

American National Standard for High Voltage Switches, Bus Supports, and Accessories Schedules of Preferred Ratings, Construction Guidelines, and Specifications

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American National Standards Institute, Inc.

The Institute of Electrical and Electronics Engineers, Inc.
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Contents

	Page
Foreword	vi
1 Introduction	1
1.1 Scope	1
1.2 References.....	1
2 Definitions	2
3 Station class outdoor air disconnect switches	2
3.1 Basis of preferred ratings	2
3.2 Preferred ratings	2
3.3 Dielectric test voltages	3
3.4 Construction specifications	3
4 Distribution class outdoor air disconnect switches.....	4
4.1 Basis of preferred ratings	4
4.2 Preferred ratings	4
4.3 Dielectric test voltages	5
4.4 Construction specifications	5
5 Indoor air switches	5
5.1 Basis of preferred ratings	5
5.2 Preferred ratings	6
5.3 Dielectric test voltages	6
5.4 Construction specifications	6
6 Grounding air switches.....	7
6.1 Basis of preferred ratings	7
6.2 Preferred ratings	7
6.3 Electrical clearances	7
6.4 Corona and radio influence test voltage limits	7
6.5 Construction specifications	7
7 Fault initiating switches	8
7.1 Basis of preferred ratings	8
7.2 Preferred ratings	8

7.3	Preferred closing time	8
7.4	Operating life expectancies	8
7.5	Corona and radio influence test voltage limits	8
7.6	Construction specifications	8
8	Outdoor, indoor, and enclosed interrupter switches	8
8.1	Basis of preferred ratings	8
8.2	Preferred rated power frequency	8
8.3	Preferred rated voltages.....	8
8.4	Preferred rated dielectric withstand	9
8.5	Preferred rated currents	10
8.6	Preferred rated switching endurance	10
8.7	Preferred rated ice breaking ability	10
8.8	Preferred rated control voltage.....	10
8.9	Preferred rated mechanical operations	11
8.10	Preferred rated terminal loading.....	11
8.11	Construction specifications	11
9	Bus supports	11
9.1	Insulators.....	11
9.2	Fittings.....	11
9.3	Phase spacing.....	11
10	Switch accessories, operating mechanisms, and switch hooks	11
10.1	Rated control voltages for power-operated mechanisms.....	11
10.2	Hook stick lengths and hook dimensions.....	12

Annexes

A	Reference data	29
B	Historical data	31
C	Bibliography	32

Figures

1	Arrangement of bolt holes in terminal pads	27
2	Outdoor air switch hook dimensions	28
B1	Typical construction classification of station class outdoor air disconnect switches	31

Tables

1	Preferred voltage ratings for station class outdoor air switches.....	13
2	Preferred switching impulse withstand voltage for station class outdoor air switches	14
3	Preferred continuous and withstand currents for station class outdoor air switches	14
4	Terminal loadings for high-voltage switches	15
5	Phase spacing and ground clearance for station class outdoor air switches and bus supports	16
6	Station class outdoor air switch-pole unit dimensions	17
7	Station class outdoor air switches preferred mounting hole spacing for 600, 1200, and 1600 ampere switches	18
8	Preferred voltage ratings for distribution class outdoor air switches	19
9	Preferred continuous and withstand currents for distribution class outdoor air switches	19
10	Phase spacing and ground clearance for distribution class outdoor air switches and bus supports	20
11	Distribution class outdoor air switches - pole unit dimensions	21
12	Preferred voltage ratings for indoor air switches	22
13	Continuous and withstand current for indoor air switches	22
14	Indoor air switches and bus supports-phase spacing and length of break	23
15	Grounding switch electrical clearance	24
16	Preferred rated switching currents for interrupter switches.....	25
17	Preferred rated control voltages and their ranges	26

Foreword (This Foreword is not part of American National Standard C37.32-2002)

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 switches:

ANSI/IEEE C37.30, Standard Requirements for High-Voltage Air Switches

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

IEEE 1247, Standard for Interrupter Switches for Alternating Current, Rated above 1000 Volts

This revision modifies the document title to allow for future inclusion of other types of High-Voltage Switches and to harmonize with the direction of the C37.30 series of standards.

This revision includes the changing of the station, distribution and indoor voltage ratings of 8.25 kV, 15.0 kV and 25.8 kV to 8.3 kV, 15.5 kV and 27 kV respectively to harmonize voltage ratings between equipment classes.

Station class voltage ratings of 121 kV, 169 kV and 242 kV have been changed to 123 kV, 170 kV and 245 kV respectively to harmonize with AC High Voltage Circuit Breakers C37.06-2000 and IEC.

Metrification of the document has continued by placing the metric equivalents first in the text and tables while retaining the inch - pound system in parentheses.

Circuit switchers are excluded from this standard.

The annexes are for information only and 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**ANSI C37.32-2002****For High Voltage Switches, Bus Supports, and Accessories—
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 disconnect, interrupter, fault initiating, and grounding switches rated above 1000 volts. Switch operator control voltage ranges (formerly C37.33), bus supports and accessories are also covered by this standard. Switches included in C37.20.2, C37.20.3, C37.20.4, C37.71, C37.72 and C37.73 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 (R1995), *Wet-Process Porcelain Insulators-Apparatus, Cap and Pin Type*

ANSI C29.9-1983 (R1996), *Wet-Process Porcelain Insulators-Apparatus, Post Type*

NEMA SG 6-2000, *Power Switching Equipment*

NEMA 107-1987 (R1993) *Methods of Measurement of Radio Influence Voltage (RIV) of High-Voltage Apparatus*

ANSI/IEEE C37.30-1998, *Standard Requirements for High-Voltage Switches*

IEEE C37.34-1994, *Test Code for High-Voltage Air Switches*

ANSI/IEEE C37.35-1996, *Guide for the Application, Installation, Operation, and Maintenance of High Voltage Air Disconnecting and Load Interrupter Switches*

ANSI/IEEE C37.36b-1990 (R1996), *Guide to Current Interruption with Horn Gap Air Switches*

ANSI/IEEE C37.37-1996, *Loading Guide for AC High-Voltage Air Switches (in Excess of 1000 Volts)*

ANSI/IEEE C37.38-1989, *Gas-Insulated, Metal-Enclosed Disconnecting, Interrupter, and Grounding Switches*

IEEE 1247-1998, *Standard for Interrupter Switches for Alternating Current, Rated Above 1000 Volts*

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 C37.100. Refer to 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 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 50 or 60 Hz shall be in accordance with tables 1, 2, and 3.

3.2.1.1 Short-time withstand current duration

The preferred short-time withstand current test duration is 1, 2, or 3 seconds with allowable I^2t variations given in C37.34.

3.2.1.2 Peak withstand current duration

The preferred peak withstand current test duration is 167 milliseconds.

3.2.2 Ice breaking ability

If an outdoor switch has an ice breaking rating, the preferred ratings shall be 10 mm (3/8 inch), and 19 mm (3/4 inch). A switch that has successfully passed the ice test and is rated for a given thickness of ice is also rated for lesser thickness.

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 C37.34. Refer to table 17 for rated control voltages for motor-operated switches and 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 fully open outdoor air switches shall withstand voltages that are 1.10 times 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 123 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 C37.34, 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 C29.8 or C29.9. Refer to 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 that are ½ inch (12 mm) in diameter.

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. Switches rated through 48.3 kV shall have base mounting holes at least 14 mm (9/16 inch) in diameter. Switches rated 72.5 kV and above shall have base mounting holes at least 17 mm (11/16 inch) 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 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 50 or 60 Hz shall be in accordance with tables 8 and 9.

4.2.1.1 Short-time withstand current duration

The preferred short-time withstand test current duration is 1, 2 or 3 seconds with allowable I^2t variations given in C37.34.

4.2.1.2 Peak withstand current duration

The preferred peak withstand current test duration is 167 milliseconds.

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.