

American National Standard

Specification for High-Voltage Expulsion Type Distribution Class Fuses, Cutouts, Fuse Disconnecting Switches and Fuse Links

Approved 1/6/97

American National Standards Institute, Inc.

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

Copyright © 2003 by the Institute of Electrical and Electronics Engineers, Inc.
All rights reserved. Printed in the United States of America.

Print: ISBN 0-7381-3606-6 SH95099
PDF: ISBN 0-7381-3607-7 SS95099

No part of this publication may be reproduced in any form, in an electronic retrieval system or otherwise, without the prior written permission of the publisher.

American National Standard

Approval of an American National Standard requires verification by ANSI that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

Consensus is established when, in the judgment of the ANSI Board of Standards Review, substantial agreement has been reached by directly and materially affected interests. Substantial agreement means much more than a simple majority, but not necessarily unanimity. Consensus requires that all views and objections be considered, and that a concerted effort be made toward their resolution.

The use of American National Standards is completely voluntary; their existence does not in any respect preclude anyone, whether he has approved the standards or not, from manufacturing, marketing, purchasing, or using products, processes, or procedures not conforming to the standards.

The American National Standards Institute does not develop standards and will in no circumstances give an interpretation of any American National Standard. Moreover, no person shall have the right or authority to issue an interpretation of an American National Standard in the name of the American National Standards Institute. Requests for interpretations should be addressed to the secretariat or sponsor whose name appears on the title page of this standard.

CAUTION NOTICE: This American National Standard may be revised or withdrawn at any time. The procedures of the American National Standards Institute require that action be taken periodically to reaffirm, revise, or withdraw this standard. Purchasers of American National Standards may receive current information on all standards by calling or writing the American National Standards Institute.

FOREWORD

(This Foreword is not part of American National Standard C37.42-1996)

This standard is a revision of ANSI C37.42-1989, to bring it up to date and in line with present day requirements for high-voltage fuses, fuse links and fuse disconnecting switches.

This standard was prepared by the NEMA High Voltage Fuse Technical Committee with cooperation from the IEEE Subcommittee on High Voltage Fuses. Liaison was maintained with Edison Electric Institute (EEI) and International Electrotechnical Commission (IEC) during the development of the revisions in order to incorporate the latest thinking up to the time of publication.

This standard is one of a series of complementary standards covering various types of high-voltage fuses and switches, arranged so that certain standards apply to all devices while other standards provide additional specifications for a particular device. For any device, ANSI/IEEE C37.40-1993, ANSI/IEEE C37.41-1994, plus the additional standard covering that device, constitute a complete standard for the device. In addition, ANSI/IEEE C37.48-1987 (R1992) is an application, operation, and maintenance guide for all the devices.

The following standards make up this series:

ANSI/IEEE C37.40-1993, Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories

ANSI/IEEE C37.41-1994, Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories

ANSI C37.42-1996, Specifications for High Voltage Expulsion Type Distribution Class Fuses, Cutouts, Fuse Disconnecting Switches and Fuse Links

ANSI C37.44-1981 (R 1992), Specifications for High Voltage Distribution Class Oil Cutouts and Fuse Links

ANSI C37.45-1981 (R 1992), Specifications for High Voltage Distribution Class Enclosed Single-Pole Air Switches

ANSI C37.46-1981 (R 1992), Specifications for High Voltage Expulsion and Current-Limiting Type Power Class Fuses and Fuse Disconnecting Switches

ANSI C37.47-1981 (R 1992), Specifications for High Voltage Current-Limiting Type Distribution Class Fuses and Fuse Disconnecting Switches

ANSI/IEEE C37.48-1987 (R1992), Guide for Application, Operation, and Maintenance of High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories

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

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

E. Byron, Chair
A.K. McCabe (*Executive Vice-Chairman, HV Standards*)
J. Scott (*Executive Vice-Chairman, LV Standards*)
D.L. Swindler (*Executive Vice-Chairman, IEC Activities*)
M. Calwise, Secretary

<i>Organizations Represented</i>	<i>Name of Representative</i>
Electric Light and Power Group	D.E. Galicia D.G. Komassa J.L. Koepfinger M.C. Mingoia J.H. Provanzana T.E. Bruck (Alt)
Institute of Electrical and Electronics Engineers	L.R. Beard P.W. Dwyer A. Monroe D.F. Peelo D. Sigmon S.C. Atkinson (Alt) D.G. Kumbara (Alt) L.V. McCall (Alt)
National Electrical Manufacturers Association	R. Garzon G. Haynes W. Kracht H.L. Miller T. Olsen D. Stone E. Byron (Alt) G.T. Jones (Alt) G. Sakats (Alt) D.L. Swindler (Alt)
Testing Laboratory Group.....	L. Frier P. Notarian
Tennessee Valley Authority	D.N. Reynolds
U.S. Dept. Of the Army-Office of the Chief of Engineers	J.A. Gildon
U.S. Dept. of the Navy-Naval Construction Battalion Cntr.	R.R. Nicholas
Western Area Power Administration	G.D. Birney

The NEMA High Voltage Fuse Technical Committee that developed this standard had the following membership:

R. Ranjan, Chair
M. C. Calwise (*Program Administrator*)

M. Allison	R. Duncan	J.S. Schaffer
L.R. Beard	S.P. Hassler	G. Smith
W.R. Crooks		J.S. Wall

Other individuals who have contributed in the development of this standard are as follows:

R.H. Arndt

J.G. Leach

J.R. Marek

The C37 Subcommittee on High-Voltage Fuses had the following members:

R.H. Arndt, *Chair*

L.R. Beard

R.L. Capra

D.R. Clark

W.R. Crooks

H.E. Foelker

J.G. Leach

J.R. Marek

W. Mikulecky

F.J. Muench

R. Ranjan

T.E. Royster

J.G. St. Clair

E.W. Schmunk

The IEEE High-Voltage Fuse Subcommittee had the following members:

L.R. Beard, *Chair*

J. Angelis

R.H. Arndt

J.L. Barger

T.A. Bellei

R.L. Capra

W.R. Crooks

H.E. Foelker

P. Hassler

W.J. Huber

J.G. Leach

J.R. Marek

F.J. Muench

H.M. Pflanz

R. Ranjan

T.E. Royster

J.G. St. Clair

J.S. Schaffer

E.W. Schmunk

V.M. Scuderi

J.G. Wood

J. Zawadzki

CLAUSE	PAGE
1. Scope	1
2. Referenced standards	1
2.1 Referenced American National Standards	1
2.2 Other referenced standards.....	2
3. Distribution class open, enclosed and open-link fuses and cutouts and fuse disconnecting switches.....	2
3.1 General rating information.....	2
3.2 Preferred ratings and performance requirements	3
3.3 Design test requirements	7
3.4 Conformance tests.....	9
3.5 Construction requirements	9
3.6 Nameplate marking for distribution class open, enclosed, and open-link fuses and cutouts.....	16
3.7 Application requirements	18
4. Fuse links for distribution class open, enclosed, and open-link fuses and cutouts	18
4.1 General rating information.....	18
4.2 Preferred ratings and performance requirements	18
4.3 Time-current-characteristic requirements for universal fuse links used in distribution class open, enclosed, and open-link fuses and cutouts	19
4.4 Mechanical interchangeability requirements for universal fuse links for open and enclosed type fuses and cutouts	20
4.5 Mechanical interchangeability requirements for universal open-link fuse links	24
4.6 Tensile withstand strength	24
4.7 Design test requirements.....	24
4.8 Nameplate marking.....	25
4.9 Application requirements	25

Specifications For High Voltage Expulsion Type Distribution Class Fuses, Cutouts, Fuse Disconnecting Switches And Fuse Links

1. Scope

This standard establishes specifications for high voltage (above 1000 volts) expulsion type distribution class fuses, cutouts, fuse disconnecting switches, fuse links and associated accessories. All of these devices are intended for use on alternating current distribution systems. These specifications apply to the following specific types of equipment:

- a) Open, enclosed, and open link types of fuses and cutouts.
- b) Open and enclosed fuse disconnecting switches
- c) Fuse supports, fuse mountings and fuse hooks of the type used exclusively with distribution class fuses, cutouts, and fuse disconnecting switches.
- d) Removable switch blades of the type used exclusively with distribution class fuses, cutouts, and fuse disconnecting switches.
- e) Fuse links of the type used exclusively with distribution class fuses, cutouts, and fuse disconnecting switches.

The fuses listed above are the same as those covered in IEC 282-2. The open and enclosed types of “distribution” class fuses and cutouts are the same as the class “A” fuses and cutouts covered in that document.

2. Referenced standards

2.1 Referenced American National Standards

This standard is intended to be used in conjunction with the following American National Standards. When these referenced American National Standards are superseded by a revision approved by the American National Standards Institute, Inc., the revision shall apply:

ANSI/ASME B1.1-1989, *Unified Inch Screw Threads (UN and UNR Thread Form)*

ANSI/ASME B18.5-1990, *Round Head Bolts (Inch Series)*

ANSI/ASME B18.2.2-1987 (R1993), *Square and Hex Nuts (Inch Series)*

ANSI/IEEE C37.40-1993, *Service Conditions and Definitions for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories*

ANSI/IEEE C37.41-1994, *Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories*

ANSI/IEEE C37.48-1987 (R1992), *Guide for Application, Operation, and Maintenance of High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories*

2.2 Other referenced standards

This standard is also intended to be used in conjunction with the following standards:

ASTM A153-82 (1987), *Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*

ASTM A575-89, *Specifications for Steel Bars, Carbon, Merchant Quality, M-Grades*

IEC 282-2-1995, *High Voltage Fuse - Part 2, Expulsion Fuses*

3. Distribution class open, enclosed and open-link fuses and cutouts and fuse disconnecting switches

3.1 General rating information

The ratings of distribution class fuses and cutouts shall be determined with tests performed using the usual service conditions defined in Clause 2 of ANSI/IEEE C37.40, except where other conditions are specified, and shall include:

- a) Rated maximum voltages, determined by the dielectric and current interrupting design tests specified in 3.3.1 and 3.3.2, respectively.
- b) Rated continuous current, determined by the temperature-rise design tests at the rated continuous current specified in 3.3.6.
- c) Rated interrupting current (breaking capacity), determined by the current interrupting design tests specified in 3.3.2.
- d) Rated short time currents (momentary, 15-cycle, and 3-second), determined by the design tests specified in 3.3.5.
 - 1) The rated momentary short-time current is the RMS value of current, including the direct-current component, that occurs in the first maximum offset current loop of the design tests specified above. The rated momentary current value for any device is based on its 15 cycle rated short time current multiplied by the appropriate asymmetry factor associated with the X/R specified. This rating provides an index of the device's ability to withstand the electromagnetic forces that occur under maximum short-circuit conditions.
 - 2) The rated 15-cycle short-time current is based on the maximum rated symmetrical interrupting current of any fuseholder that is interchangeable with the disconnecting blade of the disconnecting cutout. This rating provides an index of the device's ability to withstand the electromagnetic forces and the heat that may be generated under short-circuit conditions.
 - 3) The rated 3-second short time rating provides an index of the device's ability to withstand the heat that may be generated under long time short circuit conditions.

- e) Basic impulse insulation level (BIL), determined by the impulse withstand tests specified in 3.3.1.
- f) Rated frequency, as specified in 3.2.2.
- g) Rated load-break current (when provision is made for load-break operation), determined by the design tests specified in 3.3.3.

3.2 Preferred ratings and performance requirements

3.2.1 Rated voltage, rated continuous current, rated interrupting current, rated short time current and basic impulse insulation level (BIL)

The rated maximum voltage, rated continuous current, rated symmetrical interrupting current, rated short time current and basic impulse insulation level for distribution class fuses and cutouts shall be as specified in tables 1A and 1B. Column 1 in table 1A and columns 1 and 2 in table 1B list the preferred maximum voltage ratings to be used for future new designs. Column 1a in table 1A and column 1a and 2a in table 1B list the preferred maximum voltage ratings of devices now being manufactured and used. Distribution class open type fuses and cutouts may have a single-voltage-rating or a slant-voltage-rating (multiple-voltage-rating). Application information and selection guidance for these devices is presented in ANSI/IEEE C37.48.

The asymmetrical interrupting current values listed in tables 1A and 1B are for information purposes only. For additional information on ratios of asymmetrical to symmetrical values (multiplication factor) see annex "C" ANSI/IEEE C37.41.

The X/R values listed in tables 1A and 1B are the values used for the high current interrupting tests. See the tables in clause 6 of ANSI/IEEE C37.41 for the X/R values used for the tests performed at lower currents.

The identifying color (color coding) specified in 2.5.1 and the terminal sizes specified in 2.5.6 listed in tables 1A and 1B are construction requirements and are not ratings.

3.2.2 Rated frequency

The rated frequency for distribution fuses and cutouts shall be 50 Hz, 60 Hz, or both.

3.2.3 Rated load-break current for distribution class load-break fuses and cutouts

The rated load-break current of distribution class load-break open, enclosed, and open-link fuses and cutouts shall be the rated continuous current of the fuses and cutouts, as specified in column 2 of table 1A and column 3 of table 1B.

3.2.4 Performance requirements

The performance requirements of distribution class fuses and cutouts of the open, enclosed and open-link type shall include:

- a) Power-frequency dry-withstand voltages as specified in 3.3.1.
- b) Impulse voltages as specified in 3.3.1.
- c) Power-frequency wet-withstand voltages as specified in 3.3.1.
- d) Temperature-rise limitations as specified in 3.3.6.
- e) Radio-influence levels as specified in 3.3.4.

3.2.5 Ratings and performance requirements other than preferred

Special circuit or environmental conditions may require devices with ratings or performance requirements that are different from the preferred values specified above. For these devices the ratings and the performance requirements shall be agreed upon by the user and the manufacturer.

Table 1A —Rated maximum voltage, rated continuous current, rated Interrupting current, rated short-time current, and basic insulation level (BIL) for enclosed fuses and cutouts

Fuses, Fuse Cutouts and Disconnecting Cutouts		Fuses and Fuse Cutouts								Disconnecting Cutouts					Fuses, Fuse Cutouts and Disconnecting Cutouts		
Rated Maximum Voltage* (kV,rms)		Rated Contin- uous Current (amps)	Rated Interrupting Current at .5 Rated Maximum Voltage (kA rms)		Rated Interrupting Current at Rated Maximum Voltage (kA rms)		Identifying Color [†]	Nom. [‡]	X\R Ratio	Rated Contin- uous Current (amps)	Rated Short-Time Current (kiloamperes)			Identi- fying Color [†]	BIL (kilo- volts)	Dimensional Range of Copper Conductor Sizes to be Accommodated by Terminals, Minimum to Maximum **	
Single Voltage Rated			Sym	Asym ^{††}	Sym	Asym ^{††}					(Momentary)	15 cycle	3 seconds			Inches	Millimeters
Col 1	Col 1a	Col 2	Col 3	Col 4	Col 5	Col 6	Col 7	Col 8	Col 9	Col 10	Col 11	Col 12	Col 13	Col 14	Col 15	Col 16	
5.5	5.2	50	2.5	3.0	1.6	2.0	—	ND	5	100	8.0	6.3	1.6	Red	60	0.128–0.316	3.25–8.03
5.5	5.2	50	6.3	8.0	4.0	5.0	Yellow	HD	5	100	8.0	6.3	1.6	Red	60	0.128–0.316	3.25–8.03
5.5	5.2	100	4.0	5.0	2.5	3.0	—	ND	5	200	14.0	11.2	3.2	Red	60	0.162–0.447	4.11–11.35
5.5	5.2	100	6.3	8.0	4.0	5.0	Yellow	HD	5	200	14.0	11.2	3.2	Red	60	0.162–0.447	4.11–11.35
5.5	5.2	100	11.2	14.0	8.0	10.0	White (Silver)	EHD	5	200	14.0	11.2	3.2	Red	60	0.162–0.447	4.11–11.35
5.5	5.2	200	11.2	14.0	8.0	10.0	Yellow	HD	5	300	20.0	16.0	5.0	Red	60	0.289–0.575	7.34–14.61
5.5	5.2	200	16.0	20.0	12.5	15.0	White (Silver)	EHD	5	300	20.0	16.0	5.0	Red	60	0.289–0.575	7.34–14.61
8.3	7.8	50	—	—	1.4	2.0	—	ND	8	100	8.0	6.3	1.6	Red	75	0.128–0.316	3.25–8.03
8.3	7.8	50	—	—	2.8	4.0	Yellow	HD	8	100	8.0	6.3	1.6	Red	75	0.128–0.316	3.25–8.03
8.3	7.8	100	—	—	2.8	4.0	—	ND	8	200	14.0	11.2	3.2	Red	75	0.162–0.447	4.11–11.35
8.3	7.8	100	—	—	5.6	8.0	White (Silver)	EHD	8	200	14.0	11.2	3.2	Red	75	0.162–0.447	4.11–11.35

*See Clause 3.2.1

[†]Color coding is not a requirement for compliance to this standard (see Clause 3.2.3)

[‡]Interrupting Rating Nomenclature: ND-Normal duty; HD - heavy duty; EHD - extra heavy duty.

**Terminal Sizes are construction requirements and are not ratings.

^{††}Asymmetrical values are provided for information only