

American National Standard

High-Voltage Air Disconnect Switches Interrupter Switches, Fault Initiating Switches, Grounding Switches, Bus Supports and Accessories Control Voltage Ranges—Schedules of Preferred Ratings, Construction Guidelines and Specifications

The Institute of Electrical and Electronics Engineers, Inc.
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American National Standard

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Foreword

(This Foreword is not part of American National Standard C37.32-1996)

The purpose of this revision is to bring the standard up-to-date and in line with present-day requirements. The standard is coordinated with the other American National Standards in the field of high-voltage air switches, insulators, and bus supports:

ANSI/IEEE C37.30, *Standard requirements for high-voltage air switches*

ANSI/IEEE C37.34, *Test code for high-voltage air switches*

ANSI/IEEE C37.35, *Guide for the Application, installation, operation, and maintenance of high-voltage air disconnecting and load interrupter switches*

ANSI/IEEE C37.36b, *Guide to current interruption with horn gap air switches*

ANSI/IEEE C37.37, *Loading guide for AC high-voltage air switches*

This standard has been expanded to include distribution class air switches, a broader coverage of interrupter switches and ANSI C37.33, *Rated Control Voltage and Their Ranges for High Voltage Air Switches*. Circuit switchers are excluded from this standard.

This standard contains three annexes, which are not considered a part of the standard.

Suggestions for the improvement of this standard will be welcome. They should be sent to the National Electrical Manufacturers Association, 1300 North 17th Street, Suite 1847, Rosslyn, VA 22209.

This standard was processed and approved for submittal to ANSI by the Accredited Standards Committee on Power Switchgear, C37. Committee approval of the standard does not necessarily imply that all members voted for its approval. At the time it approved this standard, the C37 Committee had the following members:

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AMERICAN NATIONAL STANDARD

High-Voltage Air Disconnect Switches Interrupter Switches, Fault Initiating Switches, Grounding Switches, Bus Supports and Accessories Control Voltage Ranges— Schedules of Preferred Ratings, Construction Guidelines and Specifications

1. Introduction

1.1 Scope

This standard provides the schedules of preferred ratings and construction specifications for high-voltage air disconnect, interrupter, fault initiating, and grounding switches rated above 1000 volts. Switch operator control voltage ranges (formerly ANSI C37.33), bus supports and accessories are also covered by this standard. High-voltage air switches included in ANSI/IEEE C37.20.2, ANSI/IEEE C37.20.3, ANSI/IEEE C37.71 and ANSI C37.72 are not covered by this standard.

1.2 References

The following standards are referenced by this text or have content relevant to the apparatus covered by this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this American National Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

ANSI C29.8-1985, *Wet-process porcelain insulators—Apparatus, cap and pin type*

ANSI C29.9-1983, *Wet-process porcelain insulators—Apparatus, post type*

NEMA SG 6-1996, *Power switching equipment*

NEMA 107-1987, *Methods of measurement of radio influence voltage (riv) of high-voltage apparatus*

ANSI/IEEE C37.30-1992, *Standard requirements for high-voltage air switches*

ANSI/IEEE C37.34-1994, *Test code for high voltage air switches*

ANSI/IEEE C37.35-1976 (R1992), *Guide for the application, installation, operation, and maintenance of high-voltage air disconnecting and load interrupter switches*

ANSI/IEEE C37.36b-1990, *Guide to current interruption with horn gap air switches*

ANSI/IEEE C37.37-1979, *Loading guide for AC high voltage air switches (in excess of 1,000 volts)*

ANSI/IEEE C37.38-1989, *Gas-insulated, metal-enclosed disconnecting, interrupter, and grounding switches*

IEEE C37.100-1992, *Standard definitions for power switchgear*

ANSI/IEEE 142-1991, *Practice for grounding of industrial and commercial power systems*

IEC 815-1986, *Guide for the selection of insulators in respect of polluted conditions*

2. Definitions

The definitions of terms contained in this document, or in other standards referred to in this document, are not intended to embrace all legitimate meanings of the terms. They are applicable only to the subject treated in this standard. An asterisk (*) following a definition indicates that at the time this standard was approved, there was no corresponding definition in IEEE C37.100. Refer to IEEE C37.100 for additional definitions

2.1 outdoor switch: Switches designated for operation outside buildings or enclosures. Outdoor switches may be exposed to the weather. Outdoor switches experience no restriction of heat transfer to the ambient.*

2.2 indoor switch: Switches designated for operation inside buildings or weather-resistant enclosures which do not restrict heat transfer to the ambient.*

2.3 enclosed switch: Switches designated for operation within a housing restricting heat transfer to the external medium.

2.4 station class: A descriptive term used to denote application or restriction or both to generating stations, switching stations, substations and transmission lines.*

2.5 distribution class: A descriptive term used to denote application or restriction or both to that part of an electric system between the substation and the customer.*

3. Station class outdoor air disconnect switches

3.1 Basis of preferred ratings

The ratings of station class outdoor disconnect switches shall be based upon the definitive conditions specified in ANSI/IEEE C37.30.

3.2 Preferred ratings

3.2.1 Voltage and current

The preferred voltage, continuous current, and withstand current ratings at the rated power frequency of 60 Hz shall be in accordance with tables 1, 2, and 3.

3.2.2 Ice breaking ability

If an outdoor switch has an ice breaking rating, the preferred ratings shall be 3/8 inch (10 mm), and 3/4 inch (20 mm). A switch that has successfully passed the ice test and is rated for a given thickness of ice is also rated for lesser thicknesses.

3.2.3 Mechanical operations

The preferred mechanical operation rating shall be 1000 operations: 900 close-open cycles without terminal loading and 100 close-open cycles with terminal loading as specified in 11.3.2 of ANSI/IEEE C37.34. Refer to table 16 for rated control voltages for motor-operated switches and 11.3.3 of ANSI/IEEE C37.34 for number of operations at minimum and maximum control voltage.

3.2.4 Terminal loading

The preferred mechanical terminal loadings shall be in accordance with table 4.

3.3 Dielectric test voltages

3.3.1 Energized parts to ground

Outdoor switches in either the open or closed positions shall withstand the voltages specified in table 1, columns 2, 3, and 4. See note 1 of table 1 and table 2 for switching impulse ratings.

3.3.2 Open gap withstand

The air gap of outdoor air switches, when in the full open position, shall withstand voltages that are 10 percent higher than the rated lightning impulse dry withstand and the power-frequency dry withstand voltages given in columns 2 and 3 of table 1. For switches rated 362 kV and higher, the open gap shall also withstand the switching impulse voltages specified in table 2.

Station class outdoor air switches having solid insulation material across the open gap shall withstand 100 percent of the voltages given in table 1 columns 2, 3 and 4.

3.3.3 Corona and radio influence test voltage limits

Switches rated 121 kV and higher when tested under dark conditions at the voltage levels specified in table 1, column 5 shall be free of visible plumes or spikes. The limits of radio-influence voltage are given in column 6. Refer to ANSI/IEEE C37.34, clause 5. and NEMA 107 for testing procedures.

3.4 Construction specifications

3.4.1 Insulators

Insulator units shall have electrical characteristics and leakage distance values equal to or exceeding those listed for equivalent insulation in ANSI C29.8 or C29.9. Refer to clause 3.4 of ANSI/IEEE C37.35 and IEC 815 for insulator creepage distance considerations under contaminated conditions. Insulators shall have sufficient mechanical strength to withstand applicable operating forces, including magnetic forces produced by the rated peak withstand current of the switches for which they are supplied, as specified in table 3.

3.4.2 Arrangement and size of bolt holes in terminal pads

Bolt hole centerlines in terminal pads, when used, shall be as shown in figure 1. Holes shall accommodate bolts with a diameter of 1/2 inch (12.7 mm).

3.4.3 Phase spacing (pole spacing)

Phase spacing for outdoor switches and bus supports shall be as specified in table 5.

3.4.4 Ground clearance

Ground clearance for outdoor switches and bus supports shall equal or exceed that specified in table 5.

3.4.5 Single-pole switch dimensions

Minimum metal-to-metal, single-pole air gap distances (switch full open position) and centerline-to-centerline spacings of insulator columns are listed in table 6. The air gap distance is based upon being at least 10 percent in excess of the minimum clearance to ground as given in table 5. These dimensions may be modified depending upon dielectric test results (See 3.3.2).

3.4.6 Base mounting holes

Spacing for the base mounting holes for 600, 1200, and 1600 ampere switches should be as specified in table 7. Other spacings can be used. Base mounting holes shall be at least 9/16 inch (14.3 mm) in diameter.

4. Distribution class outdoor air disconnect switches

4.1 Basis of preferred ratings

The ratings of distribution class outdoor air disconnect switches shall be based upon the definitive conditions specified in ANSI/IEEE C37.30.

4.2 Preferred ratings

4.2.1 Voltage and current

The preferred voltage, continuous current and withstand current ratings at the rated power frequency of 60 Hz shall be in accordance with tables 8 and 9.

4.2.2 Ice breaking ability

Refer to 3.2.2 for preferred ratings.

4.2.3 Mechanical operations

The preferred number of mechanical operations shall be as specified in 3.2.3.

4.2.4 Terminal loading

The preferred mechanical terminal loading shall be in accordance with table 4.

4.3 Dielectric test voltages

4.3.1 Energized parts to ground

Outdoor switches in either the open or closed positions shall withstand the voltages specified in table 8, columns 2, 3 and 4.

4.3.2 Open gap withstand

The air gap of outdoor switches, when in the full open position, shall withstand voltages that are 10 percent higher than the rated lightning impulse dry withstand and the power-frequency dry withstand voltages given in columns 2 and 3 of table 8.

Distribution class outdoor air switches having solid insulation material across the open gap shall withstand 100 percent of the voltages given in table 8, columns 2, 3 and 4.

4.3.3 Corona and radio influence test voltage limits

Switches rated below 121 kV have no corona or radio influence voltage requirements.

4.4 Construction specifications

4.4.1 Insulators

Insulators shall have electrical characteristics and leakage distance values such as to coordinate with the switch dielectric test voltage withstand requirements of 4.3.1. Refer to clause 3.4 of ANSI/IEEE C37.35 and IEC 815 for insulator creepage distance considerations under contaminated conditions. The insulators shall have sufficient strength to withstand the applicable operating force, including magnetic force produced by the rated peak withstand current of the switch to which they are applied, as specified in table 9.

4.4.2 Arrangement and size of bolt holes in terminal pads

Bolt hole centerlines shall be as shown in figure 1. Holes shall accommodate bolts that are 1/2 inch (12.7 mm) in diameter.

4.4.3 Phase spacing (pole spacing)

Phase spacing for distribution class switches and bus supports shall be as specified in table 10.

4.4.4 Ground clearance

Ground clearance for distribution class switches and bus supports shall equal or exceed that specified in table 10.

4.4.5 Single pole switch dimensions

The minimum metal-to-metal single pole air gap distances (switch full open position) shall be as listed in table 11 with possible modifications as noted.

5. Indoor air switches

5.1 Basis of preferred ratings

The ratings of indoor air switches shall be based upon the definitive conditions specified in ANSI/IEEE C37.30, except that they are not subjected to wind loads and they do not have ice breaking ratings.

5.2 Preferred ratings

5.2.1 Voltage and current

The preferred voltage, and preferred continuous and withstand current ratings at the rated power frequency of 60 Hz shall be in accordance with table 12.

5.2.2 Mechanical operations

The preferred number of mechanical operations shall be as given in 3.2.3.

5.2.3 Terminal loading

Presently, there are no preferred mechanical terminal loadings for indoor switches.

5.3 Dielectric test voltages

5.3.1 Energized parts to ground

Indoor air switches, in either the open or closed positions, shall withstand the dielectric test voltages specified in columns 2, 3, and 4 of table 12.

5.3.2 Open gap withstand

The length of the air gap of indoor air switches, when in the full open position, shall be such that the open gap or gaps will withstand a test voltage that is 10 percent higher than the lightning impulse dry and power-frequency dry withstand test voltages specified in columns 2 and 4 of table 12.

Indoor air switches having solid insulation material across the open gap shall withstand 100 percent of the voltages given in table 12, columns 2, 3 and 4.

5.3.3 Corona and radio influence test voltage limits

Switches rated below 121 kV have no corona or radio influence voltage requirements.

5.4 Construction specifications

5.4.1 Insulators

Insulator units shall have electrical characteristics and leakage distance values such as to coordinate with the switch dielectric test voltage withstand requirements of 5.3. The insulators shall have sufficient strength to withstand the applicable operating force, including the magnetic force produced by the rated peak withstand current of the switch to which they are applied, as specified in table 12.

5.4.2 Arrangement and size of bolt holes in terminal pads

The arrangement of bolt hole centerlines in terminal pads, when used, shall be as shown in figure 1. Holes shall accommodate bolts that are 1/2 inch (12.7 mm) in diameter.

5.4.3 Phase spacing

The minimum metal-to-metal clearance between phases for indoor air switches and bus supports shall be as specified in table 13.

5.4.4 Single pole switch dimensions

The minimum metal-to-metal single pole air gap distances (switch full open position) shall be as specified in table 13 with possible exceptions as noted.

6. Grounding switches

6.1 Basis of preferred ratings

The ratings of high-voltage grounding switches shall be based upon the definitive conditions specified in ANSI/IEEE C37.30.

6.2 Preferred ratings

6.2.1 Voltage and current

The preferred voltage and withstand current ratings at the rated power frequency of 60 Hz shall be in accordance with tables 1, 3, 8, 9, and 12. Grounding switches have no continuous current ratings but have withstand current ratings which may be equal to or less than the disconnect switch rating.

6.2.2 Ice breaking ability

Refer to 3.2.2 for preferred ratings for outdoor switches. Indoor switches have no ice breaking requirements.

6.3 Electrical clearances

The electrical clearance between the grounding blade and the nearest energized part during ground blade travel shall be equal to or greater than the minimum gap distance listed in table 14. In the fully open position of the grounding blade, the switch shall withstand the voltages listed in columns 2, 3, and 4 of tables 1, 8, and 12.