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AMERICAN NATIONAL STANDARD

American National Standard

ANSI C37.47-1981 (R1992)

American National Standard

Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current Limiting Fuses

(includes Supplement ANSI C37.47a-1981)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
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ANSI®
C37.47-1981
Revision of
ANSI C37.47-1969

American National Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses

Secretariat

Institute of Electrical and Electronics Engineers
National Electrical Manufacturers Association

Approved May 22, 1980

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supplement to specifications for distribution fuse disconnecting switches, fuse supports, and current-limiting fuses

Approved December 21, 1982

Secretariat: National Electrical Manufacturers Association

On page 8 of ANSI C37.47-1981, add the following note to Section 3.2:

NOTE: This paragraph does not imply that a back-up fuse with an assigned "C" rating will clear fault currents less than the published minimum interrupting rating.

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CORRECTION

American National Standard
Specifications for Distribution Fuse
Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses,
ANSI C37.47-1981

Page 10 Revise 4.5.1 to read:

4.5.1 Range of Time-Current Curves. The range of melting- and total clearing-time-current characteristics shall be from 0.01 to 1000 seconds for all current ratings of general-purpose distribution current-limiting fuses and shall be 0.01 to 100 seconds for all current ratings of back-up distribution current-limiting fuses.

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Foreword

(This Foreword is not a part of American National Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses, ANSI C37.47-1981.)

This standard is a revision of American National Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current Limiting Fuses, ANSI C37.47-1969, to bring it up to date and in line with present requirements for high-voltage fuses and switches.

This standard was prepared by the C37 Subcommittee on High-Voltage Fuses with cooperation from the IEEE Subcommittee on High-Voltage Fuses and from NEMA. Liaison was maintained with EEI and IEC during the revision process in order to incorporate the latest thinking up to the time of publication.

This publication is one of a series of complementary American National Standards covering various types of high-voltage fuses and switches, so arranged that certain of the standards apply to all devices, while each of the other standards provides additional specifications for a particular device. For any device, ANSI/IEEE C37.40-1981, ANSI/IEEE C37.41-1981, plus the additional standard covering that device constitute a complete standard for the device. In addition, ANSI C37.48-1969 is an application, operation, and maintenance guide for all the devices.

The following American National Standards make up this series:

American National Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.40-1981

American National Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.41-1981

American National Standard Specifications for Distribution Cutouts and Fuse Links, ANSI C37.42-1981 [This revision includes pertinent data formerly contained in ANSI C37.43. The C37.43 standard is dropped as redundant.]

American National Standard Specifications for Distribution Oil Cutouts and Fuse Links, ANSI C37.44-1981

American National Standard Specifications for Distribution Enclosed Single-Pole Air Switches, ANSI C37.45-1981

American National Standard Specifications for Power Fuses and Fuse Disconnecting Switches, ANSI C37.46-1981

American National Standard Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current Limiting Fuses, ANSI C37.47-1981

American National Standard Guide for Application, Operation, and Maintenance of Distribution Cutouts and Fuse Links, Secondary Fuses, Distribution Enclosed Single-Pole Air Switches, Power Fuses, Fuse Disconnecting Switches, and Accessories, ANSI C37.48-1969

Suggestions for improvement of this standard will be welcome. They should be sent to the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

This standard was processed and approved for submittal to ANSI by American National Standards Committee on Power Switchgear, C37. Committee approval of the standard does not

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necessarily imply that all the committee 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 Specifications for Distribution Fuse Disconnecting Switches, Fuse Supports, and Current-Limiting Fuses

1. Scope

This standard applies to high-voltage distribution current-limiting fuses (above 600 volts) and accessories for alternating-current distribution systems as follows:

(1) Distribution current-limiting fuse units

(2) Outdoor and indoor distribution fuse disconnecting switches and fuse supports of the type used exclusively with distribution current-limiting fuse units

2. Rating

2.1 Rating Information

2.1.1 Ratings of Distribution Fuse Disconnecting Switches and Fuse Supports. The ratings of distribution fuse disconnecting switches and fuse supports shall include:

(1) Rated continuous current, determined by the temperature-rise design tests at rated continuous current specified in 4.4 and made under the usual service conditions specified in 2.1 of American National Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.40-1981.

(2) Rated maximum voltage, determined by the rating of the fuse unit employed therewith and by dielectric design tests specified in 4.1 and made at altitudes up to 3300 feet (1000 meters).

(3) Basic impulse insulation level (BIL), determined by impulse withstand tests specified in 4.1.

2.1.2 Ratings of Distribution Current-Limiting Fuse Units. The ratings of distribution current-limiting fuse units shall include:

(1) Rated continuous current, determined by the electrical interchangeability requirements specified in Section 3 and the temperature-rise design test specified in 4.4 and made under the usual service conditions specified in Section 2 of ANSI/IEEE C37.40-1981.

(2) Rated maximum voltage, as specified in 2.3.

(3) Rated frequency, as specified in 2.4.

(4) Rated maximum interrupting current, in terms of available rms short-circuit current, determined by the current interrupting design tests specified in 4.2.

(5) Rated minimum interrupting current for backup fuses, in terms of available rms current, as specified in 2.6 and determined by interrupting tests specified in 4.2.

2.1.3 Performance Characteristics of Distribution Fuse Disconnecting Switches and Fuse Supports. The performance characteristics of distribution fuse disconnecting switches shall include:

(1) Normal-frequency dry-withstand voltages, as specified in 4.1.

(2) Normal-frequency wet- or dew-withstand voltages of outdoor and indoor fuses, as specified in 4.1.

(3) Temperature-rise limitations, as specified in 4.4 and in Table 2 of ANSI/IEEE C37.40-1981.

(4) Radio-influence voltage, as specified in 4.3.

2.1.4 Performance Characteristics of Distribution Current-Limiting Fuse Units. The performance characteristics of distribution current-limiting fuse units shall include:

(1) Melting-time-current characteristics, specified as electrical interchangeability requirements in Section 3, and determined as specified in 4.5.

(2) Total clearing-time-current characteristics, determined as specified in 4.5.

(3) Cutoff characteristics, as determined in 6.6 of American National Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.41-1981.

(4) Overvoltage characteristics, as determined in 6.5 of ANSI/IEEE C47.41-1981.

2.2 Rated Continuous Current

2.2.1 Distribution Current-Limiting Fuse Units. The preferred continuous current ratings of the distribution current-limiting fuse units shall be 6, 8, 10, 12, 15, 18, 20, 25, 30, 40, 50, 65, 80, 100, 125, 150, and 200 amperes.

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Table 1
Basic Impulse Insulation Level

Rated Maximum Voltage (kV, rms)	Basic Impulse Insulation Level (BIL)* (kV, crest)	
2.8	60	45
5.5	75	60
8.3	95	75
15.5	110	95
22	150	125
27.0	150	125

*Two standard values have been established for each voltage rating.

2.2.2 **Distribution Fuse Disconnecting Switches and Fuse Supports.** The rated continuous current of fuse disconnecting switches and fuse supports shall be 50, 100, or 200 amperes.

2.3 **Rated Maximum Voltages.** The preferred rated maximum voltages of distribution current-limiting fuse units, fuse disconnecting switches, and fuse supports shall be 2.8, 5.5, 8.3, 15.5, 22, and 27 kV.

2.4 **Rated Frequency.** The rated frequency of distribution current-limiting fuses shall be 50 or 60 Hz, or both.

2.5 **Rated Maximum Interrupting Currents.** The preferred rated maximum symmetrical interrupting currents of distribution current-limiting fuses shall be 12.5, 16, 20, 25, 31.5, 40, and 50 ka (rms).

NOTE: Rated interrupting currents follow the 10-series of preferred numbers in American National Standard Preferred Numbers, ANSI Z17.1-1973.

2.6 **Rated Minimum Interrupting Current.** The rated minimum interrupting current for distribution current-limiting backup fuses shall be designated by the manufacturer.

2.7 **Basic Impulse Insulation Level (BIL) of Distribution Current-Limiting Fuse Disconnecting Switches and Fuse Supports.** The basic impulse insulation level (BIL) of distribution current-limiting fuse disconnecting switches and fuse supports shall be as given in Table 1.

3. Electrical Interchangeability Requirements of Distribution Current-Limiting Fuse Units

3.1 **Melting-Time–Current Characteristics.** Melting-time–current characteristics shall be as follows:

(1) The current responsive element shall melt in 1000 seconds at an rms current within the range of 170% to 240% of the continuous current rating of the fuse unit.

(2) The melting-time–current characteristic of a distribution current-limiting fuse at any current higher than the value at 1000 seconds shall be shown by the manufacturer's published time–current curves, since the current responsive element is a distinctive feature of each manufacturer.

(3) For any given melting time, the maximum steady state rms current shall not exceed the minimum by more than 20%.

3.2 **Identification by "C."** Distribution current-limiting fuse units whose melting-time–current characteristics conform to the electrical interchangeability requirements specified in 3.1 shall be identified by the letter "C" (see 6.2).

4. Design Test Requirements

4.1 **Dielectric Tests.** The fuse disconnecting switch and fuse supports shall be capable of withstanding the test voltages specified in 4.1.1 when tested as specified in Section 4 of ANSI/IEEE C37.41-1981.

4.1.1 **Test Voltages.** The test voltages shall be as given in Tables 2 and 3.

4.1.2 **Points of Application of Voltage.** The test voltages shall be applied as indicated in Section 4 of ANSI/IEEE C37.41-1981.

4.2 **Interrupting Tests**

4.2.1 **Determination of Interrupting Rating.** Distribution current-limiting fuses shall be tested as specified in Section 6 of ANSI/IEEE C37.41-1981, and shall meet the requirements specified in 6.1.2.3 of ANSI/IEEE C37.41-1981.

4.2.1.1 **Peak Overvoltages for Distribution Current-Limiting Fuses.** Peak overvoltages for distribution current-limiting fuses, as determined in accordance with 6.5 of ANSI/IEEE C37.41-1981, shall not exceed those given in Table 4.

4.2.2 **Cutoff (Peak Let-Through) Current.** Cutoff (peak let-through) current for distribution current-limiting fuses shall be determined as specified in 6.6 of ANSI/IEEE C37.41-1981.

4.3 **Radio-Influence Tests.** Distribution current-limiting fuses, when new and clean and when tested as specified in Section 9 of ANSI/IEEE C37.41-1981, shall be capable of meeting the limits of radio-influence voltage at the test voltages specified in Table 5.

4.4 **Temperature-Rise Limitations.** Distribution current-limiting fuses shall be capable of carrying their

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Table 2
Outdoor Distribution Current-Limiting Fuses

	Terminal-to-Ground Withstand Voltage			Terminal-to-Terminal Withstand Voltage	
BIL	Normal-Frequency Dry Test, 1 min (kV, rms)	Normal-Frequency Wet Test, 10 s* (kV, rms)	Impulse Test, 1.2 X 50 μs (kV, crest)	Normal-Frequency Dry Test, 1 min (kV, rms)	Impulse Test, 1.2 X 50 μs (kV, crest)
45	15	13	45	15	45
60	21	20	60	21	60
75	27	24	75	27	75
95	35	30	95	35	95
110	50	45	110	50	110
125	42	36	125	42	125
150	70	60	150	70	150

*Normal-frequency wet-withstand voltages on the insulators, which meet these values, will be satisfactory in lieu of this test, provided the design of the complete device does not decrease the normal frequency withstand test voltages of the insulators.

Table 3
Indoor Distribution Current-Limiting Fuses

	Terminal-to-Ground Withstand Voltage			Terminal-to-Terminal Withstand Voltage	
BIL	Normal-Frequency Dry Test, 1 min (kV, rms)	Normal-Frequency Dew Test, 10 s* (kV, rms)	Impulse Test, 1.2 X 50 μs (kV, crest)	Normal-Frequency Dry Test, 1 min (kV, rms)	Impulse Test, 1.2 X 50 μs (kV, crest)
45	15	10	45	15	45
60	19	15	60	19	60
75	26	24	75	26	75
95	35	26	95	35	95
110	50	30	110	50	110
125	42	28	125	42	125
150	60	40	150	60	150

*Normal-frequency dew-withstand voltages on the insulators, which meet these values, will be satisfactory in lieu of this test, provided the design of the complete device does not decrease the normal frequency withstand test voltages of the insulators.

Table 4
Maximum Permissible Overvoltages for Current-Limiting Distribution Fuses

	Maximum Peak Overvoltage (kV, crest)	
Rated Maximum Voltage (kV, rms)	Through 12 Amperes	Over 12 Amperes
2.8	13	9
5.5	25	18
8.3	38	26
15.5	70	49
22	117	70
27	123	84

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Table 5
Limits of Radio-Influence Voltage

Rated Maximum Voltage (kV, rms)	Test Voltage (volts)	Limit of Radio-Influence Voltage (μV at 1 MHz)
2.8	3 000	250
5.5	5 800	250
8.3	8 700	250
15.5	16 000	250
22	22 500	250
27.0*	16 000*	250

*The 27-kV fuse is applied only on the basis of line-to-line voltage. All others are based on possible application at line-to-ground voltage.

rated continuous current when tested as specified in Section 11 of ANSI/IEEE C37.41-1981 and in 4.4.1 and 4.4.2.

4.4.1 After carrying their rated continuous current for the time specified in 11.2.1 of ANSI/IEEE C37.41-1981, there shall be no deterioration of any part of the fuse. The temperature rise of the fuse unit and fuse support, when fused with a maximum rated fuse unit and tested within an ambient temperature range of 10°C to 40°C as specified in 11.2.2 of ANSI/IEEE C37.41-1981, shall not exceed the values given in Table 2 of ANSI/IEEE C37.40-1981.

If the fuses are used in an enclosure in which the ambient temperature may reach 55°C, the fuses may have to be derated in order to meet the operating limits for both conducting and insulating parts.

4.4.2 When distribution current-limiting fuses are used in enclosures exposed to solar radiation, the ambient temperature inside the enclosure shall not exceed 55°C, and the temperature rises shall be at least 15°C lower than specified in Table 2 of ANSI/IEEE C37.41-1981, under either of the following conditions:

(1) The fuse is tested in the enclosure, and the rises are measured over the inside ambient.

(2) The fuse is tested outside the enclosure, and the rises are measured over the outside ambient.

When distribution current-limiting fuses are used in enclosures not exposed to solar radiation, the temperature rise measured in the enclosure shall not exceed the temperature rise specified in Table 2 of ANSI/IEEE C37.40-1981, and the limits of total temperature in Table 2 of ANSI/IEEE C37.40-1981 shall not be exceeded when all internal heat-generating devices are operating at maximum rating.

4.5 Time-Current Tests. The time-current curves for distribution current-limiting fuses shall be determined as specified in Section 12 of ANSI/IEEE C37.41-1981. A sufficient number of tests shall be made to ensure that all fuse units meet the accuracy specified in 3.1(3).

4.5.1 Range of Time-Current Curves. The range of melting- and total clearing-time-current characteristics shall be from 0.01 to 1000 seconds for all current ratings of general-purpose distribution current-limiting fuses.

5. Conformance Tests for Distribution Current-Limiting Fuse Disconnecting Switches and Fuse Supports

Conformance tests, as defined in 3.3 of ANSI/IEEE C37.40-1981, shall consist of a normal-frequency dry-withstand voltage test. The test shall be conducted as specified in 4.1 above and in 4.2.1 of ANSI/IEEE C37.41-1981.

6. Nameplate Marking

6.1 Fuse Disconnecting Switches or Fuse Supports. The following minimum information shall be placed on the distribution current-limiting fuse supports or fuse disconnecting switches:

(1) Manufacturer's name or trademark or monogram

(2) Manufacturer's type or identification number

(3) Rated continuous current (maximum and, if limited, minimum sizes of fuse units to be used)

(4) Rated maximum voltage

(5) Basic impulse insulation level (BIL)

6.2 Distribution Current-Limiting Fuse Units. The following minimum information shall be placed on the distribution current-limiting fuse units or on the shipping containers. The minimum information that shall appear on the fuse units is indicated by an asterisk (*).

(1) Manufacturer's name or trademark or monogram*

(2) Manufacturer's type or identification number*

(3) Manufactuer's type or identification number of the fuse support or fuse disconnecting switch for which the fuse units are designed

(4) Rated continuous current*

(5) Rated maximum voltage*

(6) Rated maximum interrupting current*

(7) Rated minimum interrupting current (for back-up fuses)

(8) Type identification C following the rated continuous current where applicable (see 3.1 and 3.2)*

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7. Revision of American National Standards Referred to in This Document

When the following American National Standards referred to in this document are superseded by a revision approved by the American National Standards Institute, Inc, the revision shall apply:

American National Standard Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.41-1981

American National Standard Preferred Numbers, ANSI Z17.1-1973

American National Standard Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories, ANSI/IEEE C37.40-1981

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