IEC 60358-1

Edition 1.0 2012-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Coupling capacitors and capacitor dividers – Part 1: General rules

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Condensateurs de couplage et diviseurs capacitifs – Partie 1: Règles générales

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

IEC 60358-1:2012

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2012 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.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de la CEI ou du Comité national de la CEI du pays du demandeur.
Si vous avez des questions sur le copyright de la CEI ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de la CEI de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
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.

Useful links:

iTeh STANDARD PREVIEW
(standards.iteh.ai)

IEC publications search - www.iec.ch/searchpub

The advanced search enables you 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It also gives information on projects, replaced and withdrawn publications.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 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b4238280eac30/iec-60358-1-2012

IEC Just Published - webstore.iec.ch/justpublished

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

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary (IEV) on-line.

Customer Service Centre - 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: csc@iec.ch.

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Liens utiles:

Recherche de publications CEI - www.iec.ch/searchpub

La recherche avancée vous permet de trouver des publications CEI en utilisant différents critères (numéro de référence, texte, comité d'études,…).
Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

Just Published CEI - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications de la CEI. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (VEI) en ligne.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

IEC 60358-1

Edition 1.0 2012-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Coupling capacitors and capacitor dividers – Part 1: General rules

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Condensateurs de couplage et diviseurs capacitifs – Partie 1: Règles générales

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX X

ICS 29.120.99; 29.240.99; 31.060.70

ISBN 978-2-83220-120-6

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

CONTENTS

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/ceebdcea-ae8a-4edb-b32f-b638280eac30/iec-60358-1-2012

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ae8a-4cdb-b32f-bd3829fcaa10/iec-60358-1-2012

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COUPLING CAPACITORS AND CAPACITOR DIVIDERS –

Part 1: General rules

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/eecbdcea-ac8a-4cdb-b32f-b6382280cae30/iec-60358-1-2012

International Standard IEC 60358-1 has been prepared by IEC Technical Committee 33: Power capacitors and their applications.

This standard cancels and replaces the second edition of IEC 60358 (1990), and constitutes a technical revision.

This edition of IEC 60358-1 includes the following significant technical changes with respect to the former edition of IEC 60358:

– The standard has been split into different parts; Part 1 is the general rules and Parts 2, 3, 4 will be specific to the PLC, filters and dividers applications.

– The routine and type test have been reviewed and are presented in Figure 2.

The text of this standard is based on the following documents:

FDIS	Report on voting
33/499/FDIS	33/508/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of July 2013 have been included in this copy.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

INTRODUCTION

For the new re-structured IEC 60358 series, the following parts are envisaged:

IEC 60358-1[1], Coupling capacitors and capacitor dividers – Part 1: General rules

IEC 60358-2[2], Coupling capacitor and capacitor dividers – Part 2: AC or DC single-phase coupling capacitor connected between line and ground for power line carrier-frequency (PLC) application

IEC 60358-3[3], Coupling capacitors and capacitor dividers – Part 3: AC or DC single-phase coupling capacitor for harmonic-filters applications

IEC 60358-4[4], Coupling capacitor and capacitor dividers – Part 4: AC or DC single-phase capacitor-divider and RC-divider connected between line and ground (except for CVT's which belong to IEC 61869-5)

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

1 To be published.

2 To be published.

3 Under consideration.

4 Under consideration.

COUPLING CAPACITORS AND CAPACITOR DIVIDERS –

Part 1: General rules

1 Scope

This part of IEC 60358 applies to:

- Capacitors, with rated voltage > 1 000 V, connected line to ground with the low voltage terminal either permanently earthed or connected to devices, for applications listed hereunder and other similar uses.

This standard serves as basic standard for the coupling capacitor, the different parts of this standard will present the supplementary specifications and tests, for example IEC 60358-2, IEC 60358-3 or IEC 60358-4.

NOTE Diagrams of coupling capacitor to which this standard applies are given in Figures A.1.

2 Normative references

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

IEC 60038, *IEC standard voltages*

IEC 60050-321:1986, *International Electrotechnical Vocabulary – Chapter 321: Instrument transformers*

IEC 60050-436:1990, *International Electrotechnical Vocabulary – Chapter 436: Power capacitors*

IEC 60050-601:1985, *International Electrotechnical Vocabulary – Chapter 601: Generation, transmission and distribution of electricity – General*

IEC 60050-604:1987, *International Electrotechnical Vocabulary – Chapter 604: Generation, transmission and distribution of electricity – Operation*

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-17, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60071-1, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60270, *High-voltage test techniques – Partial discharge measurements*

IEC 60721 (all parts), *Classification of environmental conditions*

IEC 61462, *Composite hollow insulators – Pressurized and unpressurized insulators for use in electrical equipment with rated voltage greater than 1 000 V – Definitions, test methods, acceptance criteria and design recommendations*

CISPR/TR 18-2, *Radio interference characteristics of overhead power lines and high-voltage equipment – Part 2: Methods of measurement and procedure for determining limits*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

NOTE Some of these terms and definitions are identical with or are similar to those of IEC 60050-321:1986, IEC 60050-436:1990, IEC 60050-601:1985 and IEC 60050-604:1987. These are indicated by the relevant reference in brackets.

3.1 General terms and definitions

3.1.1
equipment
general term used for this standard, either for complete capacitor, capacitor divider, RC-divider

3.1.2
coupling capacitor
capacitor used for the transmission of signals in a power system

[SOURCE: IEC 60050-436:1990, 436-02-11]

3.1.3
rated frequency of equipment
frequency for which the coupling capacitor has been designed

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.4
standard reference range of frequency
range of frequency which is applicable for the equipment

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/bdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

3.1.5
rated voltage
U_R
value of the voltage which appears in the designation of the equipment and on which its performance is based

[SOURCE: IEC 60050-321:1986, 321-01-12]

3.1.6
highest voltage for equipment
U_m
a.c.: the highest r.m.s. value of phase-to-phase voltage for which the equipment is designed and may be used in respect of its insulation

d.c.: the highest value of line to ground voltage for which the equipment is designed and may be used in respect of its insulation

3.1.7
d.c.-system voltage
U_{DC}
highest mean or average operating voltage to earth, excluding harmonics and commutation overshoots

[SOURCE: IEC 60071-5]

3.1.8
Maximum d.c.-system voltage
U_{DCmax}
maximum D.C.-system voltage is almost a pure d.c. voltage with a magnitude dependent on voltage control and measuring tolerance excluding harmonics and commutation overshoots.

3.1.9
rated insulation level
combination of voltage values which characterises the insulation of the equipment with regard to its capability to withstand dielectric stresses

3.1.10
isolated neutral system
system where the neutral point is not intentionally connected to earth, except for high impedance connections for protection or measurement purposes

[SOURCE: IEC 60050-601:1985, 601-02-24]

3.1.11
solidly earthed (neutral) system
system whose neutral point(s) is (are) earthed directly

[SOURCE: IEC 60050-601:1985, 601-02-25]

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.12
impedance earthed (neutral) system
system whose neutral point(s) is (are) earthed through impedances to limit earth fault currents

[SOURCE: IEC 60050-601:1985, 601-02-26]

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

3.1.13
resonant earthed (neutral) system
system in which one or more neutral points are connected to earth through reactances which approximately compensate the capacitive component of a single-phase-to-earth fault current

[SOURCE: IEC 60050-601:1985, 601-02-27]

Note 1 to entry: With resonant earthing of a system, the residual current in the fault is limited to such an extent that an arcing fault in air is self-extinguishing.

3.1.14
earth fault factor
at a given location of a three-phase system, and for a given system configuration, the ratio of the highest r.m.s. phase-to-earth power frequency voltage on a healthy phase during a fault to earth affecting one or more phases at any point on the system to the r.m.s. value of phase-to-earth power frequency voltage which would be obtained at the given location in the absence of any such fault

[SOURCE: IEC 60050-604:1987, 604-03-06]

3.1.15
earthed neutral system
system in which the neutral is connected to earth either solidly or through a resistance or reactance of sufficiently low value to reduce transient oscillations and to give a current sufficient for selective earth fault protection

a) A three-phase system with effectively earthed neutral at a given location is a system characterized by an earth fault factor at this point which does not exceed 1,4

Note 1 to entry: This condition is obtained approximately when, for all system configurations, the ratio of zero-sequence reactance to the positive-sequence reactance is less than 3 and the ratio of zero-sequence resistance to positive-sequence reactance is less than one.

b) A three-phase system with non-effectively earthed neutral at a given location is a system characterized by an earth fault factor at this point that may exceed 1,4

3.1.16
unified specific creepage distance USCD
creepage distance of an insulator divider by the r.m.s value of the highest operating voltage across the insulator

Note 1 to entry: This definition differs from that of specific creepage distance where the line-line value of the highest voltage for the equipment is used (for a.c. systems usually $U_m/\sqrt{3}$). For line-to-earth insulation, this definition will result in a value that $\sqrt{3}$ times that given by the definition of specific creepage distance in IEC/TR 60815 (1986).

Note 2 to entry: For Um see IEC 60050-604:1987, 604-03-01.

Note 3 to entry: It is generally expressed in mm/KV and usually expressed as a minimum.

3.1.17
exposed installation
installation in which the apparatus is subject to overvoltages of atmospheric origin

NOTE Such installations are usually connected to overhead transmission lines either directly or through a short length of cable.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.1.18
non-exposed installation
installation in which the apparatus is not subject to overvoltages of atmospheric origin

Note 1 to entry: Such installations are usually connected to underground cable networks.

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

3.1.19
rated voltage factor
F_V
multiplying factor to be applied to the rated voltage U_R to determine the maximum voltage at which equipment must comply with relevant thermal requirements for a specified time

3.1.20
rated temperature category of the equipment
range of temperature of the ambient air or of the cooling medium for which the equipment has been designed

3.1.21
line terminal
terminal intended for connection to a line conductor of a network

[SOURCE: IEC 60050-436:1990, 436-03-01]

3.1.22
mechanical stress
stresses on different parts of the equipment as a function of four main forces:

– forces on the terminals due to the line connections,
– forces due to the wind on the cross-section of the equipment with and without line trap mounted on the top of a coupling/filter capacitor,
– seismic forces and
– electrodynamic forces due to short circuit current

3.1.23
voltage-connected equipment
equipment which has only one connection to the high voltage line

Note 1 to entry: Under normal conditions the top connection carries only the current of the equipment.

3.1.24
current-connected equipment
equipment which has two connections to the high voltage line

Note 1 to entry: The terminals and the top connection are designed to carry the line current under normal conditions.

3.1.25
line trap-connected coupling/filter capacitor
coupling/filter capacitor which supports a line trap on its top

Note 1 to entry: In this case, the two connections to the line trap carry the HV line current and one connection from the line trap to the capacitor carries the current of the capacitor

Note 2 to entry: The pedestal-mounting line traps in two phases generate additional forces during a short circuit in more than one phase.

3.2 Coupling capacitor terms and definitions

3.2.1
coupling capacitor
capacitor used for the transmission of signals in a power system

[SOURCE: IEC 60050-436:1990, 436-02-11]

iTeh STANDARD PREVIEW
(standards.iteh.ai)
IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

3.2.2
(capacitor) element
device consisting essentially of two electrodes separated by a dielectric

3.2.3
(capacitor) unit
assembly of one or more capacitor elements in the same container with terminals brought out

[SOURCE: IEC 60050-436:1990, 436-01-04]

3.2.4
(capacitor) stack
assembly of capacitor units connected in series

[SOURCE: IEC 60050-436:1990, 436-01-05]

3.2.5
capacitor
general term used when it is not necessary to state whether reference is made to a capacitor unit or to a capacitor stack

3.2.6
rated capacitance of a capacitor C_R
capacitance value for which the capacitor has been designed

Note 1 to entry: This definition applies:

- for a capacitor unit, to the capacitance between the terminals of the unit;
- for a capacitor stack, to the capacitance between line and low voltage terminals or between line and earth terminals of the stack

3.2.7
low voltage terminal of a coupling capacitor
terminal (N_{HF}) intended for connection to earth either directly or via a drain coil of negligible value of impedance, at rated frequency, for power line carrier (PLC) application

[SOURCE: IEC 60050-436:1990, 436-03-04, modified]

3.2.8
capacitance tolerance
permissible difference between the actual capacitance and the rated capacitance under specified conditions

[SOURCE: IEC 60050-436:1990, 436-04-01]

3.2.9
equivalent series resistance of a capacitor
virtual resistance which, if connected in series with an ideal capacitor of capacitance value equal to that of the capacitor in question, would have a power loss equal to the active power dissipated in that capacitor under specified operating conditions at a given high frequency

3.2.10
capacitor losses
active power dissipated in the capacitor

[SOURCE: IEC 60050-436:1990, 436-04-10]

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.2.11
tangent of the loss angle (tanδ) of a capacitor
ratio between the active power P_a and the reactive power P_r: tanδ = P_a/P_r

IEC 60358-1:2012
https://standards.iteh.ai/catalog/standards/sist/cecbdcea-ac8a-4cdb-b32f-b638280eac30/iec-60358-1-2012

3.2.12
temperature coefficient of capacitance T_C
fractional change of the capacitance for a given change in temperature:

$$T_K = \frac{\Delta C}{Co\,\Delta T}\,\frac{1}{K} or \frac{1}{°C}$$

ΔC represents the observed change in capacitance over the temperature interval ΔT

$C_{20\,°C}$ represents the capacitance measured at 20 °C

Note 1 to entry: The term $\Delta C/\Delta T$ according to this definition is usable only if the capacitance is an approximate linear function of the temperature in the range under consideration. If not, the temperature dependency of the capacitance should be shown in a graph or a table.

3.2.13
dielectric of a capacitor
insulating material between the electrodes

Note 1 to entry: The major insulation generally consists of paper, plastic film, or a mixed of paper and plastic film subsequently treated and impregnated with oil or gas at atmospheric pressure or higher.

4 Service conditions

4.1 General

Detailed information concerning classification of environmental conditions is given in the IEC 60721 series.