IEC 60358-4

Edition 1.0 2018-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Coupling capacitors and capacitor dividers –
Part 4: DC or AC single-phase capacitor dividers

Condensateurs de couplage et diviseurs capacitifs –
Partie 4: Diviseurs capacitifs monophasés pour courant alternatif ou pour courant continu

IEC 60358-4:2018-07(en-fr)

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

Tel.: +41 22 919 02 11
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.

IEC Catalogue - 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
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 It also gives information on projects, replaced and withdrawn publications.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
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
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
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
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) 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 IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC 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.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. 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 de termes électroniques et électriques. Il contient 21 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
67 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

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

IEC 60358-4

Edition 1.0 2018-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Coupling capacitors and capacitor dividers –
Part 4: DC or AC single-phase capacitor dividers

Condensateurs de couplage et diviseurs capacitifs –
Partie 4: Diviseurs capacitifs monophasés pour courant alternatif ou pour courant continu

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 29.120.99; 29.240.99; 31.060.70

ISBN 978-2-8322-5863-7

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.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

____

COUPLING CAPACITORS AND CAPACITOR DIVIDERS –

Part 4: DC or AC single-phase capacitor dividers

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.

International Standard IEC 60358-4 has been prepared by IEC technical committee 33: Power capacitors and their applications.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
33/616/FDIS	33/617/RVD

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

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

A list of all Parts in the IEC 60358 series, published under the general title *Coupling capacitors and capacitor dividers*, can be found on the IEC website.

Parts 2 through 4 of IEC 60358 are to be used in conjunction with the latest edition of IEC 60358-1 and its amendments. They were established on the basis of the first edition (2012) of that standard.

Parts 2 through 4 of IEC 60358 supplement or modify the corresponding clauses in IEC 60358-1.

When a particular subclause of Part 1 is not mentioned in Parts 2 through 4, that subclause applies as far as is reasonable. When this document states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

For additional clauses, subclauses, figures, tables or annexes, the following numbering system is used:

- subclauses, tables and figures which are additional to those in Part 1 are numbered starting from 200 for Part 2, 300 for Part 3 and 400 for Part 4;
- additional tables or annexes in the remaining Parts are lettered 2A, 2B, 3A, 3B, etc.
- as the notes are integrated into the clauses, their numbering are starting from 1 as usual.

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

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

INTRODUCTION

This series consists of the following Parts:

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

IEC 60358-2, *Coupling capacitors 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, *Coupling capacitors and capacitor dividers – Part 3: AC or DC coupling capacitor for harmonic-filters applications*

IEC 60358-4, *Coupling capacitors and capacitor dividers – Part 4: DC or AC single-phase capacitor dividers*

COUPLING CAPACITORS AND CAPACITOR DIVIDERS –

Part 4: DC or AC single-phase capacitor dividers

1 Scope

This Part 4 of IEC 60358 applies to DC or AC single-phase capacitor-dividers connected between line and ground used for manufacturing Voltage Transformers as well as for other applications.

NOTE 1 Diagrams of dividers to which this standard applies are given in Figures 401 and 402 (402.1 and 402.2).

NOTE 2 This standard specifies the basic requirements of the dividers; the requirements of the complete Voltage Transformers are given in the IEC 61869 series.

2 Normative references

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.

IEC 60358-1:2012, *Coupling capacitors and capacitor dividers – Part 1: General rules*

3 Terms and definitions

Clause 3 of IEC 60358-1:2012 is applicable with the following additional text:

Subclause 3.1.6 is applicable with the following additional Note:

NOTE For DC voltage divider, U_m include also peak voltage of harmonics.

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.400 Voltage divider definitions

3.400.1
voltage divider
device comprising resistors, inductors, capacitors, transformer(s) or a combination of these components such that, between two points of the device, a desired fraction of the voltage applied to the device as a whole can be obtained

Note 1 to entry: In this standard, voltage divider consists on HV-part, internal and/or external LV-part.

[SOURCE: IEC 60050-312:2001, 312-02-32]

3.400.2
rated primary voltage
U_{pr}
value of the primary voltage which appears in the designation of the voltage divider and on which its performance is based

Note 1 to entry For a divider the performance is everything concerning the measurement behaviour: transformation ratio, accuracy, burden, input voltage range, etc.

[SOURCE: IEC 60050-321:1986, 321-01-12, modified ("voltage transformer" replaced by "voltage divider", Note 1 to entry added)]

3.400.3
rated secondary voltage
U_{sr}
value of the secondary voltage which appears in the designation of the voltage transformer and on which its performance is based

[SOURCE: IEC 60050-321:1986, 321-01-16]

3.400.4
capacitor voltage divider
C-Divider
voltage divider consisting only of capacitors

[SOURCE: IEC 60050-321:1986, 321-03-15]

3.400.5
R-C voltage divider
RC-Divider

voltage divider consisting capacitors with parallel connected resistors

3.400.6
C-R voltage divider
CR-divider
voltage divider consisting capacitors with series connected resistors

3.400.7
R-C-R voltage divider
RCR-divider
voltage divider consisting capacitors with series & parallel connected resistors

3.400.8
rated capacitance of divider C_R
capacitance value for which the divider has been designed

(resultant capacitance: $C_R = C_1 \times C_2/(C_1 + C_2)$)

Note 1 to entry: C_1 and C_2 are as presented in Figure 401.

3.400.9
rated parallel resistance of divider R_{PR}
resistance value for which the RC- & RCR-voltage divider has been designed

(resultant resistance: $R_{PR} = R_{P1} + R_{P2}$)

Note 1 to entry: R_{P1} and R_{P2} are as presented in Figure 401.

3.400.10
rated series resistance of divider R_{SR}
resistance value for which the CR- & RCR-voltage divider has been designed

(resultant resistance: $R_{SR} = R_{S1} + R_{S2}$)

Note 1 to entry: R_{S1} and R_{S2} are as presented in Figure 401.

3.400.11
high-voltage capacitor
capacitor connected between the high-voltage terminal and the intermediate voltage terminal of a capacitor divider

SEE: Figures 402.1 to 402.2.

[SOURCE: IEC 60050-436:1990, 436-02-12]

3.400.12
intermediate voltage capacitor
capacitor connected between the intermediate voltage terminal and the low-voltage terminal of a capacitor divider

SEE: Figures 402.1 to 402.2.

[SOURCE: IEC 60050-436, 436-02-13]

3.400.13
ratio of a capacitor divider (voltage ratio)
ratio of the rated primary voltage applied to the capacitor divider (U_{pr}) to the open-circuit intermediate voltage

Note 1 to entry: This ratio corresponds to the sum of the capacitances of the high voltage and intermediate voltage capacitors divided by the capacitance of the high voltage capacitor:

$$(C_1 + C_2)/C_1$$

Note 2 to entry: C_1 and C_2 include the stray capacitances, which are generally negligible.

[SOURCE: IEC 60050-436:1990, 436-04-05, modified (addition of "(U_{pr})", addition of Notes to entry)]

4 Service conditions

Clause 4 of IEC 60358-1:2012 is applicable, unless otherwise specified in the specific product standard.

5 Ratings

Clause 5 of IEC 60358-1:2012 is applicable, unless otherwise specified in the specific product standard.

6 Design requirements

Clause 6 of IEC 60358-1:2012 is applicable, with the following additions and replacements:

6.1 Insulation requirements

6.1.400 AC applications

Subclause 6.1 of IEC 60358-1:2012 is applicable, unless otherwise specified in the specific product standard.

6.1.401 DC applications

Subclause 6.1 of IEC 60358-1:2012 is applicable with the following replacement for DC withstand voltage test

For DC application, the DC withstand voltage test is defined with a factor F_T = 1,5. The voltage shall be applied during one hour in both polarities, unless otherwise specified in the specific product standard.

DC-test voltage = ($F_T \times U_m$) = 1,5 × U_m.

6.2 Other insulation requirements

Subclause 6.2 of IEC 60358-1:2012 is applicable except for the following modifications in 6.2.1 and 6.2.2:

6.2.1 Low voltage terminal not exposed to weather

Replace Subclause 6.2.1 of IEC 60358-1:2012 with the following new subclause:

6.2.1.400 Intermediate voltage terminal and low voltage terminal non exposed to weather

Intermediate voltage terminal and low voltage terminal shall withstand an AC voltage of 3 kV against earth terminal, unless otherwise specified in the specific product standard.

If the intermediate voltage is higher than 0,72/√3 kV, the test voltage has to be adapted according to Table 3 of 60358-1:2012.

6.2.2 Low voltage terminal exposed to weather

Subclause 6.2.2 of IEC 60358-1:2012 is applicable, with the following addition:

6.2.2.400 Intermediate voltage terminal exposed to weather

Intermediate voltage terminal shall withstand the AC voltage test according to Subclause 6.2.2 of IEC 60358-1:2012, unless otherwise specified in the specific product standard.

6.3 Electromagnetic emission requirements – Radio interference voltage (RIV)

Subclause 6.3 of IEC 60358-1:2012 is applicable, with the following modification: Delete Note 2.

Annex C of IEC 60358-1:2012 is applicable, with the following modification: Delete Note 3.

6.4 Mechanical requirements

Subclause 6.4 of IEC 60358-1:2012 is applicable, unless otherwise specified in the specific product standards.

7 Test conditions

Clause 7 of IEC 60358-1:2012 is applicable.

8 Classification of tests

8.1 General

Clause 8 of IEC 60358-1:2012 is applicable.

8.2 Routine tests

Subclause 8.2 of IEC 60358-1:2012 is applicable with the following additions:

8.2.400 Routine tests for voltage divider

Subclause 9.2.400.2 gives supplementary information how to perform the power frequency withstand voltage test on an intermediate terminal.

The following supplementary tests shall be done:

a) Verification of terminal marking (9.2.400.3)

8.3 Type tests

Subclause 8.3 of IEC 60358-1:2012 is applicable.

8.4 Special tests

Subclause 8.4 of IEC 60358-1:2012 is applicable.

9 Routine tests

Clause 9 of IEC 60358-1:2012 is applicable with the following additions:

9.1 Tightness of the liquid-filled equipment

Subclause 9.1 of IEC 60358-1:2012 is applicable.

NOTE Tightness test for gas insulated equipment is specified in Subclause 9.1.2 of IEC 60358-1:2012.

9.2 Electrical tests

Subclause 9.2 of IEC 60358-1:2012 is applicable, with the following additions:

9.2.400 Electrical tests for divider

9.2.400.1 General

The routine tests on the capacitor part are specified in Subclause 8.2 of IEC 60358-1:2012 with the following modifications:

9.2.400.1.1 Capacitance, tanδ and resistance measurement

The HV-capacitance shall be measured as in Subclause 9.2.2 of IEC 60358-1:2012.

The LV-capacitance can be measured with different methods (for ex: RLC bridge, etc.).