



IEEE Standard Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Line Sectionalizers for Alternating Current Systems up to and Including 38 kV

IEEE Power and Energy Society

Developed by the
Switchgear Committee

IEEE Std C37.63™-2024
(Revision of IEEE Std C37.63-2013)

STANDARDS

IEEE Standard Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Line Sectionalizers for Alternating Current Systems up to and Including 38 kV

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Switchgear Committee
of the
IEEE Power and Energy Society

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Abstract: Required definitions, ratings, procedures for performing design tests and production tests, constructional requirements, and application considerations for overhead and pad-mounted, dry-vault, and submersible automatic line sectionalizers for ac systems are specified in this standard.

Keywords: cutout type, dry-vault, IEEE Std C37.63™, pad-mounted, sectionalizers, submersible

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Introduction

This introduction is not part of IEEE Std C37.63-2024, IEEE Standard Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Line Sectionalizers for Alternating Current Systems up to and Including 38 kV.

This standard has been revised and updated from the 2013 revision of IEEE Std C37.63. This revision incorporates significant improvements that reflect the present state of the art in automatic line sectionalizers. These improvements include changes and additions in the following areas:

- Added design and construction requirements to 6.10 for degrees of protection for enclosures.
- Added design and construction requirements to 6.15 for electromagnetic compatibility (EMC).
- Added design test to 7.23 test procedure for submersible units.
- Referenced IEEE Std 4TM-2013, IEEE Standard Techniques for High-Voltage Testing.
- Replaced reference to IEEE Std 1247TM-1998 by adopting reference to IEEE Std C37.30.4TM-2018 and IEEE Std C37.100.2TM, or by incorporating specifications within this document.
- General structure of the document has been made compatible to IEEE standards formatting by renumbering subclauses away from the three digit number used in IEEE Std C37.100.1TM-2018.
- [Annex A](#) (informative) X/R ratios was modified to conform with [Annex B](#) of recently published IEEE Std C37.62TM-2020.

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IEEE Standard Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Line Sectionalizers for Alternating Current Systems up to and Including 38 kV

1. Overview

1.1 Scope

This standard applies to all overhead, pad-mounted, dry-vault, and submersible single-pole or multi-pole alternating-current automatic line sectionalizers for rated maximum voltages above 1 kV up to and including 38 kV. Voltages above 38 kV shall be considered special applications.

In order to simplify the terminology in this standard, the term *sectionalizer* has been substituted for *automatic line sectionalizer* wherever possible.

1.2 Purpose

The purpose of this standard is to describe the requirements for sectionalizers. Qualification to this standard should give reasonable assurance to the user that equipment meeting the requirements of this standard will perform in a satisfactory manner, provided that it has been properly selected for the intended application and is installed in accordance with the manufacturer's recommendations.

1.3 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall equals is required to*).^{6,7}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should equals is recommended that*).

⁶The use of the word *must* is deprecated and cannot be used when stating mandatory requirements; *must* is used only to describe unavoidable situations.

⁷The use of *will* is deprecated and cannot be used when stating mandatory requirements; *will* is only used in statements of fact.

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they shall be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI C37.85, American National Standard for Switchgear—AC High-Voltage Power Vacuum Interrupters—Safety Requirements for X-Radiation Limits.⁸

IEC 60502-1, Power Cables with Extruded Insulation and Their Accessories for Rated Voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV).⁹

IEC 60529, Degrees of Protection Provided by Enclosures (IP Code).

IEC 62271-111:2019/IEEE Std C37.60™-2018, IEC/IEEE International Standard for High-voltage Switchgear and Controlgear—Part 111: Automatic Circuit Reclosers for Alternating Current Systems up to and Including 38 kV.

IEEE Std 4™-2013, IEEE Standard for High-Voltage Testing Techniques.^{10,11}

IEEE Std 386™, IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV.

IEEE Std C37.09™-2018, IEEE Standard Test Procedures for AC High-Voltage Circuit Breakers with Rated Maximum Voltage Above 1000 V.

IEEE Std C37.30.4™-2018, IEEE Standard for Test Code for Switching and Fault Making Tests for High-Voltage Interrupter Switches, Interrupters or Interrupting Aids Used on or Attached to Switches Rated for Alternating Currents Above 1000 V.

IEEE Std C37.68™-2023, IEEE Standard for Design, Test, and Application Requirements for Microprocessor-Based Controls of Distribution Pad-mount, Dry Vault, Wet Vault, and Polemount Switchgear Rated Above 1 kV and up to and Including 38 kV.

IEEE Std C37.75™, IEEE Standard for Pad-Mounted, Pole-Mounted and Submersible Switchgear Enclosures and Associated Control Enclosures—Coastal and Non-Coastal Environmental Integrity.

IEEE Std C37.100.1™-2018, IEEE Standard of Common Requirements for High-Voltage Power Switchgear Rated Above 1000 V.

⁸ANSI publications are available from the American National Standards Institute (<https://www.ansi.org/>).

⁹IEC publications are available from the International Electrotechnical Commission (<https://www.iec.ch>) and the American National Standards Institute (<https://www.ansi.org/>).

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IEEE Std C37.100.2™, IEEE Standard for Common Requirements for Testing of AC Capacitive Current Switching Devices over 1000 V.

IEEE Std C37.301™, IEEE Standard High Voltage Switchgear (Above 1000 V) Tests Techniques—Partial Discharge Measurements.

ISO 7000, Graphical symbols for use on equipment—Registered symbols.¹²

3. Definitions

For the purposes of this document, the following terms and definitions apply. For terms not defined in this clause, the following hierarchy applies:

- IEEE Std C37.100.5™-2018
- IEEE Standards Dictionary Online¹³

approximately sinusoidal: Also referred to as essentially sinusoidal, refers to where the waveshape should approximate a sinusoid with both half cycles closely alike. The waveform should have a ratio of peak-to-rms values equal to $1.414\% \pm 5\%$. It can generally be assumed that this requirement will be met if the total harmonic distortion (THD) does not exceed 5%.

NOTE—Refer to 6.2.1 of IEEE Std 4™-2013.^{14,15}

cutout type sectionalizer: A sectionalizer, typically single-phase, that is very similar in outward appearance to a distribution open dropout type fuse cutout and is used in a distribution cutout fuse support (mounting).

immunity: Ability of a device, equipment, or system to perform without degradation of performance in the presence of electromagnetic disturbance.

live tank sectionalizer: A sectionalizer consisting of a switching chamber that is insulated and is at line potential.

minimum actuating current: The minimum rms current that actuates a counting operation or an automatic operation.

non-sustained disruptive discharge (NSDD): Disruptive discharge associated with current interruption that does not result in the resumption of power frequency current or, in the case of capacitive current interruption, does not result in current in the main load circuit.

sectionalizer: A self-contained circuit-opening device that automatically opens the main electrical circuit after sensing and responding to a predetermined number of successive main current impulses equal to or greater than a predetermined magnitude. The sectionalizer opens after other devices have deenergized the main electrical circuit. It may also have a provision to be manually operated to interrupt loads.

NOTE—A sectionalizer includes an assembly of control elements required to detect current and/or voltage and control the sectionalizer operation.

¹²ISO publications are available from the International Organization for Standardization (<https://www.iso.org/>) and the American National Standards Institute (<https://www.ansi.org/>)

¹³IEEE Standards Dictionary Online is available at: <http://dictionary.ieee.org>. An IEEE account is required for access to the dictionary, and one can be created at no charge on the dictionary sign-in page.

¹⁴Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

¹⁵Information on references can be found in Clause 2.

series coil sectionalizer: A sectionalizer in which main circuit current impulses above a specified value, flowing through a solenoid or operating coil, provide the energy required to operate the counting mechanism.

submersible: Constructed to be successfully operable when submerged in water under specified conditions of pressure and time.

susceptibility: The inability of a device, equipment, or system to perform without degradation in the presence of an electromagnetic disturbance.

4. Normal (usual) and special (unusual) service conditions

4.1 Normal (usual) service conditions

Subclause 3.1 of IEEE Std C37.100.1-2018 applies with the following addition:

A submersible sectionalizer (subsurface or vault) that is installed in a below-grade enclosure may be subject to occasional flooding (not to exceed 10 d) to a depth not exceeding 3 m above the top of the sectionalizer.

Exposure to chemical or electrochemical reactions may be encountered in a below-grade environment. The below-grade environment may contain chemicals that contribute to mild corrosive reactions.

4.1.1 Indoor sectionalizers

Subclause 3.2.1 of IEEE Std C37.100.1-2018 applies.

4.1.2 Outdoor sectionalizers

Subclause 3.2.2 of IEEE Std C37.100.1-2018 applies.

4.2 Special (unusual) service conditions

Subclause 3.3 of IEEE Std C37.100.1-2018 applies.

5. Ratings

5.1 Rating information

The list of ratings given in the first paragraph of 5.1 of IEEE Std C37.100.1-2018 does not apply and is replaced by the following list of ratings:

- a) Rated maximum voltage
- b) Rated lightning impulse withstand voltage
- c) Rated power frequency withstand voltage
- d) Rated power frequency
- e) Rated continuous current
- f) Rated short-time (symmetrical) withstand current and duration
- g) Rated peak withstand current
- h) Rated control voltages (where applicable)

The following switching ratings are optional; they only apply to sectionalizers that are designed for the respective switching ratings:

- i) Rated load switching current
- j) Rated line charging and cable charging current
- k) Rated unloaded transformer switching current
- l) Rated fault-making current

5.2 Rated maximum voltage (V)

NOTE—In IEC standards, rated maximum voltage is denoted by U_r .

Subclause 5.2 of IEEE Std C37.100.1-2018 does not apply.

The rated maximum voltage indicates the upper limit of the highest voltage of systems for which the sectionalizer is intended. The preferred values of rated maximum voltage are given in [Table 1](#) and [Table 2](#). Special ratings for series coil sectionalizers are given in [Annex B](#).

Table 1—Preferred voltage ratings for overhead sectionalizers

Line no. (See NOTE 1)	Rated maximum voltage (kV)	Rated lightning impulse withstand voltage (kV) (See NOTE 2)	Rated power- frequency dry withstand voltage (kV) (See NOTE 2)	Rated power- frequency wet withstand voltage (kV) (See NOTE 2)
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5
1	15.0	95	36	36
2	15.5	110	50	50
3	27.0	125	60	60
4	38.0	150	70	70
11	12.0	75	28	28
12	17.5	95	38	38
13	24.0	125	50	50
14	36.0	170	70	70

NOTE 1—Lines 11 to 14 refer to distribution systems commonly found outside of North America; the test withstand levels in column 3 and 4 were selected from Table 1b of IEEE Std C37.100.1-2018.

NOTE 2—Cutout type sectionalizers usually have ratings that are associated with the distribution cutout mounting in which they are applied. IEEE Std C37.42™-2016 [\[B7\]](#) gives preferred values for the distribution cutout fuse support.

**Table 2—Preferred voltage ratings and related test requirements for
pad-mounted, dry-vault, and submersible sectionalizers**

Line no. (See NOTE 1)	Rated maximum voltage (kV)	Rated lightning impulse voltage (kV)	Rated power- frequency dry withstand voltage (kV) (See NOTE 2)	Rated power- frequency wet withstand voltage (kV)	DC withstand voltage (kV) (See NOTE 3)
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6
1	—	—	—	—	—
2	15.5	95	35	Not required	53
3	27.0	125	60	Not required	78
4	38.0	150	70	Not required	103
11	12.0	60	28	Not required	42
12	17.5	75	38	Not required	57
13	24.0	95	40	Not required	78
14	36.0	145	50	Not required	103

NOTE 1—Lines 11 to 14 refer to distribution systems commonly found outside of North America; the test withstand levels in columns 3 and 4 were selected from Table 1 of IEC 62271-1-2017 [B2].

NOTE 2—The rated power-frequency dry withstand voltage for North America (line 1, line 3, and line 4) is reduced, as compared to Table 1, to take into account the reduced withstand capability of some cable components (i.e., elbows, Tee connectors).

NOTE 3—DC voltage testing of field-aged cables is not a recommended practice. Refer to IEEE Std 400.1™ [B3] and IEEE Std 400.2™ [B5] for guidelines on testing of dielectric shielded cables. Refer also to IEEE Std 433™ [B6] a comparison of some characteristics of high voltage testing using 60-Hz ac, dc and 0.1-Hz methods. The dc withstand test requirement on the sectionalizer demonstrates its capability to withstand either dc or VLF testing of connected cables.

5.3 Rated insulation level

Subclause 5.3 of IEEE Std C37.100.1-2018 does not apply.

The preferred values of insulation level voltage are given in Table 1 and Table 2.

In Table 1 and Table 2, the withstand voltage applies at the standardized reference atmosphere [temperature (20 °C), pressure (101.3 kPa), and humidity (11 g/m³)] specified in IEEE Std 4-2013. For special service conditions, see 4.2.

5.4 Rated power-frequency (f_r)

Subclause 5.4 of IEEE Std C37.100.1-2018 applies.

5.5 Rated continuous (normal) current and temperature rise

5.5.1 Rated continuous (normal) current (I_r)

Subclause 5.5.1 of IEEE Std C37.100.1-2018 applies with the following addition:

Series coil sectionalizers have special ratings determined by the series coil itself. The continuous current and the load switching current ratings of series coil sectionalizers are given in Annex B (see Table B.1 and Table B.2).

5.5.2 Temperature rise

Subclauses 5.5.2 and 5.5.3 of IEEE Std C37.100.1-2018 apply.

5.6 Rated short-time withstand current (I_k)

Subclause 5.6 of IEEE Std C37.100.1-2018 applies with the following addition:

Preferred values for the 1 second rated short-time withstand currents for series coil sectionalizers are given in [Table B.2](#).

5.7 Rated peak withstand current (I_p)

Subclause 5.7 of IEEE Std C37.100.1-2018 applies with the following modification:

The preferred peak withstand current levels for series coil sectionalizers are given in [Table B.2](#).

5.8 Rated duration of short-circuit (t_k)

Subclause 5.8 of IEEE Std C37.100.1-2018 does not apply.

The rated short-circuit withstand current duration shall be 1 second.

Sectionalizers shall also have a related, required capability for a 10 second short-time withstand current. The preferred 10 second short-circuit withstand current rating is 32.5% of the rated 1 second short-time withstand current rating.

NOTE—The 1 second and 10 second short-time withstand current tests provide two points on a damage curve to assist the user in coordinating the device with upstream reclosers and downstream fuses and transformers. Refer to IEEE Std C37.48™-2020 [\[B7\]](#) for additional information.

5.9 Rated supply voltage of closing and opening devices and of auxiliary and control circuits (U_a)

Subclause 5.9 of IEEE Std C37.100.1-2018 applies.

5.10 Rated supply frequency of closing and opening devices and of auxiliary circuits

Subclause 5.10 of IEEE Std C37.100.1-2018 applies.

5.11 Rated pressure of compressed gas supply for insulation and/or operation

Subclause 5.11 of IEEE Std C37.100.1-2018 is not applicable.

At the present time, there are no requirements defined for this subject.

5.12 Rated filling levels for insulation and/or operation

Subclause 5.12 of IEEE Std C37.100.1-2018 is not applicable.

At the present time, there are no requirements defined for this subject.