

**Pararrayos. Parte 5: Recomendaciones para la selección y utilización. (Ratificada por la Asociación Española de Normalización en mayo de 2018.)**

Pararrayos. Parte 5: Recomendaciones para la selección y utilización. (Ratificada por la Asociación Española de Normalización en mayo de 2018.)

*Surge arresters - Part 5: Selection and application recommendations (Endorsed by Asociación Española de Normalización in May of 2018.)*

*Parafoudres - Partie 5: Recommandations pour le choix et l'utilisation (Entérinée par l'Asociación Española de Normalización en mai 2018.)*

En cumplimiento del punto 11.2.5.4 de las Reglas Internas de CEN/CENELEC Parte 2, se ha otorgado el rango de documento normativo español UNE al documento normativo europeo EN IEC 60099-5:2018 (Fecha de disponibilidad 2018-03-23)

Este documento está disponible en los idiomas oficiales de CEN/CENELEC/ETSI.

Este anuncio causará efecto a partir del primer día del mes siguiente al de su publicación en la revista AENOR.

La correspondiente versión oficial de este documento se encuentra disponible en la Asociación Española de Normalización (Génova 6 28004 MADRID, [www.une.org](http://www.une.org)).

Las observaciones a este documento han de dirigirse a:

## Asociación Española de Normalización

Génova, 6  
28004 MADRID-España  
Tel.: 915 294 900  
[info@une.org](mailto:info@une.org)  
[www.une.org](http://www.une.org)

© UNE 2018

Prohibida la reproducción sin el consentimiento de UNE.

Todos los derechos de p

This is a preview. Click here to purchase the full publication.

**EUROPEAN STANDARD**  
**NORME EUROPÉENNE**  
**EUROPÄISCHE NORM**

**EN IEC 60099-5**

March 2018

ICS 29.120.50; 29.240.10

Supersedes EN 60099-5:2013

English Version

**Surge arresters - Part 5: Selection and application  
recommendations  
(IEC 60099-5:2018)**

Parafoudres - Partie 5: Recommandations pour le choix et  
l'utilisation  
(IEC 60099-5:2018)

Überspannungsableiter - Teil 5: Anleitung für die Auswahl  
und die Anwendung  
(IEC 60099-5:2018)

This European Standard was approved by CENELEC on 2018-02-23. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels**

© 2018 CENELEC All rights of exploitation in any form and by any means reserved worldwide for CENELEC Members.

Ref. No. EN IEC 60099-5:2018 E

This is a preview. Click here to purchase the full publication.

## European foreword

The text of document 37/437/FDIS, future edition 3 of IEC 60099-5, prepared by IEC/TC 37 "Surge arresters" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60099-5:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-11-23
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-02-23

This document supersedes EN 60099-5:2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

## Endorsement notice

The text of the International Standard IEC 60099-5:2018 was approved by CENELEC as a European Standard without any modification.

**Annex ZA**  
(normative)

**Normative references to international publications  
with their corresponding European publications**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60071-1	2006	Insulation co-ordination -- Part 1: Definitions, principles and rules	EN 60071-1	2006
+ A1	2010		+ A1	2010
IEC 60071-2	1996	Insulation co-ordination -- Part 2: Application guide	EN 60071-2	1997
IEC 60099-4	2004	Surge arresters -- Part 4: Metal-oxide surge arresters without gaps for a.c. systems	EN 60099-4	2004
+ A1	2006		+ A1	2006
+ A2	2009		+ A2	2009
IEC 60099-4	2014	Surge arresters - Part 4: Metal-oxide surge arresters without gaps for a.c. systems	EN 60099-4	2014
IEC 60099-6	2002	Surge arresters -- Part 6: Surge arresters - containing both series and parallel gapped structures - Rated 52 kV and less	-	-
IEC 60099-8	2011	Surge arresters -- Part 8: Metal-oxide surge arresters with external series gap (EGLA) for overhead transmission and distribution lines of a.c. systems above 1 kV	EN 60099-8	2011
IEC 60507	-	Artificial pollution tests on high-voltage ceramic and glass insulators to be used on a.c. systems	EN 60507	-
IEC 62271-200	-	High-voltage switchgear and controlgear -- EN 62271-200 Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV	-	-
IEC 62271-203	-	High-voltage switchgear and controlgear -- EN 62271-203 Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	-	-
IEC/TR 60071-4	-	Insulation co-ordination -- Part 4: Computational guide to insulation co- ordination and modelling of electrical networks	-	-
IEC/TS 60815-1	2008	Selection and dimensioning of high-voltage - insulators intended for use in polluted conditions - Part 1: Definitions, information and general principles	-	-



# INTERNATIONAL STANDARD



---

**Surge arresters –  
Part 5: Selection and application recommendations**



This is a preview. Click here to purchase the full publication.



**THIS PUBLICATION IS COPYRIGHT PROTECTED  
Copyright © 2018 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office  
3, rue de Varembé  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

**About the IEC**

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

**About IEC publications**

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

**IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)**

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

**IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)**

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

**IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)**

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

**Electropedia - [www.electropedia.org](http://www.electropedia.org)**

The world's leading online dictionary of electronic and electrical terms containing 21 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

**IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)**

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

**IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)**

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).



# INTERNATIONAL STANDARD



---

**Surge arresters –  
Part 5: Selection and application recommendations**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 29.120.50; 29.240.10

ISBN 978-2-8322-5075-4

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD .....	9
1 Scope .....	11
2 Normative references .....	11
3 Terms and definitions .....	12
4 General principles for the application of surge arresters .....	21
5 Surge arrester fundamentals and applications issues .....	22
5.1 Evolution of surge protection equipment .....	22
5.2 Different types and designs and their electrical and mechanical characteristics .....	23
5.2.1 General .....	23
5.2.2 Metal-oxide arresters without gaps according to IEC 60099-4 .....	24
5.2.3 Metal-oxide surge arresters with internal series gaps according to IEC 60099-6 .....	34
5.2.4 Externally gapped line arresters (EGLA) according to IEC 60099-8 .....	36
5.2.5 Application considerations .....	39
6 Insulation coordination and surge arrester applications .....	52
6.1 General .....	52
6.2 Insulation coordination overview .....	52
6.2.1 General .....	52
6.2.2 IEC insulation coordination procedure .....	53
6.2.3 Overvoltages .....	53
6.2.4 Line insulation coordination: Arrester Application Practices .....	59
6.2.5 Substation insulation coordination: Arrester application practices .....	64
6.2.6 Insulation coordination studies .....	68
6.3 Selection of arresters .....	70
6.3.1 General .....	70
6.3.2 General procedure for the selection of surge arresters .....	70
6.3.3 Selection of line surge arresters, LSA .....	84
6.3.4 Selection of arresters for cable protection .....	93
6.3.5 Selection of arresters for distribution systems – special attention .....	95
6.3.6 Application and coordination of disconnectors .....	96
6.3.7 Selection of UHV arresters .....	98
6.4 Standard and special service conditions .....	99
6.4.1 Standard service conditions .....	99
6.4.2 Special service conditions .....	99
7 Surge arresters for special applications .....	103
7.1 Surge arresters for transformer neutrals .....	103
7.1.1 General .....	103
7.1.2 Surge arresters for fully insulated transformer neutrals .....	103
7.1.3 Surge arresters for neutrals of transformers with non-uniform insulation .....	103
7.2 Surge arresters between phases .....	104
7.2.1 General .....	104
7.2.2 6-arrester arrangement .....	104
7.2.3 4-arrester (Neptune) arrangement .....	104
7.3 Surge arresters for rotating machines .....	105
7.4 Surge arresters in parallel .....	106

7.4.1	General .....	106
7.4.2	Combining different designs of arresters.....	107
7.5	Surge arresters for capacitor switching .....	107
7.6	Surge arresters for series capacitor banks .....	109
8	Asset management of surge arresters .....	110
8.1	General.....	110
8.2	Managing surge arresters in a power grid .....	110
8.2.1	Asset database .....	110
8.2.2	Technical specifications.....	110
8.2.3	Strategic spares .....	110
8.2.4	Transportation and storage .....	111
8.2.5	Commissioning .....	111
8.3	Maintenance .....	111
8.3.1	General .....	111
8.3.2	Polluted arrester housing .....	112
8.3.3	Coating of arrester housings.....	112
8.3.4	Inspection of disconnectors on surge arresters .....	112
8.3.5	Line surge arresters.....	112
8.4	Performance and diagnostic tools .....	112
8.5	End of life .....	113
8.5.1	General .....	113
8.5.2	GIS arresters .....	113
8.6	Disposal and recycling .....	113
Annex A (informative)	Determination of temporary overvoltages due to earth faults .....	114
Annex B (informative)	Current practice .....	118
Annex C (informative)	Arrester modelling techniques for studies involving insulation coordination and energy requirements .....	119
C.1	Arrester models for impulse simulations.....	119
C.2	Application to insulation coordination studies .....	120
C.3	Summary of proposed arrester models to be used for impulse applications .....	120
Annex D (informative)	Diagnostic indicators of metal-oxide surge arresters in service.....	122
D.1	General.....	122
D.1.1	Overview .....	122
D.1.2	Fault indicators .....	122
D.1.3	Disconnectors.....	122
D.1.4	Surge counters .....	122
D.1.5	Monitoring spark gaps .....	123
D.1.6	Temperature measurements .....	123
D.1.7	Leakage current measurements of gapless metal-oxide arresters .....	123
D.2	Measurement of the total leakage current .....	128
D.3	Measurement of the resistive leakage current or the power loss.....	129
D.3.1	General .....	129
D.3.2	Method A1 – Using the applied voltage signal as a reference .....	129
D.3.3	Method A2 – Compensating the capacitive component using a voltage signal .....	130
D.3.4	Method A3 – Compensating the capacitive component without using a voltage signal .....	131
D.3.5	Method A4 – Capacitive compensation by combining the leakage current of the three phases .....	131