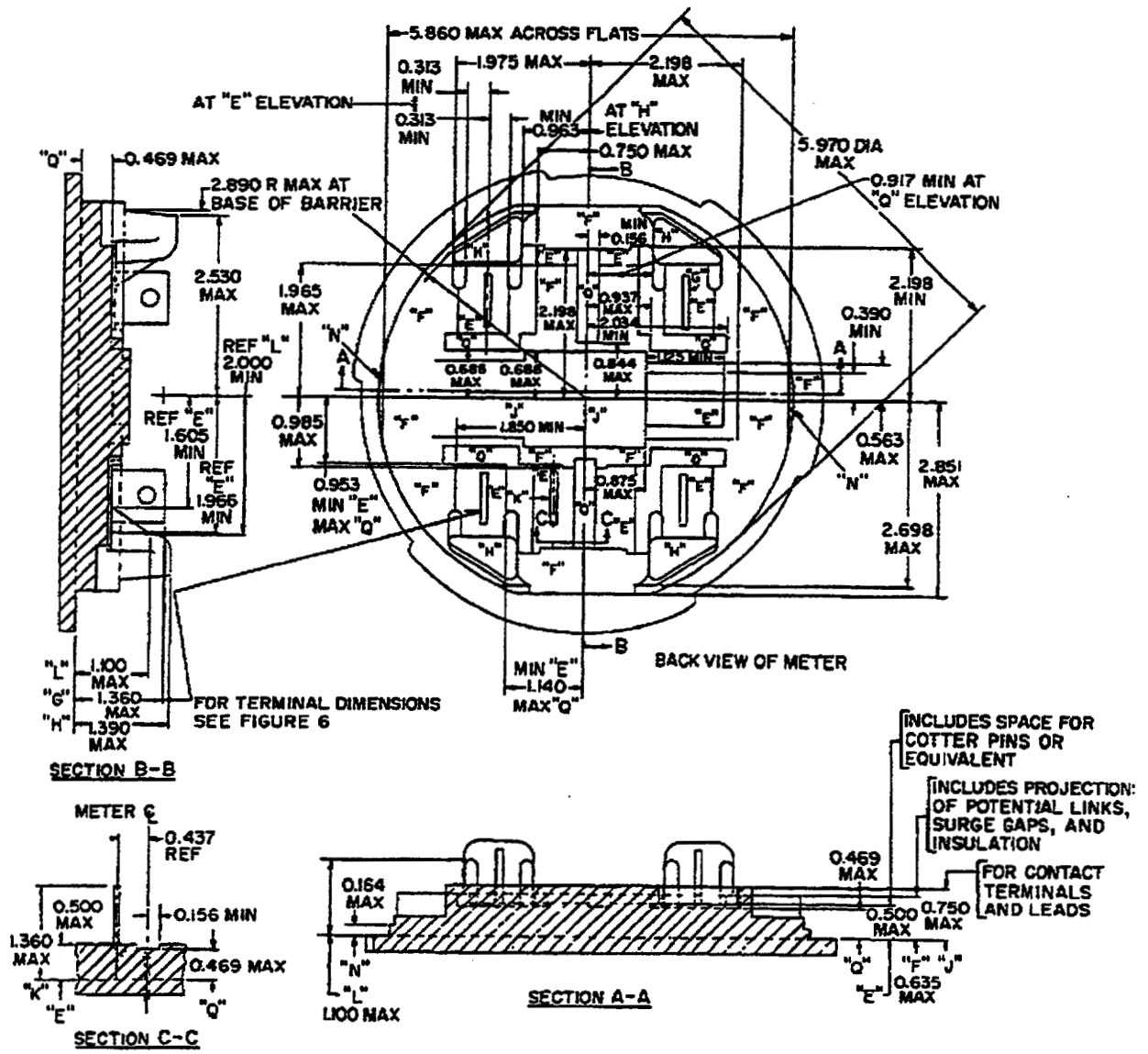
Not for Resale



NOTES:
(1) All dimensions are in inches.
(2) Symmetry should be assumed on dimensions from centerlines unless otherwise specified.
(3) For 5-terminal meters for use in 7-terminal socket, see Figure 3.

Figure 3 – Envelope of surfaces that project into socket for 4- to 6-terminal meters

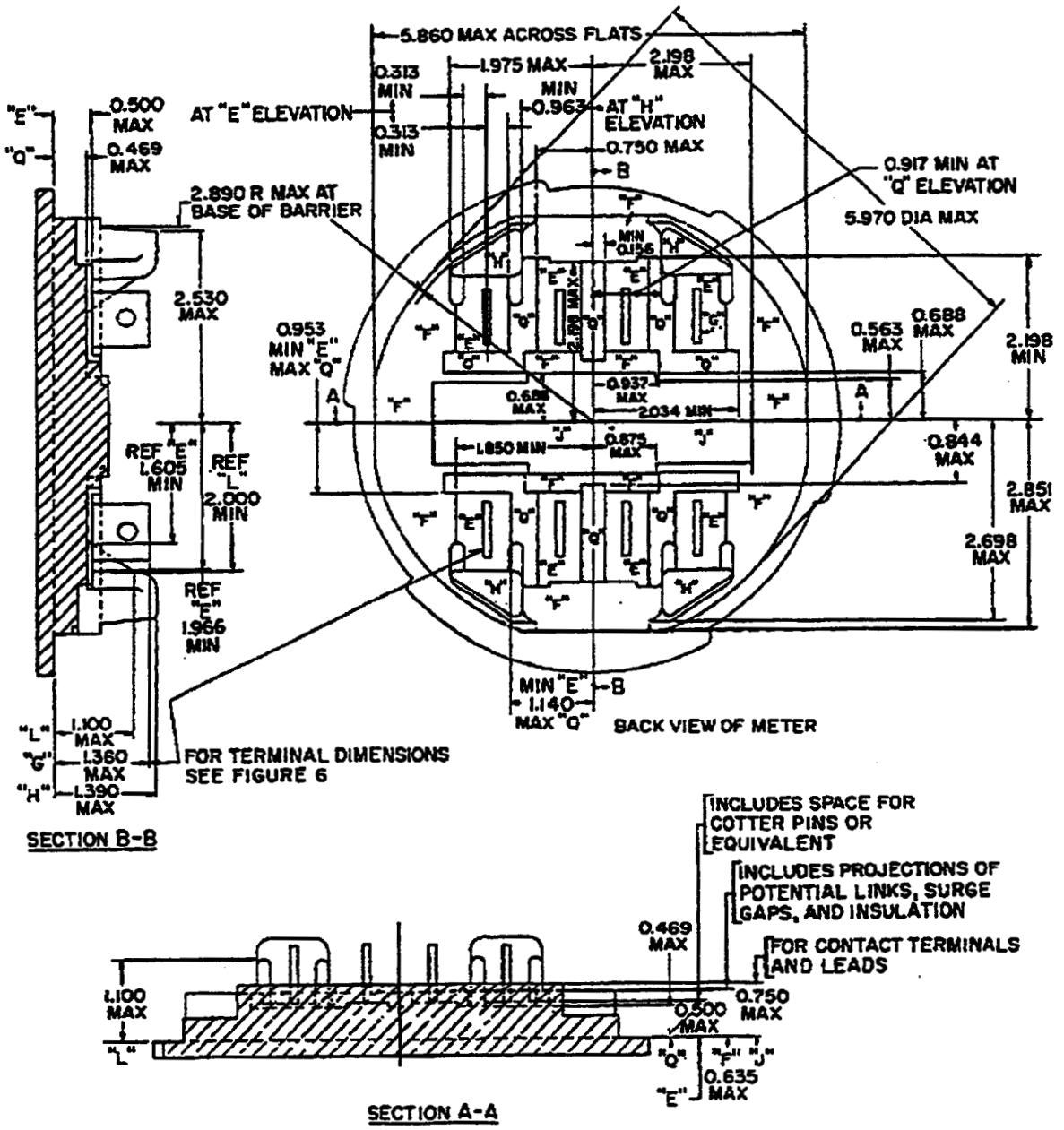
Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



NOTES:
(1) All dimensions are in inches.
(2) Symmetry should be assumed on dimensions from centerlines unless otherwise specified.

Figure 4 – Envelope of surfaces that project into socket for 5-terminal meters in 7-terminal sockets

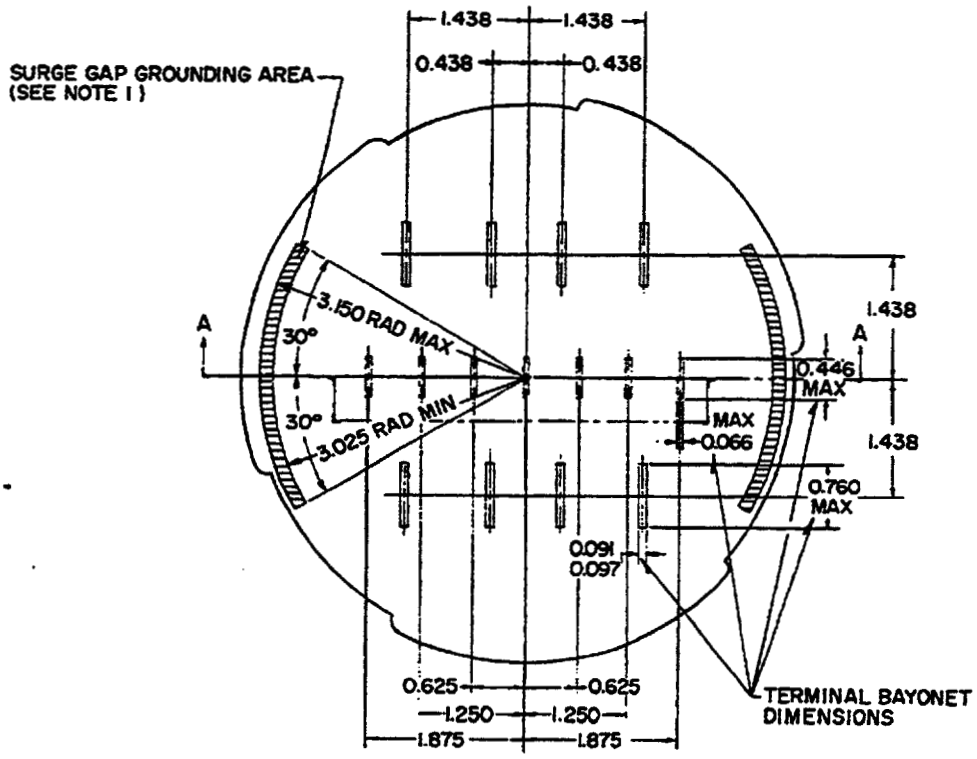
Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

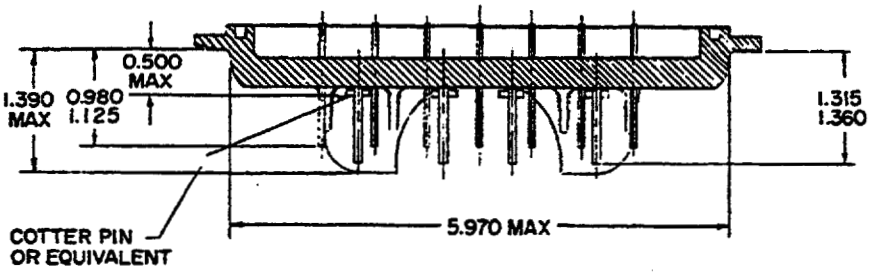


NOTES:
(1) All dimensions are in inches.
(2) Symmetry should be assumed on dimensions from centerlines unless otherwise specified.

Figure 5 – Envelope of surfaces that project into socket for 7- and 8-terminal meters

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

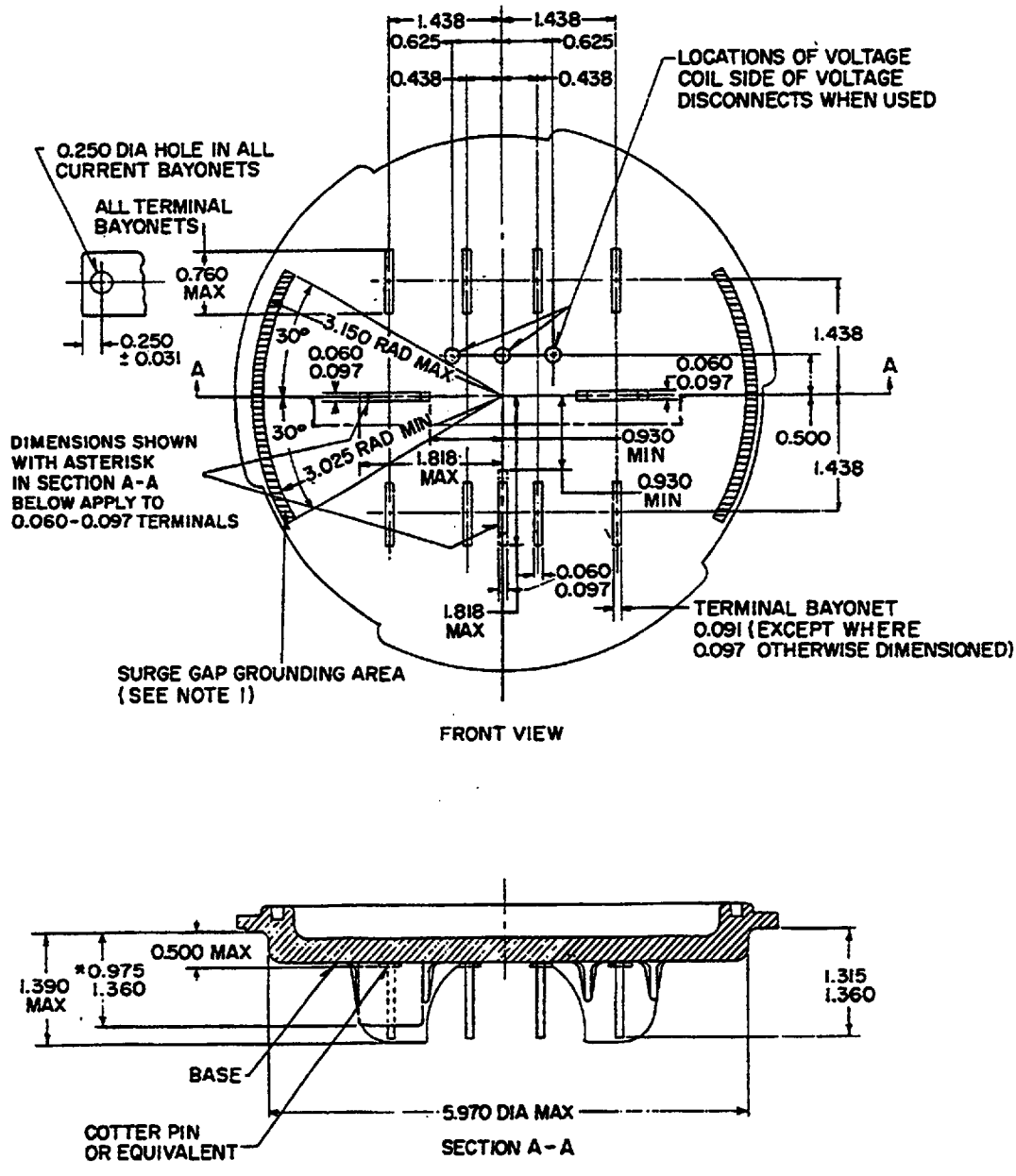




NOTES:
(1) All dimensions are in inches.
(2) Symmetry should be assumed on dimensions from center lines unless otherwise specified.

Figure 6 – Envelope of surfaces that project into socket for 8-terminal and 13- to 15-terminal meters

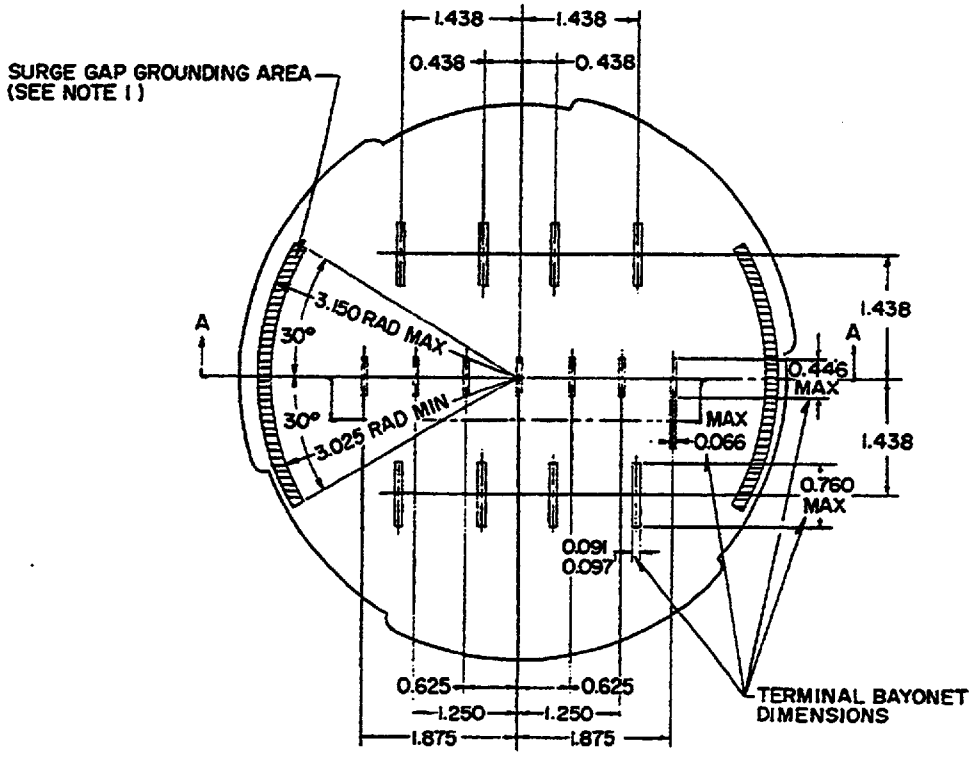
Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



NOTES:
(1) Grounding straps of surge gaps shall fall within the angle shown and be of sufficient length to provide contact surfaces from the minimum to the maximum radii. (Grounding means in the socket shall extend over the full angle shown and be located anywhere between the radii units).
(2) All dimensions are in inches.
(3) Unless otherwise specified, tolerances shall be ± 0.016 inch on single dimensions and ± 0.031 inch on cumulative dimensions.

Figure 7 -- Mounting and terminal dimensions for detachable single element and multi-element watthour meters with 4- to 8-terminals

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



NOTES:

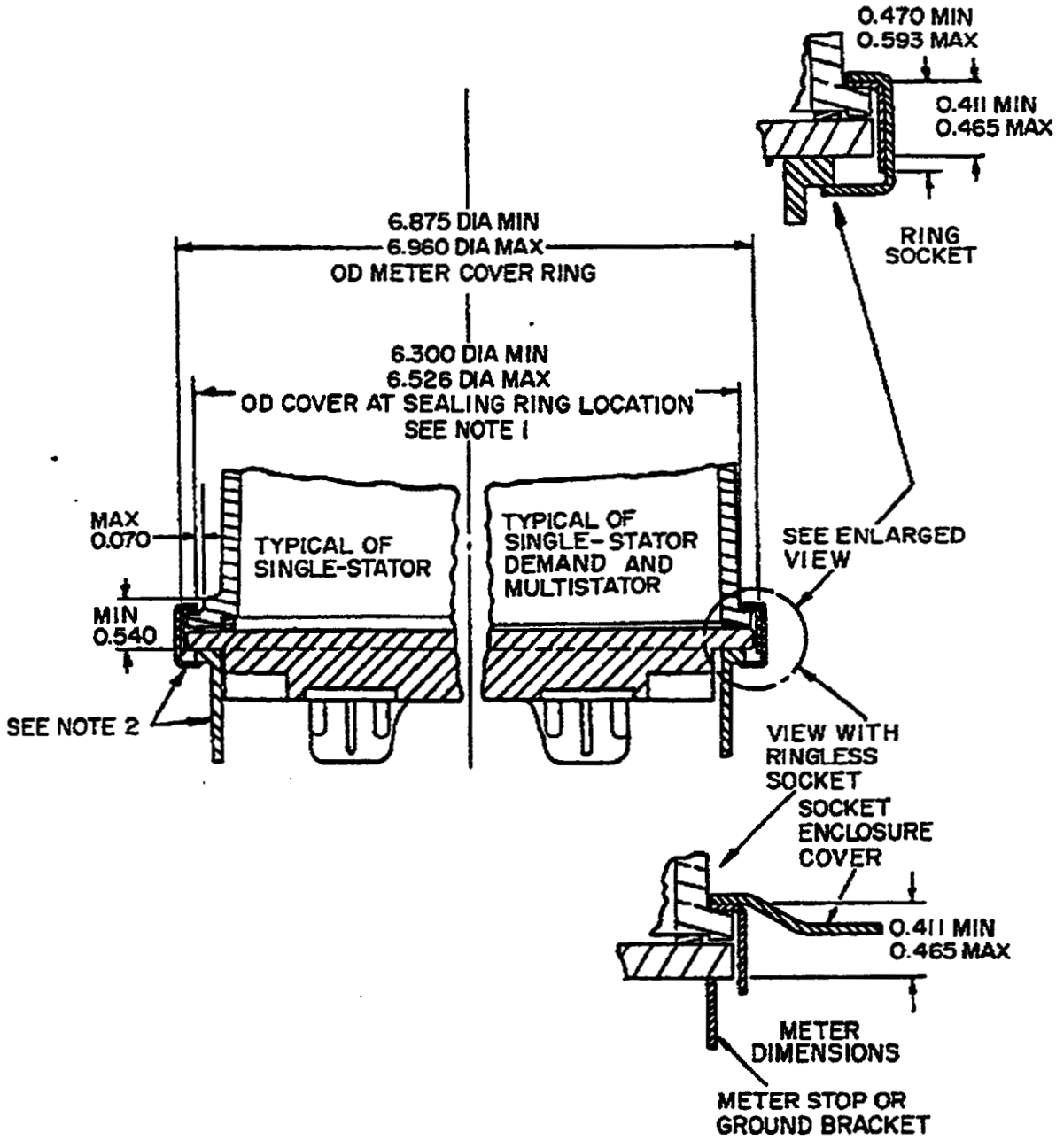
(1) Grounding straps of surge gaps shall fall within the angle shown and be of sufficient length to provide contact surfaces from the minimum to the maximum radii. (Grounding means in the socket shall extend over the full angle shown and be located anywhere between the radii units).

(2) All dimensions are in inches.

(3) Unless otherwise specified, tolerances shall be ± 0.016 inch on single dimensions and ± 0.031 inch on cumulative dimensions.

Figure 8 – Mounting and terminal dimensions for detachable multi-element watthour meters with 8-terminals and 13- to 15-terminals

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



NOTES:
(1) Prior to 1965 some meter covers had a minimum OD as low as 6.087 inches.
(2) For socket and sealing ring dimensions refer to ANSI C12.7-1993.
(3) All dimensions are in inches.

Figure 9 – Envelope of round covers for detachable single element and multi-element watthour meters

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

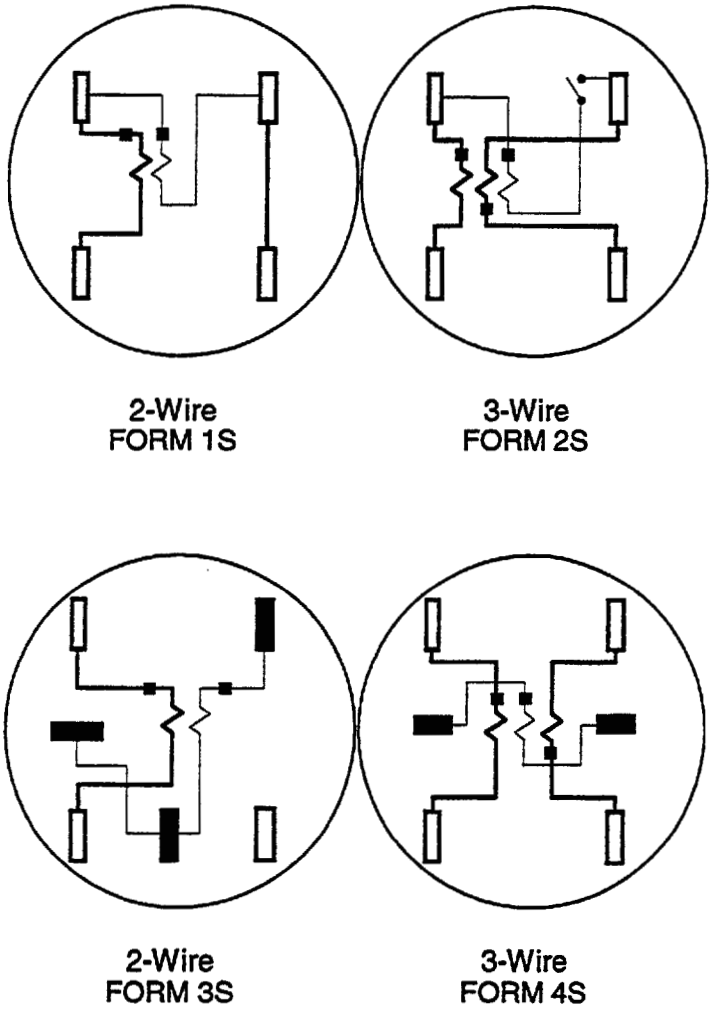


Figure 10 – Internal connections for detachable single element watthour meters (front views)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

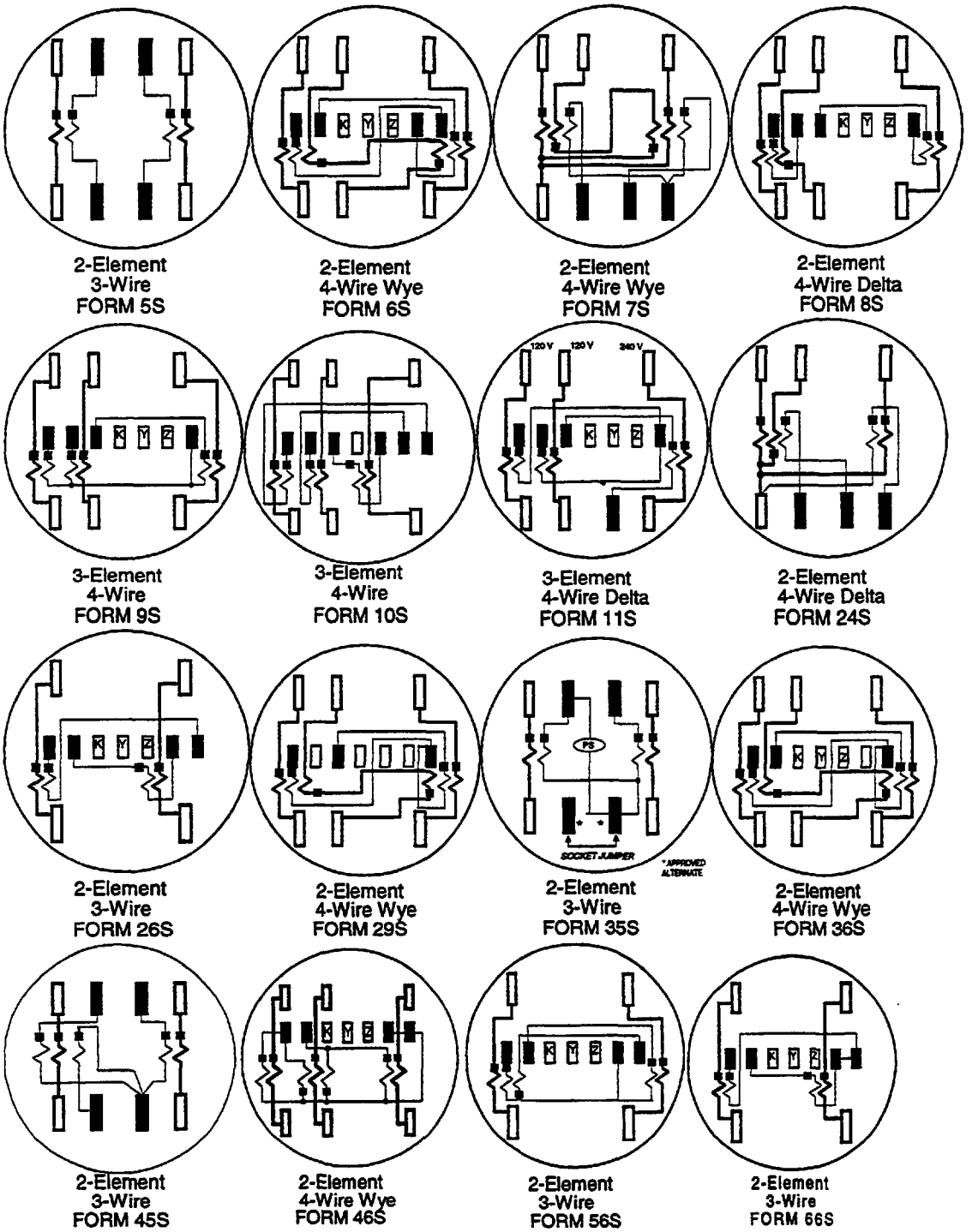


Figure 11 – Internal connections for transformer rated detachable multi-element watthour meters (front views)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

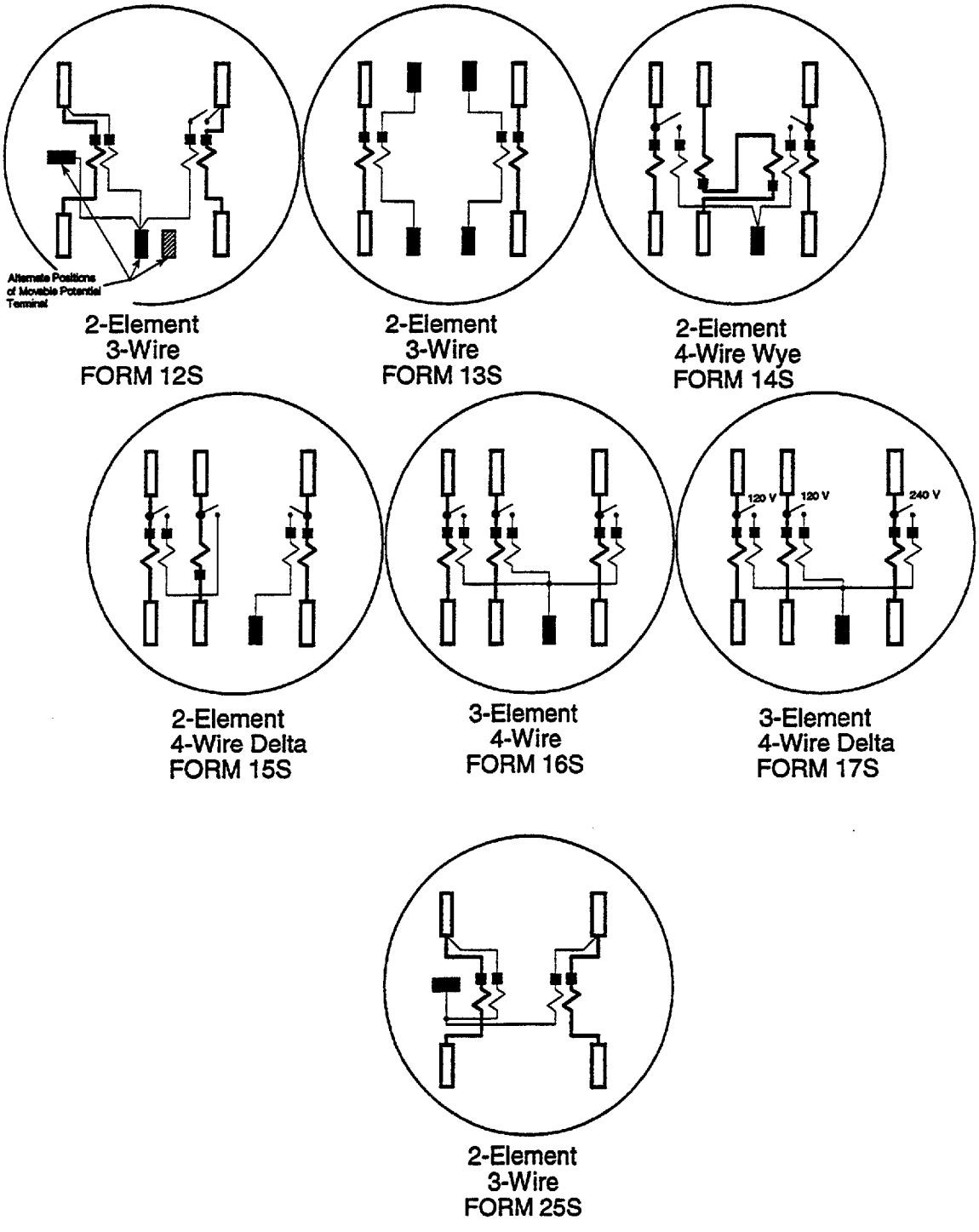
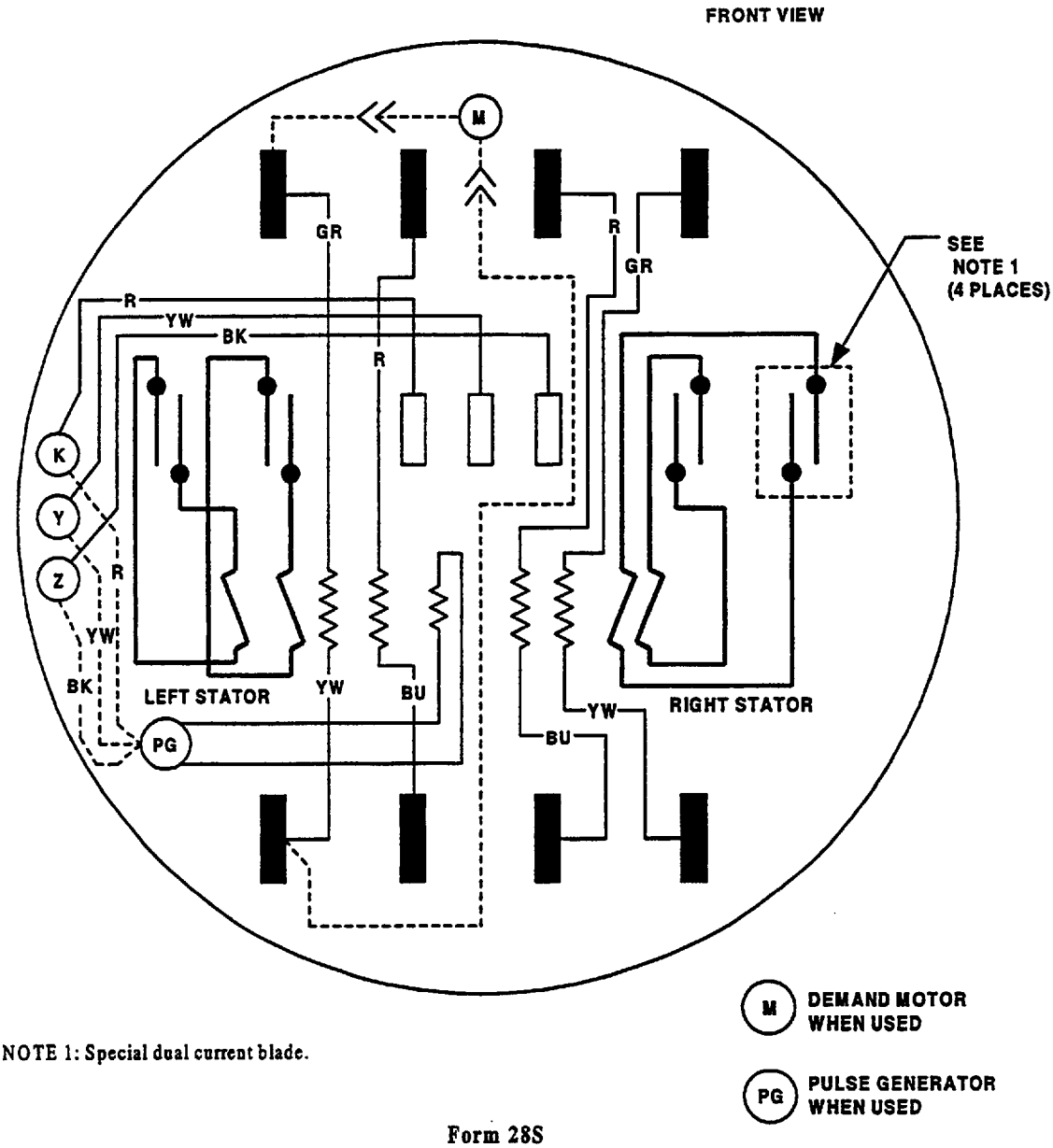


Figure 12 – Internal connections for self contained detachable multi-element watthour meters (front views)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



NOTE 1: Special dual current blade.

Form 28S

Figure 12a – 2-element, 4-wire (universal) form 28S

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

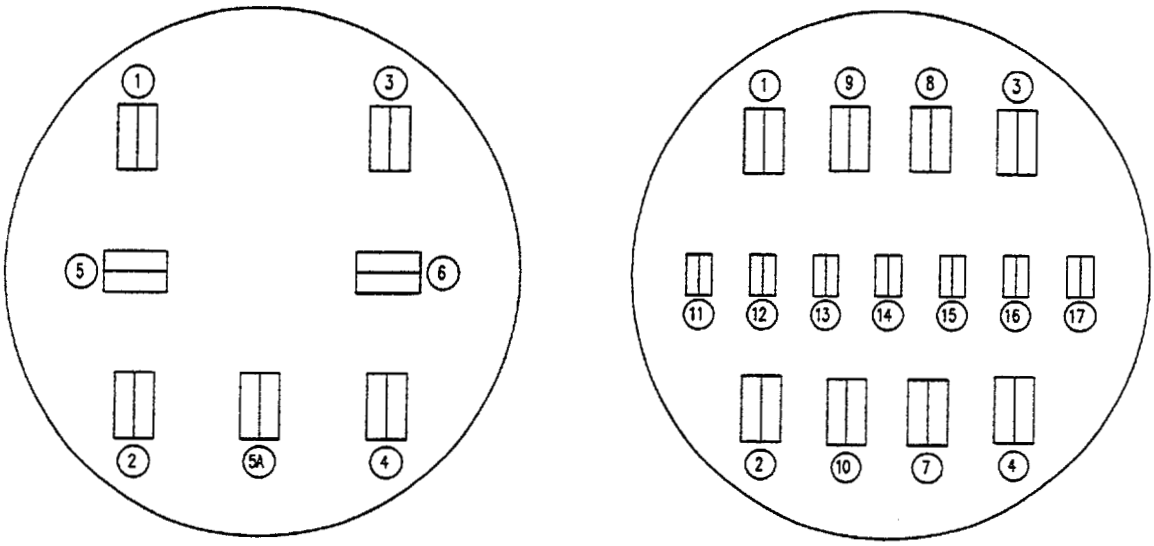
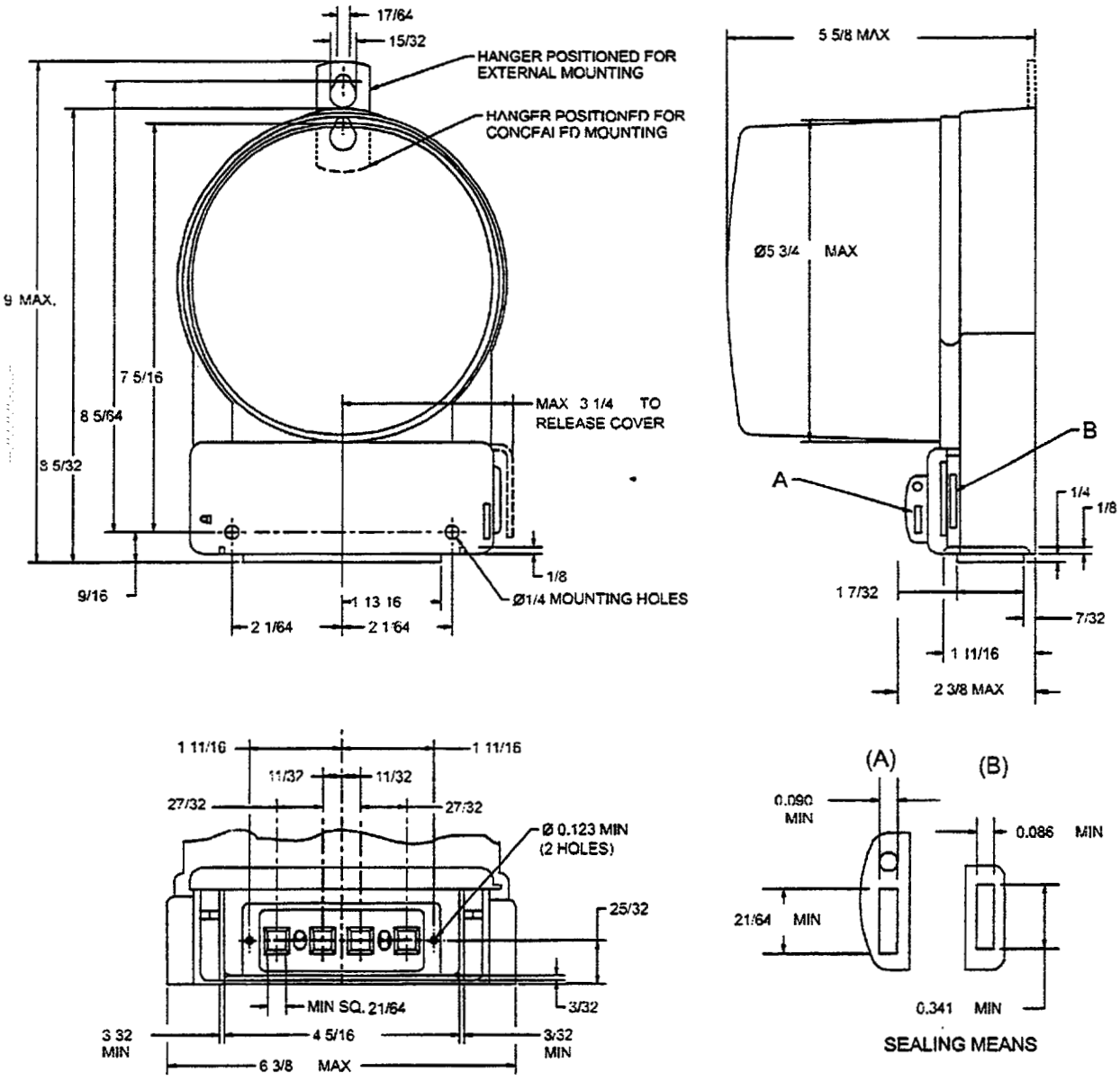


Figure 13 – Socket jaw position identification (front view of socket)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



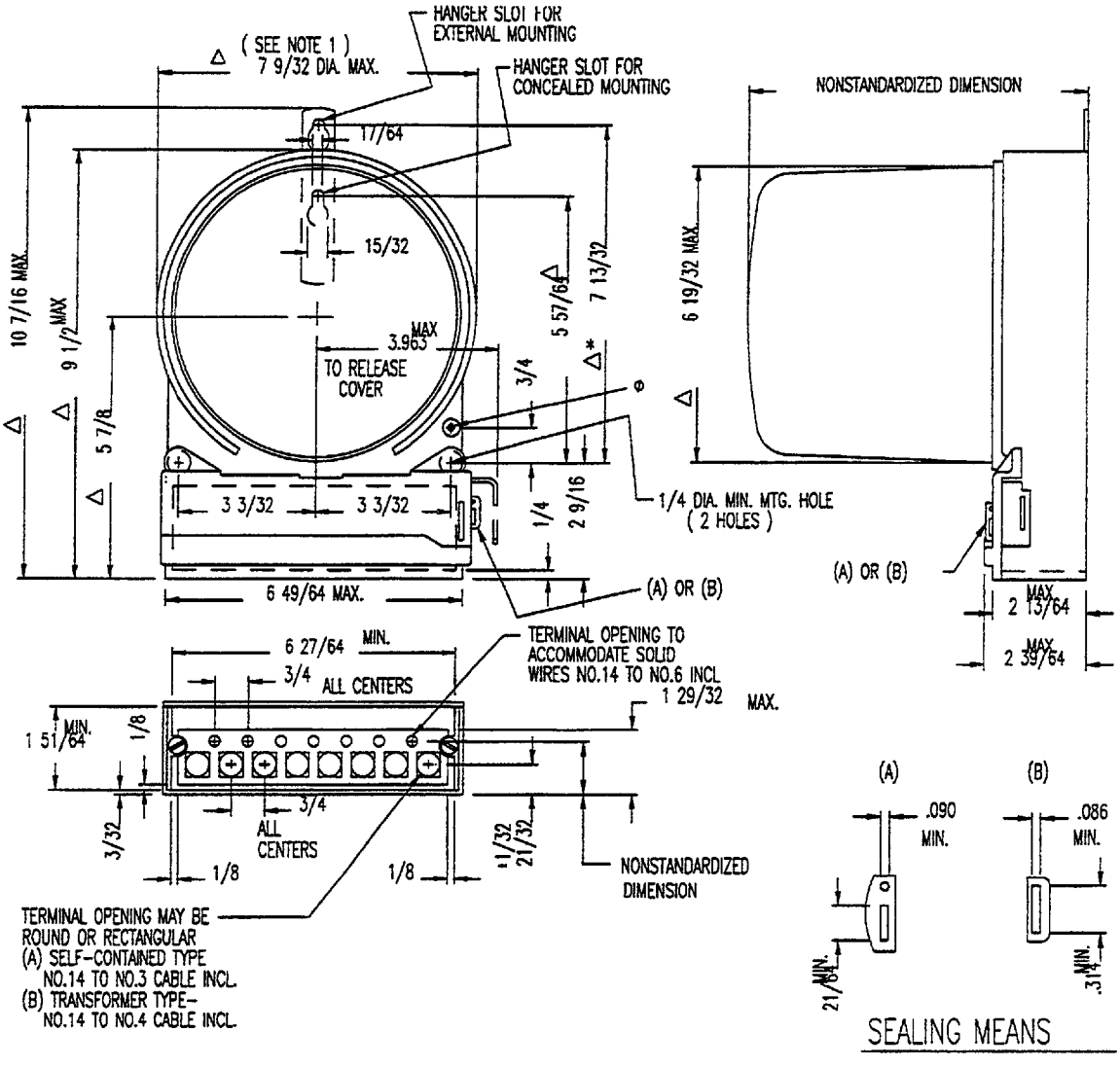
NOTES:

(1) All dimensions are in inches.

(2) Unless otherwise specified, tolerances shall be ± 1/64 inch on single dimensions and ± 1/32 inch on cum

Figure 14 – Outline and terminal dimensions for bottom-connected single element watthour meters

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale



* Location of mounting stud to obtain universal mounting of all meters

Ø Location of grounding lug

NOTES :

(1) Dimensions marked △ apply only to 2-stator meters. These dimensions are not standardized for meters having more than two stators.

(2) All dimensions are in inches.

(3) Unless otherwise specified, tolerances shall be 1/64 of an inch on single dimensions and 1/32 of an inch on cumulative dimensions.

Figure 15 – Outline and mounting dimensions for bottom-connected multi-element watthour meters

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

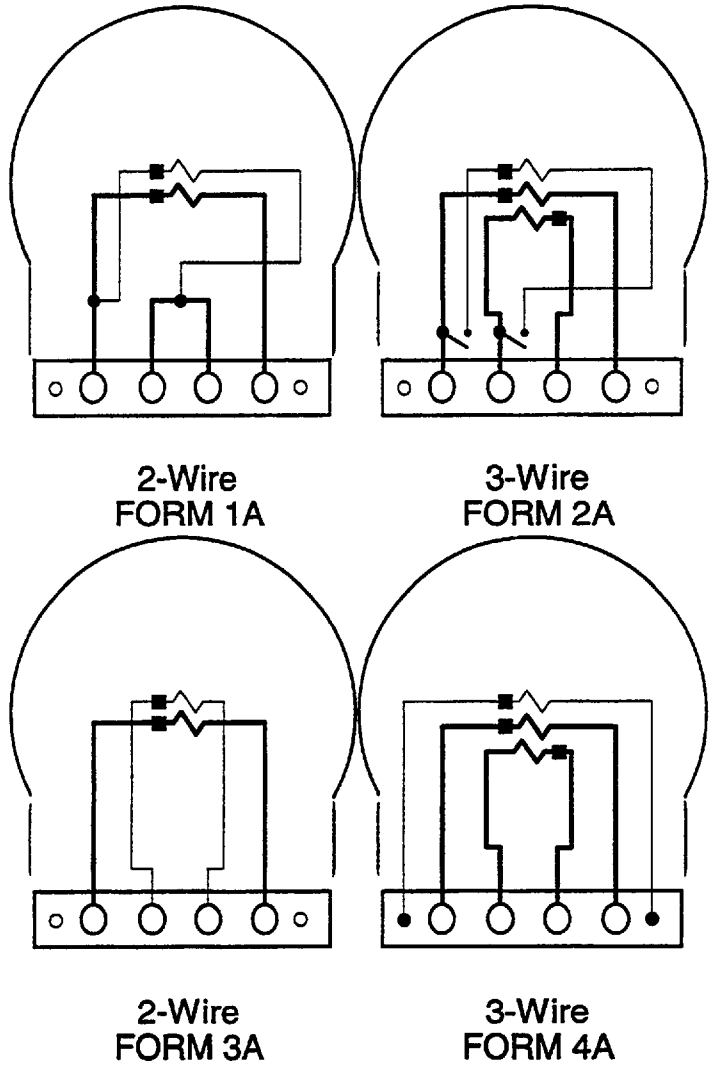


Figure 16 – Internal connections for bottom-connected single element watthour meters (front views)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

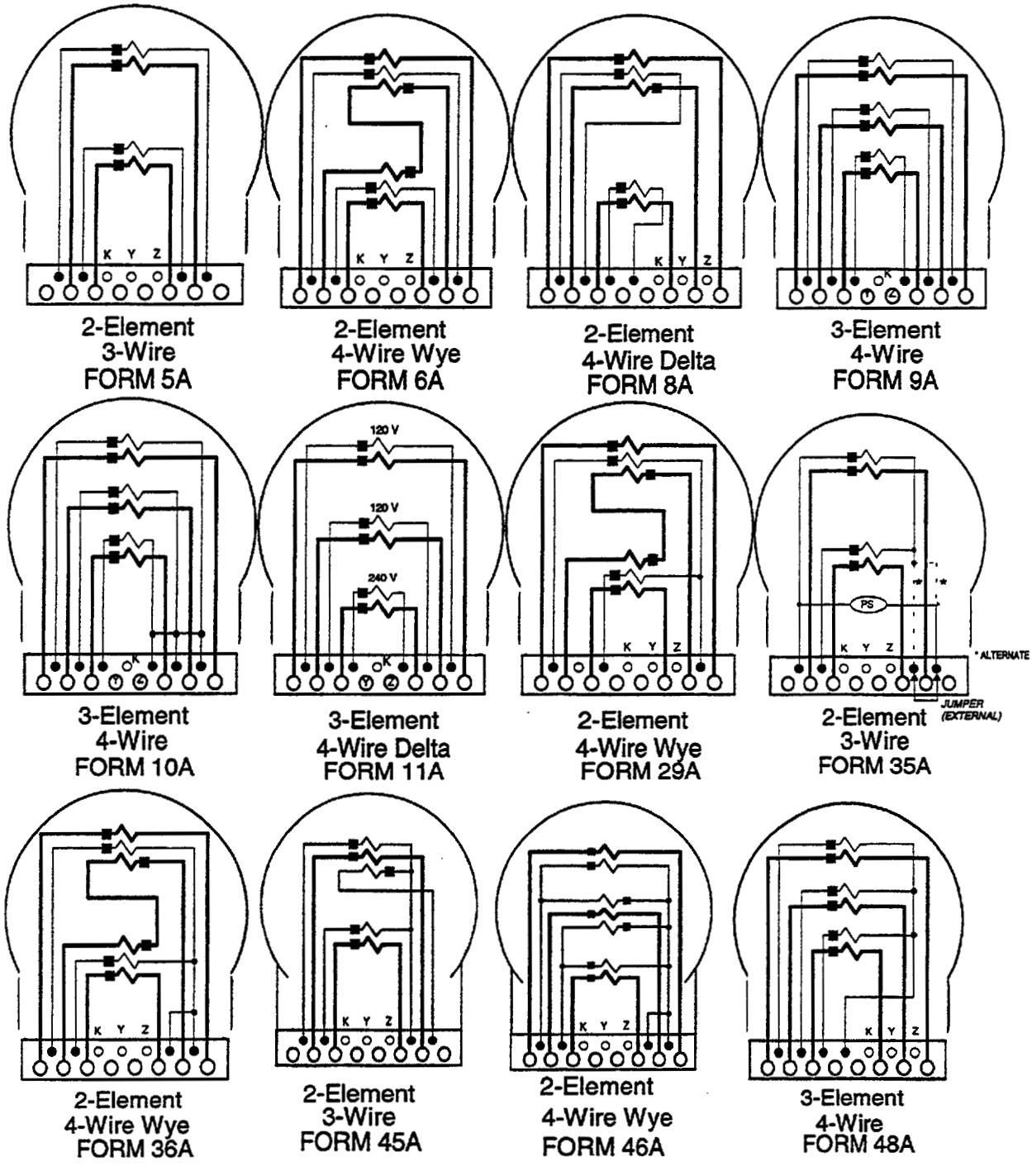


Figure 17 – Internal connections for transformers rated bottom-connected multi-element watthour meters (front views)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale

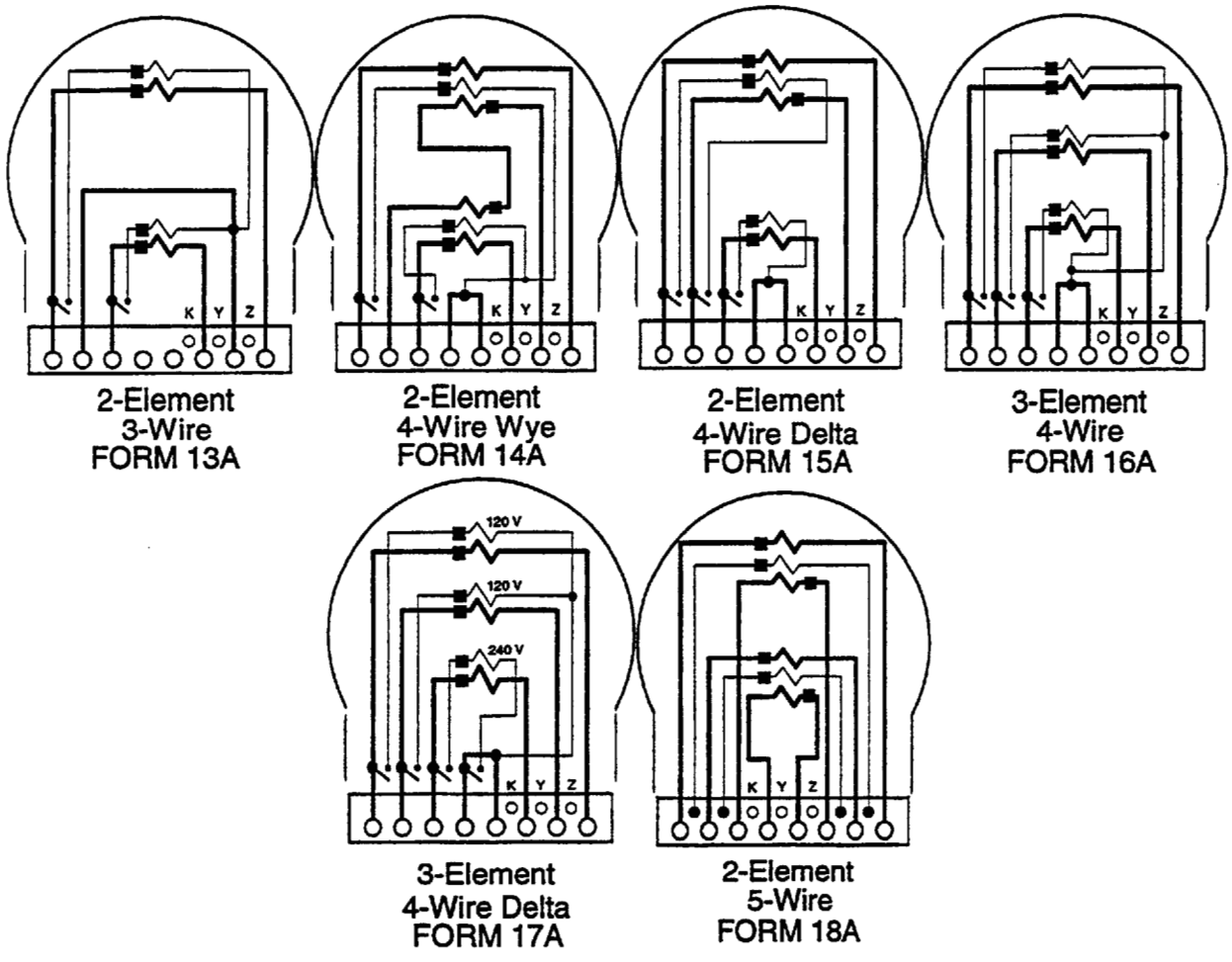


Figure 18 – Internal connections for self contained bottom-connected multi-element watthour meters (front views)

Copyright National Electrical Manufacturers Association
Provided by IHS under license with NEMA
No reproduction or networking permitted without license from IHS
Not for Resale