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NEMA STANDARDS PUBLICATION NO. SG-3

# Low-Voltage Power Circuit Breakers

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 2101 L STREET, N.W., WASHINGTON, D.C. 20037

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# SG 3-1990

# *LOW-VOLTAGE POWER CIRCUIT BREAKERS*

*Published by:*

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# TABLE OF CONTENTS


| | | Page |
|---|---|---|
| | FOREWORD | ii |
| | SCOPE | iii |
| **Section 1** | REFERENCED STANDARDS<br>Referenced Standards | 1 |
| **Section 2** | METAL-ENCLOSED LOW-VOLTAGE POWER CIRCUIT BREAKER SWITCHGEAR<br>Exceptions to American National Standard C37.20.1-1987 | 1 |
| **Section 3** | METAL-CLAD AND STATION-TYPE CUBICLE SWITCHGEAR<br>Exceptions to American National Standard C37.20.2-1987 | 1 |
| **Section 4** | METAL-ENCLOSED INTERRUPTER SWITCHGEAR<br>Exceptions to American National Standard C37.20.3-1987 | 2 |
| **Section 5** | CONTROL SWITCHBOARDS<br>Exceptions to American National Standard C37.21-1988 | 2 |
| **Section 6** | METAL-ENCLOSED BUS AND CALCULATING LOSSES IN ISOLATED-PHASE BUS<br>Exceptions to American National Standard C37.23-1987 | 2 |
| **Section 7** | GUIDE FOR EVALUATING THE EFFECTS OF SOLAR RADIATION ON OUTDOOR METAL-ENCLOSED SWITCHGEAR<br>Exceptions to American National Standard C37.24-1988 | 2 |
| **Section 8** | CONFORMANCE TESTING OF METAL-ENCLOSED LOW-VOLTAGE AC POWER CIRCUIT BREAKER SWITCHGEAR ASSEMBLIES<br>Exceptions to American National Standard C37.51-1988 | 2 |
| **Section 9** | DEFINITIONS FOR POWER SWITCHGEAR<br>Exceptions to American National Standard C37.100-1981 | 3 |




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## Foreword

This is one of several NEMA Standards Publications covering the range of low- to high-voltage switchgear products. Such products are generally applied to utility and industrial use with a portion going to commercial applications. User and general interest input played a significant part in the development of the product requirements carried by this publication. It, as well as these other NEMA Standards Publications, is not intended to stand alone because without exception:

1. It adopts by reference the appropriate American National Standards (approved by American National Standards Committee C37) as the main body of this NEMA publication.
2. It offers a vehicle for getting into print the proposed NEMA revisions of the pertinent C37 Standards, until such time as those revisions can be evaluated, approved, and published as a revision of the particular American National Standard.
3. It covers additional information about a product of specific interest to the manufacturing community, which the American National Standards Committee does not include in its scope.

Within this NEMA Publication, therefore, the main focus is on American National Standards and the consensus method of standards approval used by ANSI.

Switchgear standards are, for the most part, developed through the combined and separate efforts of the Institute of Electrical and Electronics Engineers, the Association of Edison Illuminating Companies, and NEMA. American National Standards Committee C37 serves as the administrator through which are channeled all switchgear proposals intended for eventual publication as American National Standards. It is within these organizations that the principal manufacturer-user exchange is accomplished. This exposes product requirements to those people having the direct responsibility for the use, design, application, maintenance, and acceptance of the products and thus assures a most objective and critical review within the voluntary standards program.

This Standards Publication has been developed in the public interest and is designed to promote a better understanding between the manufacturer and the user and to assist the user in selecting and obtaining the proper switchgear assembly for his or her particular need.

These standards are periodically reviewed by the Switchgear Section of NEMA for any revisions necessary to keep them up to date with advancing technology. Proposed or recommended revisions should be submitted to:

Manager, Engineering Department
National Electrical Manufacturers Association
2101 L Street, N.W.
Washington, D.C. 20037



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## Scope

This standards publication covers:

1. Power switchgear assemblies including, but not specifically limited to, equipment for the control and protection of apparatus used for power generation, conversion, transmission, and distribution:
   - Low-voltage metal-enclosed power ac circuit breaker switchgear assemblies, in indoor and outdoor, rated 1000 volts ac or less including, either drawout or stationary low-voltage power circuit breakers.
   - Low-voltage metal enclosed power dc circuit breaker switchgear assemblies, indoor or outdoor rated 3200 volts dc or less, including either drawout or stationary dc circuit breakers.
   - Metal-clad switchgear assemblies, indoor or outdoor, rated above 1000 volts ac, including drawout medium voltage power circuit breakers and/or load interrupter switches;
   - Metal enclosed interrupter switchgear assemblies, indoor or outdoor, rated above 1000 volts ac, including drawout or stationary medium voltage load interrupter switches; and,
   - Station type cubicle switchgear, indoor or outdoor, rated above 1000 volts ac, including stationary medium voltage power circuit breakers.
2. Metal enclosed power bus and connections when furnished external to the metal-enclosed switchgear assemblies.
3. Control switchboards, indoor or outdoor, rated 600 volts ac or 250 volts dc or less consisting of the following types:
   - Vertical switchboards, open or enclosed;
   - Dual switchboards;
   - Duplex switchboards;
   - Control desks (console);
   - Benchboards;
   - Dual and duplex benchboards;
   - Fixed rack cabinets; and,
   - Swing rack cabinets.
4. Renewal and spare parts designed exclusively for any switchgear assemblies enumerated in this section and not included in the scope of some other subdivision.



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# SECTION 1
# REFERENCED STANDARDS

## 1.1 REFERENCED STANDARDS

*In this Publication, reference is made to the standards listed below. Copies are available from the indicated sources.*

American National Standards Institute
1430 Broadway
New York, New York 10018

| | |
|---|---|
| C37.20.1-1987 | *Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear* |
| C37.20.2-1987 | *Metal-Clad and Station-Type Cubicle Switchgear* |
| C37.20.3-1987 | *Metal-Enclosed Interrupter Switchgear* |
| C37.21-1988 | *Control Switchboards* |
| C37.23-1987 | *Metal-Enclosed Bus and Calculating Losses in Isolated-Phase Bus* |
| C37.24-1988 | *Guide for Evaluating the Effects of Solar Radiation on Outdoor Metal-Clad Switchgear* |
| C37.51-1988 | *Conformance Testing of Metal-Enclosed Low-Voltage ac Power Circuit Breaker Switchgear Assemblies* |
| C37.100-1981 | *Definitions for Power Switchgear* |

# SECTION 2
# METAL-ENCLOSED LOW-VOLTAGE POWER CIRCUIT BREAKER SWITCHGEAR

## 2.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.20.1-1987

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.20.1-1987.

NEMA Standard 9-5-1990.

# SECTION 3
# METAL-CLAD AND STATION-TYPE CUBICLE SWITCHGEAR

## 3.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.20.2-1987

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.20.2-1987.

NEMA Standard 9-5-1990.

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# SECTION 4
# METAL-ENCLOSED INTERRUPTER SWITCHGEAR

## 4.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.20.3-1987

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.20.3-1987.

NEMA Standard 9-5-1990.

# SECTION 5
# CONTROL SWITCHBOARDS

## 5.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.21-1988

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.21-1988.

NEMA Standard 9-5-1990.

# SECTION 6
# METAL-ENCLOSED BUS AND CALCULATING LOSSES IN ISOLATED-PHASE BUS

## 6.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.23-1987

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.23-1987.

NEMA Standard 9-5-1990.

# SECTION 7

# GUIDE FOR EVALUATING THE EFFECTS OF SOLAR RADIATION ON OUTDOOR METAL-ENCLOSED SWITCHGEAR

## 7.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.24-1988

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.24-1988.

NEMA Standard 9-5-1990.

# SECTION 8
# CONFORMANCE TESTING OF METAL-ENCLOSED LOW-VOLTAGE AC POWER CIRCUIT BREAKER SWITCHGEAR ASSEMBLIES

## 8.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.51-1988

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.51-1988.

NEMA Standard 9-5-1990.

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# SECTION 9
# DEFINITIONS FOR POWER SWITCHGEAR

## 9.1 EXCEPTIONS TO AMERICAN NATIONAL STANDARD C37.100-1981 (R1989)

The following American National Standard has been approved as a NEMA Standard and shall be inserted in this section: C37.100-1981 (R1989).

NEMA Standard 9-5-1990.

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# NEMA STANDARDIZATION

The purpose of NEMA Standards, their classification and status are set forth in certain clauses of the NEMA *Standardization Policies and Procedures* manual and are referenced below:

## Purpose of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for their particular needs. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

*(Standardization Policies and Procedures, p. 1)*

## Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

*(Standardization Policies and Procedures, p. 2)*

## Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the Standards Publication may be capable of otherwise equivalent performance.

*(Standardization Policies and Procedures, p. 8)*

## Categories of Standards

National Electrical Manufacturers Association Standards are of three classes:

1. NEMA Standard, which relates to a product, process or procedure commercially standardized and subject to repetitive manufacture, which standard has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon;
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote thereon.
3. Adoptive Standard, which is adopted in whole or in part from the standards of another organization, either domestic, regional, or international.

*(Standardization Policies and Procedures, pp 7 & 16)*

## Authorized Engineering Information

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote on the standard.

*(Standardization Policies and Procedures, pp. 7 & 16)*

## Official Standards Proposal

An Official Standards Proposal is an official draft of a proposed standard which is formally recommended to an outside organization(s) for consideration, comment and/or approval, and which has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon. *(Standardization Policies and Procedures, pp 7 & 16)*

## Identification of Status

Standards in NEMA Standards Publications are identified in the foreword or following each standard as "NEMA Standard" or "Suggested Standard for Future Design." These indicate the status of the standard. These words are followed by a date which indicates when the standard was adopted in its present form by the Association.

The material identified as "Authorized Engineering Information" and "Official Standards Proposal" is designated similarly.

July 17, 1990

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# POWER SWITCHGEAR ASSEMBLIES
# LOW & MEDIUM VOLTAGE POWER CIRCUIT BREAKERS
# MEDIUM VOLTAGE LOAD INTERRUPTER SWITCHES VOTING CLASSIFICATION
# OF THE
# NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION

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