AMERICAN NATIONAL STANDARD

American National Standard

# ANSI C37.22-1997

# AMERICAN NATIONAL STANDARD PREFERRED RATINGS AND REQUIRED CAPABILITIES FOR INDOOR AC MEDIUM-VOLTAGE SWITCHES USED IN METAL-ENCLOSED SWITCHGEAR

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# Preferred Ratings and Related Required Capabilities for Indoor AC Medium-Voltage Switches Used in Metal-Enclosed Switchgear

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**National Electrical Manufacturers Association**

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**Foreword** (This foreword is not part of ANSI C37.22-1997, *Preferred Ratings and Related Required Capabilities for Indoor AC Medium-Voltage Switches Used in Metal-Enclosed Switchgear.*)

This new standard reflects the ongoing, definitive changes being made in standards for technical improvement as well as to reflect industry practice.

Periodic review of this standard takes place through the normal ANSI procedural requirement that standards be reaffirmed, revised or withdrawn within five years of the original publication date.

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

Vice President, Engineering Department
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This standard was processed and approved for submittal to ANSI by Accredited Standard Committee of Power Switchgear, C37. Committee approval of the standard does not necessarily imply that all committee members voted for its approval. The basic data included in this new document is a result of new standards being developed that need the Preferred Ratings contained herein. At the time of approval, the C37 Committee had the following members:

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The following members of NEMA Power Switchgear Assemblies Technical Committee worked on this standard prior to its publication:

**G. Sakats, Chairman**

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**AMERICAN NATIONAL STANDARD** **C37.22-1997**

# Preferred Ratings and Related Required Capabilities for Indoor AC Medium-Voltage Switches Used in Metal-Enclosed Switchgear

## 1 Scope

This standard provides preferred ratings for indoor AC medium-voltage switches used in metal-enclosed switchgear.

## 2 Referenced standards

This standard is intended to be used in conjunction with the following standards. When the referenced standards are superseded by an approved revision, the revision shall apply; except in the case of ANSI/IEEE Std. 4, the 1978 edition shall apply.

ANSI/IEEE C37.20.4-1997, *Trial Use Guide for Indoor AC Medium-Voltage Switches for Use in Metal-Enclosed Switchgear**

ANSI/IEEE C84.1-1982, *Voltage Ratings (60 Hz)—Electric Power Systems and Equipment*

ANSI/IEEE C37.100-1992, *Definitions for Power Switchgear*

ANSI/IEEE C37.20.2-1994, *Metal-Clad and Station-Type Cubicle Switchgear*

ANSI/IEEE C37.20.3-1987 (R1993), *Metal-Enclosed Interrupter Switchgear*

ANSI/IEEE Std 4-1978, *IEEE Standard Techniques for High-Voltage Testing*

## 3 Indoor medium-voltage switches

For basis of rating, refer to ANSI/IEEE C37.20.4, Indoor AC Medium-Voltage Switches for Use in Metal-Enclosed Switchgear. The preferred ratings for these switches are listed in tables 1, 2, 3, 4 and 5.

**Table 1–Preferred voltage and insulation levels for indoor AC medium-voltage switches for use in metal-enclosed switchgear**

| Line No. | Rated Maximum Voltage kV, rms (1) | Dielectric Withstand Test Voltages | | Reference DC Withstand kV (2) |
|---|---|---|---|---|
| | | Impulse Withstand* kV, Peak (3) | Power Frequency Withstand kV, rms (3) | |
| | Col 1 | Col 2 | Col 3 | Col 4 |
| 1 | 4.76 | 60 | 19 | 27 |
| 2 | 8.25 | 95 | 36 | 50 |
| 3 | 15 | 95 | 36 | 50 |
| 4 | 27 | 125 | 60 | (2) |
| 5 | 38 | 150 | 80 | (2) |

* 1.2 x 50 microseconds positive and negative waves. Ref. ANSI/IEEE Std. 4.

(Number in parentheses in the table refer to the following correspondingly numbered notes.)

For service conditions, definitions and interpretation of ratings, tests and qualifying terms, see ANSI/IEEE C37.20.4 and ANSI/IEEE C37.100.

(1) The voltage rating is based on ANSI C84.1, where applicable, and is the maximum voltage for which the switch is designed and is the upper limit for operation.

(2) The column headed DC Withstand is given as a reference only for those using DC tests. It represents values believed to be appropriate and approximately equivalent to the corresponding power frequency withstand test values specified for each voltage rating. The presence of this column in no way implies any requirement for a DC withstand test on AC equipment or that a DC withstand test represents an acceptable alternative to power frequency withstand tests. When making DC tests, the voltage should be raised to the test value in discrete steps and held for a period of 1 min. Because of the variable voltage distribution encountered when making DC withstand tests, the manufacturer should be contacted for recommendations before applying DC withstand tests.

(3) Field tests are made at 0.75 times the values listed.

**Table 2–Preferred short-time, momentary and fault closing current ratings for indoor AC medium-voltage switches used in metal-enclosed switchgear**

| Line No. | Ratings | | | | Reference Fault Closing and Momentary Current kA, Peak |
|---|---|---|---|---|---|
| | Rated Continuous Current at 60 Hz Amperes, rms | Rated Short-Time Current* kA, rms (Symmetrical) | Rated Momentary Current kA, rms (Asymmetrical) | Rated Fault Closing Current kA, rms (Asymmetrical) | |
| | Col 1 | Col 2 | Col 3 | Col 4 | Col 5 |
| 1 | 200 | 12.5 | 20 | 20 | 33 |
| 2 | 600, 1200 | 25 | 40 | 40 | 65 |
| 3 | 600, 1200 | 38 | 61 | 61 | 99 |
| 4 | 1200 | 50 | 80 | 80 | 130 |
| 5 | 2000, 3000 | 38 | 61 | N/A | 99 |
| 6 | 2000, 3000 | 50 | 80 | N/A | 130 |

* The preferred duration of short-time current is 2 seconds

**Table 3–Preferred load current switching ratings and endurance capabilities**

| Line No | Rated Load Current Switching at 60 Hz Amperes, rms | Number of Operations at Rated Maximum Voltage (kV rms) (Each operation is comprised of one closing plus one opening) | | | | |
|---|---|---|---|---|---|---|
| | | 4.76 kV | 8.25 kV | 15 kV | 27 kV | 38 kV |
| | Col 1 | Col 2 | Col 3 | Col 4 | Col 5 | Col 6 |
| 1 | 200, 600 | 50 | 30 | 30 | 10 | 5 |
| 2 | 1200 | 20 | 10 | 10 | -- | -- |

**Table 4–Mechanical endurance capabilities**

| Line No. | Rated Continuous Current Amperes, rms | Rated Fault Closing Current kA, rms Asymmetrical | Number of No-Load Operations (Each operation is comprised of one closing plus one opening) | |
|---|---|---|---|---|
| | | | Rated Maximum Voltage 4.76–15 kV, rms | Rated Maximum Voltage 27–38 kV, rms |
| | Col 1 | Col 2 | Col 3 | Col 4 |
| 1 | 200, 600 | None | 750 | 500 |
| 2 | 200 | 20 | 600 | 450 |
| 3 | 600 | 40 | 500 | 350 |
| 4 | 600 | 61 | 350 | 250 |
| 5 | 1200 | None | 400 | 300 |
| 6 | 1200 | 40/61 | 250 | 150 |
| 7 | 1200 | 80 | 150 | 100 |
| 8 | 2000 | None | 300 | 250 |
| 9 | 3000 | None | 250 | 200 |

**Table 5–Preferred rated control voltages and their ranges for indoor AC medium-voltage switches used in metal-enclosed switchgear**

Operating mechanisms are designed for the rated control voltages listed with operational capability throughout the indicated voltage ranges to accommodate variations in source regulation, coupled with DC low charge levels, as well as DC high charge levels maintained with DC floating chargers. The maximum voltage is measured at the point of user connection to the switch with no operating current flowing and the minimum voltage is measured with maximum operating current flowing.

| | Direct Current Control Voltage | | | Alternating Current Control Voltage | |
|---|---|---|---|---|---|
| | | Ranges (1) (2) (3) (6) (9) (10) | | | Ranges (1) (2) (3) (9) |
| | | Functions | | | |
| Line No. | Rated Control Voltage (volts, DC) | Closing and Auxiliary (4) | Opening (5) | Rated Control Voltage (volts 60 Hz) | Closing Opening & Auxiliary Functions (4) (5) |
| | Col 1 | Col 2 | Col 3 | Col 4 | Col 5 |
| 1 | 24 | (7) | 14–28 | Single Phase | Single Phase |
| 2<br>3 | 48 (7)<br>– | 38–56<br>– | 28–56<br>– | 120<br>240 | 104–127 (8)<br>208–254 (8) |
| 4 | 125 | 100–140 | 70–140 | Polyphase | Polyphase |
| 5<br>6 | 250<br>– | 200–280<br>– | 140–280<br>– | 208Y/120<br>240 | 180Y/104 –<br>208–254 |

NOTES: (Number in parentheses in the table refer to the following correspondingly numbered notes.)

(1) Electrically operated motors, contactors, solenoids, valves, and the like, need not carry a nameplate voltage rating that corresponds to the control voltage rating shown in the table as long as these components perform the intended duty cycle (usually intermittent) in the voltage range specified.

(2) Relays, motors, or other auxiliary components that function as a part of the control for a device shall be subject to the voltage limits imposed by this standard, whether mounted at the device or at a remote location.

(3) Device control components, in some applications, may be exposed to control voltages exceeding those specified here due to abnormal conditions such as abrupt changes in line loading. Such applications require specific study, and the manufacturer should be consulted. Also, application of switchgear control components containing solid-state control, exposed continuously to control voltages approaching the upper limits of ranges specified herein, require specific attention and the manufacturer should be consulted before application is made.

(4) Closing functions include (a) the closing power mechanism, and (b) the means (coils, contactors, seal-in relays, and the like) to actuate the power mechanisms. Auxiliary functions include all functions except closing and opening.

(5) Opening is the release of the holding means that permits stored energy to open the device.

(6) It is recommended that the coils of closing, auxiliary, and opening components that are connected continually to one DC potential should be connected to the negative control bus so as to minimize electrolytic deterioration.

(7) 24-volt or 48-volt control voltages are recommended only when both the control components and devices are located near the battery or where special effort is made to ensure adequate control voltage at the control terminals. The 24-volt closing function is not recommended.

(8) Includes heater circuits.

(9) Devices utilizing standard auxiliary relays for control may not function at lower extremes of voltage ranges when relay coils are hot, as after repeated or continuous operation.

(10) Direct current control voltage sources, such as those derived from rectified alternating current, may contain sufficient inherent ripple to modify the operation of control devices to the extent that they may not function over the entire specified voltage ranges.